Maintenance and Service Guide

HP mt45 Mobile Thin Client

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**.

Software terms

Important Notice about Customer Self-Repair Parts

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

Safety warning notice

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

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1 Product description

Table 1-1 Product components and their descriptions

Category	Description
Product Name	HP mt45 Mobile Thin Client
Processors	AMD® Ryzen™ 3 PRO 3300U Mobile Processor with Radeon™ Vega Graphics
Graphics	**Internal graphics**
	Radeon Vega Graphics
	Supports HD decode, DX12, HDMI 2.0, HDCP 2.2 via HDMI or DisplayPort™ up to 4K @ 60 Hz
	Supports independent displays through docking stations as follows:
	• HP UltraSlim Docking Station–maximum resolution = dual 2K @ 60 Hz, single 4K @ 60 Hz, 1920 × 1200 @ 60 Hz (VGA); dock connectors: 1 VGA, 2 DisplayPorts
	• HP USB-C Dock G4–maximum resolution = dual 2K @ 60 Hz, single 4K @ 60 Hz; dock connectors: 1 HDMI, 2 DisplayPorts
	• HP Elite USB-C Dock G5–maximum resolution = dual 2K @ 60 Hz, single 4K @ 60 Hz; dock connectors: 1 HDMI, 2 DisplayPorts
	• HP USB-C/A Universal Dock G2–maximum resolution = three 4K @ 60 Hz via USB Type-C, dual 4K @ 60 Hz; dock connectors via USB Type-A: 1 HDMI, 2 DisplayPorts
	• HP Thunderbolt Dock–maximum resolution = dual 2K @ 60 Hz, single 4K @ 60 Hz, 1600 × 900 (VGA); dock connectors: 1 HDMI, 2 DisplayPorts, 1 VGA
Panel	Supports privacy filter and narrow bezel
	35.6 cm (14.0 in), UWVA, non-touch
	Full high-definition (FHD) (1920 × 1080), antiglare, 250 nits, 45% CG, eDP, slim, without camera
	FHD (1920 × 1080), antiglare, 250 nits, 45% CG, eDP, slim, with HD camera
	FHD (1920 × 1080), antiglare, 250 nits, 45% CG, eDP, slim, with HD + IR camera
	FHD (1920 × 1080), antiglare, 250 nits, 45% CG, eDP, slim, without camera, with WWAN
	FHD (1920 × 1080), antiglare, 250 nits, 45% CG, eDP, slim, with HD camera, with WWAN
	FHD (1920 × 1080), antiglare, 250 nits, 45% CG, eDP, slim, with HD + IR camera, with WWAN
	FHD (1920 × 1080), antiglare, 1000 nits, 72% CG, eDP + PSR, flat, Ambient Light Sensor, privacy, with HD + IR camera, with WWAN
	35.6 cm (14.0 in), UWVA, touch screen
	FHD (1920 × 1080), antiglare, 250 nits, 45% CG, eDP, slim, with HD + IR camera, with WWAN, TOP
Memory	Two memory module slots
	Memory is customer accessible/upgradeable
	DDR4-2400 dual channel support
	Supports up to 8 GB of system RAM in the following configurations:

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

Category	Description
	● 8192 MB (8192 MB × 1 or 4096 MB × 2)
	● 4096 MB (4096 MB × 1) (available only with HP ThinPro)
Primary storage	128 GB, SATA-3, SS, TLC, M.2 (2280), NGFF, solid-state drive
Audio and video	HP Bang & Olufsen Audio
	Multi-array microphone (including rear-facing 3rd microphone)
	Stereo speakers (2) (13 mm × 38 mm × 4 mm)
	Webcam HD RGB 720p
	Webcam HD RGB 720p + IR
	Camera privacy cover
	Supports WDR (Wide Dynamic Range)
	Support for models without camera
RJ-45 (network)	RTL8111EPH-CG (DASH)
	The following support S3/S5 wake on LAN/HBMA (via out of band): HP USB–C Dock G4, HP Thunderbolt Dock 120 W G2, HP USB–C Mini Dock, HP Elite USB–C Dock G5, and HP USB–C Universal Dock G2
	The following support S0/S3/S5 MAPT (via out of band): HP USB–C Dock G4, HP Thunderbolt Dock 120 W G2,, HP USB–C Mini Dock, HP Elite USB–C Dock G5, and HP USB–C Universal Dock G2
Wireless networking	**Bluetooth®**
	Bluetooth 5.0 support
	Wireless local area network (WLAN)
	Integrated WLAN options with dual antennas (M.2 2230 socket PCIe/USB):
	● Intel Wireless-AC 9260 802.11ac 2 × 2 Wi–Fi + Bluetooth 5.0 (non-vPro, supporting Gigabit Wi-Fi speeds)
	Two WLAN antennas built into bottom of display assembly
	Compatible with Wi-Fi CERTIFIED Miracast™-certified devices
	Supports HP Connection Optimizer with data analytics
	Supports WoWLAN S3
	Supports HP LAN-Wireless Protection (WLAN/LAN/WWAN switching)
	Supports Static BIOS SAR
	Supports Turbo Lite Wi-Fi
	Supports Fast PCIe Error Identification
	Near-Field Communication (NFC)
	NXP NPC300 Near Field Communication Module (NXP NPC300 I2C 10 mm x 17 mm)
	NFC antenna
	Support for models without NFC

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

Category	Description
	Wireless wide area network (WWAN)
	Two WWAN antennas (worldwide 5 band, configured at top of display panel)
	Supports the following WWAN formats:
	Integrated WWAN options with dual antennas (M.2 30 × 42 socket PCIe):
	• Intel XMM™ 7360 LTE-Advanced (CAT 9)
	Support for models without WWAN
	Support for WWAN after market option (AMO)
Ports	USB Type-C (Alt mode)
	USB 3.1 Gen 1 port
	USB 3.1 Gen 1 charging port
	HDMI 2.0 connector
	RJ-45 (network) connector
	Docking connector
	Audio-out (headphone)/audio-in (microphone) combo jack
	AC port
Sensors	Ambient light sensor (ALS)
	Hall sensor
Keyboard/pointing devices	**Keyboard**
	HP Collaboration Keyboard
	• Dual point, non-backlit, spill resistant with drain
	• Dual point, backlit, spill resistant with drain, with HP Dura Keys
	• Dual point, backlit, spill resistant with drain, with HP Dura Keys, privacy
	Touchpad
	Support for Microsoft® precision touchpad default gestures
Power requirements	**Battery**
	HP Long Life Lithium Polymer Soft Pack Battery, 3 cell, 50 Wh
	HP Fast Charge Technology
	AC adapter
	65 W Smart right angle, 4.5 mm
	65 W Smart right angle, 4.5 mm - Argentina
	65 W Smart right angle, 4.5 mm - EM
	65 W Straight USB Type C
	45 W Smart right angle, 4.5 mm

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

Category	Description
	45 W Smart right angle, 4.5 mm – Argentina
	45 W Smart right angle, 4.5 mm, 2 prong (Japan only)
	45 W Straight USB Type C
	Power cord
	2-wire plug (C7), 1.0 m
	3-wire plug (C5), 1.8 m
	3-wire plug (C5), 1.0 m
	Duckhead power cord (C5) 1.0 m
	Duckhead power cord (C5) 1.8 m
	Duckhead power cord (C5)
Security	Security lock
	Trusted Platform Module (TPM) 2.0 (Infineon, soldered down)
	Touch fingerprint sensor (landed, touch with 8 × 8 sensor)
	Support for models without a fingerprint reader
	Smart card reader (active)
	Support for models without a smart card reader
	Preboot authentication (password, smart card)
	Hardware enforced Firmware Protection: HP Hardware Root of Trust + Sure Start Gen5
Operating system	Operating system version: ThinPro
	HP ThinPro 7.x
	HP Smart Zero Core
	Windows 10 IoT 64 Enterprise 2019 LTSC
Serviceability	**End user replaceable parts**
	AC adapter
	Solid-state drive
	Memory module
	WLAN module
	WWAN module
	Keyboard

2 Components

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

📝 **NOTE:** Some actions in this user guide may require Admin logon. If you are unable to access the information below and throughout this user guide by following the instructions, then you must first log in to the system using the Admin account.

Right

Table 2-1 Right-side components and their descriptions

Component		Description
(1)	SIM card slot	Supports a wireless subscriber identity module (SIM) card. The SIM card slot is located on the side of the computer.
(2)	Audio-out (headphone)/Audio-in (microphone) combo jack	Connects optional powered stereo speakers, headphones, earbuds, a headset, or a television audio cable. Also connects an optional headset microphone. This jack does not support optional standalone microphones.
		WARNING! To reduce the risk of personal injury, adjust the volume before putting on headphones, earbuds, or a headset. For additional safety information, 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.
(3)	USB SuperSpeed port	Connects a USB device, such as a cell phone, camera, activity tracker, or smartwatch, and provides high-speed data transfer.
(4)	HDMI port	Connects an optional video or audio device, such as a high-definition television, any compatible digital or audio component, or a high-speed High Definition Multimedia Interface (HDMI) device.

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

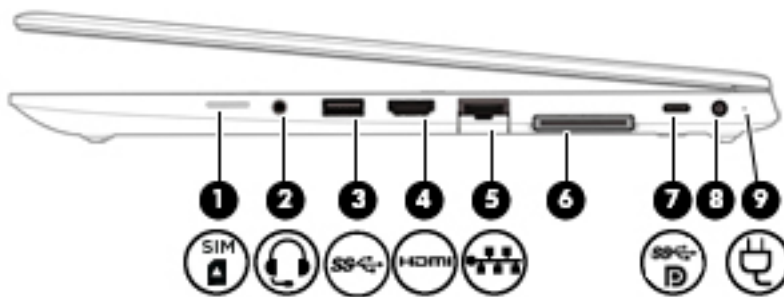| Component		Description
(5)	RJ-45 (network) jack/status lights	Connects a network cable.
		• Green (left): The network is connected.
		• Amber (right): Activity is occurring on the network.
(6)	Docking connector	Connects an optional docking device.
(7)	USB Type-C SuperSpeed port and DisplayPort connector	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.
(8)	Power connector	Connects an AC adapter.
(9)	Battery light	When AC power is connected:
		• White: The battery charge is greater than 90 percent.
		• Amber: The battery charge is from 0 to 90 percent.
		• Off: The battery is not charging.
		When AC power is disconnected (battery not charging):
		• Blinking amber: The battery has reached a low battery level. When the battery has reached a critical battery level, the battery light begins blinking rapidly.

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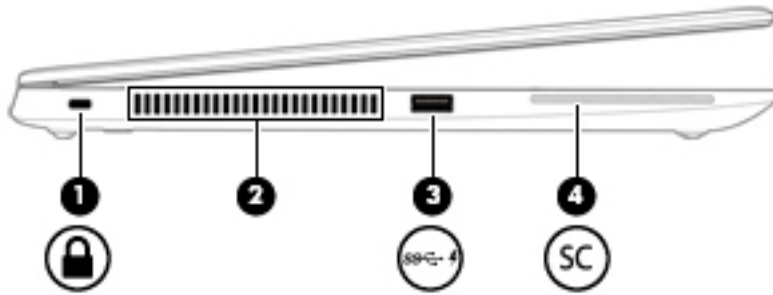
Table 2-2 Left-side components and their descriptions

Component		Description
(1)	Security cable slot	Attaches an optional security cable to the computer.
		NOTE: The security cable is designed to act as a deterrent, but it may not prevent the computer from being mishandled or stolen.
(2)	Vent	Enables airflow to cool internal components.
		NOTE: The computer fan starts up automatically to cool internal components and prevent overheating. It is normal for the internal fan to cycle on and off during routine operation.
(3)	USB SuperSpeed port with HP Sleep and Charge	Connects a USB device, provides high-speed data transfer, and even when the computer is off, charges most products such as a cell phone, camera, activity tracker, or smartwatch.
(4)	Smart card reader	Supports optional smart cards.

Displays
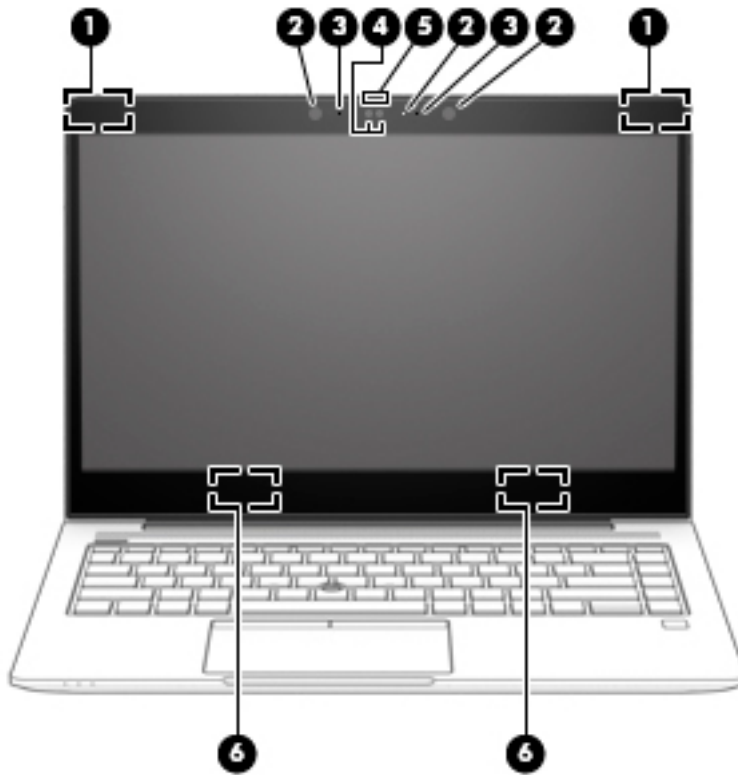
Table 2-3 Touch screen display components and their descriptions

	Component	Description
(1)	WWAN antennas* (select products only)	Send and receive wireless signals to communicate with wireless wide area networks (WWANs).
(2)	Infrared LEDs (2) and webcam LED (select products only)	On: One or more cameras are in use.
(3)	Internal microphones (2)	Record sound.
(4)	Camera(s) (select products only)	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, slide the cover to the right. ● To conceal the camera, slide the cover to the left.
(6)	WLAN antennas*	Send and receive wireless signals to communicate with wireless local area networks (WLANs).

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

Component	Description
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**.	

Table 2-4 Non-touch screen display components and their descriptions

Component		Description
(1)	WWAN antennas*(select products only)	Send and receive wireless signals to communicate with wireless wide area networks (WWANs).
(2)	Ambient light sensor (select products only)	Adjusts the brightness of the display, depending on the ambient light.
(3)	Infrared LEDs (2) and camera light (select products only)	On: One or more cameras are in use.
(4)	Internal microphones (2)	Record sound.
(5)	Camera(s) (select products only)	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.
(6)	Camera privacy cover (select products only)	When closed, the camera privacy cover conceals the camera.

Table 2-4 Non-touch screen display components and their descriptions (continued)

Component		Description
		● To reveal the camera, slide the cover to the right.
		● To conceal the camera, slide the cover to the left.
(7)	WLAN antennas*	Send and receive wireless signals to communicate with wireless local area networks (WLANs).

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

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

To access this guide:

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

Keyboard area

Touchpad
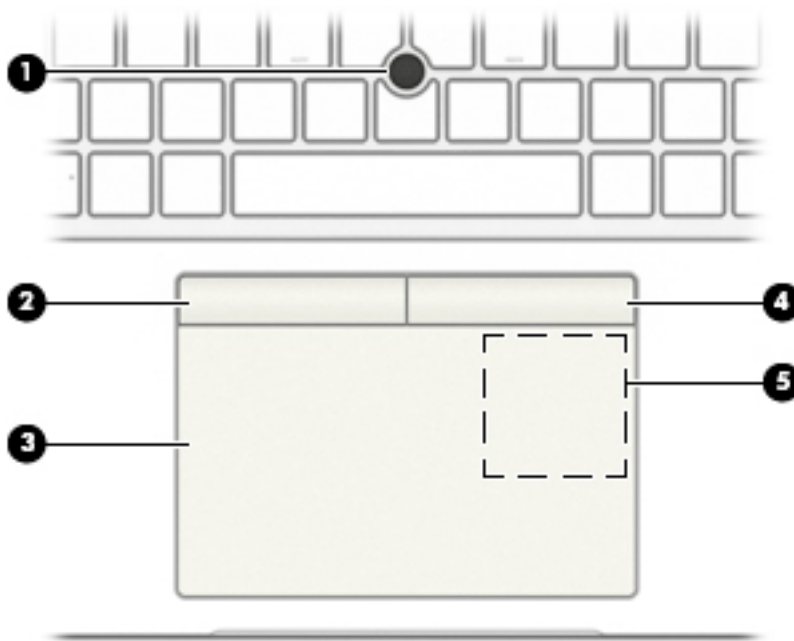
Table 2-5 Touchpad components and their descriptions

Component		Description
(1)	Pointing stick	Moves the pointer on the screen.
(2)	Left touchpad button	Functions like the left button on an external mouse.
(3)	Touchpad zone	Reads your finger gestures to move the pointer or activate items on the screen.
(4)	Right touchpad button	Functions like the right button on an external mouse.
(5)	Near Field Communications (NFC) tapping area and antenna*(select products only)	Allows you to wirelessly share information when you tap it with an NFC-enabled device.

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

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

To access this guide:

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

Lights

Table 2-6 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.
(2)	Caps lock light	On: Caps lock is on, which switches the key input to all capital letters.
(3)	Mute light	• On: Computer sound is off.
		• Off: Computer sound is on.
(4)	Microphone mute light	• On: Microphone is off.
		• Off: Microphone is on.
(5)	Num lk light	On: Num lock is on.
(6)	Wireless light	On: An integrated wireless device, such as a wireless local area network (WLAN) device and/or a Bluetooth® device, is on.
		NOTE: On some models, the wireless light is amber when all wireless devices are off.

