Maintenance and Service Guide

SUMMARY

This guide provides information about spare parts, removal and replacement of parts, security, backing up, and more.

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Product notice

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

Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS update to take full advantage of Windows functionality. Windows 10 is automatically updated, which is always enabled. ISP fees may apply and additional requirements may apply over time for updates. Go to http://www.microsoft.com for details.

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

Software terms

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

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

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

Safety warning notice

Reduce the possibility of heat-related injuries or of overheating the computer by following the practices described.

⚠ **WARNING!** To reduce the possibility of heat-related injuries or of overheating the computer, do not place the computer directly on your lap or obstruct the computer air vents. Use the computer 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 come into contact with the skin or a soft surface, such as pillows or rugs or clothing, during operation. The computer and the AC adapter comply with the user-accessible surface temperature limits defined by applicable safety standards.

Table of contents

1 Computer features

This chapter provides you with an overview of your computer's features.

Standard features

To identify a typical computer configuration, read this section. Features vary depending on the model.

Landscape orientation

Portrait orientation

The Engage One Pro is designed for long-term deployment within general retail, hospitality, and other markets. It includes the following features:

- Integrated All-in-One (AiO) form factor available in landscape or portrait orientation
- Display panel (wide-aspect ratio); FHD 1920 × 1080 resolution, antiglare, antismudge, in the following sizes:

  - **39.6 cm** (15.6 in), 400 nits
  - **49.5 cm** (19.5 in), 450 nits
  - **60.5 cm** (23.8 in), 625 nits

    NOTE: The typical brightness of the panel is measured in nits before antiglare coating.

- Optional 100 mm × 100 mm VESA mounting bracket
- Optional countertop mounting bracket
- Choice of three stands:
  - Performance stand, height adjustable and tilt
  - Pro stand, tilt
  - Vertical stand, tilt
- Three available hubs:
  - Advanced Fanless Hub
  - Column hub
  - VESA hub
- Major HP peripherals:
  - Magnetic strip reader (MSR) (integrated into the head unit as configure to order)
  - LCD customer-facing display (CFD)
  - 2D barcode scanner
  - Biometric fingerprint reader
  - NFC authentication

Integrated features

To identify the computer features, use this illustration and table.

NOTE: Some integrated devices are optional.

Table 1-1 Identifying the integrated features

Features			
1	Near-field communication (NFC)	6	Fanless base hub (select products only)
2	Camera	7	Customer-facing display (CFD)
3	Display panel	8	Integrated magnetic stripe reader (MSR)
4	Fingerprint reader	9	Optional USB interface barcode scanner
5	Stand	10	Internal column hub
NOTE: You can configure the head unit in either landscape or portrait orientation.			

Stand options

To identify the available stands, use this illustration and table.

Table 1-2 Identifying the stands

Options	
1	Pro stand with 40°–120° tilt
2	Vertical stand with 15°–40° tilt
3	Performance stand, height adjustable with 50 mm lift and 40°–120° tilt
NOTE:	The stands are shown on a stability base.

Advanced Fanless Hub components

To identify the Advanced Fanless Hub features, use this illustration and table.

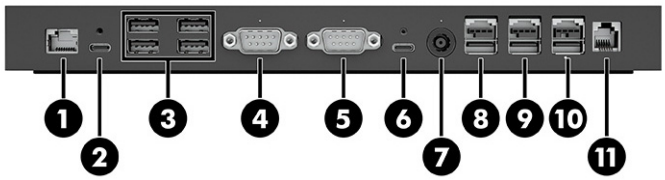


Table 1-3 Identifying the Advanced Fanless Hub features

Features			
1	RJ-45 (network) jack	7	Power connector
2	USB Type-C® powered connector (27W)	8	Powered USB 12 V connector
3	USB SuperSpeed ports (4)	9	Powered USB 12 V connector
4	Powered serial connector	10	Powered USB 24 V connector
5	Powered serial connector	11	RJ-12 (cash drawer) jack
6	USB powered connector (140 W)		
IMPORTANT:	Use only with a HP-provided USB cable that is rated at a minimum of 140 W.		
IMPORTANT:	To avoid damage to the computer, **do not** plug a telephone cable into the RJ-12 (cash drawer) jack.		

VESA hub components

To identify the VESA® hub features, use this illustration and table.

Table 1-4 Identifying the VESA hub features

Features			
1	RJ-45 (network) jack	4	Powered USB 12 V connector
2	Power connector	5	USB Type-C charging connector (27 W)
3	Powered USB 24 V connector	6	USB SuperSpeed ports (3)

Column hub components

To identify the column hub features, use this illustration and table.

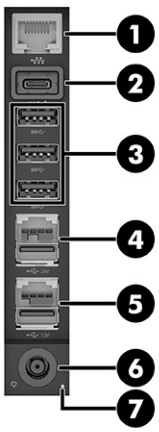


Table 1-5 Identifying the column hub features

Features			
1	RJ-45 (network) jack	5	Powered USB 12 V connector
2	USB Type-C powered connector (27 W)	6	Power connector

Table 1-5 Identifying the column hub features (continued)

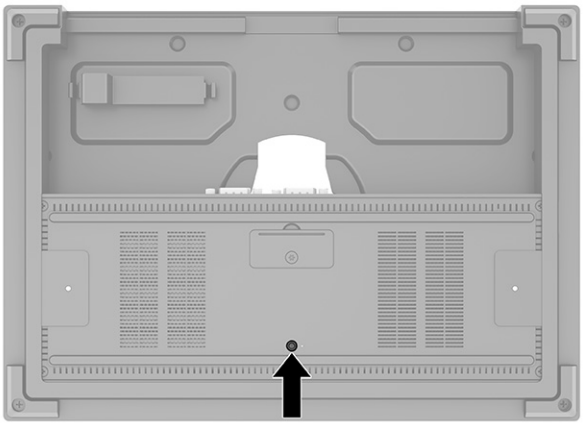
Features			
3	USB SuperSpeed ports (3)	7	Power light
4	Powered USB 24 V connector		

Locating the Engage One Pro power button

The computer power button is located on the bottom left edge of the bezel.

Locating the fanless hub power button

The power button is located on the underside of the hub.



The head unit controls the fanless hub. When the head unit is turned off, the hub is turned off and power is not available from the hub ports. The exception is the hub USB port that connects to the head unit. That port remains powered so that it can continue to communicate with the head unit and allow the hub to turn back on when the head unit is turned on.

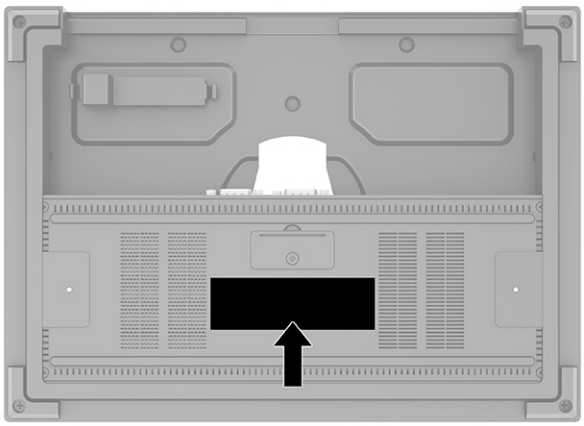
After the system has been turned off, you can press the power button on the underside of the hub to allow power to be available on the hub ports while the head unit remains turned off.

Engage One Pro serial number location

Each computer has a unique serial number and a product ID number that are located on the exterior of the computer. Keep these numbers available when you contact customer service for assistance.

Advanced Fanless Hub serial number location

Each hub has a unique serial number and a product ID number that is located on the exterior of the hub. Keep these numbers available when you contact customer service for assistance.



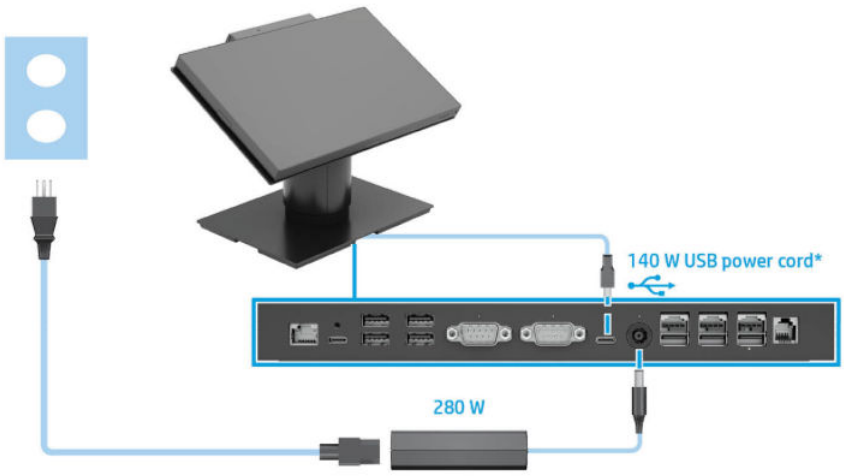
Regulatory information is located in the base plate or wall mount. Install the base plate or wall mount back after disassembly.

Cabling

There are several cabling scenarios.

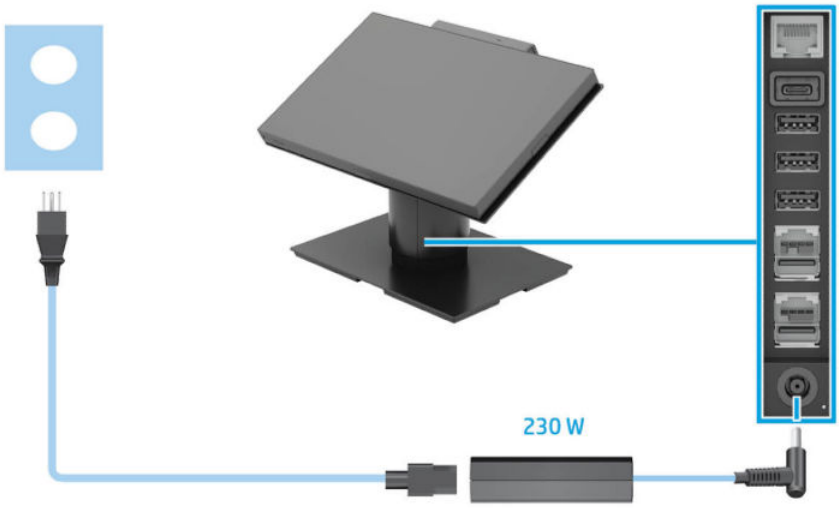
Cable matrix for Engage One Pro with the Advanced Fanless Hub

To identify the cable matrix for Engage One Pro with the Advanced Fanless Hub, use this illustration.



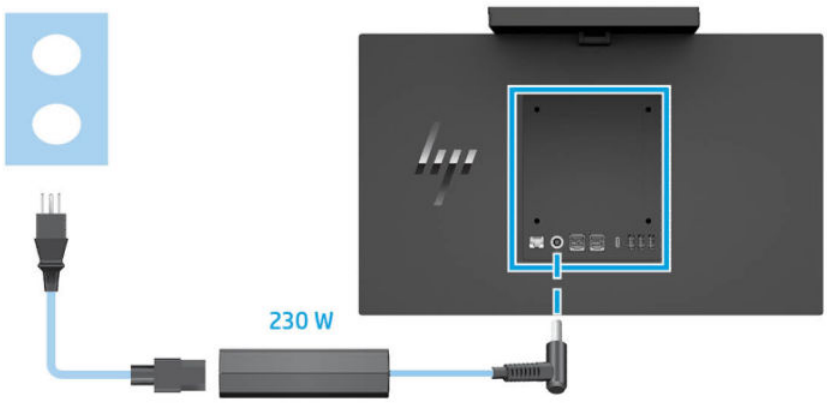
Cable matrix for Engage One Pro with the column hub

To identify the cable matrix for Engage One Pro with the column hub, use this illustration.



Cable matrix for Engage One Pro with the VESA hub

To identify the cable matrix for Engage One Pro with the VESA hub, use this illustration.



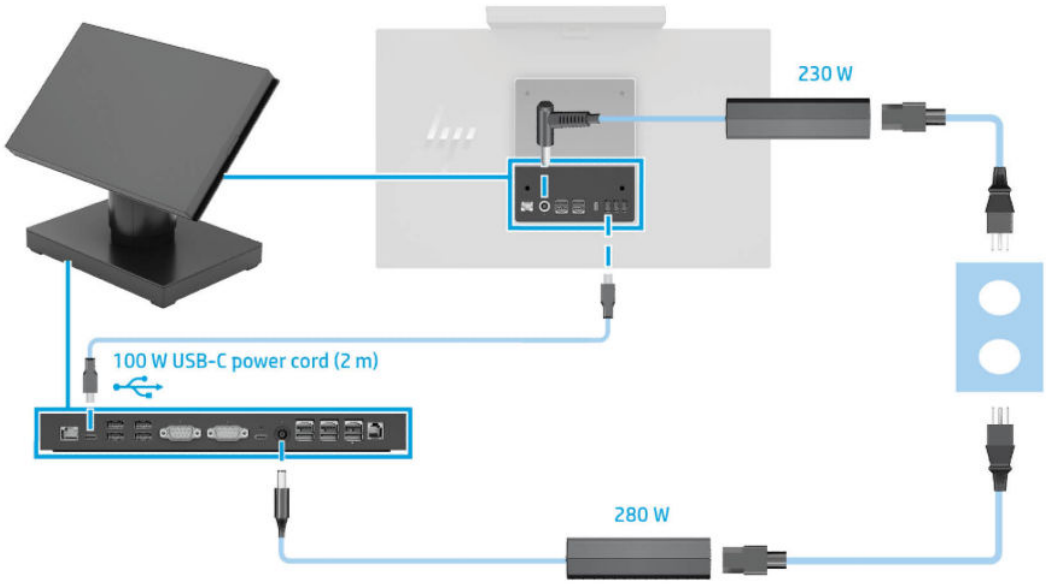
Cable matrix for Engage One Pro with the Advanced Fanless Hub and column hub

To identify the cable matrix for Engage One Pro with the Advanced Fanless Hub and column hub, use this illustration.

NOTE: If the system is configured so the Advanced Fanless Hub is daisy chained as the second hub, when the system is off, the USB Type-C port (27 W) charging function is disabled. To enable charging from this port, press the Advanced Fanless Hub power button or turn on the head unit.

Cable matrix for Engage One Pro with the Advanced Fanless Hub and VESA hub

To identify the cable matrix for Engage One Pro with the Advanced Fanless Hub and VESA hub, use this illustration.



NOTE: If the system is configured so the Advanced Fanless Hub is daisy chained as the second hub, when the system is off, the USB Type-C port (27 W) charging function is disabled. To enable charging from this port, press the Advanced Fanless Hub power button or turn on the head unit.

Configuring the fanless hub powered serial ports

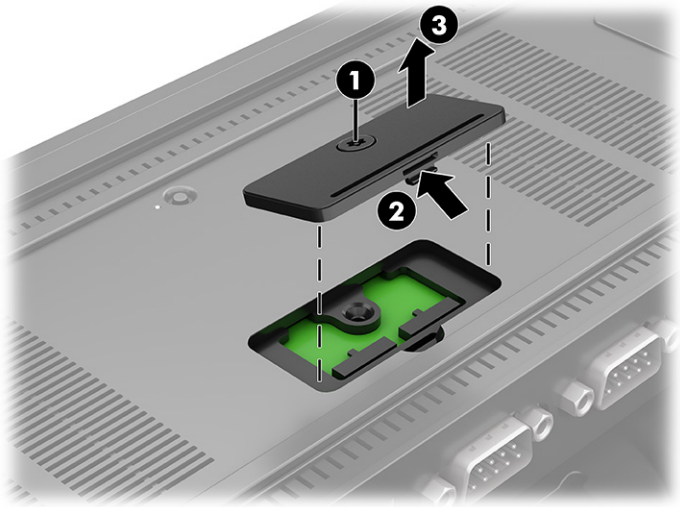
You can configure the serial ports as standard (unpowered) serial ports or powered serial ports. Some devices use a powered serial port. If the serial port is configured as a powered port, devices that support a powered serial interface do not require an external power source.

To configure the powered serial ports:

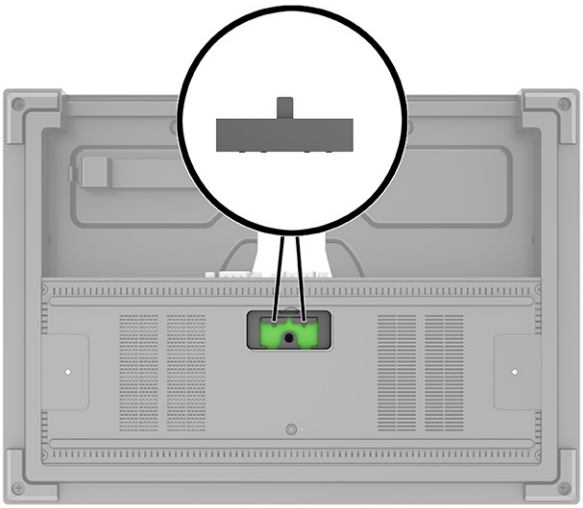
1. Turn off the computer properly through the operating system, and turn off any external devices.
2. Disconnect the power cord.

NOTE: Regardless of the power state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. You must disconnect the power cord and wait approximately 30 seconds for the power to drain to avoid damage to the internal components of the computer.

3. Loosen the captive Torx screw on the voltage switch cover on the underside of the hub **(1)**, and then use the inset **(2)** to remove the cover **(3)**.



4. Adjust the voltage select switch behind each serial port to the setting that you want.



5. Install the voltage switch cover onto the hub.
6. Reconnect the hub power cord and peripheral devices.

Power states

This table provides power state information for the VESA hub and column hub.

Power states are defined as follows:

- S0: On/working
- S3: Sleep
- S4: Hibernate
- S5: Off/shutdown

Table 1-6 Hub power states: VESA hub/Column hub

Host status	Hub status	PLTRST# Host	DMC	DeMUX	Top USB3.2 G2 hub	DP Conv	MUX	USB-A port	USB2.0 hub	27W PD USB-C	PUSB 12V/24V	Host Disc
LPS	S5	Low	On	On	Off	Off	Off	Off	Off	Off	Off	N/A
S5	S5	Low	On	On	Off	Off	Off	Off	Off	Off	Off	N/A
S4	S5	Low	On	On	Off	Off	Off	Off	Off	Off	Off	N/A
S3	S3	Low	On	On	On	On	On	On	On	On	On	N/A
S0	S0	High	On	On	On	On	On	On	On	On	On	N/A
Soft reboot	Reboot	Toggle	On	On	On	On	On	On	On	On	On	N/A
Always-on (F10)	S0	High	On	On	On	On	On	On	On	On	On	On

NOTE: By default, HP USB-C ports are charging capable in S4/S5 states.