Table 2-6 Lights and their descriptions (continued)

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

Buttons, vents, speakers, and fingerprint reader
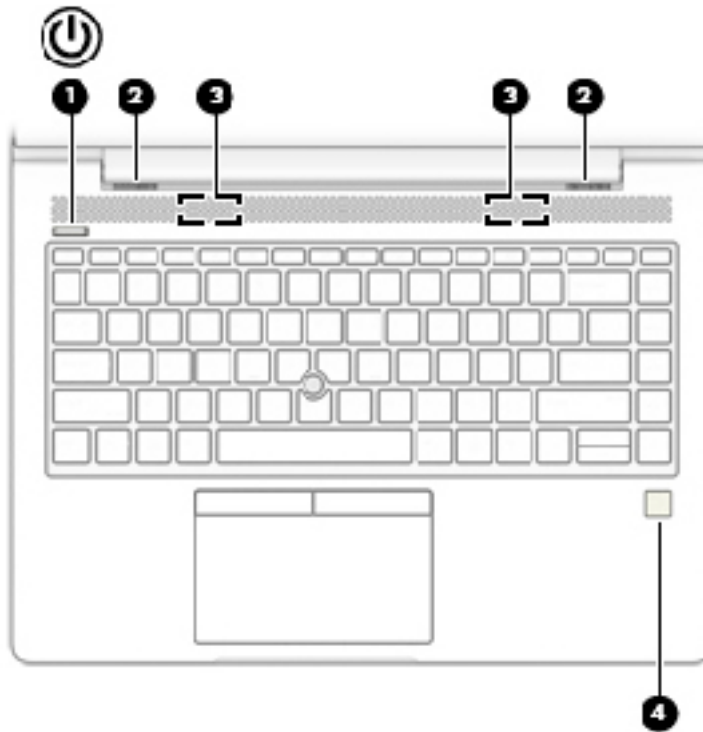
Table 2-7 Buttons, vents, speakers, and fingerprint reader and their descriptions

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).
		CAUTION: Pressing and holding down the power button results in the loss of unsaved information.
		If the computer has stopped responding and shutdown procedures are ineffective, press and hold the power button for at least 5 seconds to turn off the computer.
		To learn more about your power settings, see your power options.
		▲ Right-click the **Power meter** icon and then select **Power Options**.
(2)	Vents	Enable airflow to cool internal components.
		NOTE: The computer fan starts up automatically to cool internal components and prevent overheating. It is normal for the internal fan to cycle on and off during routine operation.
(3)	Speakers	Produce sound.
(4)	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 2-8 Special keys and their descriptions

Component		Description
(1)		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.
(2)	⊞	Windows key	Opens the Start menu.
			NOTE: Pressing the Windows key again will close the Start menu.
(3)		Action keys	Execute frequently used system functions.
(4)		Embedded numeric keypad	A numeric keypad superimposed over the keyboard alphabet keys. When 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.
(5)	▤	Windows application key	Displays options for a selected object.
(6)		num lk key	Turns the embedded numeric keypad on and off.

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 2-9 Hot keys and their descriptions

Key	Description
C	Turns on scroll lock.
R	Breaks the operation.
S	Sends a programing query.

Bottom
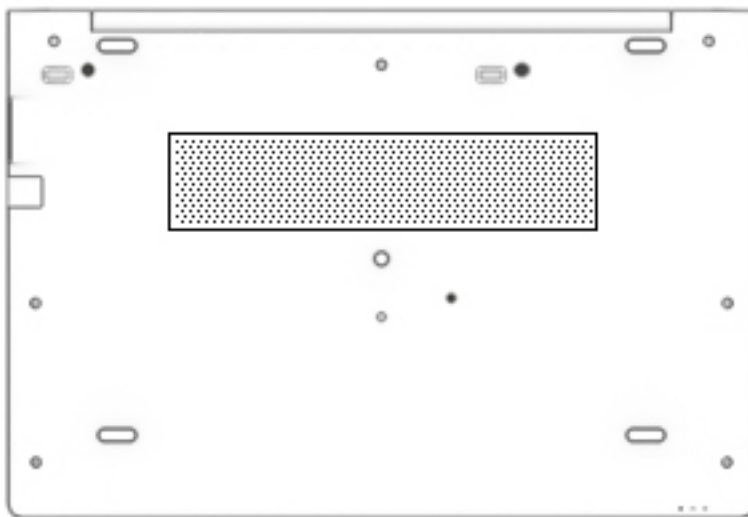
Table 2-10 Bottom components and their descriptions

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

Front

Table 2-11 Front components 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.
(2)	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.
(3)	Drive light	Blinking white: The hard drive is being accessed.
(4)	Internal microphones (2)	Record sound.

Labels

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

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

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

  Your service label will resemble one of the examples shown below. Refer to the illustration that most closely matches the service label on your computer.
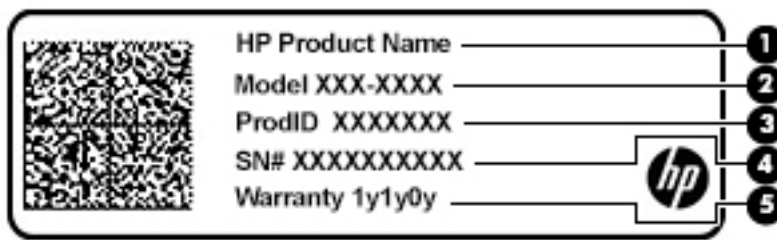
Table 2-12 Service label components

Component	
(1)	HP product name
(2)	Model number
(3)	Product ID
(4)	Serial number
(5)	Warranty period
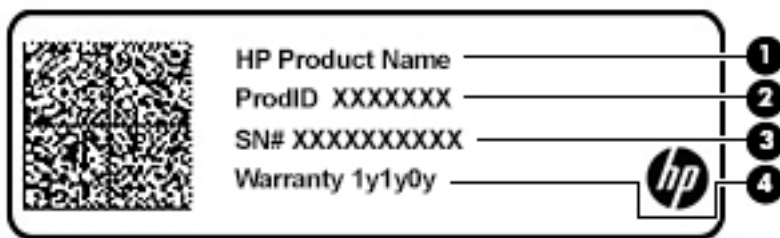
Table 2-13 Service label components

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

Table 2-13 Service label components (continued)

Component	
(3)	Serial number
(4)	Warranty period

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

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

3   Illustrated parts catalog

Computer major components

Table 3-1 Computer major components and their descriptions

Item	Component	Spare part number
	Display assembly	
	Display assemblies are available as spare parts at the subcomponent level only. For more display assembly spare part information, see Display assembly subcomponents on page 22.	
(1)	Non-touch display	not available as a whole assembly
(2)	Touch display	not available as a whole assembly
(3)	**Keyboard** (backlit)	L14377-xx1
	For a list of keyboard country codes, see Keyboard on page 40.	
(4)	**Top cover** (includes power button)	L62293-001
(5)	**RJ-45 board with bracket**	L14386-001
(6)	**Touchpad**	
	For use in models without an NFC module	L62731-001
	For use in models with an NFC module	L62732-001
(7)	**Touchpad button board**	L18311-001
(8)	**RTC battery**	L17255-001
(9)	**Power button board** (includes cable)	L62738-001
(10)	**USB board** (includes bracket and cable)	L62735-001
(11)	**USB board bracket** (included in the Bracket Kit)	L62737-001
(12)	**Fingerprint reader assembly** (includes cable)	L62741-001
	NOTE: The fingerprint reader bracket is included in the Bracket Kit, spare part number L62737-001.	
(13)	**NFC module** (includes antenna and touchpad foam)	L14385-001
(14)	**Speakers** (includes cable)	L62736-001
(15)	**Smart card reader board**	L62733-001
	NOTE: The smart card reader pass-thru board (for use in models without a smart card) is available as spare part number L62743-001.	
(16)	**System board** (includes AMD Ryzen 3 PRO 3300U Mobile Processor with Radeon Vega Graphics and replacement thermal material)	L62972-301
(17)	**Fan**	L62739-001
(18)	**Heat sink**	L68813-001
(19)	**Memory module** (DDR-2666)	
	4 GB	L10598-850
(20)	**WLAN/Bluetooth combo card**	
	Intel Wireless-AC 9260 802.11ac 2 × 2 Wi-Fi + Bluetooth 5.0 (non-vPro, supporting Gigabit Wi-Fi speeds)	920687-001

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

Item	Component	Spare part number
(21)	**WWAN module**	
	Intel XMM 7360 LTE-Advanced (CAT 9)	L15398-001
(22)	**Solid-state drive (SSD)**	
	128 GB, SATA-3, TLC	L62973-001
(23)	**Battery** (3 cell, 50 Wh, 4.33 Ah)	933321-855
(24)	**Bottom cover**	L62728-001

Display assembly subcomponents
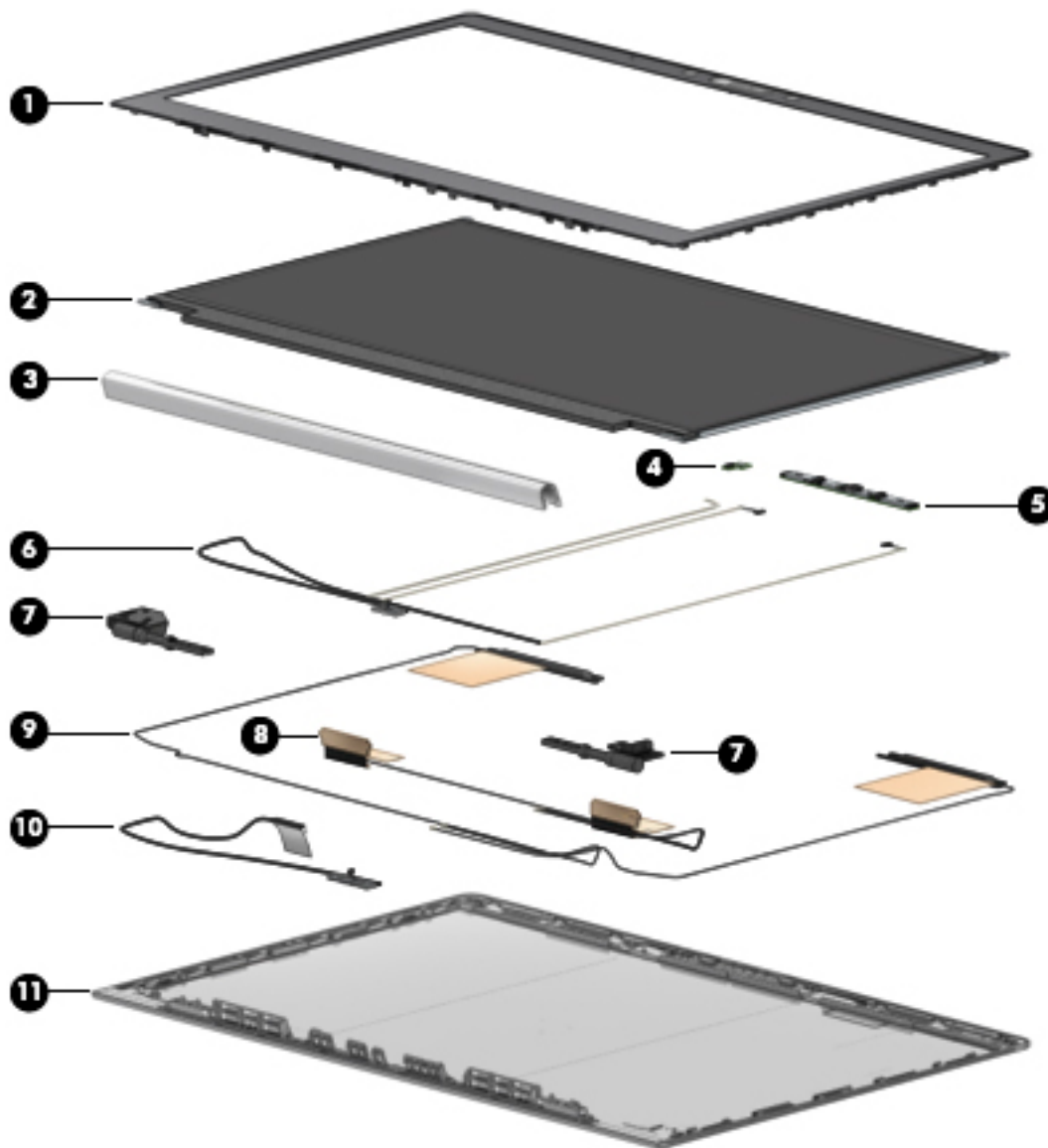
Table 3-2 Display components and their descriptions

Item	Component	Spare part number
(1)	**Bezel**	
	For use in models with microphone modules	L62747-001
	For use in models with an HD camera (includes camera privacy cover)	L62748-001
	For use in models with an IR camera (includes camera privacy cover)	L62749-001
(2)	**Raw panel**	
	FHD, non-touch, 250 nits	L62773-001
	FHD, non-touch, privacy	L62774-001
	FHD, touch-on panel (TOP), privacy, 1000 nits	L62771-001
(3)	**Hinge cover**	L14376-001 (Hinge Kit)
(4)	**Ambient light sensor board** (includes double-sided tape)	L62745-001
(5)	**Camera module**	
	HD camera	L62742-001
	IR camera	L64702-001
	Microphone module (includes double-sided tape, not shown)	L62744-001
(6)	**Camera cable** (HD and IR models)	L64668-001 (Cable Kit)
(7)	**Hinges (left and right)**	L14376-001 (Hinge Kit)
(8)	**WLAN antenna** (available with display enclosure)	
(9)	**WWAN antenna** (available with display enclosure)	
(10)	**Display cable**	L64668-001 (Cable Kit)
(11)	**Display enclosure** (includes tape, gasket, and foam for display)	L62729-001

Plastics Kit
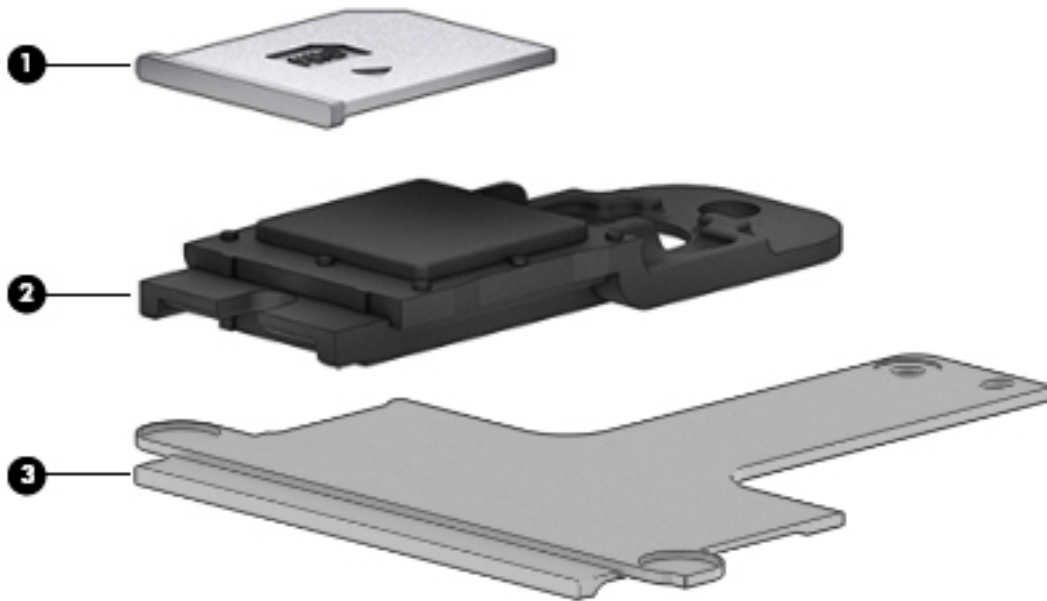
Table 3-3 Plastics Kit components and their descriptions

Item	Component	Spare part number
	Plastics kit	L60631-001
(1)	SIM card reader insert	
(2)	Fingerprint reader insert	
(3)	Smart card reader insert	
	Camera privacy cover (not illustrated)	

Cable Kit

Table 3-4 Cable Kit components and their descriptions

Description	Spare part number
Cable Kit, includes the following cables:	L64668-001
Pointing stick cable	
USB board cable	
Card reader cable	
Touchpad cable	
Fingerprint reader cable	
NFC cable	
Power button board cable	
FHD display panel cable	
UHD display panel cable	
TOP panel cable	
UHD display (600 nits) cable	
Privacy display, flat cable	
Privacy display TOP, cable	
Webcam/microphone cable	
IR webcam cable	
IR + ALS webcam cable	

Miscellaneous parts

Component	Spare part number
AC adapter (non-PFC, 4.5 mm):	
65 W HP Smart AC adapter, 3 prong	710412-001
65 W USB Type-C, nPFC, 1.8 m	L32392-001
65 W HP Smart AC Adapter for use in Argentina	710340-850
65 W HP Smart AC adapter, EM	913691-850
45 W USB Type-C, nPFC, wall mount, 1.8 m	L32390-001
45 W HP Smart AC adapter, 2 prong	742436-001
45 W HP Smart AC Adapter for use in Argentina	741553-852
45 W HP Smart AC adapter, nPFC, 4.5 mm	741727-001
Screw Kit	L14352-001
Hardware Kit, includes system board heat sink shielding and solid-state drive shielding	L68814-001
Bracket Kit (includes USB support bracket and fingerprint reader bracket)	L62737-001
Plastics Kit (includes SIM card insert, fingerprint reader insert, smart card insert, and camera privacy cover)	L60631-001

4 Removal and replacement procedures preliminary requirements

Tools required

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

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

Service considerations

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

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

Plastic parts

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

Cables and connectors

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

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

Drive handling

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

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

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

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

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

Avoid dropping drives from any height onto any surface.

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

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

Avoid exposing a drive to temperature extremes or liquids.

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

Workstation guidelines

Follow these grounding workstation guidelines:

- Cover the workstation with approved static-shielding material.
- Use a wrist strap connected to a properly grounded work surface and use properly grounded tools and equipment.
- Use conductive field service tools, such as cutters, screw drivers, and vacuums.
- When fixtures must directly contact dissipative surfaces, use fixtures made only of static-safe materials.
- Keep the work area free of nonconductive materials, such as ordinary plastic assembly aids and 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 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	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 18 for details.

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

There are as many as 12 screws that must be removed, replaced, and/or loosened when servicing Customer Self-Repair parts. Make special note of each screw size and location during removal and replacement.

Preparation for disassembly

See Removal and replacement procedures preliminary requirements on page 27 for initial safety procedures.

1. Turn off the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.

2. Disconnect the power from the computer by unplugging the power cord from the computer.

3. Disconnect all external devices from the computer.

Bottom cover

Table 5-1 Bottom cover description and part number

Description	Spare part number
Bottom cover	L62728-001

Before removing the bottom cover, follow these steps:

▲ Prepare the computer for disassembly (Preparation for disassembly on page 32).

Remove the bottom cover:

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

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

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

Reverse the removal procedures to install the bottom cover.

Solid-state drive (SSD)

Table 5-2 Solid-state drive description and part number

Description	Spare part number
128 GB, SATA-3, TLC	L62973-001
Solid-state drive shielding	L68814-001

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

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Disconnect the battery cable from the system board (see Battery on page 44).

Remove the solid-state drive:

1. Remove the Phillips M2.0 × 2.0 screw **(1)** that secures the drive to the system board.

2. Remove the drive by pulling it away from the connector **(2)**.

📝 **IMPORTANT:** When replacing the solid-state drive, remove the shielding from the old drive and install it on the replacement drive.
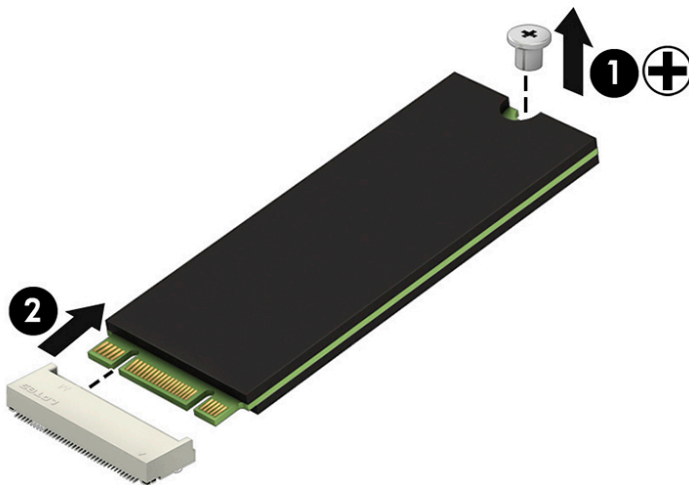
Reverse this procedure to install the solid-state drive.

Memory modules

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

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

Table 5-3 Memory module descriptions and part numbers

Description	Spare part number
4 GB (DDR-2666)	L10598-850

IMPORTANT: Before adding new memory, make sure you update the computer to the latest BIOS, available at www.hp.com.
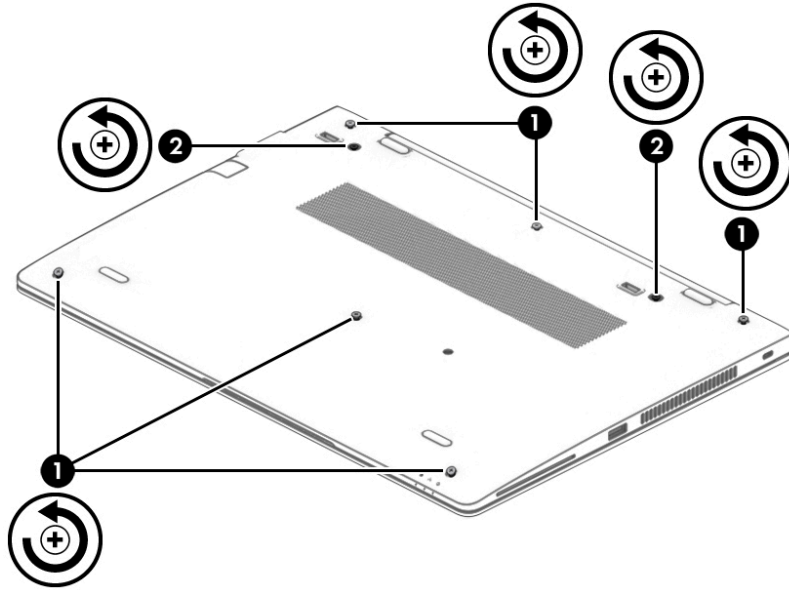
Before removing the memory module, follow these steps:

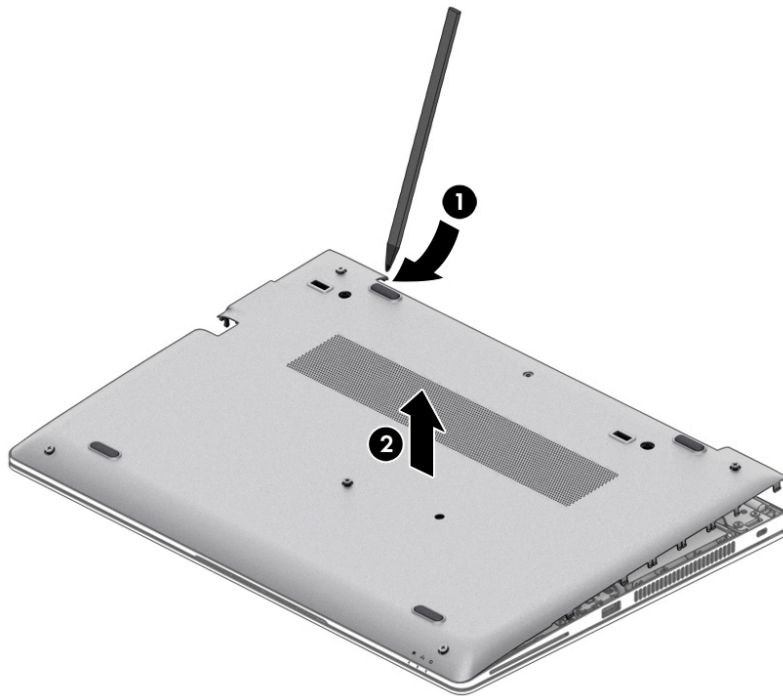1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Disconnect the battery cable from the system board (see Battery on page 44).

Remove the memory module:

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

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

   IMPORTANT: Do not remove memory shielding from the system board when replacing memory.

   NOTE: The computer uses two memory sockets. The socket labeled **2** houses the expansion memory module and the socket labeled **1** houses the primary memory module. The removal procedure is the same for both memory sockets.
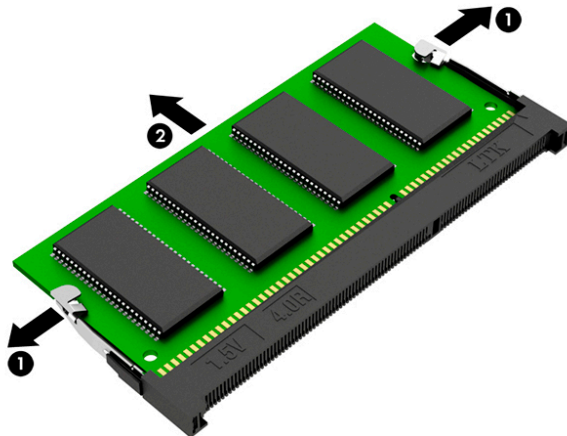
Reverse this procedure to install a memory module.

WLAN/Bluetooth combo card

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

The WLAN module and WWAN module are not interchangeable.

Table 5-4 **WLAN module description and part number**

Description	Spare part number
Intel Wireless-AC 9260 802.11ac 2 × 2 Wi-Fi + Bluetooth 5.0 (non-vPro, supporting Gigabit Wi-Fi speeds)	920687-001

Before removing the WLAN module, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Disconnect the battery cable from the system board (see Battery on page 44).

Remove the WLAN module:

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

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

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

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

> 📝 **NOTE:** WLAN modules are designed with a notch to prevent incorrect insertion.
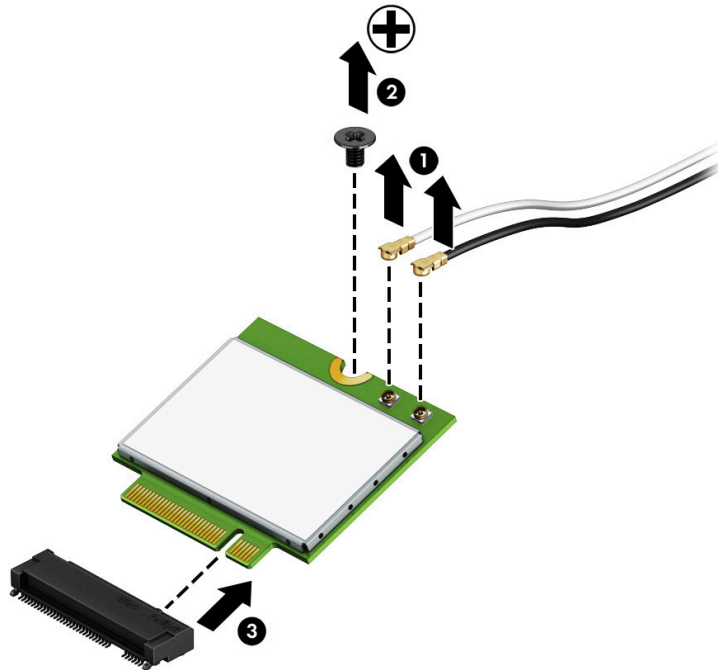
> 📝 **NOTE:** If the WLAN antennas are not connected to the terminals on the WLAN module, the protective sleeves must be installed on the antenna connectors, as shown in the following illustration.
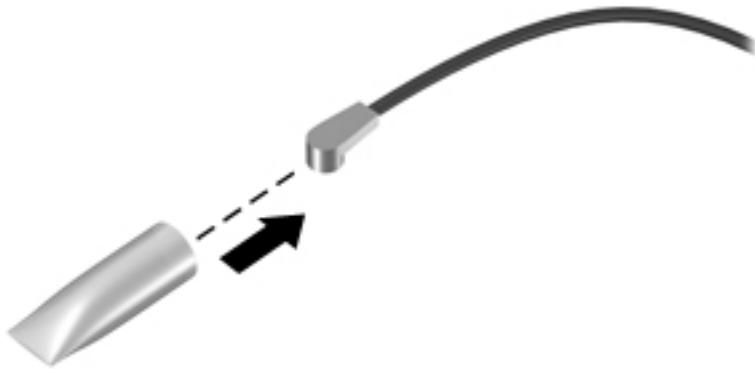
Reverse this procedure to install the WLAN module.

WWAN module

The WLAN module and WWAN module are not interchangeable.

The WWAN module is available on select models only.

Table 5-5 WWAN module descriptions and part numbers

Description	Spare part number
Intel XMM 7360 LTE-Advanced (CAT 9)	L15398-001

Before removing the WWAN module, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Disconnect the battery cable from the system board (see Battery on page 44).

Remove the WWAN module:

1. Position the computer upside-down.

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

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

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

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

📝 **NOTE:** WWAN modules are designed with a notch to prevent incorrect insertion.
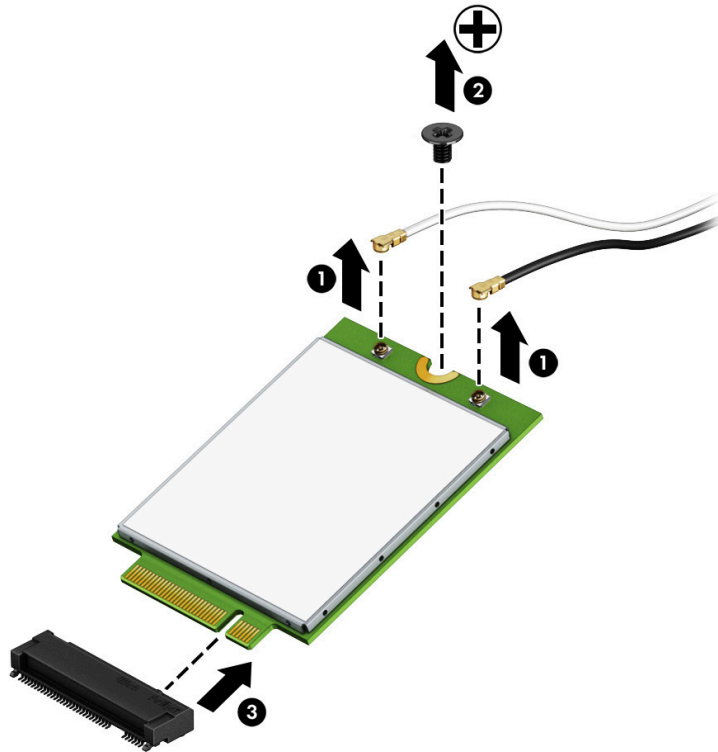
📝 **NOTE:** If the WWAN antennas are not connected to the terminals on the WWAN module, the protective sleeves must be installed on the antenna connectors, as shown in the following illustration.
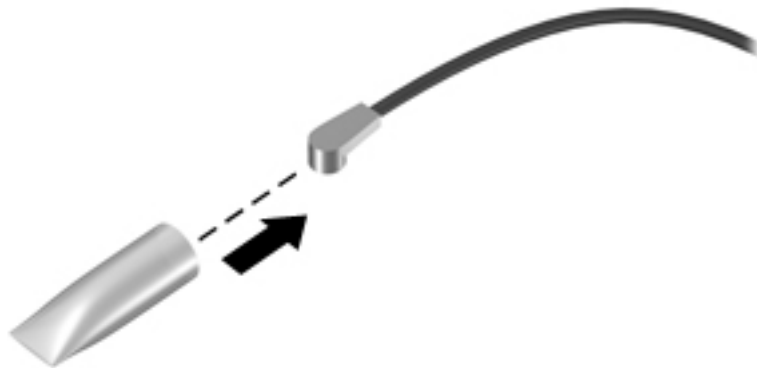
Reverse this procedure to install the WWAN module.

Keyboard

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

Table 5-6 Keyboard descriptions and part numbers

Description	Spare part number
Keyboard, backlit	L14377-xx1

Table 5-7 Keyboard country codes

For use in country or region	Spare part number	For use in country or region	Spare part number	For use in country or region	Spare part number
Belgium	–A41	India	–D61	Slovenia	–BA1
Brazil	–201	Israel	–BB1	South Korea	–AD1
Bulgaria	–261	Italy	–061	Spain	–071
Canada	–DB1	Japan	–291	Sweden and Finland	–B71
Czech Republic and Slovakia	–FL1	Latin America	–161	Switzerland	–BG1
Denmark	–081	The Netherlands	–B31	Taiwan	–AB1
Denmark, Finland, and Norway	–DH1	Northern Africa	–FP1	Thailand	–281
France	–051	Norway	–091	Turkey	–141
Germany	–041	Portugal	–131	Turkey F	–541
Greece	–151	Romania	–271	Ukraine	–BD1
Hungary	–211	Russia	–251	United Kingdom	–031
Iceland	–DD1	Saudi Arabia	–171	United States	–001

Before removing the keyboard, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Disconnect the battery cable from the system board (see Battery on page 44).

Remove the keyboard:

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

   NOTE: The screws are labeled with a keyboard symbol.

2. Insert a screwdriver or similar thin tool into the release hole near the fan, and then press on the back of the keyboard until it releases **(2)**.

NOTE: Cables connect the bottom of the keyboard to the system board. Do not prematurely pull the keyboard cables out of the system board connectors.
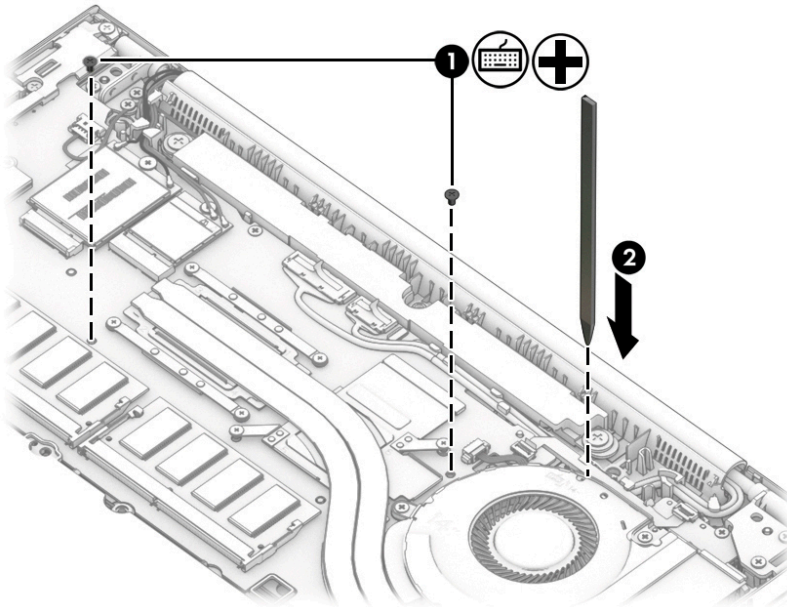
3. Position the computer upright with the front toward you, and then open the computer as far as possible.

4. Lift the top of the keyboard **(1)**, and then pull the keyboard up to remove the tabs from the computer **(2)**.
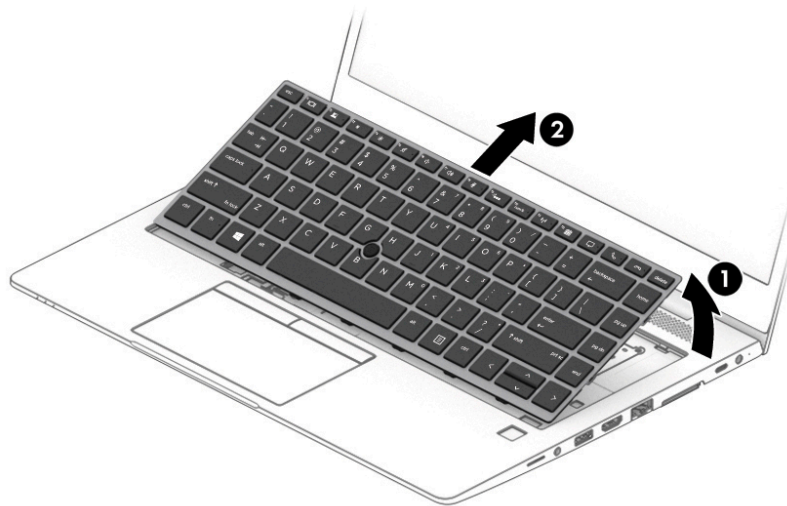
5. Rotate the keyboard over onto the palm rest **(1)**.