Table 1-7 Hub power states: Fanless hub

Host status	Hub status	PLTRST # Host	DMC	140W PD USB-C	DeMUX	Top USB3.2 hub	RJ-45	DP Conv & MUX	Bot USB3.2, 2.0 hub, USB-A, 27W PD USB-C	PUSB 12V/ 24V	P-serial ports	Cash drawer	Host Disc
LPS	S5	Low	On	On	Off	Off	Off	Off	Off	Off	Off	Off	N/A
S5 w/o WoL	S5	Low	On	On	On	On	Off	Off	Off	Off	Off	Off	N/A
S5 w/WoL	S5 WoL	Low	On	On	On	On	On	Off	Off	Off	Off	Off	N/A
S4 w/o WoL	S5	Low	On	On	On	Off	Off	Off	Off	Off	Off	Off	N/A
S4 w/WoL	S5 WoL	Low	On	On	On	On	On	Off	Off	Off	Off	Off	N/A
S3 W/o WoL	S3	Low	On	On	On	On	Off	On	On	Off	Off	Off	N/A
S3 w/WoL	S3 WoL	Low	On	On	On	On	On	On	On	Off	Off	Off	N/A
S0	S0	High	On	On	On	On	On	On	On	On	On	On	N/A
Soft reboot	Reboot	Toggle	On	On	On	On	On	On	On	On	1s pulse	On	N/A
Always-on (F10)	S0	High	On	On	On	On	On	On	On	On	On	On	On

NOTE: By default, HP USB-C ports are charging capable in S4/S5 states.

Table 1-8 Power state for stack dock: Engage One Pro► VESA hub/Column hub► Fanless hub

Host status	Hub status	PLTRST# Host	DMC	140W PD USB-C	DeMUX	Top USB3.2 G2 hub	DP Conv	MUX	USB-A port	USB2.0 hub	27W PD USB-C	PUSB 12V/24V	Host Disc
LPS	S5	Low	On	On	Off	Off	Off	Off	Off	Off	Off*	Off	N/A
S5 Fanless hub WoL	S5	Low	On	On	On	On	Off	On	Off	Off	On	Off	N/A
S4 Fanless hub WoL	S5	Low	On	On	On	Off	Off	On	Off	Off	On	Off	N/A
S3 Fanless hub WoL	S3	Low	On	On	On	On	On	On	On	On	On	Off	N/A
S0	S0	High	On	On	On	On	On	On	On	On	On	On	N/A
Soft reboot	Reboot	Toggle	On	On	On	On	On	On	On	On	On	On	N/A
Always-on (F10)	S0	High	On	On	On	On	On	On	On	On	On	On	On

In single dock scenario, HP BIOS sends the VW base on the fanless hub power state table. DMC in each dock supports the WOL VW based on capability.

In stack dock scenario, HP BIOS/EC sends the VW base on the fanless hub power state table. The VESA hub passes the VW from BIOS to the fanless hub. The VESA hub filters the VW and implements non-WoL.

NOTE: By default, HP USB-C ports are charging capable in S4/S5 states.

Off* signifies USB data off but CC On and vSafe0V to vSafe5V VBUS transition on UFP attach; port is charging capable.

2 Illustrated parts catalog

Use this information to determine the spare parts that are available for the computer.

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

Computer major components

To identify the computer major components, use this illustration and table.

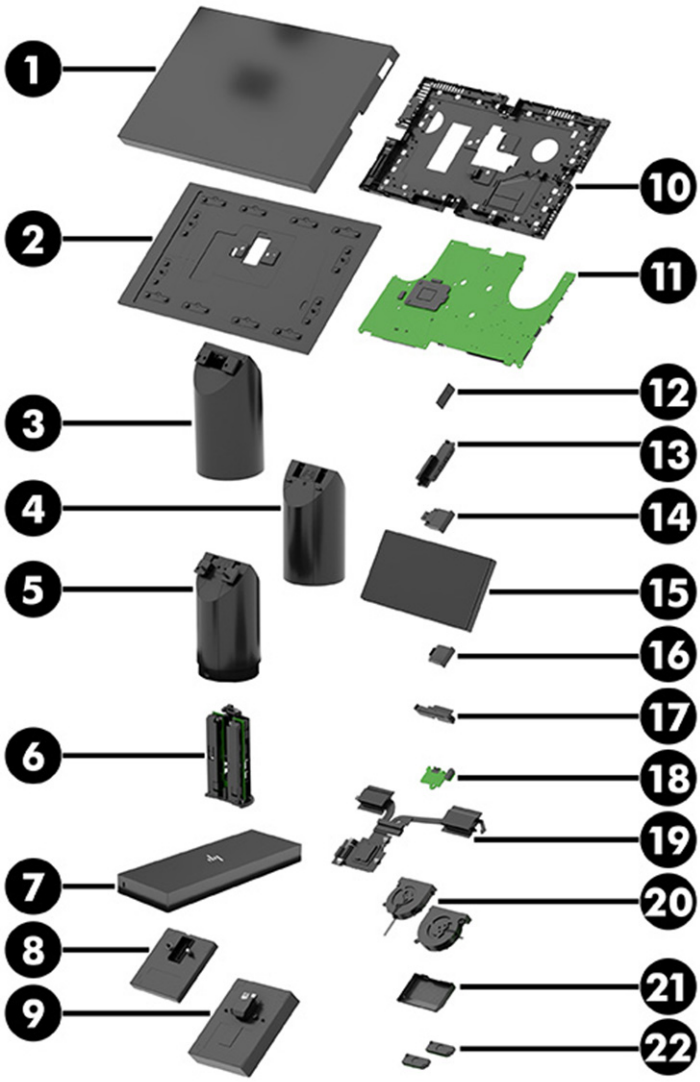


Table 2-1 Computer major components and their descriptions

Item	Description
(1)	**Display head unit**
	60.5 cm (23.8 inch) models, landscape orientation
	60.5 cm (23.8 inch) models, landscape orientation, with camera
	60.5 cm (23.8 inch) models, portrait orientation
	49.5 cm (19.5 inch) models, landscape orientation
	49.5 cm (19.5 inch) models, landscape orientation, with camera
	49.5 cm (19.5 inch) models, portrait orientation
	39.6 cm (15.6 inch) models, landscape orientation
	39.6 cm (15.6 inch) models, landscape orientation, with camera
	39.6 cm (15.6 inch) models, portrait orientation
(2)	**Back plate**
	60.5 cm (23.8 inch) models
	49.5 cm (19.5 inch) models
	39.6 cm (15.6 inch) models
(3)	**Vertical stand**
(4)	**Pro stand**
(5)	**Performance stand**
(6)	**Column hub**
(7)	**Advanced Fanless Hub**
	Advanced Fanless Hub frame and clip (not illustrated)
(8)	**VESA mount**
(9)	**VESA hub**
(10)	**System board cover**
(11)	**System board** (includes replacement thermal material)
(12)	**NFC assembly**
(13)	**Magnetic stripe reader**
(14)	**Barcode scanner**
(15)	**HP Engage One Pro 6.6” Display (CFD)**
(16)	**Expansion slot insert**
(17)	**Fingerprint reader**
(18)	**Power button board**
(19)	**Heat sink assembly**
(20)	**Fans**

Table 2-1 Computer major components and their descriptions (continued)

Item	Description
(21)	**Memory cover**
(22)	**Speakers**
	Backlight board (not illustrated)
	Stability base (not illustrated)
	Camera assembly (not illustrated)
	60.5 cm (23.8 inch) models and 49.5 cm (19.5 inch) models
	39.6 cm (15.6 inch) models
	WLAN module (not illustrated)
	Intel Wi-Fi 6 AX201 (2 × 2) and Bluetooth® M.2 Combo Card, non-vPro™
	Intel Wi-Fi 6 AX201 (2 × 2) and Bluetooth M.2 Combo Card, vPro™
	Memory modules (PC4-3200; not illustrated)
	16 GB
	8 GB
	4 GB
	Processor (includes replacement thermal material; not illustrated)
	Intel® Core® i9-10900F (2.8 GHz, 20 MB Intel Smart Cache, 10 core, 65 W)
	Intel Core i7-10700E (2.9 GHz, 16 MB Intel Smart Cache, 8 core, 65 W)
	Intel Core i5-10500E (3.1 GHz, 12 MB Intel Smart Cache, 6 core, 65 W)
	Intel Core i3-10100E (3.6 GHz, 6 MB Intel Smart Cache, 4 core, 65 W)
	Intel Pentium® Gold G6400E (3.8 GHz, 4 MB Intel Smart Cache, 2 core, 58 W)
	Intel Celeron® G5900E (3.2 GHz, 2 MB Intel Smart Cache, 2 core, 58 W)
	Solid-state drive (M.2 2280, PCIe; not illustrated)
	1 TB, TLC
	512 GB, TLC
	512 GB + 32 GB Optane™ memory
	256 GB, TLC
	256 GB, TLC, self-encrypting drive (SED)
	256 GB + 16 GB Optane memory
	128 GB, TLC

Miscellaneous parts

To identify the various computer parts, use this table.

Table 2-2 Miscellaneous parts and their descriptions

Description
Antenna Kit
39.6 cm (15.6 inch) models
49.5 cm (19.5 inch) models
60.5 cm (23.8 inch) models
Antenna Kit, NFC module
AC adapter
280 W
230 W
Power cord (C13)
Antenna cover
Column cable hook
Adapter
USB-to-serial
USB-C to-DisplayPort™
USB-C to-HDMI 2.0
USB-C to-VGA
Stand top cover
Pro stand
Vertical stand
Performance stand
Counter mount kit
Flexible pole, single
Flexible pole back bracket
SSD door
HP Engage 6.6 inch pole display
HP Engage One Pro Integrated BCS
Cables
USB-C to USB-C (3.1, Gen2), 20 V, 5 A, 320 mm (12.6 in)
USB-C to USB-C (3.1, Gen2), 20 V, 5 A, 2 m (6.6 ft)
USB-C to USB-C (3.1, Gen2), 20 V, 7 A, 178 mm (7 in)
USB-C to USB-C (3.1, Gen2), 20 V, 7 A, 510 mm (20 in)
USB-C to USB-C (3.1, Gen2), 20 V, 7 A, 2 m (6.6 ft)
RJ-45 (network) cable, 140 mm (5.5 in)

Table 2-2 Miscellaneous parts and their descriptions (continued)

Description
RJ-45 (network) cable, Vertical stand, 100 mm (4 in)
I/O block cable, VESA hub
Backlight-to-system board cable, 49.5 cm (19.5 in) models
Backlight-to-system board cable, 60.5 cm (23.8 inch) models
Backlight-to-panel cable, 60.5 cm (23.8 inch) models
USB-C® cable, CCG-5
USB-A cable, 49.5 cm (19.5 in) models
USB-A cable, 60.5 cm (23.8 inch) models
Fingerprint reader cable
Magnetic stripe reader cable
NFC cable
Switch cable, 60.5 cm (23.8 inch) models
Switch cable, 49.5 cm (19.5 in) models
Switch cable, 39.6 cm (15.6 inch) models
Microphone Y-cable, 49.5 cm (19.5 in)/60.5 cm (23.8 inch) models
Microphone Y-cable, 39.6 cm (15.6 inch) models
Touch board cable, 60.5 cm (23.8 inch) models
Touch board cable, 49.5 cm (19.5 in) models
EDP cable, 39.6 cm (15.6 inch) models
Display (LVDS cable), 60.5 cm (23.8 inch) models
Display (LVDS cable), 49.5 cm (19.5 in) models

3 Routine care, SATA drive guidelines, and disassembly preparation

This information provides general service information for the computer. Adherence to the procedures and precautions is essential for proper service.

IMPORTANT: When the computer is plugged into an AC power source, AC voltage is always applied to the system board. You must disconnect the power cord from the power source before opening the computer to prevent electric shock, system board, or component damage.

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

This table shows how humidity affects the electrostatic voltage levels generated by different activities. A product can be degraded by 700 V.

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

Table 3-1 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

Table 3-1 Static electricity occurrence based on activity and humidity (continued)

	Relative humidity		
Removing DIPs (dual in-line packages) from plastic tube	400 V	700 V	2,000 V
Removing DIPs from vinyl tray	2,000 V	4,000 V	11,500 V
Removing DIPs from polystyrene foam	3,500 V	5,000 V	14,500 V
Removing bubble pack from PCB (printed circuit board)	7,000 V	20,000 V	26,500 V
Packing PCBs in foam-lined box	5,000 V	11,000 V	21,000 V
Multiple electric components can be packaged together in plastic tubes, trays, or polystyrene foam.			

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 this 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 3-2 Static shielding protection levels

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

Grounding the work area

To prevent static damage at the work area, use these 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 these 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

Operating guidelines

This information details how to prevent overheating and to help prolong the life of the computer.

- Keep the computer away from excessive moisture, direct sunlight, and extremes of heat and cold.
- Operate the computer on a sturdy, level surface. Leave a 10.2 cm (4 inch) clearance on all vented sides of the computer and above the monitor to permit the required airflow.
- Never restrict the airflow into the computer by blocking any vents or air intakes. Do not place the keyboard, with the keyboard feet down, directly against the front of the desktop unit as this also restricts airflow.
- Occasionally clean the air vents on all vented sides of the computer. Lint, dust, and other foreign matter can block the vents and limit the airflow. Be sure to unplug the computer before cleaning the air vents.
- Never operate the computer with the cover or side panel removed.
- Do not stack computers on top of each other or place computers so near each other that they are subject to each other's recirculated or preheated air.
- If the computer is to be operated within a separate enclosure, intake and exhaust ventilation must be provided on the enclosure, and the same operating guidelines listed previously still apply.
- Keep liquids away from the computer and keyboard.
- Never cover the ventilation slots on the monitor with any type of material.
- Install or enable power management functions of the operating system or other software, including Sleep states.

Routine care

Use this information to properly care for your computer.

General cleaning safety precautions

Use this information to safely clean your computer.

⚠ **CAUTION:** To prevent electric shock or damage to components, never clean a product while it is turned on or plugged in.

- Never use solvents or flammable solutions to clean the computer.
- Never immerse any parts in water or cleaning solutions; apply any liquids to a clean cloth and then use the cloth on the component.
- Always unplug the computer when cleaning with liquids or damp cloths.
- Always unplug the computer before cleaning the keyboard, mouse, or air vents.
- Disconnect the keyboard before cleaning it.
- Wear safety glasses equipped with side shields when cleaning the keyboard.

Removing dirt and debris from your computer

Here are the recommended steps to clean dirt and debris from your computer.

1. Wear disposable gloves made of latex (or nitrile gloves, if you are latex-sensitive) when cleaning the surfaces.
2. Turn off your device and unplug the power cord and other connected external devices. Remove any installed batteries from items such as wireless keyboards.

CAUTION: To prevent electric shock or damage to components, never clean a product while it is turned on or plugged in.

3. Moisten a microfiber cloth with water. The cloth should be moist, but not dripping wet.

IMPORTANT: To avoid damaging the surface, avoid abrasive cloths, towels, and paper towels.

4. Wipe the exterior of the product gently with the moistened cloth.

IMPORTANT: Keep liquids away from the product. Avoid getting moisture in any openings. If liquid makes its way inside your HP product, it can cause damage to the product. Do not spray liquids directly on the product. Do not use aerosol sprays, solvents, abrasives, or cleaners containing hydrogen peroxide or bleach that might damage the finish.

5. Start with the display (if applicable). Wipe carefully in one direction, and move from the top of the display to the bottom. Finish with any flexible cables, like power cord, keyboard cable, and USB cables.
6. Be sure that surfaces have completely air-dried before turning the device on after cleaning.
7. Discard the gloves after each cleaning. Clean your hands immediately after you remove the gloves.

See Cleaning your computer with a disinfectant on page 23 for recommended steps to clean the high-touch, external surfaces on your computer to help prevent the spread of harmful bacteria and viruses.

Cleaning your computer with a disinfectant

The World Health Organization (WHO) recommends cleaning surfaces, followed by disinfection, as a best practice for preventing the spread of viral respiratory illnesses and harmful bacteria.

After cleaning the external surfaces of your computer using the steps in Removing dirt and debris from your computer on page 22, you might also choose to clean the surfaces with a disinfectant. A disinfectant that is within HP's cleaning guidelines is an alcohol solution consisting of 70% isopropyl alcohol and 30% water. This solution is also known as rubbing alcohol and is sold in most stores.

Follow these steps when disinfecting high-touch, external surfaces on your computer:

1. Wear disposable gloves made of latex (or nitrile gloves, if you are latex-sensitive) when cleaning the surfaces.
2. Turn off your device and unplug the power cord and other connected external devices. Remove any installed batteries from items such as wireless keyboards.

CAUTION: To prevent electric shock or damage to components, never clean a product while it is turned on or plugged in.

3. Moisten a microfiber cloth with a mixture of 70% isopropyl alcohol and 30% water. The cloth should be moist, but not dripping wet.

CAUTION: Do not use any of the following chemicals or any solutions that contain them, including spray-based surface cleaners: bleach, peroxides (including hydrogen peroxide), acetone, ammonia, ethyl alcohol, methylene chloride, or any petroleum-based materials, such as gasoline, paint thinner, benzene, or toluene.

IMPORTANT: To avoid damaging the surface, avoid abrasive cloths, towels, and paper towels.

4. Wipe the exterior of the product gently with the moistened cloth.

IMPORTANT: Keep liquids away from the product. Avoid getting moisture in any openings. If liquid makes its way inside your HP product, it can cause damage to the product. Do not spray liquids directly on the product. Do not use aerosol sprays, solvents, abrasives, or cleaners containing hydrogen peroxide or bleach that might damage the finish.

5. Start with the display (if applicable). Wipe carefully in one direction, and move from the top of the display to the bottom. Finish with any flexible cables, like power cord, keyboard cable, and USB cables.
6. Be sure that surfaces have completely air-dried before turning the device on after cleaning.
7. Discard the gloves after each cleaning. Clean your hands immediately after you remove the gloves.

Enabling HP Easy Clean (select products only)

HP Easy Clean helps you to avoid accidental input while you clean the computer surfaces. This software disables devices such as the keyboard, touch screen, and touchpad for a preset amount of time so that you can clean all computer surfaces.

1. Start HP Easy Clean in one of the following ways:
   - Select the **Start** menu, and then select **HP Easy Clean**.

     – or –

   - Select the **HP Easy Clean** icon in the taskbar.

     – or –

   - Select **Start**, and then select the **HP Easy Clean** tile.
2. Now that your device is disabled for a short period, see Removing dirt and debris from your computer on page 22 for the recommended steps to clean the high-touch, external surfaces on your computer. After you remove the dirt and debris, you can also clean the surfaces with a disinfectant. See Cleaning your computer with a disinfectant on page 23 for guidelines to help prevent the spread of harmful bacteria and viruses.

Cleaning the computer case

Follow all safety precautions before cleaning the computer case.

To clean the computer case, follow these procedures:

- To remove light stains or dirt, use plain water with a clean, lint-free cloth or swab.
- For stronger stains, use a mild dishwashing liquid diluted with water. Rinse well by wiping it with a cloth or swab dampened with clear water.
- For stubborn stains, use isopropyl (rubbing) alcohol. No rinsing is needed because the alcohol evaporates quickly and does not leave a residue.
- After cleaning, always wipe the unit with a clean, lint-free cloth.
- Occasionally clean the air vents on the computer. Lint and other foreign matter can block the vents and limit the airflow.

Cleaning the keyboard

Use this information to properly clean the keyboard. Follow all safety precautions before cleaning the keyboard.

To clean the tops of the keys or the keyboard body, follow the procedures described in Cleaning the computer case on page 24.

When cleaning debris from under the keys, review all rules in General cleaning safety precautions on page 22 before following these procedures.