6. Disconnect the main keyboard cable from the system board ZIF connector **(2)**.

7. Disconnect the pointing stick cable from the system board ZIF connector **(3)**.

8. Disconnect the keyboard backlight cable from the system board ZIF connector **(4)** (select models only).

9. Remove the keyboard **(5)**.
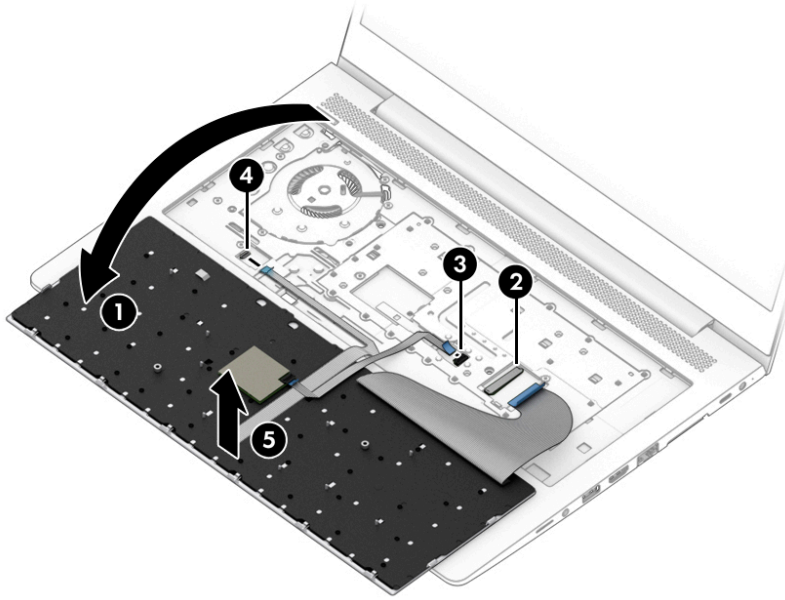
Reverse this procedure to install the keyboard.

6 Removal and replacement procedures for authorized service provider parts

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

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

Component replacement procedures

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

There are as many as 81 screws that must be removed, replaced, and/or loosened when servicing authorized service provider only parts. Make special note of each screw size and location during removal and replacement.

Battery

Table 6-1 Battery description and part number

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

Before removing the battery, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

To remove the battery:

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

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

2. Remove the five Torx T8 2.5 × 4.0 screws **(2)**.
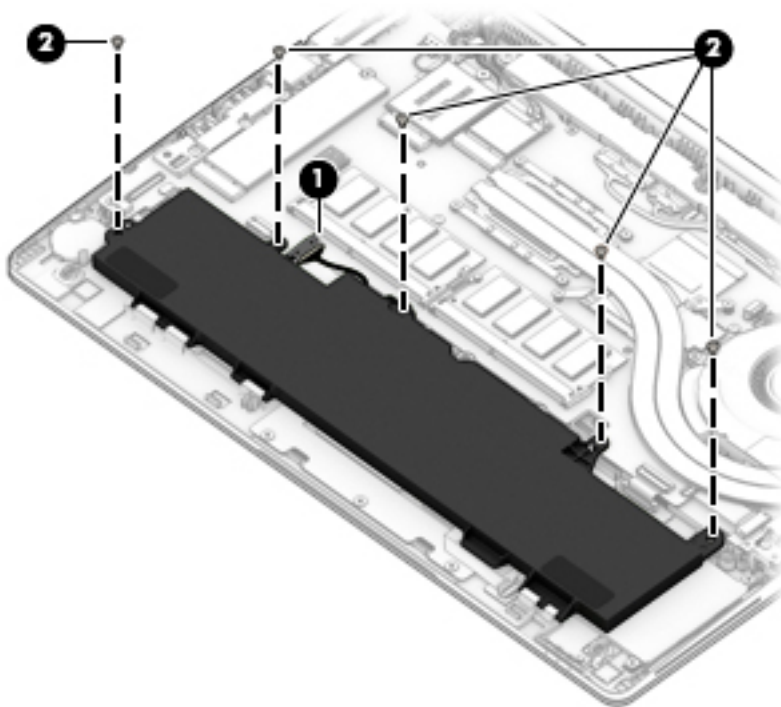
3. Rotate the top of the battery upward **(1)**, and then lift the battery out of the computer **(2)**.

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

Reverse the removal procedures to install the battery.

Heat sink assembly

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

Table 6-2 Heat sink description and part number

Description	Spare part number
Heat sink	L68813-001
Heat sink shielding	L68814-001

Before removing the heat sink assembly, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Disconnect the battery cable from the system board (see Battery on page 44).

Remove the heat sink assembly:

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

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

Do not remove the shielding from the thermal module or heat pipe.

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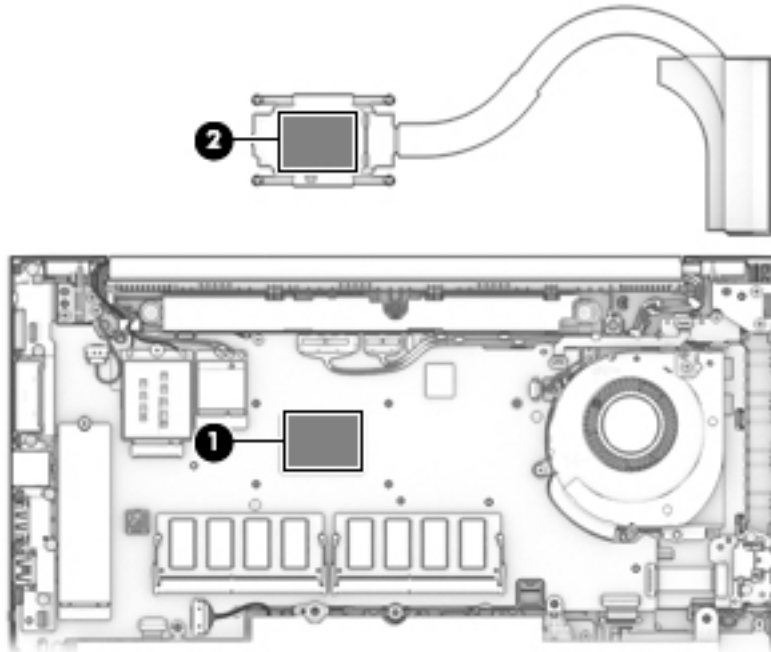
Reverse this procedure to install the heat sink.

RTC battery

Description	Spare part number
RTC battery	L17255-001

Before removing the RTC battery, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Disconnect the battery cable from the system board (see Battery on page 44).

Remove the RTC battery:

1. Disconnect the RTC battery cable from the system board **(1)**.

2. Using a flat tool, pry the battery from the holder **(2)**, and then remove the battery from the computer **(3)**.
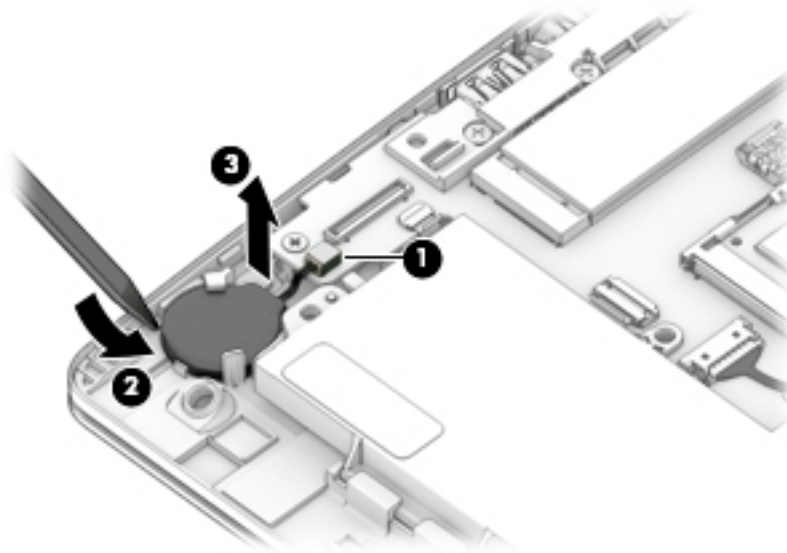
Reverse this procedure to install the RTC battery.

USB board

Table 6-4 USB board and support bracket descriptions and part numbers

Description	Spare part number
USB board (includes support bracket and cable)	L62735-001
USB support bracket (included in the Bracket Kit)	L62737-001

Before removing the USB board, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Disconnect the battery cable from the system board (see Battery on page 44).

Remove the USB board:

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

2. Remove the two Phillips M2.0 × 3.0 screws **(2)** that secure the board to the computer.

3. Lift the bracket from the board **(3)**.

4. Remove the board from the computer **(4)**.
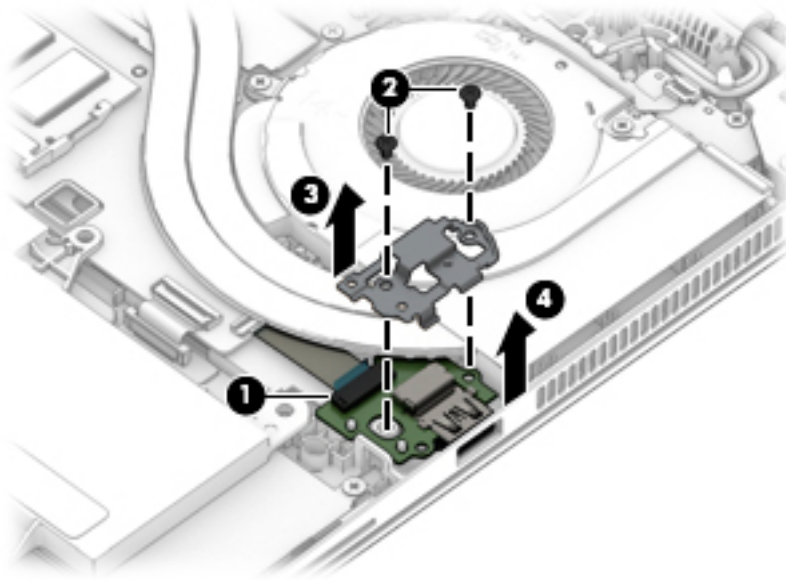
Reverse this procedure to install the USB board.

RJ-45 board with bracket

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

Description	Spare part number
RJ-45 board with bracket	L14386-001

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

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

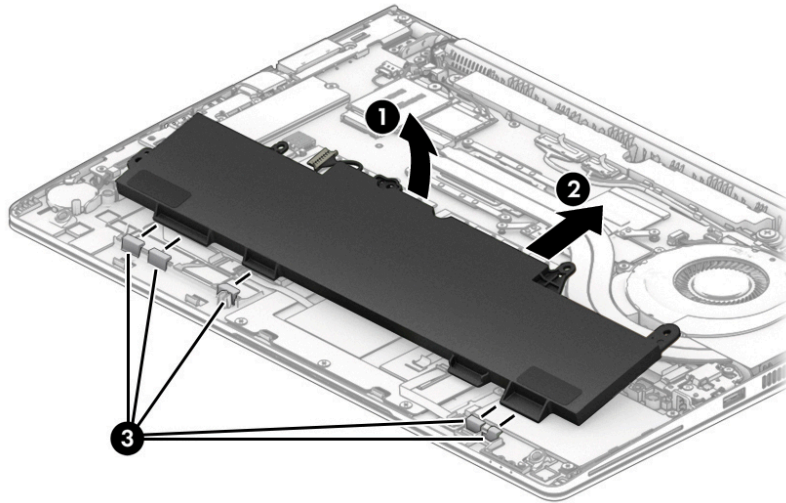2. Remove the bottom cover (see Bottom cover on page 32).

3. Disconnect the battery cable from the system board (see Battery on page 44).

Remove the RJ-45 board and bracket:

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

2. Rotate the assembly out of the computer **(2)**.
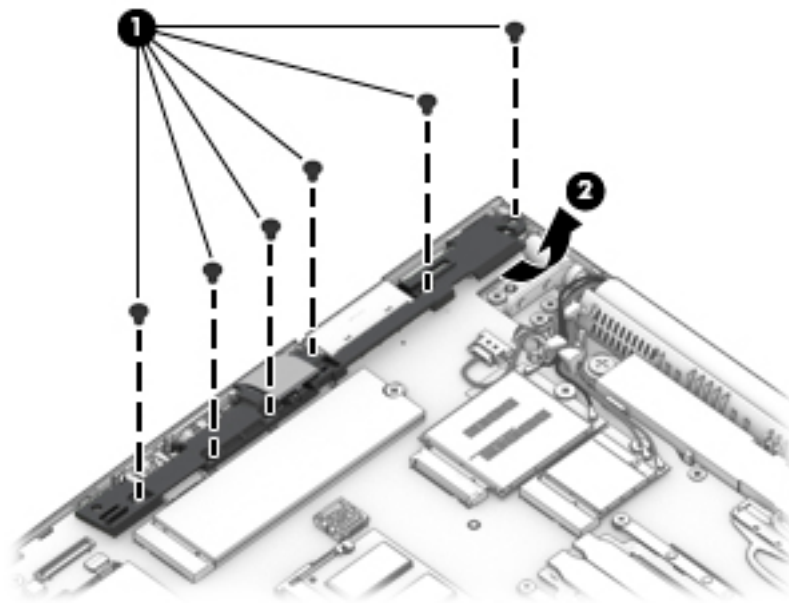
Reverse this procedure to install the RJ-45 assembly.

Power button board

Table 6-6 Power button board description and part number

Description	Spare part number
Power button board assembly (includes cable)	L62738-001

Before removing the power button board, follow these steps:

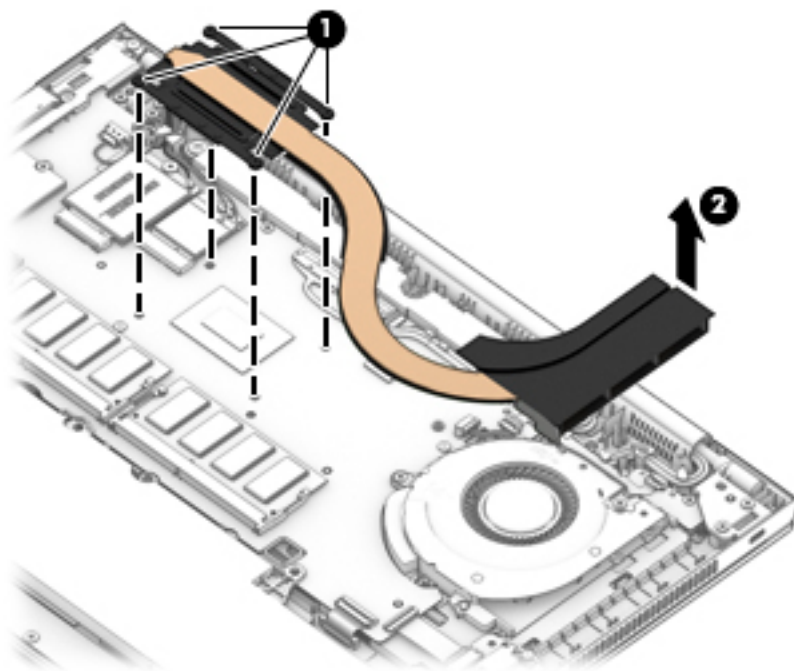1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Disconnect the battery cable from the system board (see Battery on page 44).

Remove the power button board:

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

1. Remove the two Phillips M2.5 × 5.0 screws **(1)** that secure the right display hinge, and then rotate the hinge upward from the power button board **(2)**.

2. Disconnect the cable from the power button board **(3)**.

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

4. Remove the power button board from the computer **(5)**.
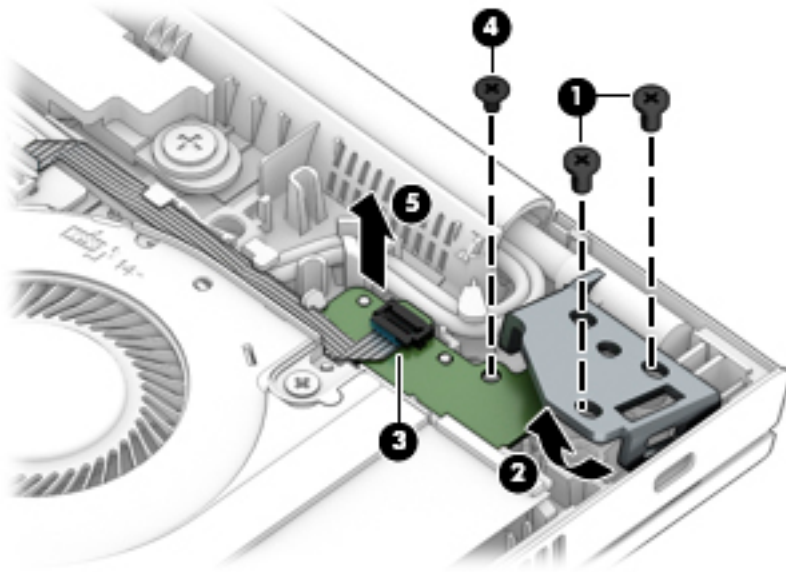
Reverse this procedure to install the power button board.

Speaker assembly

Table 6-7 Speaker assembly description and part number

Description	Spare part number
Speaker assembly (includes cable)	L62736-001

Before removing the speaker assembly, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Disconnect the battery cable from the system board (see Battery on page 44).

Remove the speaker assembly:

1. Disconnect the speaker cable from the system board **(1)**, and then remove the cable from the clip **(2)**.

2. Remove the two broadhead Phillips M2.0 × 2.0 screws **(3)** that secure the speaker to the computer.

3. Remove the speaker from the computer **(4)**.
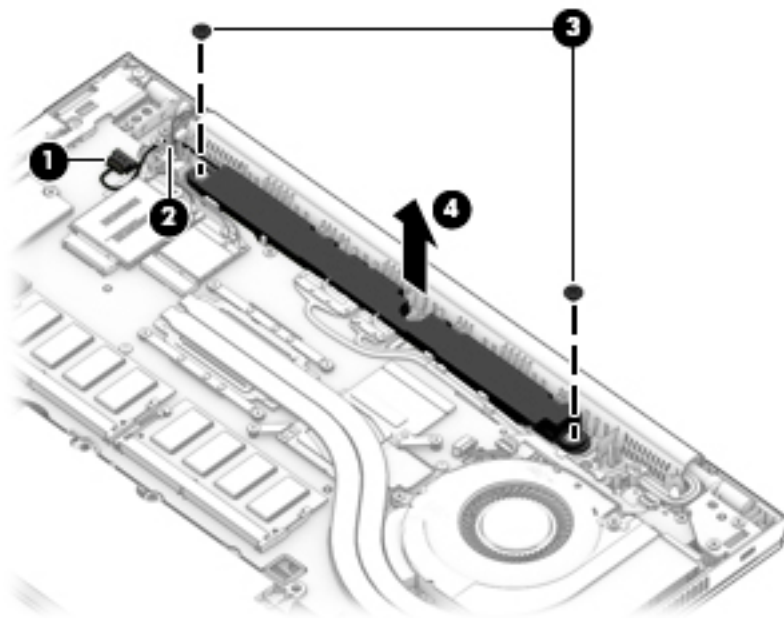
Reverse this procedure to install the speaker.

Touchpad

Table 6-8 Touchpad descriptions and part numbers

Description	Spare part number
Touchpad for use in models without an NFC module	L62731-001
Touchpad for use in models with an NFC module	L62732-001

Before removing the touchpad, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Remove the battery (see Battery on page 44).

Remove the touchpad:

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

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

3. Disconnect the card reader cable from the ZIF connector on the touchpad **(3)**.
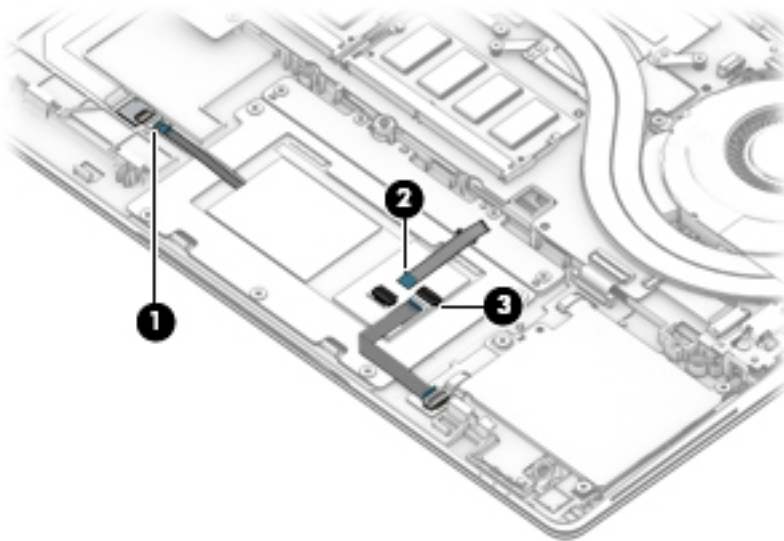
4. Remove the five Phillips M2.0 × 2.5 screws **(1)** that secure the touchpad to the computer.

5. Remove the touchpad from the computer **(2)**.
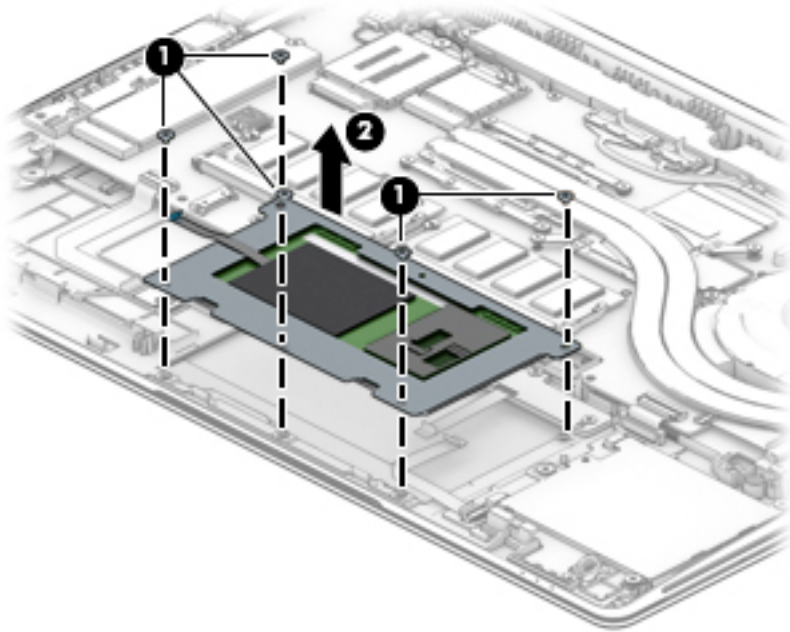
Reverse this procedure to install the touchpad.

Touchpad button board

Table 6-9 Touchpad button board descriptions and part numbers

Description	Spare part number
Touchpad button board	L18311–001

Before removing the touchpad button board, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Remove the battery (see Battery on page 44).

Remove the touchpad button board:

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

2. Remove the four Phillips M2.0 × 3.0 screws **(2)** that secure the board to the computer, and then remove the touchpad button board from the computer **(3)**.
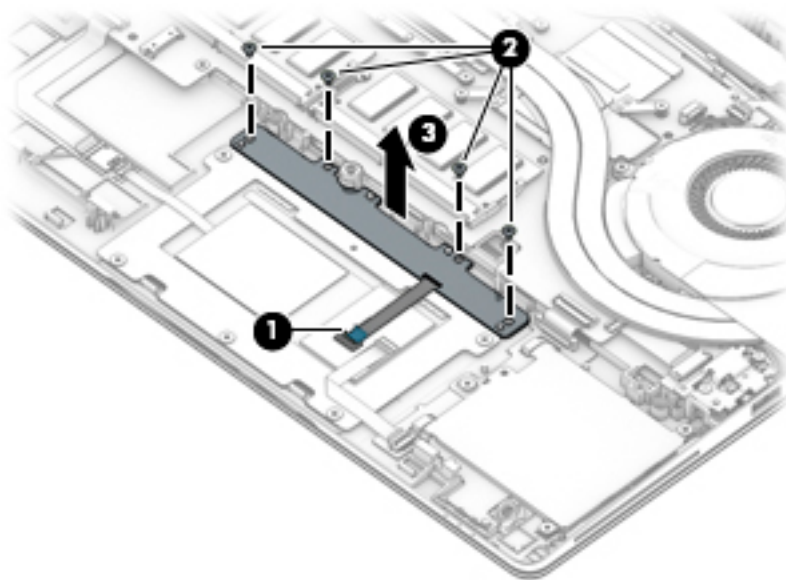
Reverse this procedure to install the touchpad button board.

NFC module

Table 6-10 NFC module description and part number

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

Before removing the NFC module, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Disconnect all external devices from the computer.

3. Remove the bottom cover (see Bottom cover on page 32).

4. Remove the battery (see Battery on page 44).

Remove the NFC module:

1. Disconnect the system board cable **(1)** and the NFC antenna **(2)** from the ZIF connectors on the NFC module.

2. Use a tool to release the NFC module from the adhesive securing it to the computer **(3)**, and then remove the module from the computer **(4)**.
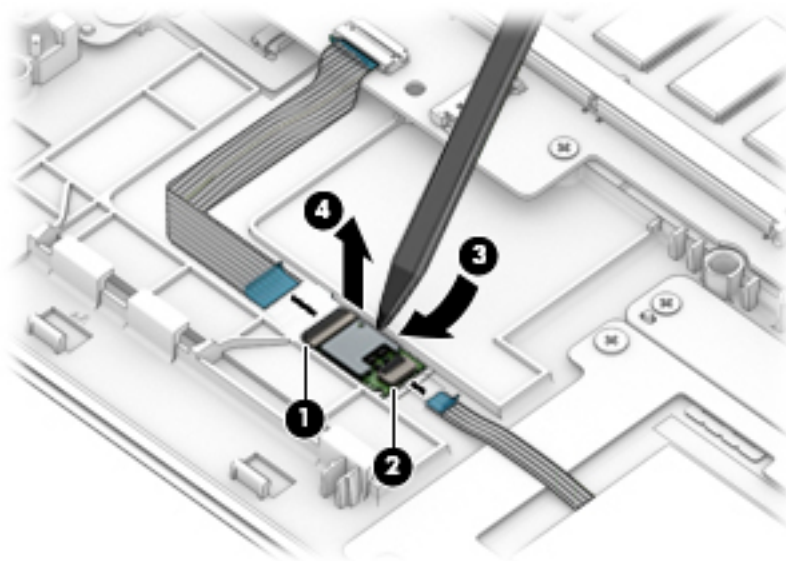
Reverse the removal procedures to install the NFC module.

Smart card reader

Smart card reader and cable descriptions and part numbers

Description	Spare part number
Smart card reader	L62733-001
Smart card reader pass-thru board (for use in models without a smart card)	L62743-001
NOTE: This board provides cable pass-through capability for models without a smart card.	
Smart card reader cable (available in Cable Kit)	L64668-001 (Cable Kit)

Before removing the card reader, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Remove the battery (see Battery on page 44).

Remove the smart card reader:

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

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

2. Disconnect the touchpad cable from the ZIF connector on the smart card reader board **(2)**.

3. Remove the three Phillips M2.0 × 2.0 screws **(3)** that secure the smart card reader to the computer.

4. Remove the smart card reader from the computer **(4)**.

Reverse this procedure to install the smart card reader.

Fan

Table 6-12 Fan description and part number

Description	Spare part number
Fan	L62739-001

Before removing the fan, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Remove the battery (see Battery on page 44).

4. Remove the keyboard (see Keyboard on page 40).

Remove the fan:

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

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

2. Remove the four Phillips M2.0 × 3.0 screws that secure the fan to the computer.
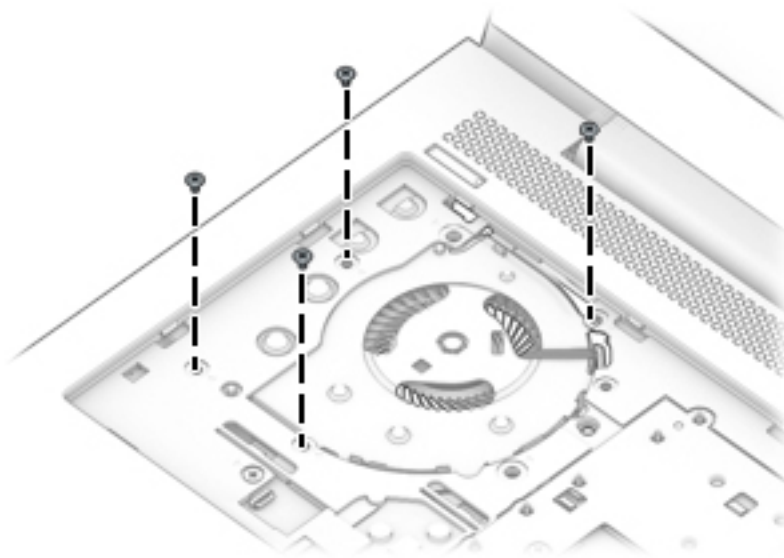
3. Close the computer and position it upside down.

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

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

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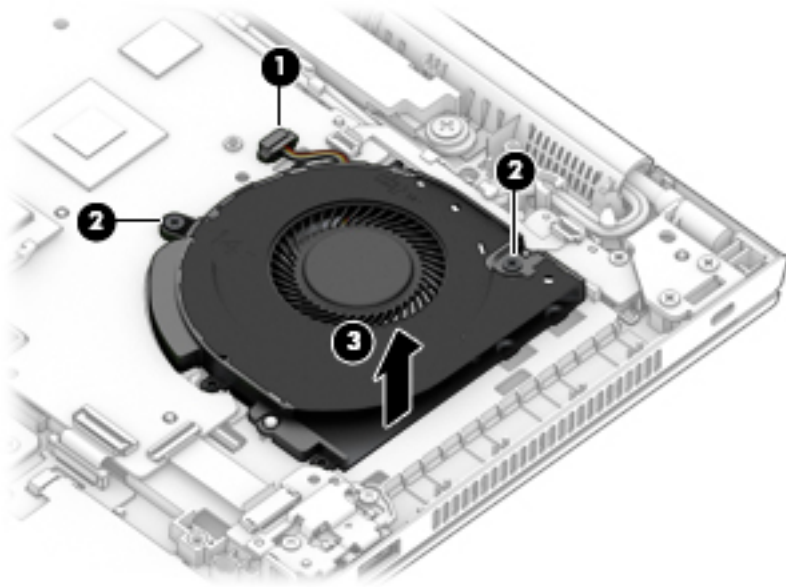
Reverse this procedure to install the fan.

System board

All system board spare part kits include replacement thermal material.

Table 6-13 System board descriptions and part numbers

Description	Spare part number
System board (includes AMD Ryzen 3 PRO 3300U Mobile Processor with Radeon Vega Graphics)	L62972-301

Before removing the system board, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Remove the battery (see Battery on page 44).

4. Remove the keyboard (see Keyboard on page 40).

5. Remove the RJ-45 board and bracket (see RJ-45 board with bracket on page 50).

6. Remove the fan (see Fan on page 58).

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

- Solid-state drive (see Solid-state drive (SSD) on page 34)

- Memory modules (see Memory modules on page 35)

- WLAN/Bluetooth module (see WLAN/Bluetooth combo card on page 36)

- WWAN module (see WWAN module on page 38)

- Heat sink (see Heat sink assembly on page 46)

Remove the system board:

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

2. Remove the three Phillips M2.0 × 3.0 screws that secure the system board to the computer.
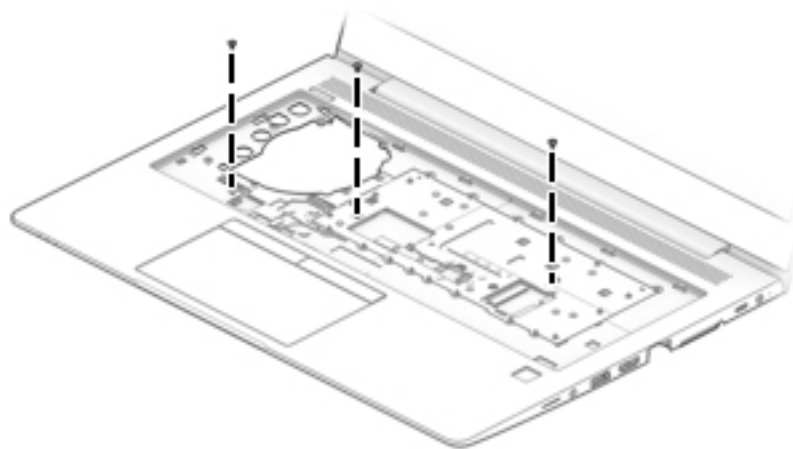
3. Close the computer and position it upside down.

4. Disconnect the following cables from the system board:

   (1) RTC battery cable

   (2) Fingerprint reader cable (reverse ZIF)

   (3) NFC module cable (ZIF)

   (4) Speaker cable

   (5) Display cable

   (6) Camera cable

   (7) Power button board cable (ZIF)

   (8) USB cable (reverse ZIF)

   (9) Smart card reader cable (ZIF)
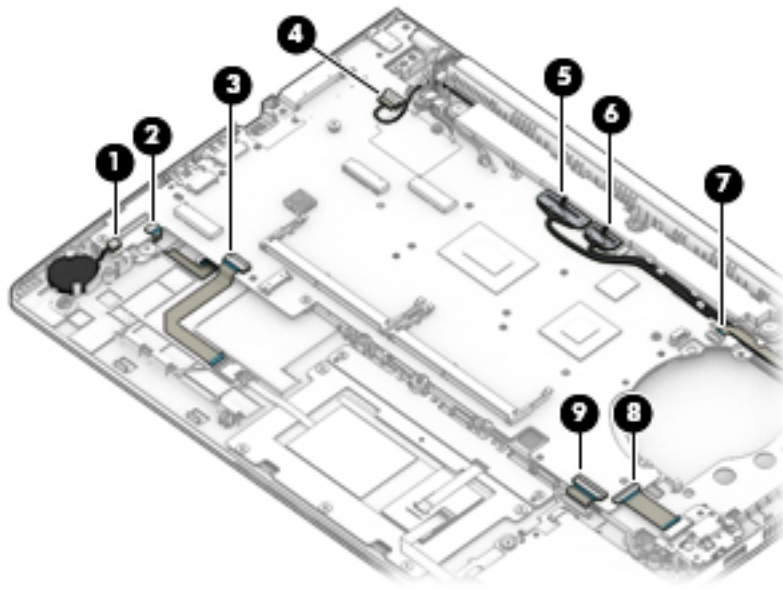
5. Remove the five Phillips M2.0 × 3.0 screws that secure the system board to the computer.
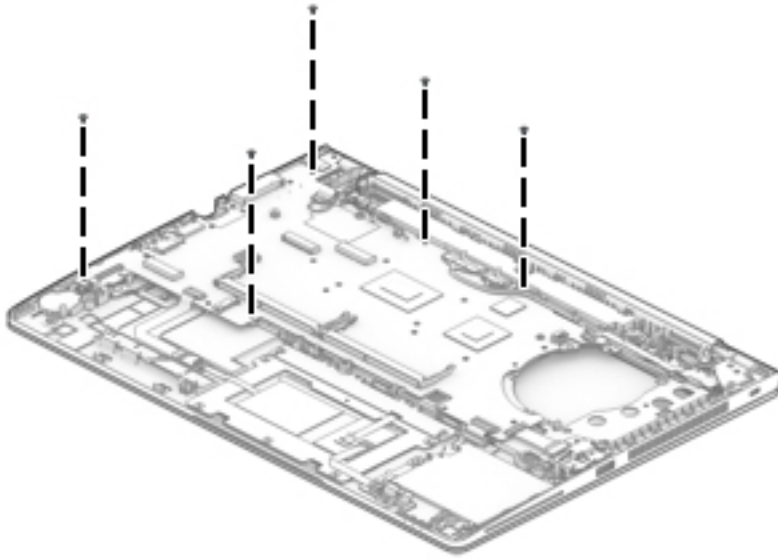
6. Lift the right side of the system board up at an angle **(1)**.

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

📝 **IMPORTANT:** Do not remove memory shielding from the system board when replacing memory or the system board.
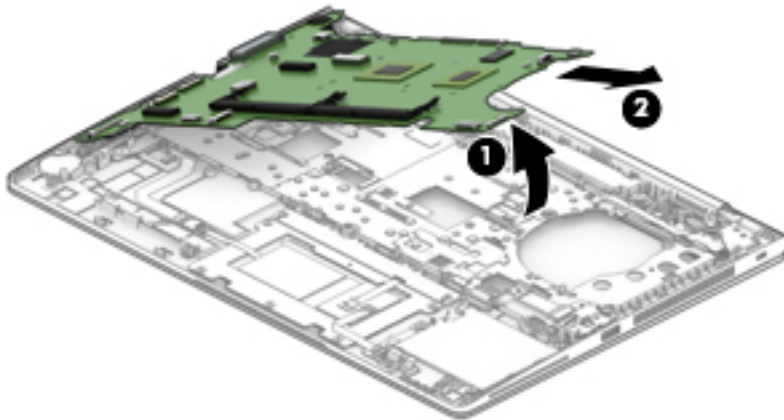
Reverse this procedure to install the system board.