CAUTION: Use safety glasses equipped with side shields before attempting to clean debris from under the keys.

- You can remove visible debris underneath or between the keys by vacuuming or shaking.
- You can use canned, pressurized air to clean debris from under the keys. Use caution because too much air pressure can dislodge lubricants applied under the wide keys.
- If you remove a key, use a specially designed key puller to prevent damage to the keys. This tool is available through many electronic supply outlets.

IMPORTANT: Never remove a wide leveled key (like the space bar) from the keyboard. If these keys are improperly removed or installed, the keyboard might not function properly.

- You can clean under a key with a swab moistened with isopropyl alcohol and squeezed out. Be careful not to wipe away lubricants necessary for proper key functions. Use tweezers to remove any fibers or dirt in confined areas. Allow the parts to air dry before reassembly.

Cleaning the monitor

Follow all safety precautions before cleaning dirt and debris from your computer. Use this information to properly clean the monitor.

- Wipe the monitor screen with a clean cloth moistened with water or with a towelette designed for cleaning monitors. Do not use sprays or aerosols directly on the screen; the liquid can seep into the housing and damage a component. Never use solvents or flammable liquids on the monitor.
- To clean the monitor body, follow the procedures in Cleaning the computer case on page 24.

Cleaning the mouse

Follow all safety precautions before cleaning dirt and debris from your computer. Use this information to properly clean the mouse.

- Clean the mouse ball by first removing the retaining plate and the ball from the housing. Pull out any debris from the ball socket and wipe the ball with a clean, dry cloth before reassembly.
- To clean the mouse body, follow the procedures in Cleaning the computer case on page 24.

Service considerations

Keep these considerations in mind during the disassembly and assembly of the computer.

Tools and software requirements

Servicing the computer requires these tools.

- Torx T-15 screwdriver
- Flat-bladed screwdriver (can sometimes be used in place of the Torx screwdriver)
- Phillips P1 screwdriver

- Nonconductive, nonmarking pry tool
- Diagnostics software

Screws

The screws used in the computer are not interchangeable. They could have standard or metric threads and might be of different lengths.

If you use an incorrect screw during the reassembly process, it can damage the unit. HP strongly recommends that you keep all screws that you remove during disassembly with the removed part and then return them to their proper locations.

IMPORTANT: As you remove each subassembly from the computer, place it away from the work area to prevent damage.

Cables and connectors

Use this information properly handle cables.

Apply only the tension required to seat or unseat the cables during insertion or removal from the connector. Handle cables by the connector whenever possible. In all cases, avoid bending or twisting the cables, and route the cables so that they cannot be caught or snagged by parts being removed or replaced.

IMPORTANT: When servicing this computer, be sure to place cables in their proper location during the reassembly process. Improper cable placement can damage the computer.

Lithium coin cell battery

The battery that comes with the computer provides power to the real-time clock and has a minimum lifetime of approximately three years.

See the appropriate removal and replacement chapter for the chassis that you are working on for instructions on the replacement procedures.

WARNING! This computer contains a lithium battery. There is a risk of fire and chemical burn if the battery is handled improperly. Do not disassemble, crush, puncture, short external contacts, dispose of in water or fire, or expose it to temperatures higher than 140°F (60°C). Do not attempt to recharge the battery.

NOTE: Do not dispose of batteries, battery packs, and accumulators with general household waste. To forward them to recycling centers or proper disposal, use the public collection system or return them to HP, their authorized partners, or their agents.

4 Removal and replacement procedures

Adherence to these procedures and precautions is essential for proper service. After completing all necessary removal and replacement procedures, run the Diagnostics utility to verify that all components operate properly.

NOTE: Not all features listed in this guide are available on all computers.

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

Preparation for disassembly

Use this information to properly prepare to disassemble and reassemble the computer.

See Routine care, SATA drive guidelines, and disassembly preparation on page 19 for initial safety procedures.

1. Remove all removable media from the computer.
2. 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.

   IMPORTANT: Turn off the computer before disconnecting any cables.

   Regardless of the power state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. In some systems, the cooling fan is on even when the computer is in the Standby or Suspend modes. Always disconnect the power cord before servicing a unit.
3. Disconnect the power from the computer by unplugging the power cord from the hub.
4. Disconnect all external devices from the computer and hubs.

CAUTION: Beware of sharp edges inside the chassis.

NOTE: During disassembly, label each cable as you remove it, and note its position and routing. Keep all screws with the removed components.

Hubs

Three different hubs are offered.

Advanced Fanless Hub

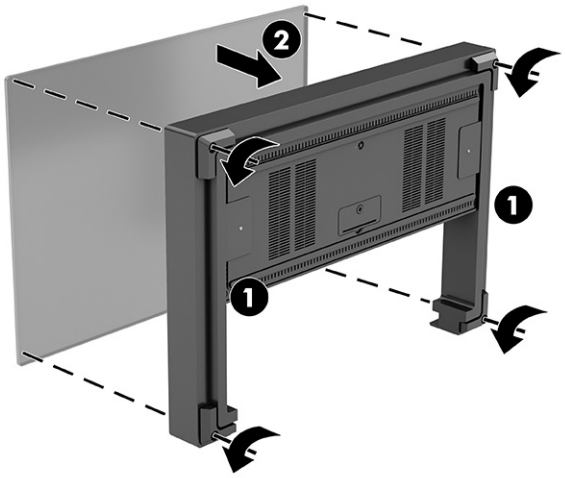
To remove the Advanced Fanless Hub, use these procedures.

Before removing the Advanced Fanless Hub, follow these steps:

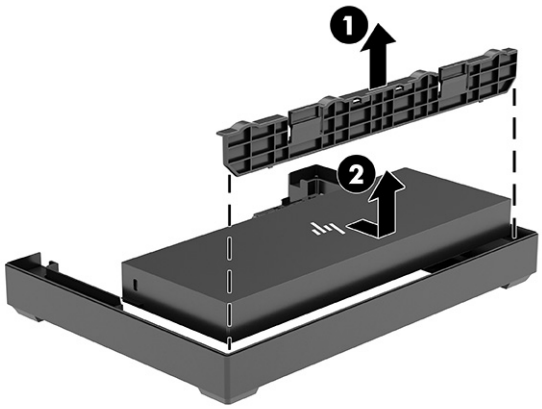
1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Position the head unit facedown on a flat surface covered by protective sheet made of foam or a clean, dry cloth.

Remove the Advanced Fanless Hub:

1. Loosen the four Phillips screws **(1)** that secure the hub to the base.
2. Remove the hub from the base **(2)**.



3. Pull the two tabs with green arrows toward the hub, and then pull the clip up to remove it **(1)**.
4. Slide the hub back, and then lift it out of the frame **(2)**.



To install the Advanced Fanless Hub, reverse the removal procedures.

VESA hub

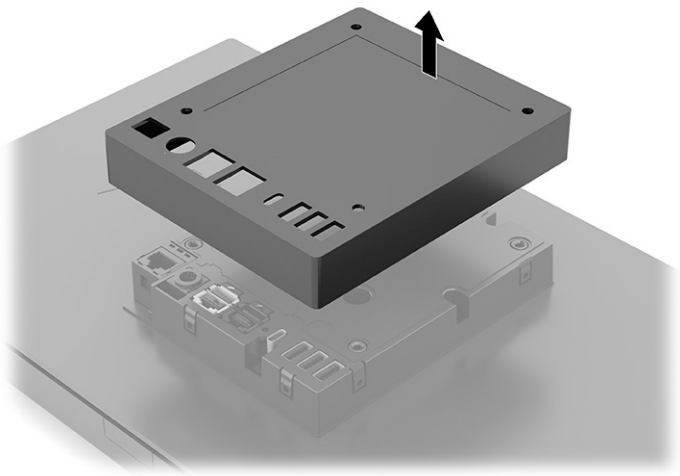
To remove the VESA hub, use these procedures.

Before removing the VESA hub, follow these steps:

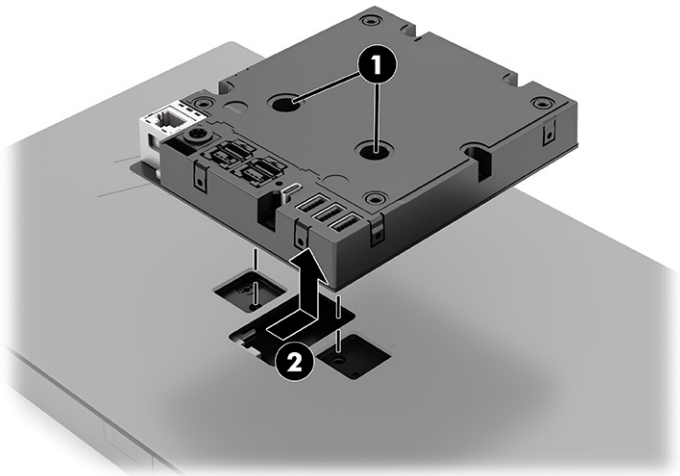
1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Position the head unit facedown on a flat surface covered by protective sheet made of foam or a clean, dry cloth.

Remove the VESA hub:

1. Pull the cover straight up and off the VESA hub.



2. Loosen the two captive Phillips screws **(1)**, slide the hub back, and then pull it up and remove it from the head unit **(2)**.



To install the VESA hub, reverse the removal procedures.

Column hub

To remove the column hub from the stand, use these procedures.

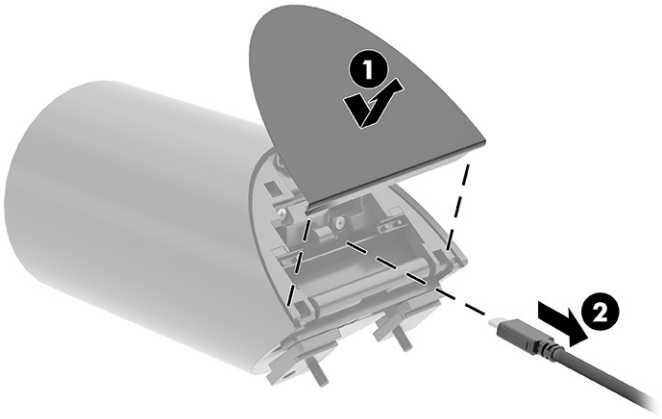
Before removing the column hub from the stand, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the stability base from the stand (Stability base on page 32).
3. Remove the head unit from the stand (Head unit from stand on page 33).

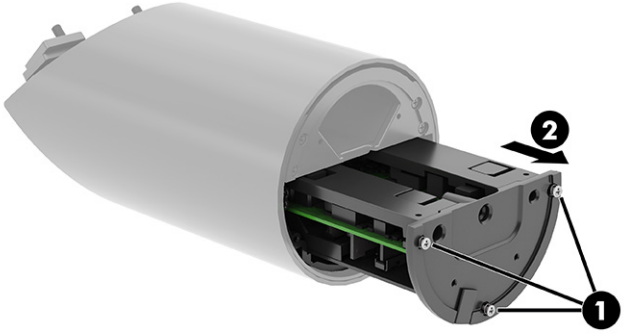
Remove the column hub:

1. Slide the top cover to release it **(1)**, and then remove the cover from the stand **(2)**.

2. Disconnect the cable from the top of the hub **(3)**.



3. Loosen the three Phillips screws **(1)** that secure the column hub to the stand, and then slide the hub out of the stand **(2)**.



To install the column hub into the stand, reverse the removal procedures.

Accessing and routing cables to the column hub

Use these sections to gain access to the column hub.

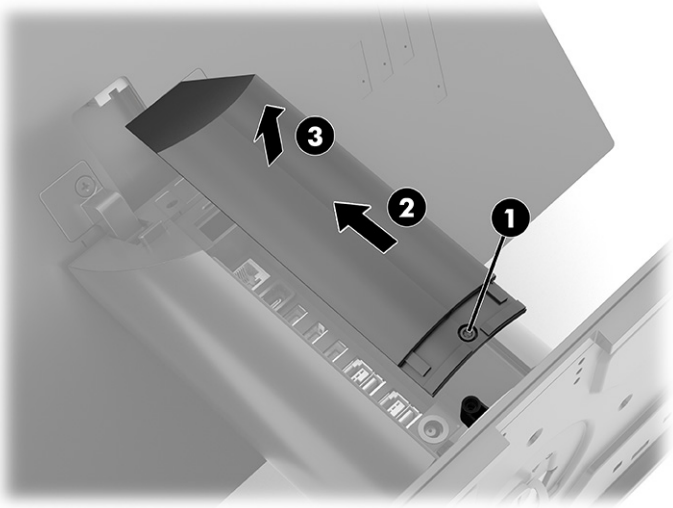
Connect cables to the column hub starting with the bottom port and working up in the following order:

- Power connector
- Power USB ports
- USB Type-A ports
- USB Type-C port
- Network jack

Removing the door on the Performance stand

To remove the Performance stand door, use this procedure and illustration.

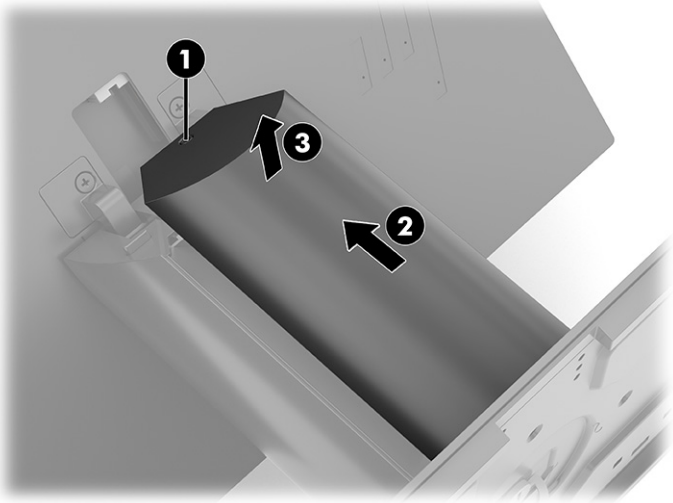
1. If necessary, adjust the stand height to access the captive screw.
2. Loosen the captive screw **(1)**.
3. Slide the door up **(2)**, and then remove it from the stand **(3)**.



Removing the door on the Pro stand

To remove the Pro stand door, use this procedure and illustration.

1. Loosen the captive screw **(1)**.
2. Lift the stand door up **(2)**, and then remove it from the stand **(3)**.

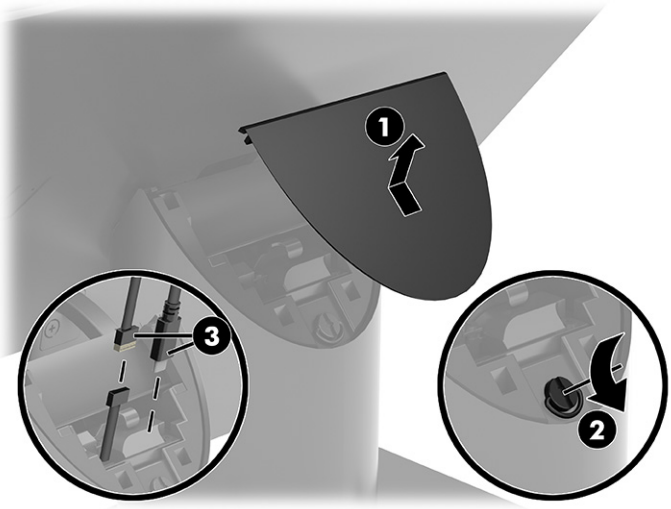


Removing the cover from the Vertical stand

To remove the Vertical stand cover, use this procedure and illustration.

1. Slide the top cover to release it **(1)**, and then remove the cover from the stand **(2)**.
2. Loosen the thumbscrew **(2)**.

3. Disconnect the cables from the inside of the stand **(3)**.



4. Lift the head unit and stand cover assembly off the stand.

TIP: When installing the Vertical stand, be sure to firmly tighten the thumbscrew so that the stand cover seats properly.

Stability base

To remove the stability base, use these procedures.

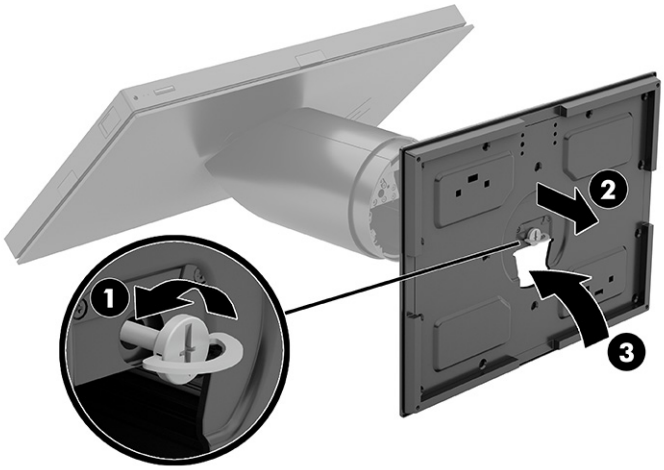
Before removing the stability base, follow these steps:

▲ Prepare the computer for disassembly (Preparation for disassembly on page 27).

Remove the stability base:

1. Loosen the thumbscrew **(1)**.

2. Separate the base from the stand **(2)**, and then pull the cables through the hole in the base **(3)**.



To install the stability base, reverse the removal procedures.

Head unit from stand

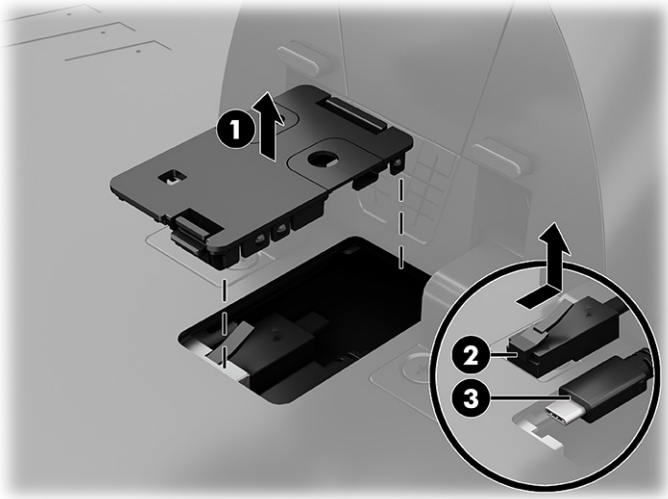
To remove the head unit from the stand, use these procedures.

Before removing the head unit from the stand, follow these steps:

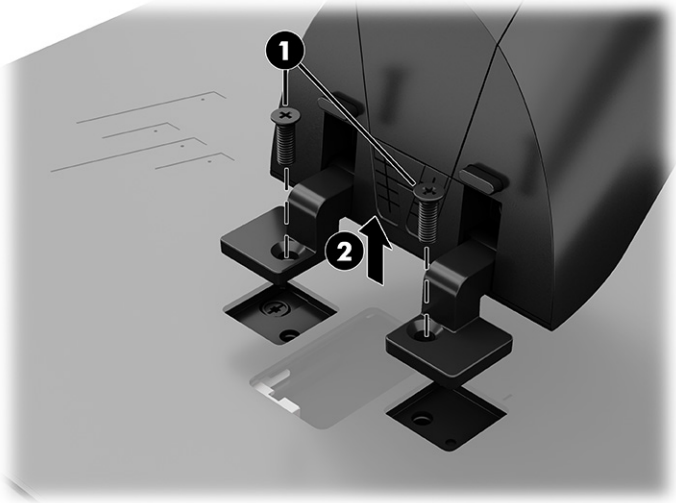
▲ Prepare the computer for disassembly (Preparation for disassembly on page 27).