Fingerprint reader assembly

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

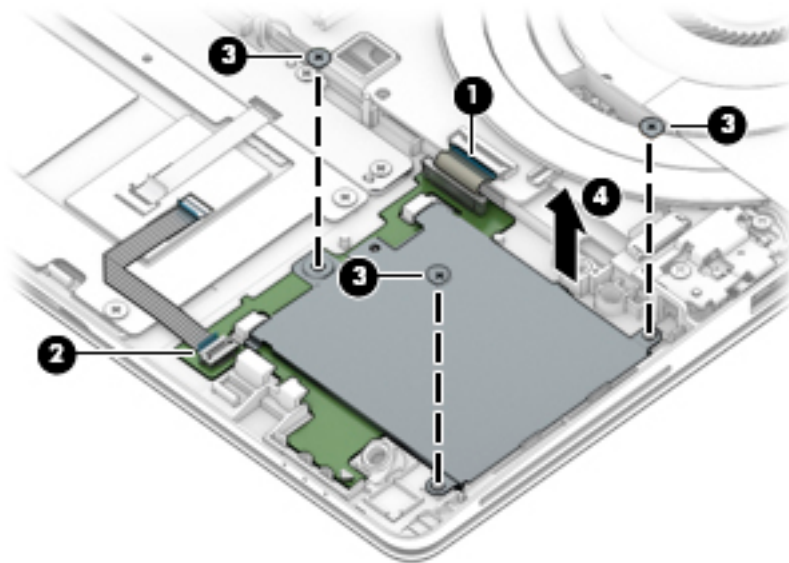| Description	Spare part number
Fingerprint reader assembly (includes cable)	L62741–001
Fingerprint reader bracket (included in Bracket Kit)	L62737–001

Before removing the fingerprint reader assembly, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Remove the battery (see Battery on page 44).

4. Remove the system board (see System board on page 60).

Remove the fingerprint reader assembly:

1. Remove the Phillips M2.0 × 3.0 screw **(1)** that secures the fingerprint reader bracket to the computer.

2. Lift the bracket from the fingerprint reader assembly **(2)**.

3. Use a tool to pry the fingerprint reader board free from the computer **(3)**, and then remove the assembly from the computer **(4)**.
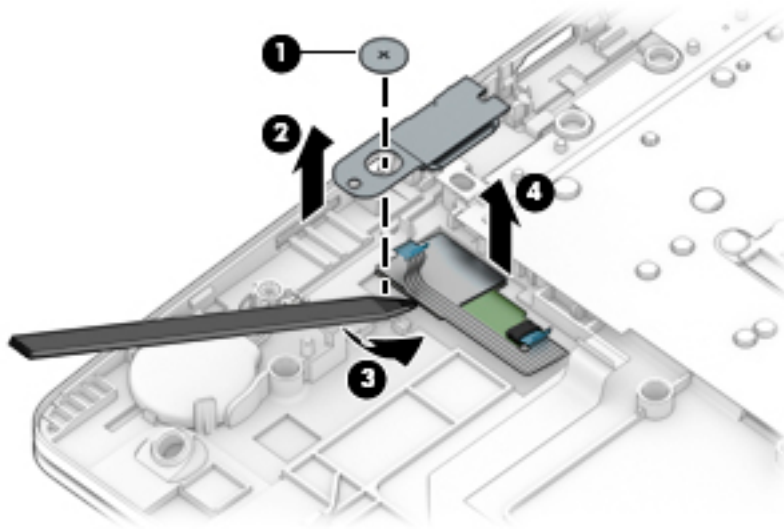
Reverse this procedure to install the fingerprint reader assembly.

Display assembly

NOTE: Displays are not available as whole assemblies – only subcomponent spare parts are available. Display assembly spare part information is also available at Display assembly subcomponents on page 22.

Before removing the display assembly, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 32).

2. Remove the bottom cover (see Bottom cover on page 32).

3. Disconnect the battery cable from the system board (see Battery on page 44).

Remove the display assembly:

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

2. Remove the antenna cables from the clips built into the computer **(3)**.

3. Disconnect the display cable **(4)** and the camera cable **(5)** from the system board.

4. Remove the cables from the clips built into the computer **(6)**.
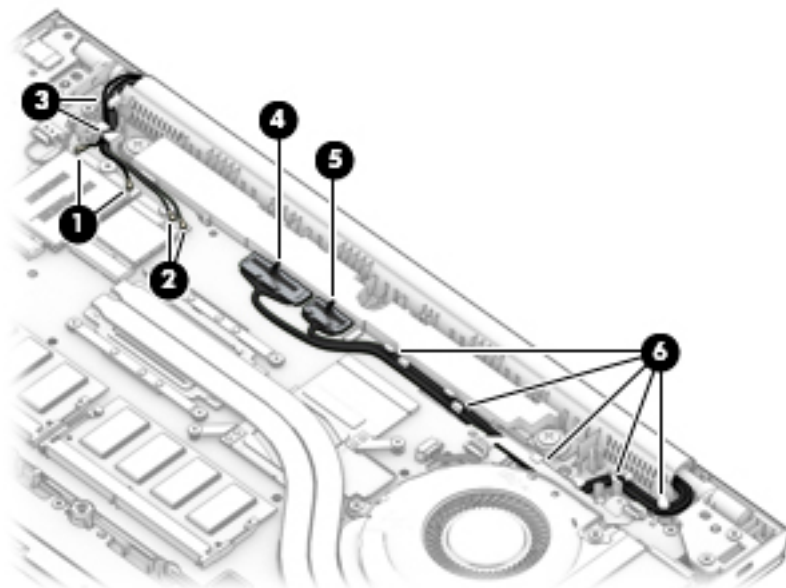
5. With the computer upside down, open the display, and then place the computer on a table with the display positioned off the edge of the table.

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

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

> **IMPORTANT:**   When installing the display assembly, be sure that the wireless antenna cables are routed and arranged properly.
>
> Failure to properly route the antennas can result in degradation of the computer's wireless performance.
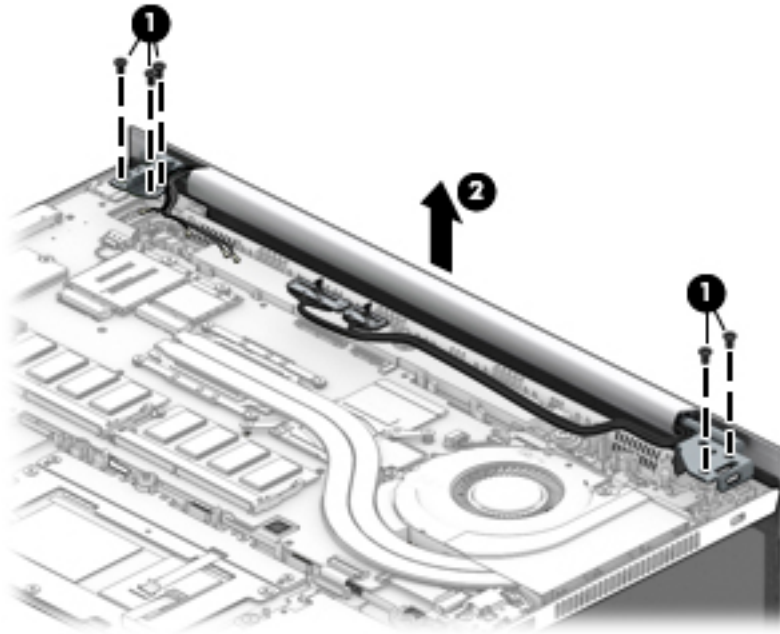
8. To remove the display hinge cover, rotate top of hinge cover away from display enclosure to release the tabs **(1)**, and then pull the cover off the enclosure **(2)**.
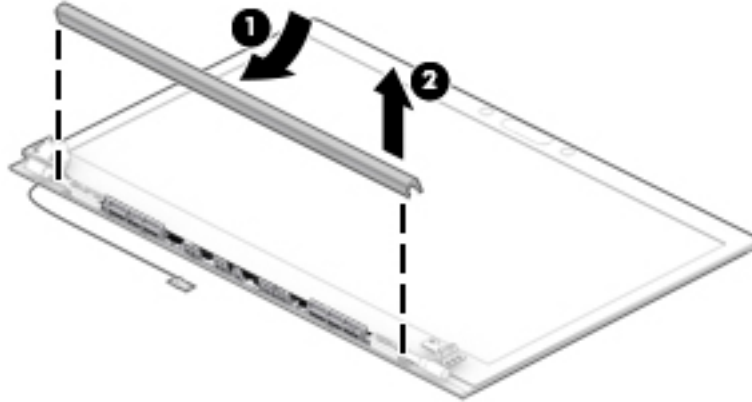
The display hinge cover is available in the Hinge Kit as spare part number L14376-001.

When installing the hinge cover, make sure all cables are routed correctly under the hinge cover and the hooks on the end of the cover are aligned correctly with the snaps on the bottom of the display **(1)**. Press the left **(2)**, and then right **(3)** middle sections of the hinge cover until it snaps into place.
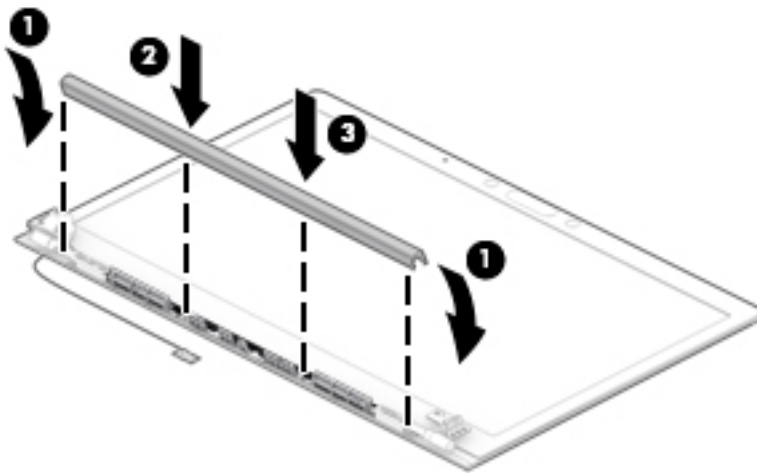
9. To remove the display bezel, flex the top **(1)** of the bezel, the inside edges of the left and right sides **(2)**, and then the bottom **(3)** of the bezel until it releases from the display enclosure.

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

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

Models with a microphone module: L62747-001

Models with an HD camera: L62748-001

Models with an IR camera: L62749-001

The camera privacy cover is available in the Plastics Kit as spare part number L60631-001.
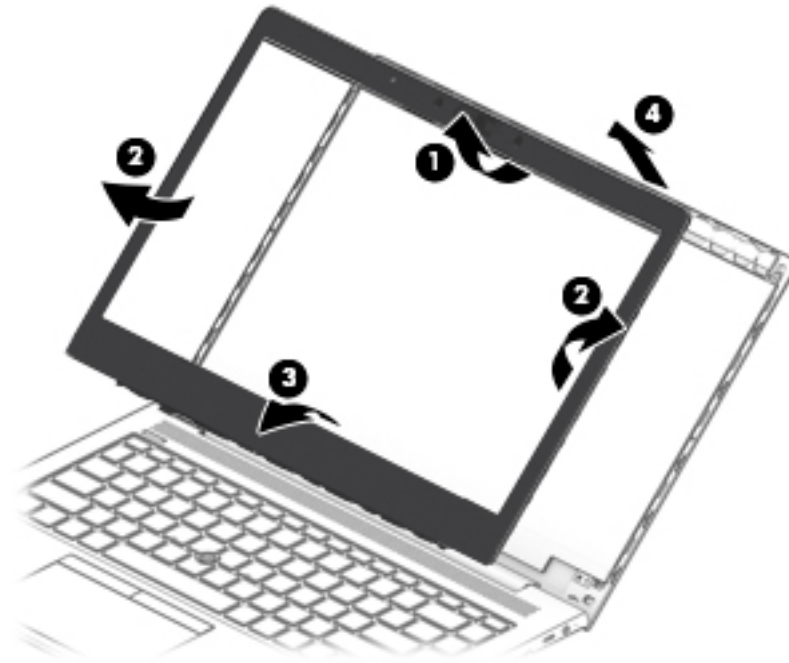
11. Two types of camera modules are available. Refer to the following procedure appropriate for your computer if it is necessary to replace the camera module:

    a. **HD camera or microphone module**

       Lift upward to release the module from the adhesive on the display enclosure **(1)**, disconnect the cable from the module **(2)**, and then remove the module from the display **(3)**.
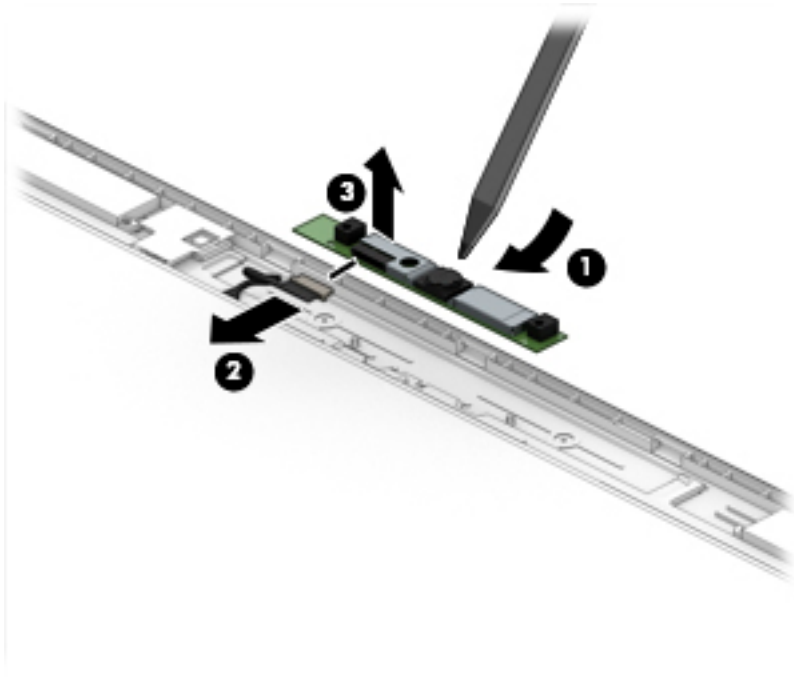
The HD camera module is available as spare part number L62742-001. The microphone module is available as spare part number L62744-001.

b. **IR camera**

Remove the tape from the module **(1)**, lift upward to release the module from the adhesive on the display enclosure **(2)**, disconnect the cables from the left and right sides of the module **(3)**, and then remove the camera module from the display **(4)**.
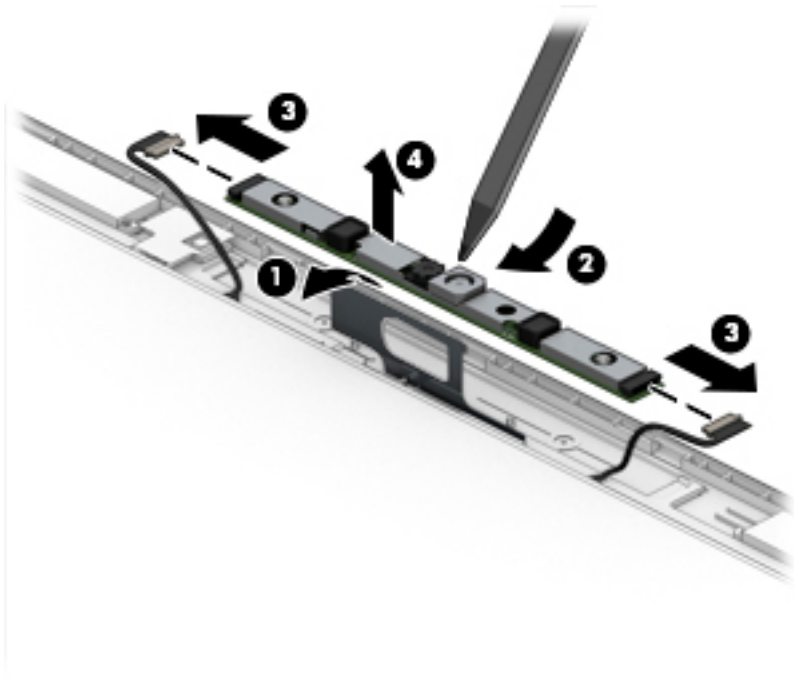
The IR camera module is available as spare part number L64702-001.

12. If it is necessary to remove the ambient light sensor board, disconnect the cable from the board **(1)**, lift upward to release the board from the adhesive on the display enclosure **(2)**, and then remove the board from the display **(3)**.
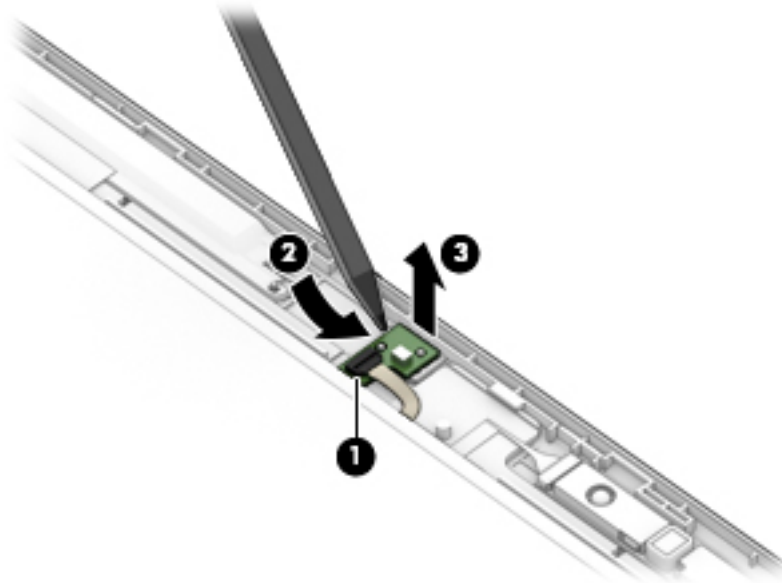
The ambient light sensor board is available as spare part number L62745-001.