Remove the head unit from the stand:

1. Remove the cable cover **(1)**.
2. Disconnect the network cable **(2)** and the USB power cord **(3)** from the head unit.



3. Remove the two screws **(1)**, and then separate the stand from the head unit **(2)**.



To install the head unit to the stand, reverse the removal procedures.

Back plate

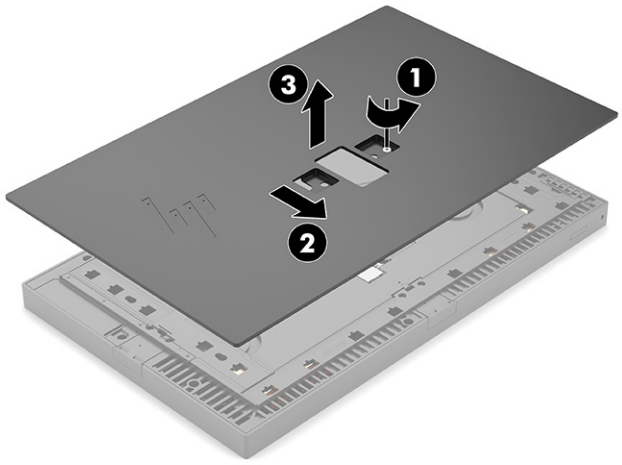
To remove the back plate, use these procedures.

Before removing the back plate, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).

Remove the back plate:

1. Loosen the captive Phillips screw **(1)** that secures the back plate to the head unit.
2. Slide the back plate toward the bottom of the head unit **(2)**, and then lift the back plate off the head unit **(3)**.



To install the back plate, reverse the removal procedures.

Expansion slot cover

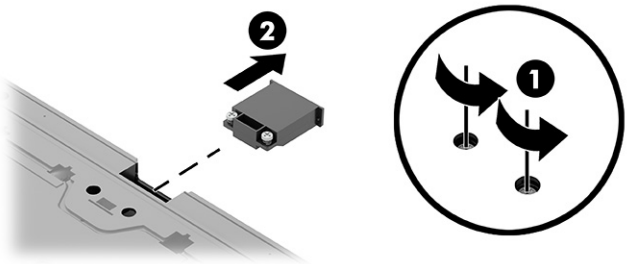
Covers are used on empty expansion slots on each side of the head unit. To remove an expansion slot cover, use these procedures.

Before removing an expansion slot cover, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).

Remove an expansion slot cover:

1. Remove the two Phillips screw that secure the cover to the head unit **(1)**.
2. Slide the cover out of the head unit **(2)**.



To install an expansion slot cover, reverse the removal procedure.

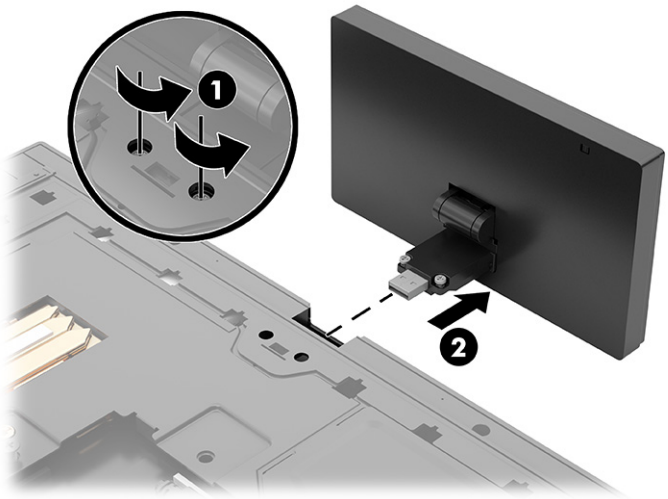
Removing the 6.6 inch customer-facing display (CFD)

To remove the customer-facing display, use this procedure and illustration.

Before removing the customer-facing display, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).

▲ Loosen the two Phillips screws **(1)**, and then pull the CFD out of the head unit **(2)**.



To install a customer-facing display, reverse the removal procedures.

Barcode scanner

To remove the barcode scanner, use these procedures.

TIP: Photo orientation changes based on which expansion port the scanner is connected to (top, left, right, or bottom). When the scanner is attached to the left or right port, the camera sensor is at a 90º angle instead of the normal 180º angle.

If an image captured by the barcode scanner does not display in the correct orientation, you can change the orientation of the image. Select **Edit Image** after capturing the image, and then select the options from the **Image Rotation** list to rotate the image.

To configure photo orientation for the scanner:

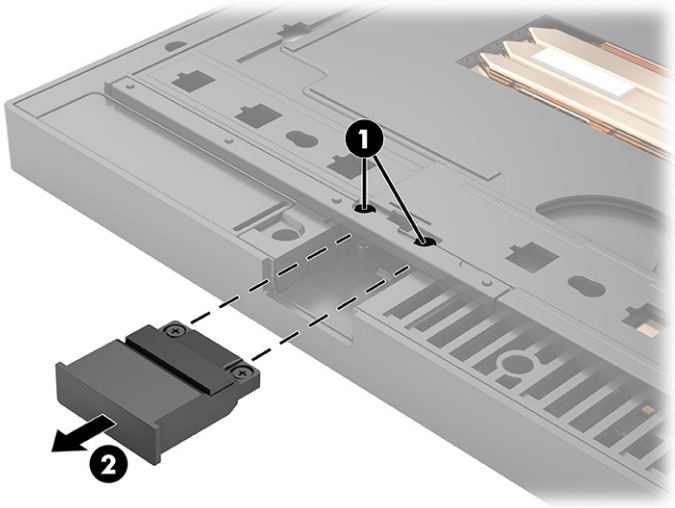
1. Launch the N-Series Configuration Utility.
2. Select **Online Device**, and then select **Configure Device**.
3. Select **Settings**, select **Systems Settings**, select **Device Settings**, and then select **Image Mirror**.
4. Select the setting from the list.
5. Select **Save to Device**.

Before removing the barcode scanner, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).

Remove the barcode scanner:

▲ Loosen the two Phillips screws, and then pull the barcode scanner out of the slot.



To install the barcode scanner, reverse the removal procedures.

Fingerprint reader

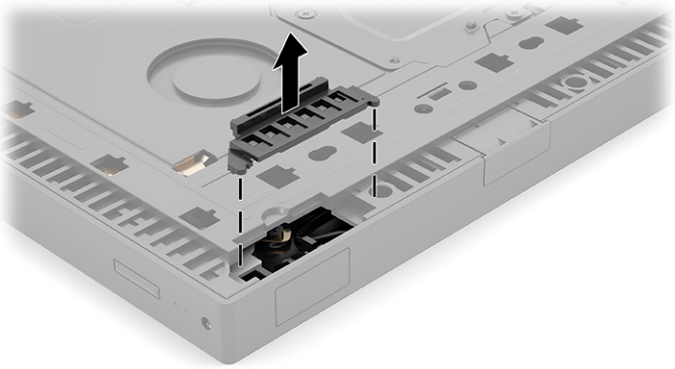
To remove the fingerprint reader, use these procedures.

Before removing the fingerprint reader, follow these steps:

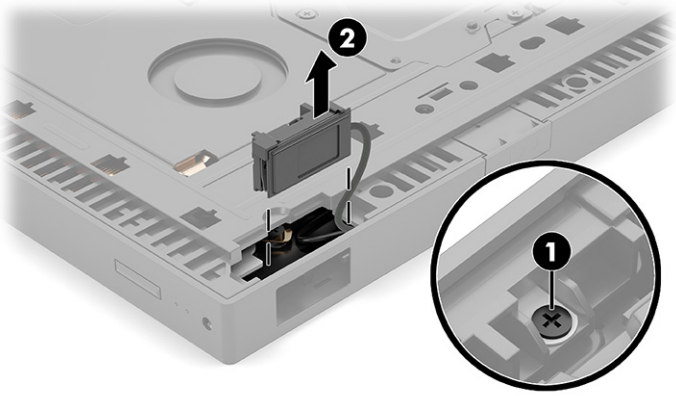
1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).

Remove the fingerprint reader:

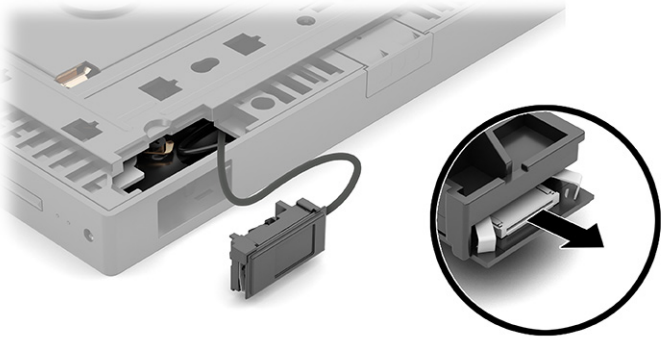
1. Pull the fingerprint reader cover straight up and off the computer.



2. Loosen the captive Phillips screw **(1)**, and then remove the fingerprint reader from the slot **(2)**.



3. Disconnect the fingerprint reader cable from the computer.



To install the fingerprint reader, reverse the removal procedures.

Magnetic stripe reader (MSR)

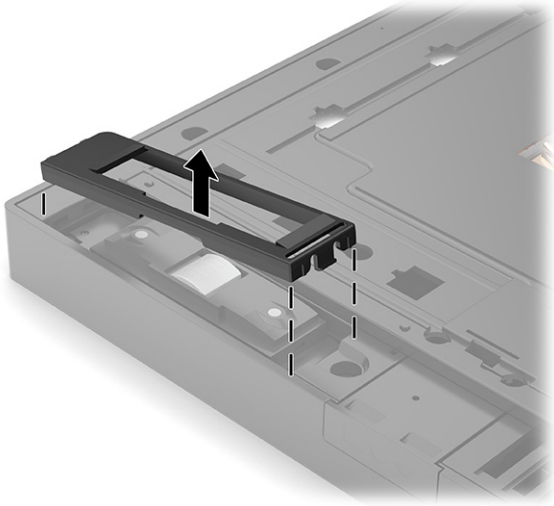
To remove the magnetic stripe reader, use these procedures.

Before removing the magnetic stripe reader, follow these steps:

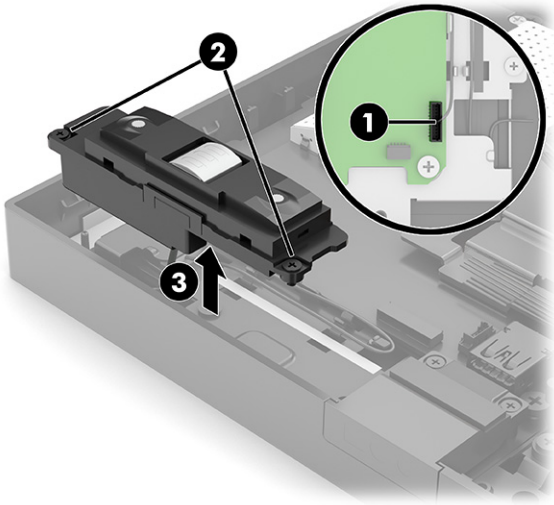
1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).

Remove the magnetic stripe reader:

1. Remove the MSR bracket from the computer.



2. Disconnect the cable from the system board **(1)**.
3. Loosen the two captive Phillips screws **(2)**, and then remove the magnetic stripe reader from the computer **(3)**.



To install the magnetic stripe reader, reverse the removal procedures.

System board cover

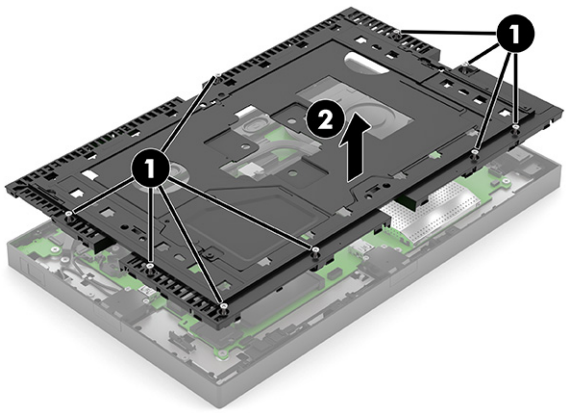
To remove the system board cover, use these procedures.

Before removing the expansion cover, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).

Remove the system board cover:

- Loosen the eight captive Phillips screws **(1)**, and then remove the cover from the head unit **(2)**.



To install the system board cover, reverse the removal procedures.

Solid-state drive

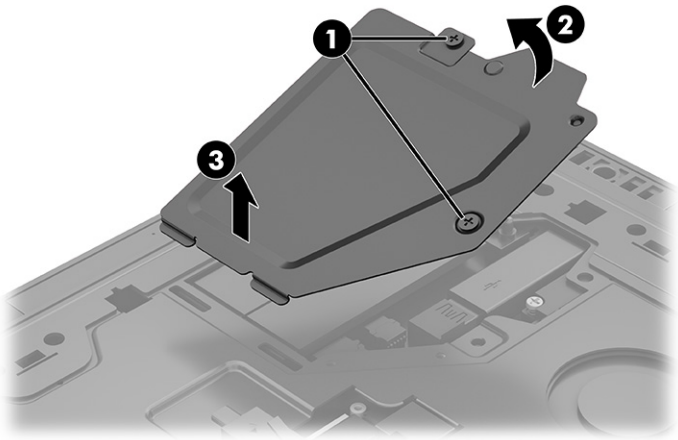
To remove the solid-state drive module, use these procedures.

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

1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).

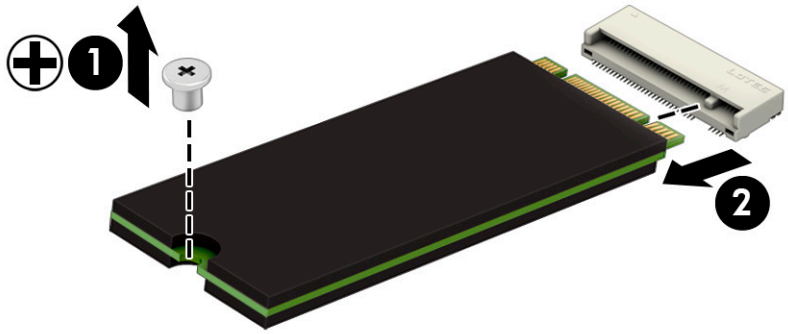
Remove the solid-state drive module:

1. Loosen the two captive Phillips screws **(1)** that secure the solid-state drive cover to the computer.
2. Lift the top of the cover upward **(2)**, and then remove the cover from the computer **(3)**.



3. Remove the screw that secures the drive **(1)**.

4. Pull the drive out of the system board connector **(2)**.



To install the solid-state drive module, reverse the removal procedure.

Memory modules (SODIMMs)

To remove the memory modules, use this information and these procedures.

The memory sockets on the system board can be populated with up to two industry-standard SODIMMs. These memory sockets are populated with at least one preinstalled SODIMM. To achieve the maximum memory support, you can populate the system board with up to 64 GB of memory.

Table 4-1 Memory module specifications

Component	Specification
Memory modules	1.2 volt DDR4-SDRAM memory modules
Compliance	Unbuffered non-ECC DDR4-2666 MHz-compliant
Pins	Industry-standard 260-pin containing the mandatory Joint Electronic Device Engineering Council (JEDEC) specification
Slots	2
Maximum memory	64 GB
Supported	2 Gbit, 4 Gbit, 8 Gbit, and 16 Gbit non-ECC memory technologies single-sided and double-sided memory modules
NOTE: The system does not operate properly if you install unsupported memory modules. Memory modules constructed with ×8 and ×16 DDR devices are supported; memory modules constructed with ×4 SDRAM are not supported.	

Use this information to correctly populate SODIMM sockets:

There are two SODIMM sockets on the system board, with one socket per channel. The sockets are labeled DIMM1 and DIMM3. The DIMM1 socket operates in memory channel A. The DIMM3 socket operates in memory channel B.

The computer comes with double data rate 3 synchronous dynamic random access memory (DDR4-SDRAM) small outline dual inline memory modules (SODIMMs).

IMPORTANT: You must disconnect the power cord and wait approximately 30 seconds for the power to drain before adding or removing memory modules. Regardless of the power state, voltage is always supplied to the memory modules as long as the computer is plugged into an active AC outlet. Adding or removing memory modules while voltage is present can cause irreparable damage to the memory modules or system board.

IMPORTANT: When handling a memory module, be careful not to touch any of the contacts. Doing so can damage the module.

The memory module sockets have gold-plated metal contacts. When upgrading the memory, use memory modules with gold-plated metal contacts to prevent corrosion, oxidation, or both, resulting from having incompatible metals in contact with each other.

Static electricity can damage the electronic components of the computer or optional cards. Before beginning these procedures, be sure that you are discharged of static electricity by briefly touching a grounded metal object.

The system automatically operates in single-channel mode, dual-channel mode, or flex mode, depending on how the SODIMMs are installed.

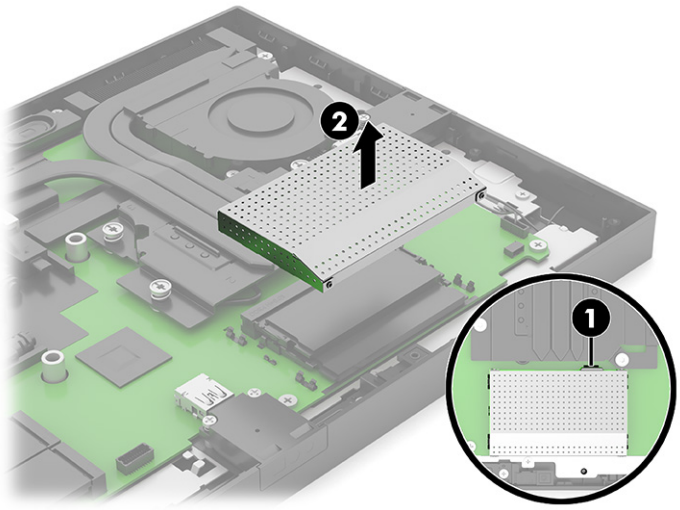
- The system operates in single-channel mode if the SODIMM sockets are populated in one channel only.
- The system operates in a higher-performing dual-channel mode if the memory capacity of the SODIMM in channel A is equal to the memory capacity of the SODIMM in channel B.
- The system operates in flex mode if the memory capacity of the SODIMM in channel A is not equal to the memory capacity of the SODIMM in channel B. In flex mode, the channel populated with the least amount of memory describes the total amount of memory assigned to dual channel and the remainder is assigned to single channel. If one channel has more memory than the other, assign the larger amount to channel A.
- In any mode, the maximum operational speed is determined by the slowest SODIMM in the system.

Before replacing the memory modules, follow these steps:

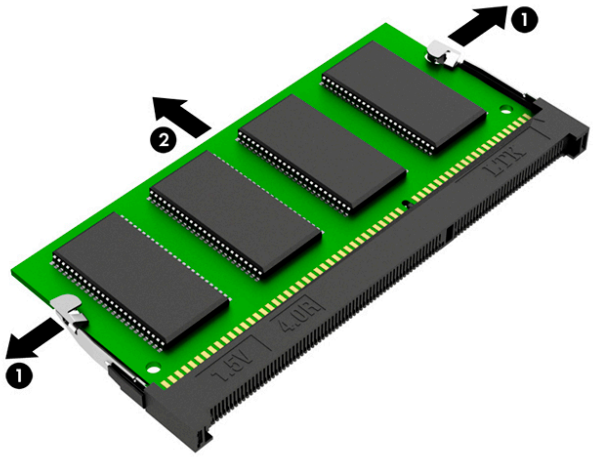
1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).
4. Remove the system board cover (System board cover on page 39).

Replace a memory module:

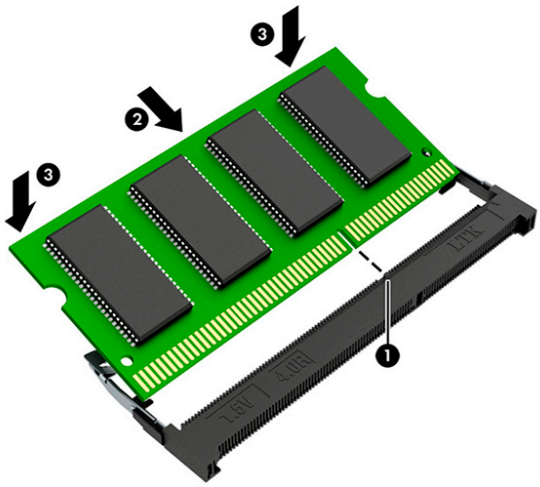
1. Insert a tool at the tab **(1)** to lift the protective shield off the memory modules **(2)**.



2. To remove a SODIMM, press outward on the two latches on each side of the SODIMM **(1)**, and then pull the SODIMM out of the socket **(2)**.



3. Match the notch on the module with the tab on the memory socket **(1)**. Slide the new SODIMM into the socket at approximately a 30° angle **(2)**, and then press the SODIMM down **(3)** so that the latches lock it in place.



The computer automatically recognizes the additional memory when you turn on the computer.

WLAN module

To remove the WLAN module, use these procedures.

Before removing the WLAN module, follow these steps:

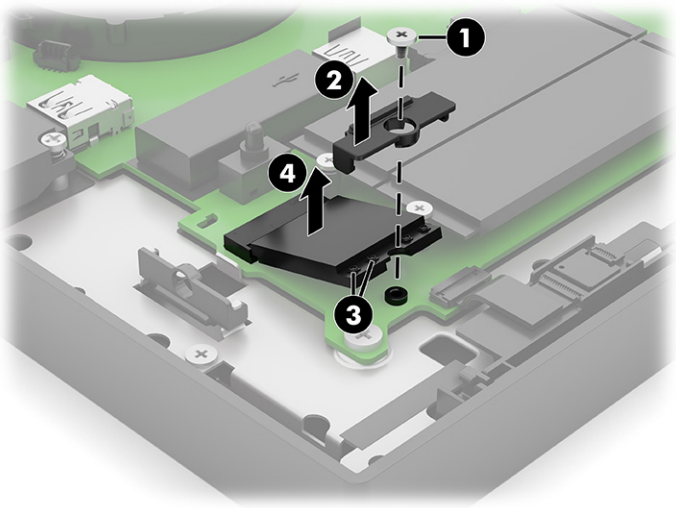
1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).
4. Remove the system board cover (System board cover on page 39).

Remove the WLAN module:

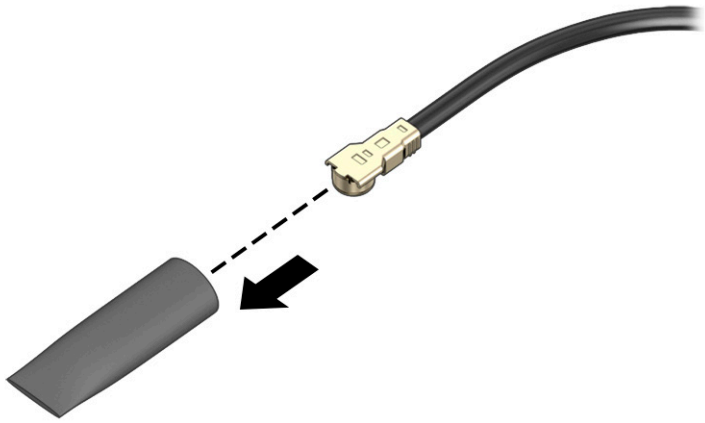
1. Remove the Phillips screw **(1)** that secures the module to the computer.
2. Remove the cover from the antenna connectors **(2)**.
3. Disconnect the antenna cables from the module **(3)**.

NOTE: The WLAN antenna cable labeled 1/MAIN connects to the WLAN module Main terminal. The WLAN antenna cable labeled 2/AUX connects to the WLAN module Aux terminal.

4. Pull the module to remove it from the socket **(4)**.



5. If the WLAN antenna is not connected to the terminal on the WLAN module, install a protective sleeve on the antenna connector, as shown in the following illustration.



To install the WLAN module, reverse the removal procedure.

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

NFC module

To remove the NFC module, use these procedures.

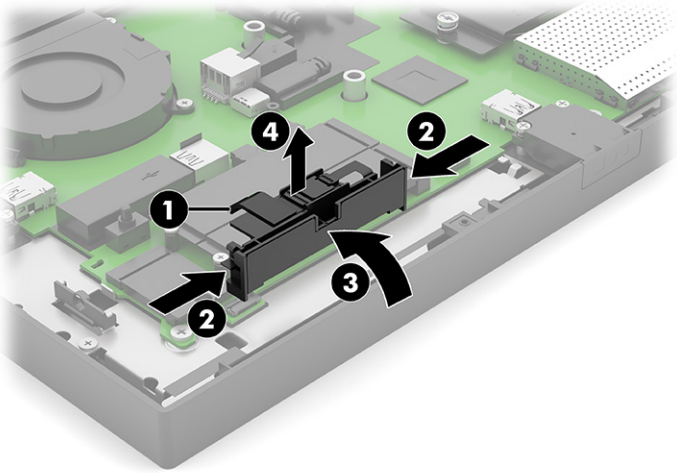
Before removing the NFC module, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).
4. Remove the system board cover (System board cover on page 39).

Remove the NFC module:

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

2. Squeeze the two tabs on the NFC module holder **(2)**, rotate the holder into the computer **(3)**, and then pull the NFC module straight up and off the computer **(4)**.



To install the NFC module, reverse the removal procedures.

Power button board

To remove the power button board, use these procedures.

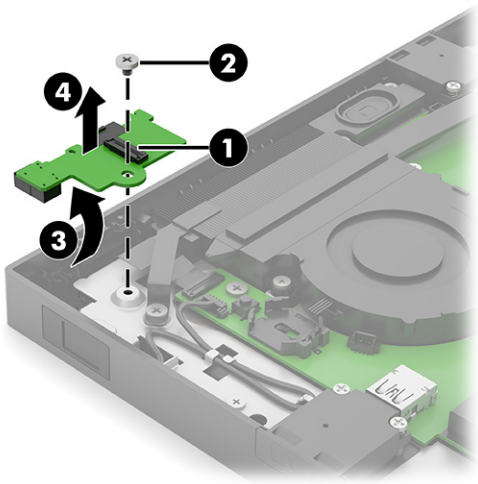
Before removing the power button board, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).
4. Remove the system board cover (System board cover on page 39).

Remove the power button board:

1. Disconnect the cable from the ZIF connector on the power button board **(1)**.
2. Remove the Phillips screws that secures the board to the computer **(2)**.

3. Rotate the back of the board upward **(3)**, and then remove the board from the computer **(4)**.



To install the power button board, reverse the removal procedure.

Heat sink assembly

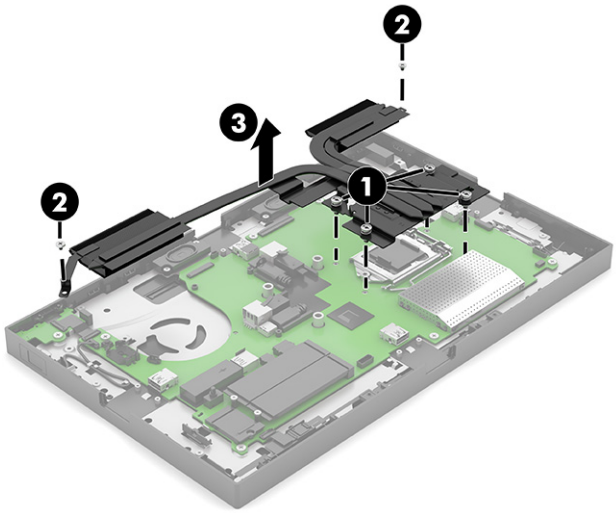
To remove the heat sink, use these procedures.

Before removing the heat sink, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).
4. Remove the system board cover (System board cover on page 39).

Remove the heat sink assembly:

1. Loosen the four captive Phillips screws **(1)** and remove the two noncaptive Phillips screws **(2)** that secure the heat sink to the computer.
2. Remove the heat sink from the computer **(3)**.



To install the heat sink, reverse the removal procedure.

Fan/heat sink assembly

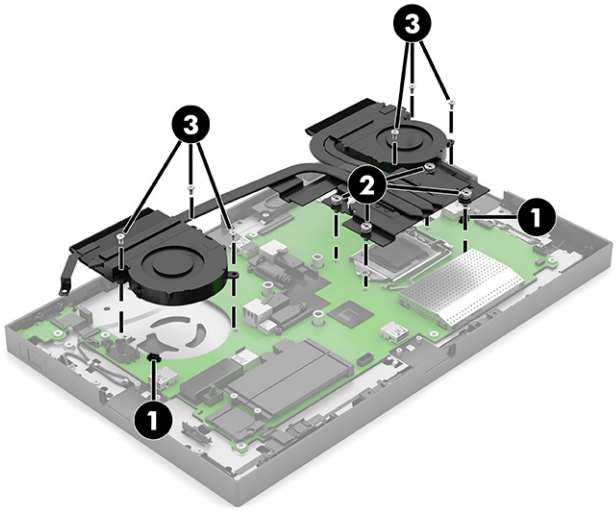
To remove the fan/heat sink, use these procedures.

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

1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).
4. Remove the system board cover (System board cover on page 39).

Remove the fan/heat sink assembly:

1. Disconnect the fan cables from the system board **(1)**.
2. Remove the six Phillips screws that secure the assembly to the computer **(2)**.
3. Remove the assembly from the computer **(3)**.



To install the fan/heat sink, reverse the removal procedure.

Processor

To remove the processor, use these procedures.

Before removing the processor, follow these steps:

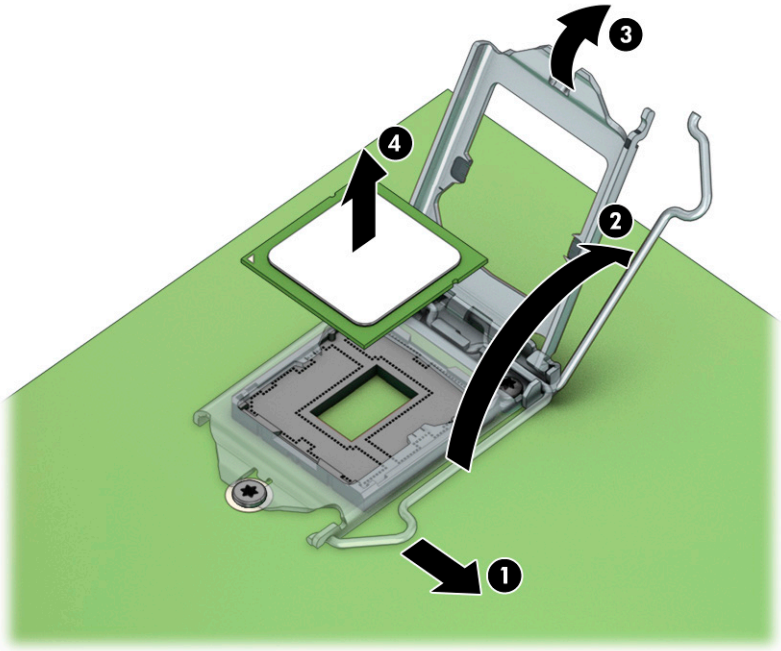
1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).
4. Remove the system board cover (System board cover on page 39).
5. Remove the fan/heat sink assembly (Fan/heat sink assembly on page 48).

Remove the processor:

1. Pull the locking lever away from the processor **(1)**, and then rotate the lever to its full open position **(2)**.
2. Raise and rotate the microprocessor retainer to its fully open position **(3)**.
3. Carefully lift the processor from the socket **(4)**.

IMPORTANT: Do not handle the pins in the processor socket. These pins are fragile, and handling them could cause irreparable damage. If pins are damaged, you might have to replace the system board.

The heat sink must be installed within 24 hours of installing the processor to prevent damage to the processor's solder connections.



To replace the processor, reverse the removal procedures.

NOTE: After installing a new processor onto the system board, always update the system ROM to ensure that the latest version of the BIOS is being used on the computer. For more information, see: https://support.hp.com/us-en/document/c06366640.

Speakers

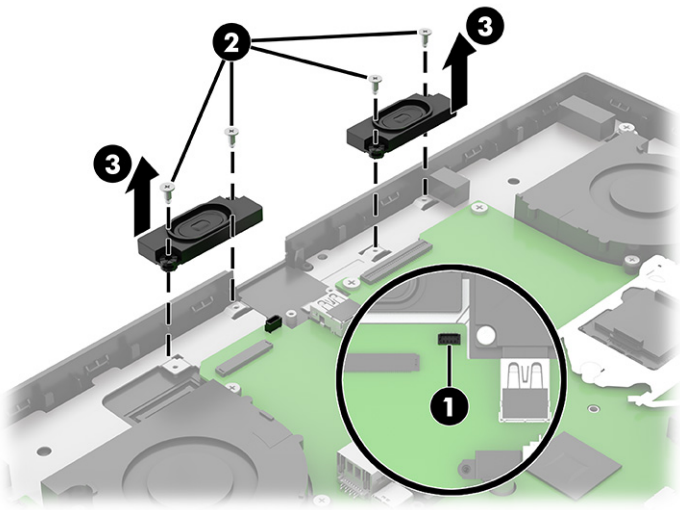
To remove the speakers, use these procedures.

Before removing the speakers, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).
4. Remove the system board cover (System board cover on page 39).
5. Remove the fan/heat sink assembly (Fan/heat sink assembly on page 48).
6. Remove the expansion slot cover (Expansion slot cover on page 35) or installed component from the expansion slot that the speaker cable routes through.

Remove the speakers:

1. Disconnect the speaker cable from the system board **(1)**.
2. Remove the four Torx screws from the speakers **(2)**.
3. Remove the speakers from the computer **(3)**.



To install the speakers, reverse the removal procedures.

Battery

To remove the battery, use these procedures. The battery that comes with the computer provides power to the real-time clock. When replacing the battery, use a battery equivalent to the battery originally installed in the computer. The computer comes with a 3 V lithium coin cell battery.

WARNING! The computer contains an internal lithium manganese dioxide battery. There is a risk of fire and burns if the battery is not handled properly. To reduce the risk of personal injury:

Do not attempt to recharge the battery.

Do not expose to temperatures higher than 60°C (149°F).

Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.

Replace the battery only with the HP spare part that is designated for this product.

IMPORTANT: Before replacing the battery, back up the computer CMOS settings. When the battery is removed or replaced, the CMOS settings are cleared.

Static electricity can damage the electronic components of the computer or optional equipment. Before beginning these procedures, be sure that you are discharged of static electricity by briefly touching a grounded metal object.

NOTE: You can extend the lifetime of the lithium battery by plugging the computer into an AC outlet. The lithium battery is used only when the computer is not connected to AC power.

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

Before removing the battery, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).

3. Remove the back plate from the head unit (Back plate on page 34).
4. Remove the system board cover (System board cover on page 39).

Remove the battery:

1. To release the battery from its holder, squeeze the metal clamp that extends above one edge of the battery **(1)**. When the battery pops up, lift it out **(2)**.

2. Slide the replacement battery into position, positive side up. The battery holder automatically secures the battery in the proper position.

System board

To remove the system board, use these procedures.

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

Before removing the system board, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).
4. Remove the system board cover (System board cover on page 39).
5. Remove the fan/heat sink assembly (Fan/heat sink assembly on page 48).

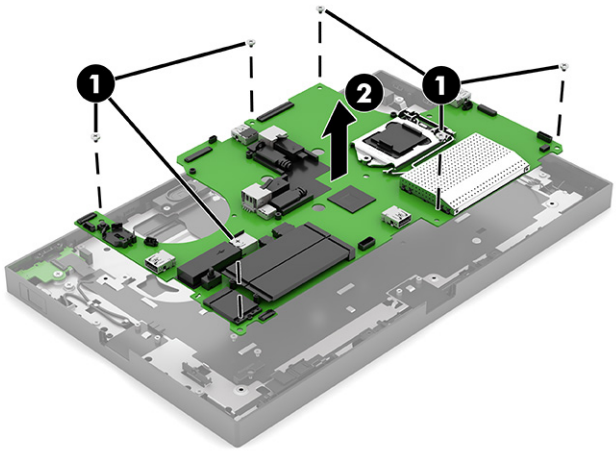
When you replace the system board, be sure to remove the following components (as applicable) from the defective system board and install them on the replacement system board:

- Memory modules (Memory modules (SODIMMs) on page 41)
- Solid-state drive (Solid-state drive on page 40)
- Processor (Processor on page 48)

Remove the system board:

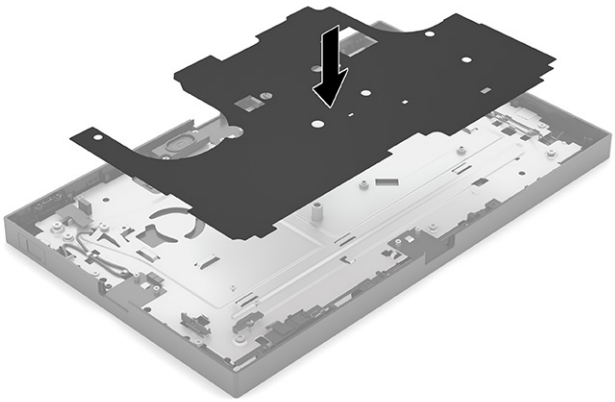
1. Disconnect the remaining cables from the system board, noting their locations for reinstallation.
2. Remove the six Phillips screws **(1)** that secure the system board to the computer.

3. Remove the system board from the computer **(2)**.



To install the system board, reverse the removal procedures.

Before installing the system board, be sure to install the protective shielding under the system board.



NOTE: When replacing the system board, you must change the chassis serial number in the BIOS.

When replacing the system board, you must reprogram the SMBIOS information about the affected computer. Failure to reprogram the board will result in eventual failure, such as an activation failure (need to reactivate the system) or a system recovery failure.

Update SMBIOS information in Computer Setup.

Antennas

To remove the antennas, use these procedures.

Before removing the antennas, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).