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

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

15. On the back of the display panel, lift the tape from the connector **(2)**, and then disconnect the display cable from the rear of the panel **(3)**.
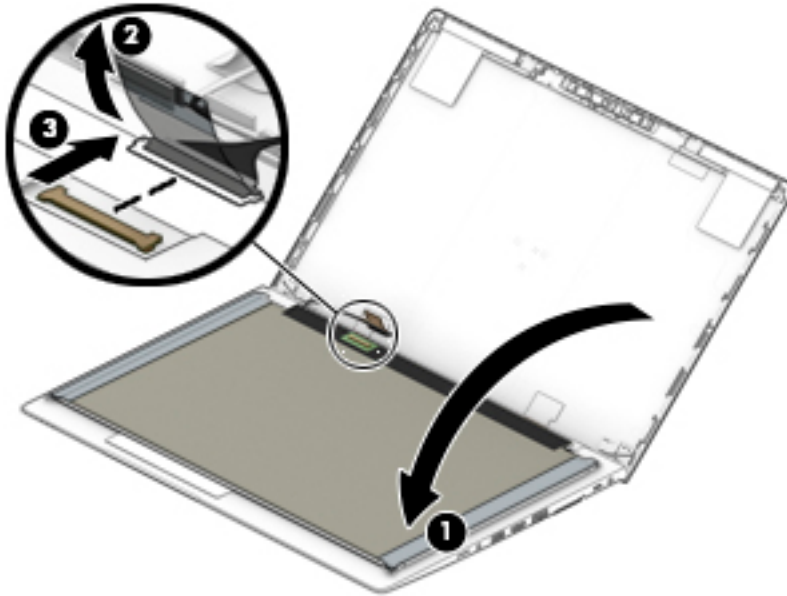
The raw display panel is available using the following spare part numbers:

FHD panel, non-touch, 250 nits: L62773-001

FHD panel, non-touch, privacy: L62774-001

FHD touch-on panel (TOP), privacy, 1000 nits: L62771-001

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

Display hinges are available as spare part number L14376-001.
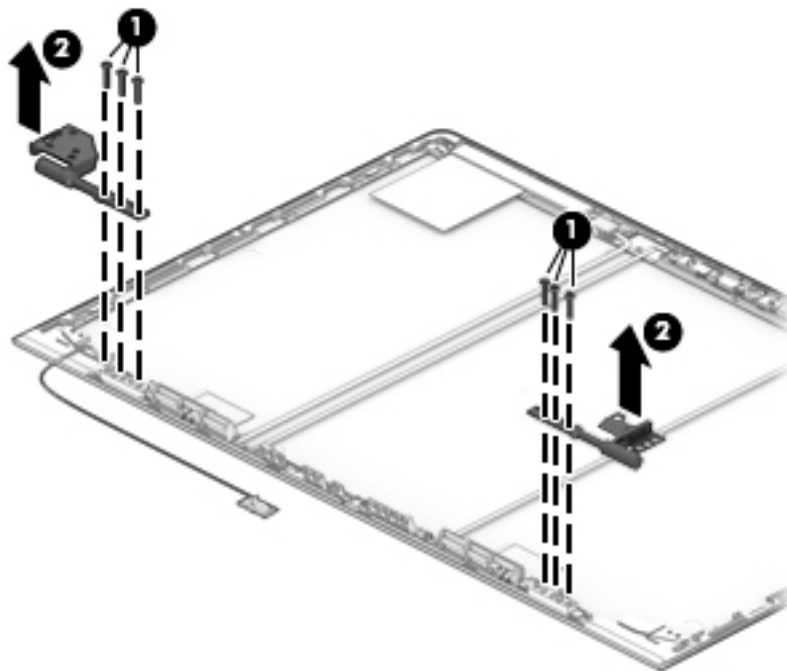
17. If it is necessary to replace the display cable, lift the cable from the routing path in the display enclosure.

The display cable is available in the Cable Kit, as spare part number L64668-001.
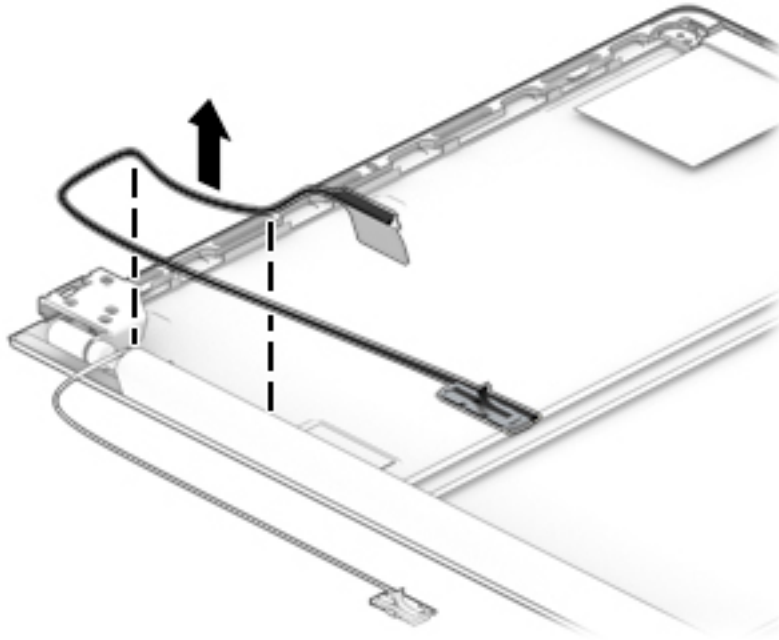
18. If it is necessary to replace the camera/ambient light sensor cable:

   a. **HD camera models**

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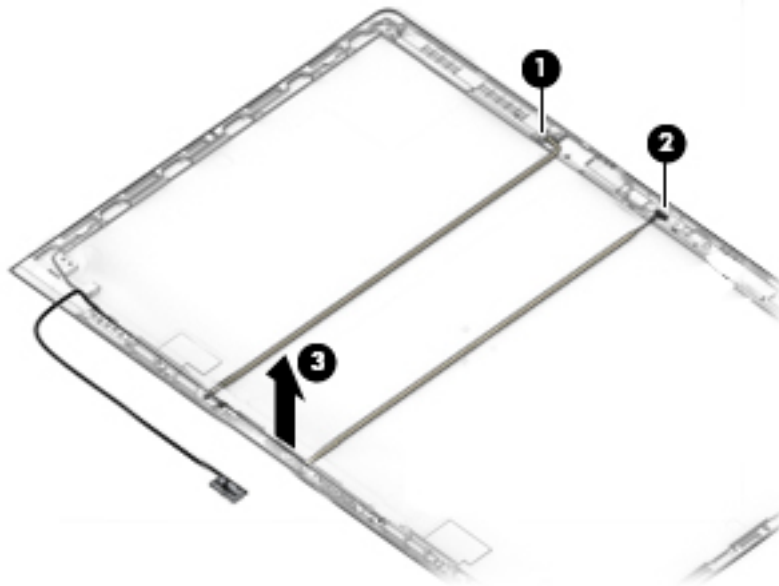
b. IR camera models

Disconnect the cable from the ambient light sensor board **(1)** from the left **(2)** and right **(3)** sides of the IR camera. Then remove the cable from the display enclosure **(4)**.
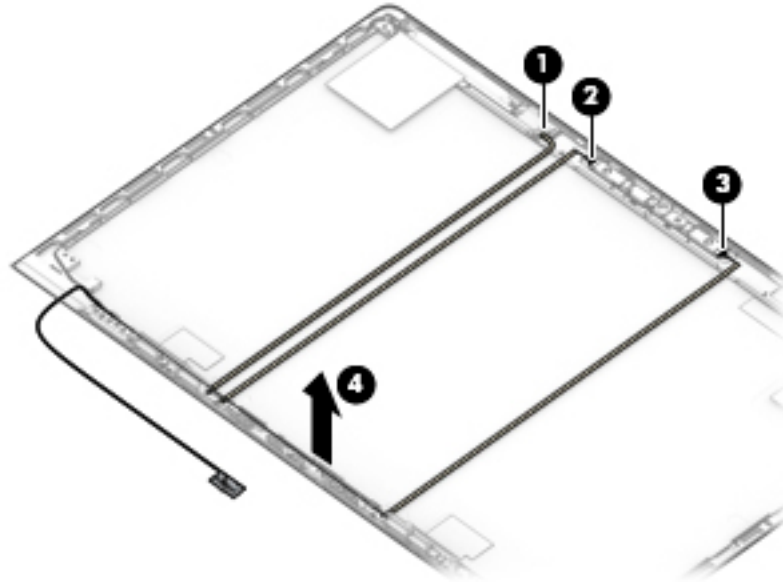
The camera cable is available in the Cable Kit as spare part number L64668-001.

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

📝 **NOTE:** The WLAN antennas are available as spare parts with the display enclosure.
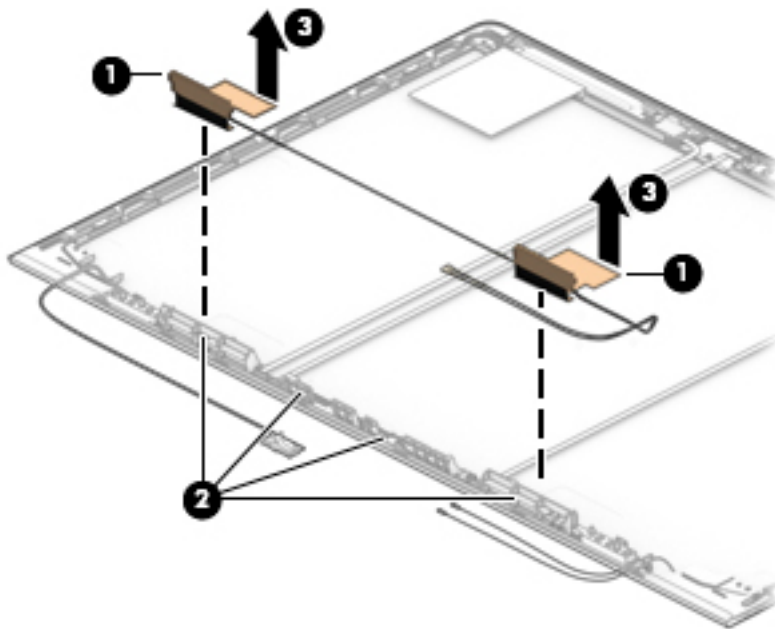
20. If it is necessary to replace the WWAN antenna cables, peel the antennas from the top of the display enclosure **(1)**, remove the antenna cables from the bottom and sides of the display enclosure **(2)**, and then remove the antenna cables **(3)**.

> **NOTE:** The WWAN antennas are available as spare parts with the display enclosure.
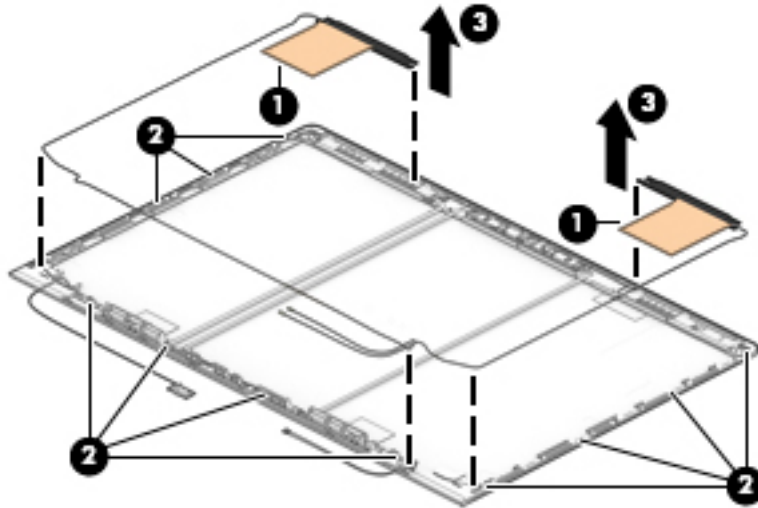
The display enclosure is available as spare part number L62729-001.

Reverse this procedure to reassemble and install the display assembly.

Top cover

Table 6-15 Top cover description and part number

Description	Spare part number
Top cover (includes power button)	L62293-001

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

7 Interpreting system validation diagnostic front panel LEDs and audible codes

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

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

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

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

NOTE: Single-beep codes and blink codes are not used.

Table 7-1 Front panel LEDs and audible codes

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

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

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

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

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

Table 7-2 Front panel LEDs and audible code indications

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

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

Using Computer Setup

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

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

Starting Computer Setup

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

Navigating and selecting in Computer Setup

- To select a menu or a menu item, use the tab key and the keyboard arrow keys and then press enter, or use a pointing device to select the item.

- To scroll up and down, select the up arrow or the down arrow in the upper-right corner of the screen, or use the up arrow key or the down arrow key on the keyboard.

- To close open dialog boxes and return to the main Computer Setup screen, press esc, and then follow the on-screen instructions.

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

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

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

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

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

Your changes go into effect when the computer restarts.

Restoring factory settings in Computer Setup

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

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

1. Start Computer Setup. See .

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

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

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

Your changes go into effect when the computer restarts.

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

Updating the BIOS

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

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

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

Determining the BIOS version

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

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

1. Start Computer Setup. See Starting Computer Setup on page 77.

2. Select **Main**, and then select **System Information**.

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

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

To check for later BIOS versions, see Downloading a BIOS update on page 78.

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.

9   Using HP PC Hardware Diagnostics

Using HP PC Hardware Diagnostics Windows (select products only)

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

If HP PC Hardware Diagnostics Windows is not installed on your computer, first you must download and install it. To download HP PC Hardware Diagnostics Windows, see Downloading HP PC Hardware Diagnostics Windows on page 81.

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 83.

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 83.

   b. Hard drive

   c. BIOS

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

Downloading HP PC Hardware Diagnostics UEFI to a USB flash drive

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

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

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

Downloading the latest HP PC Hardware Diagnostics UEFI version

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

1. Go to http://www.hp.com/go/techcenter/pcdiags. The HP PC Diagnostics home page is displayed.

2. Select **Download HP Diagnostics UEFI**, and then select **Run**.

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

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

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

1. Go to http://www.hp.com/support.

2. Enter the product name or number, select your computer, and then select your operating system.

3. In the **Diagnostics** section, follow the on-screen instructions to select and download the specific UEFI Diagnostics version for your computer.

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

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

Downloading Remote HP PC Hardware Diagnostics UEFI

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

Downloading the latest Remote HP PC Hardware Diagnostics UEFI version

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

1. Go to http://www.hp.com/go/techcenter/pcdiags. The HP PC Diagnostics home page is displayed.

2. Select **Download Remote Diagnostics**, and then select **Run**.

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

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

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

1. Go to http://www.hp.com/support.

2. Select **Get software and drivers**, select your type of product, enter the product name or number in the search box that is displayed, select your computer, and then select your operating system.

3. In the **Diagnostics** section, follow the on-screen instructions to select and download the **Remote UEFI** version for the product.

Customizing Remote HP PC Hardware Diagnostics UEFI settings

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

- Set a schedule for running diagnostics unattended. You can also start diagnostics immediately in interactive mode by selecting **Execute Remote HP PC Hardware Diagnostics**.

- Set the location for downloading the diagnostic tools. This feature provides access to the tools from the HP website or from a server that has been preconfigured for use. Your computer does not require the traditional local storage (such as a disk drive or USB flash drive) to run remote diagnostics.

- Set a location for storing the test results. You can also set the user name and password settings used for uploads.

- Display status information about the diagnostics run previously.

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

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

2. Select **Advanced**, and then select **Settings**.

3. Make your customization selections.

4. Select **Main**, and then **Save Changes and Exit** to save your settings.

Your changes take effect when the computer restarts.

10 Diagnostics and troubleshooting

LEDs

Table 10-1 Power and IDE Flash Activity LEDs

LED	Status
Power LED Off	When the unit is plugged into the wall socket and the Power LED is off, the unit is powered off. However, the network can trigger a Wake On LAN event in order to perform management functions.
Power LED On	Displays during boot sequence and while the unit is on. During boot sequence, hardware initialization is processed and startup tests are performed on the following: - Processor initialization - Memory detection and initialization - Video detection and initialization **NOTE:** If one of the tests fails, the unit will simply stop, but the LED will stay on. If the video test fails, the unit beeps. There are no messages sent to video for any of these failed tests. **NOTE:** After the video subsystem is initialized, anything that fails will have an error message.
NOTE: RJ-45 LEDs are located inside the RJ-45 connector on the top, rear panel of the thin client. The LEDs are visible when the connector is installed. Blinking green indicates network activity, and amber indicates a 100MB speed connection.	
IDE LED is Off	When the unit is powered on and the flash activity light is off, then there is no access to the system flash.
IDE LED blinks white	Indicates the system is accessing the internal IDE flash.

Wake-on LAN

Wake-on LAN (WOL) allows a computer to be turned on or resumed from sleep state by a network message. You can enable or disable WOL in Computer Setup using the **S5 Maximum Power Savings** setting.

To enable or disable WOL:

1. Turn on or restart the computer.

2. Press either esc or F10 while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

   NOTE: If you do not press esc or F10 at the appropriate time, you must restart the computer and again press esc or F10 when the monitor light turns green to access the utility.

3. If you pressed esc, press F10 to enter Computer Setup.

4. Navigate to **Power > Hardware Power Management**.

5. Set **S5 Maximum Power Savings** as follows:

   - Disable WOL = Enabled

   - Enable WOL = Disabled

6. Press F10 to accept any changes.

7. Select **File** > **Save Changes and Exit**.

Power-On Sequence

At power-on, the flash boot block code initializes the hardware to a known state, then performs basic power-on diagnostic tests to determine the integrity of the hardware. Initialization performs the following functions:

1. Initializes CPU and memory controller.

2. Initializes and configures all PCI devices.

3. Initializes video software.

4. Initializes the video to a known state.

5. Initializes USB devices to a known state.

6. Performs power-on diagnostics. For more information, see "Power-On Diagnostic Tests".

7. The unit boots the operating system.

Resetting the Setup and Power-on passwords

You can reset the Setup and Power-on passwords as follows:

1. Turn off the computer and disconnect the power cord from the power outlet.

2. Remove the side access panel and the metal side cover.

3. Remove the password jumper from the system board header labeled PSWD/E49.

4. Replace the metal side cover and the side access panel.

5. Connect the computer to AC power, and then turn on the computer.

6. Turn off the computer and disconnect the power cord from the power outlet.

7. Remove the side access panel and the metal side cover.

8. Replace the password jumper.

9. Replace the metal side cover and the side access panel.

Power-on diagnostic tests

The Power-on diagnostics performs basic integrity tests of the hardware to determine its functionality and configuration. If a diagnostic test fails during hardware initialization the unit simply stops. There are no messages sent to video.