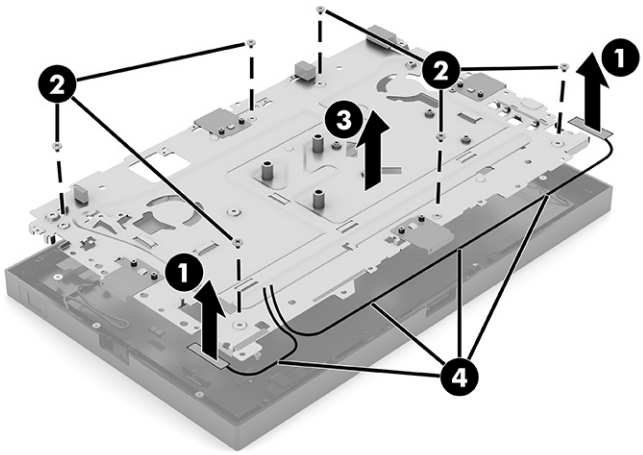
3. Remove the back plate from the head unit (Back plate on page 34).
4. Remove the system board cover (System board cover on page 39).
5. Remove the fan/heat sink assembly (Fan/heat sink assembly on page 48).
6. Remove the system board (System board on page 51).

Remove the antennas:

1. Peel the antennas off the left and right sides of the frame under the system board **(1)**.
2. Remove the six Phillips screws from the frame **(2)**.

NOTE: Screw holes are marked with “M3” on the frame.

3. Lift the frame up to access the antenna cables underneath **(3)**, and then remove antenna cables from tape underneath the frame **(4)**.



To replace the antennas, reverse the removal procedures.

Display panel cable

To remove the display panel cable, use these procedures.

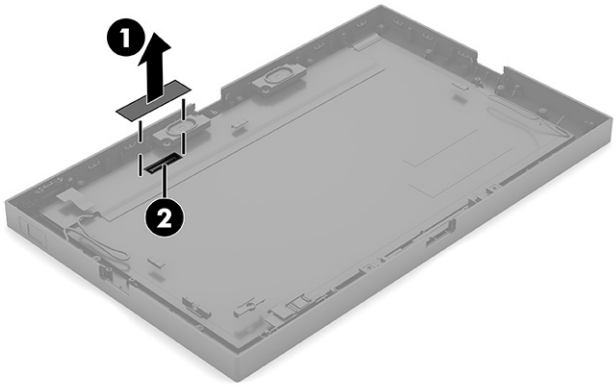
Before removing the display panel cable follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 27).
2. Remove the head unit from the stand (Head unit from stand on page 33).
3. Remove the back plate from the head unit (Back plate on page 34).
4. Remove the system board cover (System board cover on page 39).
5. Remove the fan/heat sink assembly (Fan/heat sink assembly on page 48).
6. Remove the system board (System board on page 51).

Remove the display panel cable:

1. Remove the metal frame from under the system board (Antennas on page 52).
2. Remove the tape from the connector **(1)**.

3. Pull the cable out of the connector **(2)**.



To install the display panel cable, reverse the removal procedure.

5 Troubleshooting without diagnostics

Use these sections to identify and correct minor problems.

⚠ **CAUTION:** Misuse of the computer or failure to establish a safe and comfortable work environment can result in discomfort or serious injury. See the *Safety & Comfort Guide* at http://www.hp.com/ergo for more information about choosing a workspace and creating a safe and comfortable work environment. For more information, see the *Safety & Regulatory Information* guide.

Before you call for technical support

If you are having problems with the computer, try these solutions to isolate the exact problem before calling for technical support.

- Run the HP diagnostic tool.
- Run the hard drive self-test in Computer Setup.
- Check the power light on the front of the computer to see if it is blinking red. The blinking lights are error codes that will help you diagnose the problem.
- If you are working on a network, plug another computer with a different cable into the network connection. There might be a problem with the network plug or cable.
- If you recently added new hardware, remove the hardware and see if the computer functions properly.
- If you recently installed new software, uninstall the software and see if the computer functions properly.
- Boot the computer to the Safe Mode to see if it will boot without all of the drivers loaded. When booting the operating system, use “Last Known Configuration.”
- See the comprehensive online technical support at http://www.hp.com/support.

To assist you in resolving problems online, HP Instant Support Professional Edition provides you with self-solve diagnostics. If you need to contact HP support, use HP Instant Support Professional Edition's online chat feature. Access HP Instant Support Professional Edition at: http://www.hp.com/go/ispe.

Access the Business Support Center (BSC) at http://www.hp.com/go/bizsupport for the latest online support information, software and drivers, proactive notification, and worldwide community of peers and HP experts.

If it becomes necessary to call for technical assistance, be prepared to do the following tasks to ensure that your service call is handled properly:

- Be in front of your computer when you call.
- Before you call, write down the computer serial number and product ID number.
- Spend time troubleshooting the problem with the service technician.
- Remove any hardware that was recently added to your system.
- Remove any software that was recently installed.
- Restore the system from the Recovery Disc Set that you created or restore the system to its original factory condition in System Software Requirement Disks (SSRD).

IMPORTANT: Restoring the system will erase all data on the hard drive. Be sure to back up all data files before running the restore process.

NOTE: For sales information and warranty upgrades (Care Packs), call your local authorized service provider or dealer.

Helpful hints

If you encounter problems with the computer or software, see this list of general suggestions before taking further action.

- Check that the computer is plugged into a working electrical outlet.
- Check that the computer is turned on and the white power light is on.
- Check the power light on the front of the computer to see if it is blinking red. The blinking lights are error codes that help you diagnose the problem.
- Press and hold any key if the system beeps. Then the keyboard should be operating correctly.
- Check all cable connections for loose connections or incorrect connections.
- Wake the computer by pressing any key on the keyboard or pressing the power button. If the system remains in suspend mode, shut down the computer by pressing and holding the power button for at least four seconds, and then press the power button again to restart the computer. If the system will not shut down, unplug the power cord, wait a few seconds, and then plug it in again. The computer will restart if it is set to turn on automatically as soon as power is restored in Computer Setup. If it does not restart, press the power button to start the computer.
- Be sure that all the needed device drivers have been installed. For example, if you are using a printer, you need a driver for that model printer.
- Remove all bootable media (such as a USB device) from the system before turning it on.
- If you have installed an operating system other than the factory-installed operating system, check to be sure that it is supported on the system.

NOTICE: When the computer is plugged into an AC power source, there is always voltage applied to the system board. You must disconnect the power cord from the power source before opening the computer to prevent system board or component damage.

Solving general problems

You might be able to easily resolve the general problems described in this section. If a problem persists and you cannot resolve it yourself or if you feel uncomfortable about performing the operation, contact an authorized dealer or reseller.

CAUTION: 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, hot surfaces, or both, be sure to disconnect the power cord from the AC outlet and allow the internal system components to cool before touching.

Cannot access the Computer Setup (F10) Utility when booting the computer

Use this information to troubleshoot the computer.

Cause	Solution
The Computer Setup (F10) Utility is set to Fast Boot causing the F10 access screen to display too briefly when booting the computer.	Before turning on the computer, press and hold f10. Turn on the computer and continue to hold F10 until the Computer Setup (F10) Utility is displayed. - or – Follow the Windows® instructions for rebooting the computer into the Computer Setup (F10) Utility.

Computer appears locked up and will not turn off when the power button is pressed

Use this information to troubleshoot the computer.

Cause	Solution
Software control of the power switch is not functional.	1. Press and hold the power button for at least 4 s until the computer turns off. 2. Disconnect the power cord from the electrical outlet.

Computer will not respond to keyboard or mouse

Use this information to troubleshoot the computer.

Cause	Solution
Computer is in Sleep state.	To resume from Sleep state, press the power button. When attempting to resume from Sleep state, do not hold down the power button for more than 4 s. Otherwise, the computer shuts down and you lose any unsaved data.
System has locked up.	Restart computer.
USB cables may not be seated properly.	Disconnect, and then reconnect USB cables to keyboard and mouse.

Computer date and time display is incorrect

Use this information to troubleshoot the computer.

Cause	Solution
RTC (real-time clock) battery may need to be replaced.	Reset the date and time under **Control Panel**. (Computer Setup can also be used to update the RTC date and time.) 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. To access Control Panel in Windows 10, type `control panel` in the taskbar search box, and then select Control Panel.

There is no sound or sound volume is too low

Use this information to troubleshoot the computer.

Cause	Solution
System volume might be set low or muted.	1. Check the front panel to see if an amber light indicates the system has been muted. Tap the touch-sensitive button to toggle the mute on and off. 2. Check the Computer Setup settings to be sure that the internal system speaker is not muted. This setting does not affect the external speakers. 3. Be sure that the external speakers are properly connected and powered on and that the speakers' volume control is set correctly. 4. Use the system volume control available in the operating system to be sure that the speakers are not muted or to increase the volume.

Poor performance

Use this information to troubleshoot the computer.

Cause	Solution
Processor is too hot.	1. Be sure that airflow to the computer is not blocked. Leave a 10.2 cm (4 inch) clearance on all vented sides of the computer to permit the required airflow. 2. Be sure that fans are connected and working properly (some fans only operate when needed). 3. Be sure that the processor heat sink is installed properly.
Hard drive is full.	Transfer data from the hard drive to create more space on the hard drive.
Low on memory.	Add more memory.
Hard drive fragmented.	Defragment hard drive.
Program previously accessed did not release reserved memory back to the system.	Restart the computer.
Virus resident on the hard drive.	Run virus protection program.
Too many applications running.	1. Close unnecessary applications to free memory. 2. Add more memory. 3. Some applications run in the background and can be closed by right-clicking their corresponding icons in the task tray.
Some software applications, especially games, are stressful on the graphics subsystem.	1. Lower the display resolution for the current application or consult the documentation that came with the application for suggestions on how to improve performance by adjusting parameters in the application. 2. Add more memory. 3. Upgrade the graphics solution.
Cause unknown.	Restart the computer.

Computer powered off automatically and the power light blinks red four times and then white two times

Use this information to troubleshoot the computer.

Cause	Solution
Processor thermal protection activated. A fan might be blocked or not turning, or the heat sink is not properly attached to the processor.	1. Be sure that the computer air vents are not blocked and the processor cooling fan is running. 2. Open the access panel, press the power button, and see if the processor fan (or other system fan) spins. If the fan does not spin, be sure that the fan cable is plugged onto the system board header. 3. If fan a plugged in and not spinning, replace it.

System does not turn on and the lights on the front of the computer are not blinking

Use this information to troubleshoot the computer.

Cause	Solution
System unable to power on.	Press and hold the power button for less than 4 s. If the hard drive light turns white, then: 1. If the computer has a voltage selector, check that the voltage selector (located on the rear of the power supply) is set to the appropriate voltage. Proper voltage setting depends on your region. 2. Remove the expansion cards one at a time until the 5V_aux light on the system board turns on. 3. Replace the system board. OR Press and hold the power button for less than 4 s. If the hard drive light does not turn white, then: 1. Check whether the unit is plugged into a working AC outlet. 2. Open the access panel and check that the power button cable is properly connected to the system board. 3. Check that the power supply cables are properly connected to the system board. 4. Check to see if the 5V_aux light on the system board is turned on. If it is turned on, then replace the power button assembly. 5. If the 5V_aux light on the system board is off, then replace the power supply. 6. Replace the system board.

Solving power problems

These tables provide common causes and solutions for power problems.

Power supply shuts down intermittently

Use this information to troubleshoot the computer.

Cause	Solution
If the computer has a voltage selector, voltage selector switch on rear of computer chassis (some models) not switched to correct line voltage (115 V or 230 V).	Select the proper AC voltage using the selector switch.
Power supply will not turn on because of internal power supply fault.	Replace the power supply.

Computer turned off automatically, power light blinks red two times followed by a two-second pause, and the computer beeps two times (Beeps stop after fifth iteration but lights continue blinking)

Use this information to troubleshoot the computer.

Cause	Solution
Processor thermal protection activated. A fan might be blocked or not turning, or the heat sink is not properly attached to the processor.	1. Be sure that the computer air vents are not blocked and the processor cooling fan is running. 2. Open the access panel, press the power button, and see if the processor fan (or other system fan) spins. If the fan does not spin, be sure that the fan cable is plugged onto the system board header. 3. If the fan is plugged in and not spinning, replace it.

Power light blinks red four times followed by a two-second pause and the computer beeps four times (Beeps stop after fifth iteration but lights continue blinking)

Use this information to troubleshoot the computer.

Cause	Solution
Power failure (power supply is overloaded).	1. If the computer has a voltage selector, check that the voltage selector, located on the rear of the power supply (some models), is set to the appropriate voltage. Proper voltage setting depends on your region. 2. Open the access panel, and be sure that the power supply cable is seated into the connector on the system board. 3. Check whether a device is causing the problem by removing all attached devices (such as hard drives or optical drives and expansion cards). Turn on the system. If the system enters 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. 4. Replace the power supply. 5. Replace the system board.

Solving keyboard and mouse problems

If you encounter keyboard or mouse problems, see the documentation that came with the equipment and the common causes and solutions listed in these tables.

Keyboard commands and typing are not recognized by the computer

Use this information to troubleshoot the computer.

Cause	Solution
Keyboard connector is not properly connected.	Shut down the computer, reconnect the keyboard, and then restart the computer.
Program in use has stopped responding to commands.	Shut down your computer using the mouse, and then restart the computer.
Keyboard needs repairs.	See the Worldwide Limited Warranty for terms and conditions.
Computer is in the Sleep state.	Press the power button to resume from the Sleep state. When attempting to resume from the Sleep date, do not hold down the power button for more than 4 seconds. Otherwise, the computer will shut down, and you will lose any unsaved data.

Mouse does not respond to movement or is too slow

Use this information to troubleshoot the computer.

Cause	Solution
Mouse connector is not properly plugged into the back of the computer.	Shut down the computer using the keyboard. 1. Press the ctrl and esc keys at the same time (or press the Windows logo key) to display the **Start** menu. 2. Use the arrow keys to scroll to and select the power icon at the top right on the menu, and then press enter. 3. Use the arrow keys to select **Shut Down**, and then press enter. 4. After the shutdown is complete, plug the mouse connector into the back of the computer (or the keyboard) and restart.
Program in use has stopped responding to commands.	Shut down the computer using the keyboard, and then restart the computer.
Mouse might need repair.	See the Worldwide Limited Warranty for terms and conditions.
Computer is in the Sleep state.	Press the power button to resume from the Sleep state. When attempting to resume from the Sleep state, do not hold down the power button for more than 4 seconds. Otherwise, the computer will shut down, and you will lose any unsaved data.
If using a wireless mouse, you might need to resynchronize the mouse with the computer.	Follow the instructions that came with the mouse.

Solving hardware installation problems

You might need to reconfigure the computer when you add or remove hardware, such as an additional drive or expansion card.

If you install a plug and play device, Windows automatically recognizes the device and configures the computer. If you install a non-plug and play device, you must reconfigure the computer after completing installation of the new hardware. In Windows, use the **Add Hardware Wizard**, and follow the instructions that appear on the screen.

To open the Add Hardware Wizard, open a command prompt and type .

⚠ **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, hot surfaces, or both, be sure to disconnect the power cord from the AC outlet and allow the internal system components to cool before touching.

A new device is not recognized as part of the system

Use this information to troubleshoot the computer.

Cause	Solution
Cables of new external device are loose or power cables are unplugged.	Be sure that all cables are properly and securely connected and that pins in the cable or connector are not bent down.
Power switch of new external device is not turned on.	Turn off the computer, turn on the external device, and then turn on the computer to integrate the device with the computer system.
When the system advised you of changes to the configuration, you did not accept them.	Reboot the computer and follow the instructions for accepting the changes.
A plug and play board might not automatically configure when added if the default configuration conflicts with other devices.	Use Windows Device Manager to clear the automatic settings for the board, and choose a basic configuration that does not cause a resource conflict. You can also use Computer Setup to reconfigure or disable devices to resolve the resource conflict. To access Device Manager in Windows 10, type `device manager` in the taskbar search box, and then select **Device Manager** from the list of applications.
USB ports on the computer are disabled in Computer Setup.	Run the Computer Setup utility and ensure that **Device available** is selected for appropriate USB ports under **Advanced** > **Port Options**.

Computer will not start

Use this information to troubleshoot the computer.

Cause	Solution
Wrong memory modules were used in the upgrade, or memory modules were installed in the wrong location.	1. Review the documentation that came with the system to determine if you are using the correct memory modules and to verify the proper installation. **NOTE:** DIMM1 or XMM1 must always be installed. DIMM1 must be installed before DIMM3. 2. Observe the beeps and lights on the front of the computer. Beeps and blinking lights are codes for specific problems. 3. If you still cannot resolve the issue, contact Customer Support.

Power light blinks red three times and then white two times

Use this information to troubleshoot the computer.

Cause	Solution
Memory is installed incorrectly or is bad.	To avoid damage to the DIMMs or the system board, you must unplug the computer power cord before attempting to reseat, install, or remove a DIMM module. 1. Reseat DIMMs. Turn on the system. 2. Replace DIMMs one at a time to isolate the faulty module. **NOTE:** DIMM1 or XMM1 must always be installed. DIMM1 must be installed before DIMM3. 3. Replace third-party memory with HP memory. 4. Replace the system board.

Solving network problems

Some common causes and solutions for network problems are listed in these tables. The guidelines do not discuss the process of debugging the network cabling.

Network driver does not detect network controller

Use this information to troubleshoot the computer.

Cause	Solution
Network controller is disabled.	1. Run Computer Setup and enable network controller. 2. Enable the network controller in the operating system using Device Manager. To access Device Manager in Windows 10, type `device manager` in the taskbar search box, and then select **Device Manager** from the list of applications.
Incorrect network driver.	Check the network controller documentation for the correct driver or obtain the latest driver from the manufacturer's website.

Network status link light never blinks

Use this information to troubleshoot the computer.

NOTE: The network status light is supposed to blink when there is network activity.

Cause	Solution
No active network is detected.	Check cabling and network equipment for proper connection.
Network controller is not set up properly.	Check for the device status within Windows, such as Device Manager for driver load and the Network Connections applet within Windows for link status. To access Device Manager in Windows 10, type `device manager` in the taskbar search box, and then select **Device Manager** from the list of applications.

Cause	Solution
Network controller is disabled.	1. Run Computer Setup and enable network controller. 2. Enable the network controller in the operating system using Device Manager. To access Device Manager in Windows 10, type `device manager` in the taskbar search box, and then select **Device Manager** from the list of applications.
Network driver is not properly loaded.	Reinstall network drivers.
System cannot autosense the network.	Disable autosensing capabilities, and force the system into the correct operating mode.

Diagnostics passes, but the computer does not communicate with the network

Use this information to troubleshoot the computer.

Cause	Solution
Network drivers are not loaded, or driver parameters do not match current configuration.	Be sure that the network drivers are loaded and that the driver parameters match the configuration of the network controller. Be sure that the correct network client and protocol is installed.
The network controller is not configured for this computer.	Select the **Network and Sharing Center** icon in the **Control Panel**, and configure the network controller. To access Control Panel in Windows 10, type `control panel` in the taskbar search box, and then select **Control Panel** from the list of applications.

System setup utility reports unprogrammed EEPROM

Use this information to troubleshoot the computer.

Cause	Solution
Unprogrammed EEPROM.	Contact an authorized service provider.

Solving memory problems

If you encounter memory problems, some common causes and solutions are listed in these tables.

IMPORTANT: Power can still be supplied to the DIMMs when the computer is turned off (depending on the Management Engine (ME) settings). To avoid damage to the DIMMs or the system board, you must unplug the computer power cord before attempting to reseat, install, or remove a memory module.

For those systems that support ECC memory, HP does not support mixing ECC and non-ECC memory. Otherwise, the computer will not boot the operating system.

NOTE: The memory count will be affected by configurations with the Management Engine (ME) enabled. The ME uses 8 MB of system memory in single-channel mode or 16 MB of memory in dual-channel mode to download, decompress, and execute the ME firmware for Out-of-Band (OOB), third-party data storage, and other management functions.

System will not boot or does not function properly after installing additional memory modules

Use this information to troubleshoot the computer.

Cause	Solution
A memory module is not installed in the DIMM1 or XMM1 socket.	Verify that a memory module is installed in the DIMM1 or XMM1 socket on the system board. This socket must be populated with a memory module.
Memory module is not the correct type or speed grade for the system, or the new memory module is not seated properly.	Replace module with the correct industry-standard device for the computer. On some models, ECC and non-ECC memory modules cannot be mixed.

Out of memory error

Use this information to troubleshoot the computer.

Cause	Solution
You have run out of memory to run the application.	Check the application documentation to determine the memory requirements.

Memory count during POST is wrong

Use this information to troubleshoot the computer.

Cause	Solution
The memory modules might not be installed correctly.	Check that the memory modules have been installed correctly and that proper modules are used.
Integrated graphics might use system memory.	No action required.

Insufficient memory error during operation.

Use this information to troubleshoot the computer.

Cause	Solution
Too many Terminate and Stay Resident programs (TSRs) are installed.	Delete any TSRs that you do not need.
You have run out of memory for the application.	Check the memory requirements for the application or add more memory to the computer.

Power light blinks red five times followed by a two-second pause and the computer beeps five times (Beeps stop after fifth iteration but lights continue blinking)

Use this information to troubleshoot the computer.

Cause	Solution
Memory is installed incorrectly or is bad.	1. Reseat DIMMs. Turn on the system. 2. Replace DIMMs one at a time to isolate the faulty module. 3. Replace third-party memory with HP memory. 4. Replace the system board.

Solving software problems

Most software problems occur as a result of these situations.

- The application was not installed or configured correctly.
- There is insufficient memory available to run the application.
- There is a conflict between applications.
- All the necessary device drivers might not have been installed.
- If you have installed an operating system other than the factory-installed operating system, it might not be supported on the system.

If you encounter software problems, see the applicable solutions listed in the following table.

Computer will not start up and the HP logo does not appear

Use this information to troubleshoot the computer.

Cause	Solution
ROM issue - POST error has occurred.	Observe the beeps and lights on the front of the computer. See the Worldwide Limited Warranty for terms and conditions.

“Illegal Operation has Occurred” error message is displayed

Use this information to troubleshoot the computer.

Cause	Solution
Software being used is not Microsoft-certified for your version of Windows.	Verify that the software is certified by Microsoft for your version of Windows (see program packaging for this information).
Configuration files are corrupt.	If possible, save all data, close all programs, and restart the computer.

6 Computer Setup (F10) Utility

This information provides details of the Computer Setup Utility.

- Change settings from the defaults or restore the settings to default values.
- View the system configuration, including settings for processor, graphics, memory, audio, storage, communications, and input devices.
- Modify the boot order of bootable devices such as hard drives or USB flash media devices.
- Enter the Asset Tag or property identification number assigned by the company to this computer.
- Enable the power-on password prompt during system restarts (warm boots) as well as during startup.
- Establish an administrator password that controls access to the Computer Setup (F10) Utility and the settings described in this section.
- Establish minimum requirements for valid passwords, including length and required types of characters.
- Secure integrated I/O functionality, including the serial, USB, or audio, or embedded NIC, so that they cannot be used until they are unsecured.
- Enable or disable different types of boot sources.
- Configure features such as Secure Boot, power management, virtualization support, and language and keyboard type used in Setup and POST.
- Replicate the system setup by saving system configuration information about a USB device and restoring it on one or more computers.
- Enable or disable DriveLock security or securely erase a hard drive (when supported by drive).

Using Computer Setup (F10) Utilities

You can access Computer Setup only by turning the computer on or restarting the system.

NOTE: On Portrait units, Computer Setup screens display in Landscape mode.

To access the Computer Setup Utilities menu, complete these steps:

1. Turn on or restart the computer.
2. Repeatedly press f10 when the power button light turns white to access the utility.

   You can also press esc to see a menu that allows you to access different options available at startup, including the Computer Setup utility.

   NOTE: If you have a system without a keyboard, such as a Zoom Room system, press the power button twice to open F10 Setup.

   A choice of four headings appears in the Computer Setup Utilities menu: Main, Security, Advanced, and UEFI Drivers.

   NOTE: If you do not press f10 at the appropriate time, you must restart the computer and again repeatedly press f10 when the power button light turns white to access the utility.

   NOTE: Selecting UEFI Drivers restarts the computer into the third-party option ROM management application. You can access this application directly by pressing f3 during startup.
3. Use the arrow (left and right) keys to select the appropriate heading. Use the arrow (up and down) keys to select the option you want, and then press enter. To return to the Computer Setup Utilities menu, press esc.
4. To apply and save changes, select **Main** > **Save Changes and Exit**.
   - If you have made changes that you do not want applied, select **Ignore Changes and Exit**.
   - To restore settings from the Advanced and Main menus to original values, select **Apply Factory Defaults and Exit**.
   - To restore settings from the Advanced and Main menus to those previously saved by **Save Custom Defaults**, select **Apply Custom Defaults and Exit**. If no custom defaults have been saved, then factory defaults are used.

   NOTE: You cannot modify settings in the Security menu by selecting **Apply Defaults**. You reset those values by selecting **Restore Security Settings to Factory Defaults** at the bottom of the **Security** menu.

   NOTE: Not all settings shown in the following sections are available for all models.

IMPORTANT: Do not turn computer power off while the BIOS is saving the Computer Setup (F10) changes because the settings could become corrupted. It is safe to turn off the computer only after exiting the F10 Setup screen.

Computer Setup—Main

This table provides information about the Computer Setup Main menu.

NOTE: Support for specific Computer Setup options can vary, depending on the hardware configuration.

Table 6-1 Computer Setup—Main

Option	Description
System Information	Lists all information in following list if **Advanced System Information** is selected. Lists smaller subset if **Basic System Information** is selected. • Product name • Memory size • Storage devices

Table 6-1 Computer Setup—Main (continued)

Option	Description
	• Processor type • Processor cache size (L1/L2/L3) • Processor speed • Processor cores • MicroCode revision • Processor stepping • Memory speed • DIMM size (for each installed module) • System BIOS version • ME Firmware version (Intel only) • ME Firmware mode (Intel only) • Audio controller • Video BIOS version • Reference code revision • Super I/O firmware version • USB Type-C controller firmware version • Born on date • Serial number • SKU number • UUID (Universally Unique Identifier) • Asset tracking number • Feature byte • Build ID • Product family • System board ID • System board CT number • Integrated MAC Address
System Diagnostics	If the hard drive has the HP Advanced Diagnostics installed, the application launches. If HP Advanced Diagnostics is not installed, then a basic version that is built into the BIOS provides the capability to perform the following functions: • Memory Test • Hard Drive Check • Language
BIOS Event Log	Lets you view the BIOS event log, export it to a USB flash drive, or clear the log the next time the computer is rebooted. • View BIOS Event Log • Export to USB Key

Table 6-1 Computer Setup—Main (continued)

Option	Description
	• Clear BIOS Event Log on Next Boot
Update System BIOS	Lets you update the system BIOS from www.hp.com or another network server, from a removable USB drive, or from a file located on the hard drive. • Check [current selection] for BIOS Updates The string that appears here depends on the setting in **BIOS Update Preferences**. • Lock BIOS Version If this option is selected, the system is locked to the current BIOS version and, updates are not allowed. • Native OS Firmware Update Service If this option is selected, the system enables firmware updates from the Window Update service. • BIOS Rollback Policy ■ Unrestricted Rollback to older BIOS—Lets you roll back to any previous version of BIOS. ■ Restricted Rollback to older BIOS—If selected, **Minimum BIOS Version** becomes active, which lets you manually enter the minimum BIOS version that you can roll back to. • Allow BIOS Updates Using a Network • BIOS Update Preferences ■ Check for Update on Next Reboot—Default is disabled. ■ BIOS Source—Lets you select either HP.com or a custom URL. If **Custom URL** is selected, **Edit Custom URL** becomes active. HP recommends using a custom URL only for a managed IT environment. ■ Automatic BIOS Update Setting Allows configuration of a periodic check for updates: **NOTE:** If Microsoft® Windows® BitLocker Drive Encryption (BDE) is enabled, it must be temporarily suspended before the BIOS is flashed. ■ Do not update ■ Checking for updates and prompt the user to accept or reject the update at that time ■ Checking for updates and install all new versions ■ Checking for updates and install only new versions marked important ■ BIOS Update Frequency ■ Daily ■ Weekly ■ Monthly (default) • Network Configuration Settings • Update System and Supported Device Firmware Using Local Media Lets you access files on either USB storage or the hard drive.
Change date and time	Lets you update system date and time.
System IDs	Lets you set the following values: • Asset Tracking Number

Table 6-1 Computer Setup—Main (continued)

Option	Description
	• Ownership Tag
Replicated Setup	**Backup current settings to USB device** Saves system configuration to a formatted USB flash media device. **Restore current settings from USB device** Restores system configuration from a USB flash media device.
Save Custom Defaults	Saves the current system configuration settings as the custom default set.
Apply Custom Defaults and Exit	Applies the custom default settings to the computer after rebooting. Does not apply to options in the **Security** menu.
Apply Factory Defaults and Exit	Restores the factory system configuration settings to the computer after rebooting. Does not apply to options in the **Security** menu.
Ignore Changes and Exit	Exits Computer Setup without applying or saving any changes.
Save Changes and Exit	Saves changes to current system configuration, exits Computer Setup, and reboots.
Suppress POST errors	Select to turn off any errors generated by Power On Self Test (POST) during boot up.

Computer Setup—Security

This table provides information about the Computer Setup Security menu.

NOTE: Support for specific Computer Setup options can vary, depending on the hardware configuration.

Table 6-2 Computer Setup—Security

Option	Description
Create BIOS Administrator Password	Lets you set and enable a BIOS administrator password, which controls access to the following features: • Setup Menu (F10) • Third Party Option ROM Management (F3) • Update system ROM • WMI commands that change system settings • BIOS Configuration Utility (BCU) • Alternative power-on password **NOTE:** Creating a BIOS user disables the Fast Boot option. **NOTE:** If the password is set, you must change Computer Setup options, update the BIOS, and make changes to certain plug and play settings under Windows.
Change BIOS Administrator Password (This selection is active only if a BIOS administrator password is set.)	Lets you change the BIOS administrator password. You must know the current password to be able to change it.
Create POST Power-On Password	The power-on password prompt appears after a power cycle or reboot. If the user does not enter the correct power-on password, the unit will not boot.

Table 6-2 Computer Setup—Security (continued)

Option	Description
Change POST Power-On Password (This selection is active only if a BIOS administrator password is set.)	Lets you change the POST power-on password. You must know the current password to be able to change it.
Password Policies	Let you set the guidelines for a valid password. Options include: • Password minimum length • Requires at least one symbol • Requires at least one number • Requires at least one uppercase character • Requires at least one lowercase character • Allow spaces **Clear Password Jumper** Select **Honor** to allow or **Ignore** to not allow the absence of the password jumper to clear the passwords at boot up. Default is **Honor**.
Administrator Authentication Policies	Lets you configure the computer to prompt for administrator authentication at the following: • F9 boot menu • F11 system recovery • F12 network boot • Capsule update • Power-on authentication
Security Configuration	**TPM Embedded Security** • **TPM Specification Version** Displays the current TPM version. • **TPM Device** Lets you set the Trusted Platform Module as available or hidden. • **TPM State** Select to enable the TPM. • **ClearTPM** Select to reset the TPM to an unowned state. After the TPM is cleared, it is also turned off. To temporarily suspend TPM operations, turn the TPM off instead of clearing it. **IMPORTANT:** Clearing the TPM resets it to factory defaults and turns it off. You will lose all created keys and data protected by those keys. • **TPM Activation Policy** ○ F1 to boot ○ Allow user to reject ○ No prompts **BIOS SureStart** • Verify Boot Block on every boot—Select to enable HP SureStart.

Table 6-2 Computer Setup—Security (continued)

Option	Description
	• BIOS Data Recovery Policy—Select Automatic or Manual to determine data recovery process. Manual recovery is intended only for situations when you want forensic analysis before HP SureStart recovery. When this policy is set to manual, HP SureStart will not correct any issues that are found until the local user enters the manual recovery key sequence. This can result in a computer that cannot boot until the manual recovery key sequence is entered. • Dynamic Runtime Scanning of Boot Block—Verifies the integrity of the BIOS boot block region several times each hour while the computer is running. Default is Enabled. • Sure Start BIOS Settings Protection—When enabled, HP Sure Start locks all critical BIOS settings and provides enhanced protection for these settings using nonvolatile (flash) memory. **NOTE:** An administrator password must be set to activate this setting. • Enhanced HP Firmware Runtime Intrusion Prevention and Detection—Enables monitoring of HP system firmware executing out of main memory while the operating system is running. Any anomalies detected in HP system firmware that is active while the operating system is running will result in a Sure Start security event being generated. • Sure Start Security Event Policy—Controls HP Sure Start behavior upon identifying a critical security event (any modification to HP firmware) while the operating system is running. – Log Event Only—HP Sure Start will log all critical security events in the HP Sure Start audio log within the HP Sure Start nonvolatile (flash) memory. – Log Event and notify user—In addition to logging all critical security events, HP Sure Start will notify the user within the operating system that a critical event has occurred. – Log Event and power off system—In addition to logging all critical security events, HP Sure Start turns of the computer upon detecting a HP Sure Start Security Event. Because of the potential for data loss, HP recommends this setting only in situations where security integrity of the system is a higher priority than the risk of potential data loss. **Secure Boot Configuration** Access to these settings requires Sure Start Secure Boot Keys Protect to be disabled. • Secure Boot—Select to enable. • Secure Boot Key Management—Lets you import custom keys, clear keys, reset keys to factory defaults, and enable an MS UEFI CA key. Clearing keys will disable secure boot. Disabling MS UEFI CA keys alters the Secure Boot key list to further restrict the allowed software components. Set this option to disable to support Device Guard. • Ready BIOS for Device Guard Use—Requires BIOS Administrator credentials and Secure Boot to be enabled. **Secure Platform Management (SPM)** SPM uses certificates rather than password to authorize operations. • SPM—Lets you provision or unprovision SPM. • HP Sure Run—Lets activate or deactivate HP Sure Run. • HP Sure Admin—Lets you enable or disable Enhanced BIOS Authentication Mode (EBAM) or clear EBAM local access keys. **Physical Presence Interface** Enable this setting to notify the user upon system power up when changes are made to system security policy. The user must manually agree to confirm the changes. **Smart Cover** • Cover Removal Sensor (Disabled/Notify user/Administrator password)

Table 6-2 Computer Setup—Security (continued)

Option	Description
	Lets you disable the cover sensor or configure what action is taken if the computer cover is removed. Default is Disabled. **NOTE:** **Notify user** alerts the user with a POST error on the first boot after the sensor detects removal of the cover. If the password is set, **Administrator Password** requires that the password be entered to boot the computer if the sensor detects that the cover has been removed. **Trusted Execution Technology (TXT)** Select to enable TXT. **Intel Software Guard Extensions (SGX)** Intel SGX is a set of processor code instructions from that allows user-level code to allocate private regions of memory, that unlike normal process memory is also protected from processes running at higher privilege levels. • Software control • Disable • Enable
Utilities	**Hard Drive Utilities** • **Save/Restore GPT of System Hard Drive** Enabling this feature saves the GUID Partition Table (GPT) of the system hard drive. If the GPT is subsequently changed, the user is prompted to choose whether to restore GPT. • **Boot Sector (MBR/GPT) Recovery Policy** Lets you set to local user control or to recover in event of corruption. • **DriveLock/Automatic DriveLock** Allows you to assign or modify a master or user password for hard drives. When this feature is enabled, the user is prompted to provide one of the DriveLock passwords during POST. If neither is successfully entered, the hard drive remains inaccessible until one of the passwords is successfully provided during a subsequent cold-boot sequence. **NOTE:** This selection appears only when at least one drive that supports the DriveLock feature is attached to the system. **IMPORTANT:** Be aware that these settings take place immediately. It is not necessary to save. **IMPORTANT:** Be sure to document the DriveLock password. Losing a DriveLock password will render a drive permanently locked. After you select a drive, the following options are available: **- Set DriveLock Master Password**. Sets the drive's master password but does not enable DriveLock. **- Enable DriveLock**. Sets the drive's user password and enables DriveLock. • **Secure Erase** Lets you select a hard drive to completely erase. After you erase a hard drive with a program that uses Secure Erase firmware commands, no file recovery program, partition recovery program, or other data recovery method can extract data from the drive. • **Allow OPAL Hard Drive SID Authentication** Default is disabled.

Table 6-2 Computer Setup—Security (continued)

Option	Description
System Management Command	Allows authorized personnel to reset security settings during a service event. Default is enabled.
Restore Security Settings to Default	This action resets security devices, clears BIOS passwords (not including DriveLock), and restores settings in the **Security menu** to factory defaults.

Computer Setup—Advanced

This table provides information about the Computer Setup Advanced menu.

NOTE: Support for specific Computer Setup options can vary, depending on the hardware configuration.