> **NOTE:** You may try to restart the unit and run through the diagnostic tests a second time to confirm the first shutdown.

The following table lists the tests that are performed on the unit.

Table 10-2 Power-on diagnostic test

Test	Description
Boot Block Checksum	Tests boot block code for proper checksum value
DRAM	Simple write/read pattern test of the first 640k of memory
Serial Port	Tests the serial port using simple port verification test to determine if ports are present
Timer	Tests timer interrupt by using polling method
RTC CMOS battery	Tests integrity of RTC CMOS battery
NAND flash device	Tests for proper NAND flash device ID present

Interpreting POST diagnostic front panel LEDs and audible codes

This section covers the front panel LED codes as well as the audible codes that may occur before or during POST that do not necessarily have an error code or text message associated with them.

⚠ **WARNING!** When the computer is plugged into an AC power source, voltage is always applied to the system board. To reduce the risk of personal injury from electrical shock and/or hot surfaces, be sure to disconnect the power cord from the wall outlet and allow the internal system components to cool before touching.

📝 **NOTE:** Recommended actions in the following table are listed in the order in which they should be performed.

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

Table 10-3 Diagnostic front panel LEDs and audible codes

Activity	Beeps	Possible Cause	Recommended Action
White Power LED On.	None	Computer on.	None
White Power LED flashes every two seconds.	None	Computer in Suspend to RAM mode (some models only) or normal Suspend mode.	No action required. Press any key or move the mouse to wake the computer.
Red Power LED flashes two times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	2	Processor thermal protection activated: A fan may be blocked or not turning. OR The heat sink/fan assembly is not properly attached to the processor. OR The unit has vents blocked or is in a location where the ambient temperature is too high.	1. Ensure that the computer air vents are not blocked and the processor cooling fan is plugged in and running, if equipped. 2. Contact an authorized reseller or service provider.
Red Power LED flashes four times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	4	Power failure (power supply is overloaded). OR The incorrect external power supply adapter is being used on the unit.	1. Check if a device is causing the problem by removing ALL attached devices. Power on the system. If the system enters the POST, then power off and replace one device at a time and repeat this procedure until failure occurs. Replace the device that is causing the failure. Continue adding devices one at a time to ensure all devices are functioning properly. 2. Replace the power supply. 3. Replace the system board.
Red Power LED flashes five times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	5	Pre-video memory error.	**CAUTION:** To avoid damage to the memory modules or the system board, you must unplug the computer power cord before attempting to reseat, install, or remove a memory module. 1. Reseat memory modules. 2. Replace memory modules one at a time to isolate the faulty module.

Table 10-3 Diagnostic front panel LEDs and audible codes (continued)

Activity	Beeps	Possible Cause	Recommended Action
			3. Replace third-party memory with HP memory.
			4. Replace the system board.
Red Power LED flashes six times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	6	Pre-video graphics error.	For systems with a graphics card: 1. Reseat the graphics card. 2. Replace the graphics card. 3. Replace the system board. For systems with integrated graphics, replace the system board.
Red Power LED flashes eight times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	8	Invalid ROM based on bad checksum.	1. Reflash the system ROM with the latest BIOS image using the BIOS Recovery procedure. 2. Replace the system board.
System does not power on and LEDs are not flashing.	None	System unable to power on.	Press and hold the power button for less than four seconds. If the solid-state drive LED turns white, the power button is working correctly. Try the following: 1. Remove the power cord from the computer. 2. Open the computer and press the yellow CMOS button on the system board for four seconds (located near the front USB ports). 3. Verify that the AC cord is plugged into the power supply. 4. Close the unit and reattach the power cord. 5. Try to power on the computer. 6. Replace the unit.

POST numeric codes and text messages

This section covers those POST errors that have numeric codes associated with them. The section also includes some text messages that may be encountered during POST.

📝 **NOTE:** The computer will beep once after a POST text message is displayed on the screen.

Table 10-4 Numeric Codes and Text Messages

Control panel message	Description	Recommended action
103-System Board Failure	DMA or timers.	1. Clear CMOS. 2. Remove expansion boards. 3. Replace the system board.
110-Out of Memory Space for Option ROMs	Recently added PCI expansion card contains an option ROM too large to download during POST.	1. If a PCI expansion card was recently added, remove it to see if the problem remains. 2. In Computer Setup, set **Advanced** > **Device Options** > **NIC PXE Option ROM Download** to **DISABLE** to prevent PXE option ROM for the internal NIC from being downloaded during POST to free more memory for an expansion card's option ROM. Internal PXE option ROM is used for booting from the NIC to a PXE server.
161-Real-Time Clock Power Loss	Invalid time or date in configuration memory. RTC (real-time clock) battery may need to be replaced.	Reset the date and time under **Control Panel** (Computer Setup can also be used). If the problem persists, replace the RTC battery. See the Removal and Replacement section for instructions on installing a new battery, or contact an authorized dealer or reseller for RTC battery replacement.
164-MemorySize Error	Memory amount has changed since the last boot (memory added or removed).	Press the F1 key to save the memory changes.
201-Memory Error	RAM failure.	1. Ensure memory modules are correctly installed. 2. Verify proper memory module type. 3. Remove and replace the identified faulty memory module(s). 4. If the error persists after replacing memory modules, replace the system board.
214-DIMM Configuration Warning	Populated DIMM Configuration is not optimized.	Rearrange the DIMMs so that each channel has the same amount of memory.
301-Keyboard Error	Keyboard failure.	1. Reconnect keyboard with computer turned off. 2. Check connector for bent or missing pins. 3. Ensure that none of the keys are depressed. 4. Replace keyboard.
510-Flash Screen Image Corrupted	Flash Screen image has errors.	Reflash the system ROM with the latest BIOS image.

Table 10-4 Numeric Codes and Text Messages (continued)

Control panel message	Description	Recommended action
512-Chassis, Rear Chassis, or Front Chassis Fan not Detected	Chassis, rear chassis, or front chassis fan is not connected or may have malfunctioned.	1. Reseat chassis, rear chassis, or front chassis fan. 2. Reseat fan cable. 3. Replace chassis, rear chassis, or front chassis fan.
513-Front Chassis fan not detected	Front chassis fan is not connected or may have malfunctioned.	1. Reseat front chassis fan. 2. Reseat fan cable. 3. Replace front chassis fan.
912-Computer Cover Has Been Removed Since Last System Startup	Computer cover was removed since last system startup.	No action required.
921-Device in PCI Express slot failed to initialize	There is an incompatibility/problem with this device and the system or PCI Express Link could not be retrained to an x1.	Try rebooting the system. If the error reoccurs, the device may not work with this system
1720-SMART Hard Drive Detects Imminent Failure	Hard drive is about to fail. (Some hard drives have a hard drive firmware patch that will fix an erroneous error message.)	1. Determine if hard drive is giving correct error message. Run the Drive Protection System test using F2 Diagnostics. 2. Apply hard drive firmware patch if applicable. (Available at http://www.hp.com/support.) 3. Back up contents and replace hard drive.
Invalid Electronic Serial Number	Electronic serial number is missing.	Enter the correct serial number in Computer Setup.
Network Server Mode Active and No Keyboard Attached	Keyboard failure while Network Server Mode enabled.	1. Reconnect keyboard with computer turned off. 2. Check connector for bent or missing pins. 3. Ensure that none of the keys are depressed. 4. Replace keyboard.
Parity Check 2	Parity RAM failure.	Run Computer Setup and Diagnostic utilities.

Troubleshooting

Basic troubleshooting

If the thin client is experiencing operating problems or will not power on, review the following items.

Table 10-5 Power-on troubleshooting

Issue	Procedures
The thin client unit is experiencing operating problems.	Ensure that the following connectors are securely plugged into the thin client unit: Power connector, keyboard, mouse, network RJ-45 connector, display
The thin client unit does not power on.	1. Verify that the power supply is good by installing it on a known working unit and testing it. If the power supply does not work on the test unit, replace the power supply. 2. If the unit does not work properly with the replaced power supply, have the unit serviced.

The thin client unit powers on and displays a splash screen, but does not connect to the server.	1. Verify that the network is operating and the network cable is working properly.
	
	2. Verify that the unit is communicating with the server by having the System Administrator ping the unit from the server:
	
	  – If the thin client pings back, then the signal was accepted and the unit is working. This indicates a configuration issue.
	
	  – If the thin client does not ping back and the thin client does not connect to the server, re-image the unit.

No link or activity on the network RJ-45 LEDs or the LEDs do not illuminate blinking green after powering on the thin client unit. (The network LEDs are located inside the RJ-45 connector on the top, rear panel of the thin client. Indicator lights are visible when the connector is installed.)	1. Verify that the network is not down. 2. Make sure the RJ-45 cable is good by installing the RJ-45 cable onto a known working device—if a network signal is detected then the cable is good. 3. Verify the power supply is good by replacing the power cable to the unit with a known working power supply cable and testing it. 4. If network LEDs still do not light and you know the power supply is good, then re-image the unit. 5. If network LEDs still do not light, run the IP configuration procedure. 6. If network LEDs still do not light, have the unit serviced.
A newly connected unknown USB peripheral does not respond or USB peripherals connected prior to the newly connected USB peripheral will not complete their device actions.	An unknown USB peripheral may be connected and disconnected to a running platform as long as you do not reboot the system. If problems occur, disconnect the unknown USB peripheral and reboot the platform.
Video does not display.	1. Verify that the monitor brightness is set to a readable level. 2. Verify the monitor is good by connecting it to a known working computer and ensure its front LED turns green (assuming the monitor is Energy Star compliant). If the monitor is defective, replace it with a working monitor and repeat testing. 3. Re-image the thin client unit and power on the monitor again. 4. Test the thin client unit on a known working monitor. If the monitor does not display video, replace the thin client unit.

Discless (No-Flash) unit troubleshooting

This section is only for those units that do not have ATA Flash capability. Because there is no ATA Flash in this model, the boot priority sequence is:

- USB device

- PXE

1.	When the unit boots, the monitor should display the following information:

Table 10-6 Diskless unit troubleshooting

Item	Information	Action
MAC Address	NIC portion of the system board is OK	If no MAC Address, the system board is at fault. Contact the Call Center for service.
GUID	General system board information	If no GUID information, the system board is at fault and should be replaced.
Client ID	Information from server	If no Client ID information there is no network connection. This may be caused by a bad cable, the server is down, or a bad system board. Contact the Call Center for service for the bad system board.
MASK	Information from server	If no MASK information there is no network connection. This may be caused by a bad cable, the server is down, or a bad system board. Contact the Call Center for service for the bad system board.
DHCP IP	Information from server	If no DHCP IP information there is no network connection. This may be caused by a bad cable, the server is down, or a bad system board. Contact the Call Center for service for the bad system board.

If you are running in a Microsoft RIS PXE environment, go to step 2.

If you are running in a Linux environment, go to step 3.

2.	If you are running in a Microsoft RIS PXE environment, press the F12 key to activate the network service boot as soon as the DHCP IP information appears on the screen.

If the unit does not boot to the network, the server is not configured to PXE.

If you missed the F12 cue, the system will try to boot to the ATA flash that is not present. The message on the screen will read: **ERROR: Non-system disk or disk error. Replace and press any key when ready.**

Pressing any key will restart the boot cycle.

3.	If you are running in a Linux environment, an error message will appear on the screen if there is no Client IP. **ERROR: Non-system disk or disk error. Replace and press any key when ready.**

Configuring a PXE server

📝 **NOTE:** All PXE software is supported by authorized service providers on a warranty or service contract basis. Customers who call the HP Customer Service Center with PXE issues and questions should be referred to their PXE provider for assistance.

Additionally, refer to the following:

– For Windows Server 2008 R2: http://technet.microsoft.com/en–us/library/7d837d88-6d8e-420c-b68f-a5b4baeb5248.aspx

– For Windows Server 2012: http://technet.microsoft.com/en–us/library/jj648426.aspx

The following services must be running, and they may be running on different servers:

1. Domain Name Service (DNS)

2. Remote Installation Services (RIS)

📝 **NOTE:** Active Directory DHCP is not required, but is recommended.

11 Backup and recovery information

This chapter provides information on software to be used for backup and recovery. The information in the chapter is standard procedure for most Thin Client products.

HP ThinUpdate software is installed on Thin Client computers (select products only) to provide backup and recovery. If it is not installed on your computer, you can download it from http://www.hp.com/support (search for the Thin Client model and click on the **Drivers & software** section of the support page for that model. For information on using this software, refer to the Manuals section).

NOTE: HP recommends periodically going to the website to check for application updates.

Use HP ThinUpdate software for the following processes:

● Creating recovery media and backups

● Restoring and recovering your system

● Installing and updating software

12 Using HP ThinUpdate to restore the image

HP ThinUpdate software is installed on Thin Client computers (select products only) to provide backup and recovery. If it is not installed on your computer, you can download it from http://www.hp.com/support (search for the Thin Client model and click on the **Drivers & software** section of the support page for that model. For information on using this software, refer to the Manuals section).

NOTE: HP recommends periodically going to the website to check for application updates.

Use HP ThinUpdate software for the following processes:

- Creating recovery media and backups

- Restoring and recovering your system

- Installing and updating software

HP ThinUpdate allows you to download images and add-ons from HP, capture an HP thin client image, and create bootable USB flash drives for image deployment.

- The Image Downloads feature lets you download an image from HP to either local storage or a USB flash drive. The USB flash drive option creates a bootable USB flash drive that can be used to deploy the image to other thin clients.

- The Image Capture feature lets you capture an image from an HP thin client and save it to a USB flash drive, which can be used to deploy the image to other thin clients.

- The Add-on Downloads feature lets you download add-ons from HP to either local storage or a USB flash drive.

- The USB Drive Management feature lets you do the following:

    - Create a bootable USB flash drive from an image file on local storage

    - Copy an .ibr image file from a USB flash drive to local storage

    - Restore a USB flash drive layout

You can use a bootable USB flash drive created with HP ThinUpdate to deploy an HP thin client image to another HP thin client of the same model with the same operating system.

System requirements

To create a recovery device for the purpose of reflashing or restoring the software image on the flash, you will need the following:

- One or more HP thin clients.

- USB flash device in the following size or larger:

    - Windows 10 IoT (if using the USB format): 32 GB

NOTE: Optionally, you can use the tool on a Windows computer.

This restore method will not work with all USB flash devices. USB flash devices that do not show up as removable drive in Windows do not support this restore method. USB flash devices with multiple partitions generally do not support this restore method. The range of USB flash devices available on the market is constantly changing. Not all USB flash devices have been tested with the HP Thin Client Imaging Tool.

13 Device management

The thin client includes a license for HP Device Manager and has a Device Manager agent preinstalled. HP Device Manager is a thin client optimized management tool used to manage the full life cycle of HP thin clients to include Discover, Asset Management, Deployment and Configuration. For more information on HP Device Manager, visit www.hp.com/go/hpdm.

If you wish to manage the thin client with other management tools such as Microsoft SCCM or LANDesk, go to www.hp.com/go/clientmanagement for more information.

14 Specifications

Computer specifications

Table 14-1 Computer specifications

	Metric	U.S.
Dimensions		
Length	234.0 mm	9.22 in
Width	326.0 mm	12.84 in
Height (non-touch)	17.9 mm	0.71 in
Height (touch)	18.05 mm	0.72 in
Weight		
Models with UHD display	1.48 kg	3.27 lbs
Models with FHD display	1.51 kg	3.32 lbs
Input power		
Operating voltage	19.0 V dc @ 4.74 A – 90 W or 18.5 V dc @ 3.5 A - 65 W or 45 W	
Operating current	4.74 A or 3.5 A	
Temperature		
Operating	0°C to 35°C	32°F to 95°F
Nonoperating	−20°C to 60°C	−4°F to 140°F
Relative humidity		
Operating	10% to 90%	
Nonoperating	5% to 95%	
Maximum altitude (unpressurized)		
Operating (14.7 to 10.1 psia)	−15 m to 3,048 m	−50 ft to 10,000 ft
Nonoperating (14.7 to 4.4 psia)	−15 m to 12,192 m	−50 ft to 40,000 ft
Shock		
Operating	125 g, 2 ms, half-sine	
Nonoperating	200 g, 2 ms, half-sine	
Random vibration		
Operating	0.75 g zero-to-peak, 10 Hz to 500 Hz, 0.25 oct/min sweep rate	
Nonoperating	1.50 g zero-to-peak, 10 Hz to 500 Hz, 0.5 oct/min sweep rate	

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

35.6 cm (14.0 in.) display specifications

Table 14-2 Display specifications

	Metric	U.S.
Active diagonal size	35.6 cm	14.0 in.
Resolution	FHD: 1920 × 1080	
Surface treatment	Antiglare	
Brightness	FHD (45% CG): 250 nits	
	FHD (72% CG): 1000 nits	
Viewing angle	UWVA	
Backlight	LED	
Aspect ratio	16:9	
Display panel interface	FHD (45% CG): eDP	
	FHD (72% CG): eDP + PSR	

M.2 SATA solid-state drive specifications

M.2 SATA solid-state drive specifications

	128 GB*
Height	1.35 mm
Weight	< 10 g
Form factor	M.2 2280-D2-B-M
Transfer rate	up to 540 MB/sec
Interface type	SATA-3
Ready time, maximum (to not busy)	1.0 ms
Access times, logical	0.1 ms
Total logical sectors	234,441,648
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.

15 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 15-1 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.

Table 15-1 Power cord requirements for specific countries and regions (continued)

Country/region	Accredited agency	Applicable note number

2. The flexible cord must be Type SVT/SJT or equivalent, No. 18 AWG, 3-conductor. The wall plug must be a two-pole grounding type with a NEMA 5-15P (15 A, 125 V ac) or NEMA 6-15P (15 A, 250 V ac) configuration. CSA or C-UL mark. UL file number must be on each element.

3. The appliance coupler, flexible cord, and wall plug must bear a "T" mark and registration number in accordance with the Japanese Dentori Law. The flexible cord must be Type VCTF, 3-conductor, 0.75 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. 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.

16 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 reboots.

   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 clear the check box 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 reboots.

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), fingerprint reader, or both, 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 16-1 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 entered 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 111.	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.
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 entered 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/

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 entered into this memory?	How is this memory write-protected?
						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 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.

17 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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