Table 6-3 Computer Setup—Advanced (for advanced users)

Option	Heading
Display Language	Lets you select the language of the menus in F10 Setup and the keyboard layout.
Scheduled Power-On	This feature wakes the system when it is off at a specified date and time.
Boot Options	Select the devices that the computer can boot from, as well as other options, including: • Startup Delay (sec). Enabling this feature adds a user-specified delay to the POST process. One purpose for the delay is to provide additional time to activate hotkeys such as esc for the Startup Menu or f10 for Computer Setup. • Fast Boot—Default is enabled. • USB Storage Boot—Default is enabled. • Network (PXE) Boot—Default is enabled. • After Power Loss—Default is Power Off. ■ Power off—Causes the computer to remain off when power is restored. ■ Power on—Causes the computer to turn on automatically as soon as power is restored. ■ Previous state—Causes the computer to turn on automatically as soon as power is restored, if it was on when power was lost. **NOTE:** If the system is configured to Power On from Keyboard Ports (see Power Management Options), then this setting is forced to Power On. • Prompt on Memory Size Change. Default is enabled. • Prompt on Fixed Storage Change. Default is disabled. • Audio Alerts During Boot. Default is enabled. When disabled, most audible beeps from errors, warnings, and password prompts during boot up are suppressed. • NumLock on at boot. Default is disabled. • UEFI Boot Order. Default is enabled. Specify the order in which UEFI boot sources (such as a internal hard drive, USB hard drive, USB optical drive, or internal optical drive) are checked for a bootable operating system image. UEFI boot sources always have precedence over legacy boot sources. **NOTE:** To drag a device to a preferred place, press enter. **Shortcut to Temporarily Override Boot Order**

Table 6-3 Computer Setup—Advanced (for advanced users) (continued)

Option	Heading
	To boot **one time** from a device other than the default device specified in Boot Order, restart the computer and press esc (to access the Startup menu) and then f9 (Boot Menu), or only f9 (skipping the Startup menu) when the power button light turns white. After POST is completed, a list of bootable devices is displayed. Use the arrow keys to select the preferred bootable device and press enter. The computer then boots from the selected non-default device for this one time.
HP Sure Recover	**HP Sure Recover** If enabled, system firmware honors local and remote requests to reinstall the operating system. If disabled, all reinstall requests are ignored. Default is enabled. **Recover from Network** If enabled, system firmware gets the recovery agent from the network. If disabled, system firmware gets the recovery agent from the local drive. Default is enabled. **Recover after Boot Failure** If enabled and no bootable UEFI operating system is found, system firmware launches HP Sure Recover. Default is disabled. **Prompt before Boot Failure Recovery** If enabled and no bootable UEFI operating system is found, the user is notified of the boot failure and asked to choose whether to start HP Sure Recover. Default is enabled.
System Options	**Configure storage controller for RAID** Default is disabled. **Configure storage controller for Intel Optane** Enables the Intel® Optane™ memory module. Default is disabled. **Turbo-boost** Default is enabled. **Hyperthreading** Lets you control processor capability. Default is enabled. **Multi-processor** Use this option to disable multi-processor support under the operating system. Default is enabled. **Virtualization Technology (VTx)** (Intel only) Controls the virtualization features of the processor. Changing this setting requires turning the computer off and then back on. Default is enabled. **Virtualization Technology for Directed I/O (VTd)** (Intel only) Controls virtualization DMA remapping features of the chipset. Changing this setting requires turning the computer off and then back on. Default is enabled. **Pre-boot DMA protection** Default is disabled. **M.2 SSD** Lets you disable the M.2 solid-state drive slot. Default is enabled. **M.2 WLAN/BT** Lets you disable the wireless module slot. Default is enabled. **Power Button Override** (disable/4 sec/15 sec/30 sec)

Table 6-3 Computer Setup—Advanced (for advanced users) (continued)

Option	Heading
	Lets you disable or enable and select the number of seconds you have to hold down the power button for it to force the system to turn off. Default is 4 sec.
	USB Type-C Connector System Software Interface (UCSI)
	Default is enabled.
	HP Application Driver
	Default is enabled.
Built-In Device Options	**Embedded LAN Controller**
	Select to show the device in the operating system. Default is enabled.
	Wake On LAN
	Lets you either disable the Wake On LAN feature or configure where the computer boots, including the network or hard drive. Default is Boot to Network.
	Video memory size
	Use this option to manage graphics memory allocation. The value you choose is allocated permanently to graphics and is unavailable to the operating system.
	Touch Device
	Select to show the device in the operating system. Default is enabled.
	NFC
	Select to show the device in the operating system. Default is enabled.
	Audio Device
	Select to show the device in the operating system. Default is enabled.
	Microphone
	Clear to disable the integrated microphone. This does not affect devices plugged into audio jacks. Default is enabled.
	Internal Speakers (does not affect external speakers)
	Clear to disable the chassis speaker or speakers. This function is applicable to normal audio playback in the operating system and does not affect the error or warning beeps during POST. Default is enabled.
	LAN/WLAN auto switching
	Select to enable auto switching between a wired and wireless connection. Default is disabled.
	Wake on WLAN
	Select to enable wake on WLAN. Default is disabled.
Port Options	**Left USB ports**
	Lets you disable the ports. Default is enabled.
	Right USB ports
	Lets you disable the ports. Default is enabled.
	Top USB ports
	Lets you disable the ports. Default is enabled.
	Bottom USB ports
	Lets you disable the ports. Default is enabled.

Table 6-3 Computer Setup—Advanced (for advanced users) (continued)

Option	Heading
	Always Power the Stand Ports When enabled, power to the stand and base remains on to support wake events and USB charging. Requires S5 Maximum Power Savings to be off. Default is disabled. **Rear USB Ports**
Power Management Options	**Runtime Power Management** (enable/disable) Allows certain operating systems to reduce processor voltage and frequency when the current software load does not require the full capabilities of the processor. Default is enabled. **Extended Idle Power States** (enable/disable) Allows certain operating systems to decrease the processors power consumption when the processor is idle. Default is enabled. **S5 Maximum Power Savings** (enable/disable) Enabling this feature reduces the power of the system as much as possible in the S5 state. Power is removed from the wake up circuitry, the expansion slots, and any management features while in S5. Default is disabled. **PCI Express Power Management** (enable/disable) Enabling this option permits the PCI Express links to use Active Power State Management (ASPM) to enter lower power states while not in use. Default is enabled. **Unique Sleep State Blink Rates** (enable/disable) This feature is designed to provide a visual indication of what Sleep state the system is in. Each Sleep state has a unique blink pattern. Default is disabled. **NOTE:** A normal shutdown goes to the S4 state for Windows 8 or later. S0 (On) = solid white light. S3 (Stand By) = 3 blinks at 1 Hz (50% duty cycle) followed by a pause of 2 seconds (white light), repeated cycles of 3 blinks and a pause. S4 (Hibernation) = 4 blinks at 1 Hz (50% duty cycle) followed by a pause of 2 seconds (white light), repeated cycles of 4 blinks and a pause. S5 (Soft Off) = Light is off.
Remote Management Options	**Active Management (AMT)** (Intel only) (enable/disable). Default is enabled. Allows you to discover, repair, and protect networked computing devices. **USB Key Provisioning Support** (enable/disable) Default is disabled. **USB Redirection Support** (enable/disable). Default is enabled. USB redirection allows USB devices plugged into a client computer to be transparently redirected to the guest operating system. **Unconfigure AMT on next boot** (Do Not Apply/Apply). Default is Do Not Apply. **SOL Terminal Emulation Mode** (ANSI / VT100). Default is ANSI. SOL (serial-over-LAN) terminal emulation mode is only activated during remote AMT (Active Management Technology) redirection operations. The emulation options allow administrators to select which mode works best with their console. **Show Unconfigure ME Confirmation Prompt** (enable/disable). Default is enabled. **Verbose Boot Messages** (enable/disable). Default is enabled.

Table 6-3 Computer Setup—Advanced (for advanced users) (continued)

Option	Heading
	Verbose boot shows additional logging information during startup, which is mainly for debugging if something goes wrong during bootup. **Watchdog Timer** (enable/disable). Default is enabled. Allows you to set amount of time for a operating system and BIOS watchdog alert to be sent if the timers are not deactivated. BIOS watchdog is deactivated by BIOS and would indicate that a halt occurred during execution if the alert is sent to the management console. An operating system alert is deactivated by the operating system image and would indicate that a hang occurred during its initialization. • OS Watchdog Timer (min.) – (5/10/15/20/25). Default is 5 min. • BIOS Watchdog Timer (min.) – (5/10/15/20/25). Default is 5 min. **CIRA Timeout (min.)** (1/2/3/4/Never) CIRA is Customer Initiated Remote Assistance, an Intel service to help users employing Active Management Technology (AMT).
Electronic labels	Displays system labels.
Remote HP PC Hardware Diagnostics	**Settings** • Diagnostics Download URL • Diagnostics Logs Upload URL • Scheduled Execution • Frequency • Execute On Next Boot • Last Execution Result **Execute Remote HP PC Hardware Diagnostics** Immediate execution of Remote HP PC Hardware based on the configurations in Settings. Be sure to note that unsaved BIOS settings are lost.

7 POST error messages

This section lists the error codes, error messages, and the various indicator light and audible sequences that you may encounter during Power-On Self-Test (POST) or computer restart, the probable source of the problem, and steps you can take to resolve the error condition.

POST Message Disabled suppresses most system messages during POST, such as memory count and non-error text messages. If a POST error occurs, the screen will display the error message. To manually switch to the POST Messages Enabled mode during POST, press any key (except f10, f11, or f12). The default mode is POST Message Disabled.

The POST mode selection determines the speed at which the computer loads the operating system and the extent to which it is tested.

Quick Boot is a fast startup process that does not run all of the system level tests, such as the memory test. Full Boot runs all of the ROM-based system tests and takes longer to complete.

You can enable Full Boot to run every 1 to 30 days on a regularly scheduled basis. To establish the schedule, reconfigure the computer to the Full Boot Every x Days mode, using Computer Setup.

NOTE: For more information about Computer Setup, see Computer Setup (F10) Utility on page 67.

POST numeric codes and text messages

This section identifies those POST errors that have numeric codes associated with them. The section also includes some text messages that you might encounter during POST.

NOTE: The computer beeps once after a POST text message is displayed on the screen.

Table 7-1 POST numeric codes and text messages

Control panel message	Description	Recommended action
002-Option ROM Checksum Error	System ROM or expansion board option ROM checksum.	1. Verify the correct ROM. 2. Flash the ROM if needed. 3. If an expansion board was recently added, remove it to see if the problem remains. 4. Clear CMOS. 5. If the message disappears, there might be a problem with the expansion card. 6. Replace the system board.
003-System Board Failure	DMA or timers.	1. Clear CMOS. 2. Replace the system board.
005-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.

Table 7-1 POST numeric codes and text messages (continued)

Control panel message	Description	Recommended action
008–Microcode Patch Error	Processor is not supported by the BIOS.	1. Upgrade BIOS to proper version. 2. Change the processor.
009–PMM Allocation Error during MEBx Download	Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM.	1. Reboot the computer. 2. Unplug the power cord, reseat the memory modules, and reboot the computer. 3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer. 4. If the error persists, replace the system board.
00A-Product Information Not Valid	The product information programmed into the system board is missing or invalid.	Use Computer Setup to update this information.
00B-MEBx Module did not checksum correctly	Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM.	1. Reboot the computer. 2. Unplug the power cord, reseat the memory modules, and reboot the computer. 3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer. 4. If the error persists, replace the system board.
00C-PMM Deallocation Error during MEBx Cleanup	Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM.	1. Reboot the computer. 2. Unplug the power cord, reseat the memory modules, and reboot the computer. 3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer. 4. If the error persists, replace the system board.
00D-Setup Error during MEBx Execution	MEBx selection or exit resulted in a setup failure.	1. Reboot the computer. 2. Unplug the power cord, reseat the memory modules, and reboot the computer. 3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer.

Table 7-1 POST numeric codes and text messages (continued)

Control panel message	Description	Recommended action
		4. If the error persists, replace the system board.
00E-Inventory Error during MEBx Execution	BIOS information passed to the MEBx resulted in a failure.	1. Reboot the computer. 2. If the error persists, update to the latest BIOS version. 3. If the error still persists, replace the system board.
00F-Interface Error during MEBx Execution	MEBx operation experienced a hardware error during communication with the ME.	1. Reboot the computer. 2. If the error persists, update to the latest BIOS version. 3. If the error still persists, replace the system board.
100-Front Audio Not Connected	Front audio cable has been detached or unseated from system board.	Reconnect or replace front audio cable.
2E1-MemorySize Error	Memory amount has changed since the last boot (memory added or removed).	The system memory size is different from the last startup. The most common reason is the removal of memory from the system board. Press the f1 key to save the memory changes.
2E2-Memory Error	Memory module configuration failed during boot up.	1. Be sure that memory modules are correctly installed. 2. Verify proper memory module type. 3. Remove and replace the identified faulty memory modules. 4. If the error persists after replacing memory modules, replace the system board.
2E3-Incompatible Memory Module in Memory Socket(s) X, X, ...	A memory module in memory socket identified in the error message is missing critical SPD information, or is incompatible with the chipset.	1. Verify proper memory module type. 2. Try another memory socket. 3. Replace with a supported module.
2E4-DIMM Configuration Warning	Populated DIMM Configuration is not optimized.	Rearrange the DIMMs so that each channel has the same amount of memory.
2E5-ECC Memory Module Detected on Unsupported Platform	Recently added memory modules support ECC memory error correction.	1. If additional memory was recently added, remove it to see if the problem remains. 2. Check product documentation for memory support information.
2E6–Memory Not Configured Correctly for Proper MEBx Execution	DIMM1 is not installed.	Make sure there is a memory module in the DIMM1 socket and that it is properly seated.
300–Configuration Change Warning	A change in storage configuration has been detected (see Boot Options menu in BIOS Setup to enable this feature). Either the installed hardware has changed, storage or firmware mode may have been changed, or	If no changes have been made prior to this warning, check that the drives are connected properly to power cables and system board. User Diagnostics (f2 during boot-up) may help identify any problem with specific devices.

Table 7-1 POST numeric codes and text messages (continued)

Control panel message	Description	Recommended action
	a storage device may have failed to respond.	
301-Hard Disk 1: 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 under using F2 Diagnostics when booting the computer. 2. Apply hard drive firmware patch if applicable. (Available at http://www.hp.com/support.) 3. Back up contents and replace hard drive.
302-Hard Disk 2: 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 under using F2 Diagnostics when booting the computer. 2. Apply hard drive firmware patch if applicable. (Available at http://www.hp.com/support.) 3. Back up contents and replace hard drive.
309 – 30C: Hard Disk 3–6: 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 under using F2 Diagnostics when booting the computer. 2. Apply hard drive firmware patch if applicable. (Available at http://www.hp.com/support.) 3. Back up contents and replace hard drive.
3F0–Boot Device Not Found	Boot device not found.	Insert boot device or load operating system.
3F1–Hard Disk 1 Error	Hard disk 1 error.	1. Check and/or replace cables. 2. Clear CMOS. 3. Replace the hard disk drive.
3F2–Hard Disk 2 Error	Hard disk 2 error.	1. Check and/or replace cables. 2. Clear CMOS. 3. Replace the hard disk drive.
400-Serial Port A Address Conflict Detected	Both external and internal serial ports are assigned to the same resources.	1. Remove any serial port expansion cards. 2. Clear CMOS. 3. Reconfigure card resources and/or run Computer Setup or Windows utilities.

Table 7-1 POST numeric codes and text messages (continued)

Control panel message	Description	Recommended action
401-Serial Port B Address Conflict Detected	Both external and internal serial ports are assigned to the same resources.	1. Remove any serial port expansion cards. 2. Clear CMOS. 3. Reconfigure card resources and/or run Computer Setup or Windows utilities.
402-Serial Port C Address Conflict Detected	Both external and internal serial ports are assigned to the same resources.	1. Remove any serial port expansion cards. 2. Clear CMOS. 3. Reconfigure card resources and/or run Computer Setup or Windows utilities.
403-Serial Port D Address Conflict Detected	Both external and internal serial ports are assigned to the same resources.	1. Remove any serial port expansion cards. 2. Clear CMOS. 3. Reconfigure card resources and/or run Computer Setup or Windows utilities.
419-Out of Memory Space for Option ROMs	Recently added PCI expansion card contains an option ROM too large to download during POST.	If a PCI expansion card was recently added, remove it to see if the problem remains.
41A-Front USB1/USB2 Not Connected	Front USB cable has been detached or unseated from system board.	Reconnect or replace front USB cable.
43A-USB Type-C I2C Not Connected	Cable is required between I2C on card and USB-C on the system board.	Install cable between I2C on card and USB-C on the system board.
500—BIOS Recovery	A system BIOS recovery has occurred.	Not applicable.
70x-Wireless Mode Not Supported	The system has detected a wireless module installed in the system that is not supported and has been disabled.	Replace with a supported module.
800-Keyboard Error	Keyboard failure.	1. Reconnect keyboard with computer turned off. 2. Check connector for bent or missing pins. 3. Be sure that none of the keys are depressed. 4. Replace keyboard.
801-Keyboard or System Unit Error	Keyboard failure.	1. Reconnect the keyboard with computer turned off. 2. Be sure that none of the keys are depressed. 3. Replace the keyboard. 4. Replace the system board.
900-CPU Fan Not Detected	CPU fan is not connected or may have malfunctioned.	1. Reseat fan. 2. Reseat fan cable.

Table 7-1 POST numeric codes and text messages (continued)

Control panel message	Description	Recommended action
		3. Replace fan.
901-Chassis, Rear Chassis, or Front Chassis Fan not Detected	Fan is not connected or might have malfunctioned.	1. Reseat fan. 2. Reseat fan cable. 3. Replace fan.
90B-Fan Failure	The system has detected that a cooling fan is not operating correctly.	1. Reseat fan. 2. Reseat fan.cable. 3. Replace fan.
90D-System Temperature	Thermal shutdown occurred. The system BIOS has detected your machine was previously shut down to avoid overheating. Overheating may occur if the cooling vents are blocked or the operating temperature exceeds the system specifications. The machine should return to normal operation once the situation is resolved.	Make sure system has proper airflow.

Interpreting system validation diagnostic front panel LEDs and audible codes

This section identifies the front panel light codes as well as the audible codes that can occur before or during POST that might not have an error code or text message associated with them.

⚠ **CAUTION:** 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 AC outlet and allow the internal system components to cool before touching.

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

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

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

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

NOTE: Single beep/blink codes are not used.

Table 7-2 Beep pattern error identification

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

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

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

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

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

Table 7-3 Interpreting POST diagnostic front panel lights and audible codes

Category	Major/minor code	Description
BIOS	2.2	The main area (DXE) of BIOS has become corrupted and there is no recovery binary image available.
	2.3	The embedded controller policy requires the user to enter a key sequence.
	2.4	The embedded controller is checking or recovering the boot block.
Hardware	3.2	The embedded controller has timed out waiting for BIOS to return from memory initialization.
	3.3	The embedded controller has timed out waiting for BIOS to return from graphics initialization.
	3.4	The system board displays a power failure (crowbar).*
	3.5	The processor is not detected.*
	3.6	The processor does not support an enabled feature.
Thermal	4.2	A processor over temperature condition has been detected.*
	4.3	An ambient temperature over temperature condition has been detected.
	4.4	An MXM over temperature condition has been detected.
System board	5.2	The embedded controller cannot find valid firmware.

Table 7-3 Interpreting POST diagnostic front panel lights and audible codes (continued)

Category	Major/minor code	Description
	5.3	The embedded controller has timed out waiting for the BIOS.
	5.4	The embedded controller has timed out waiting for BIOS to return from system board initialization.
	5.5	The embedded controller rebooted the system after a possible lockup condition had been detected through the use of a System Health Timer, Automated System Recovery Timer, or other mechanism.

* Indicates hardware triggered event; all other events are controlled by the BIOS.

8 Password security and resetting CMOS

This computer supports two security password features that you can establish through the Computer Setup Utilities menu: administrator password and power-on password.

When you establish only an administrator password, any user can access all the information on the computer except Computer Setup. When you establish only a power-on password, the power-on password is required to access Computer Setup and any other information on the computer. When you establish both passwords, only the administrator password will give you access to Computer Setup.

When both passwords are set, you can use the administrator password in place of the power-on password as an override to log in to the computer. This feature is useful for a network administrator.

IMPORTANT: Back up the BIOS settings or save them as custom defaults in case you need them later. You can back up in Computer Setup or with the BiosConfigUtility tool available from www.hp.com. See Computer Setup (F10) Utility on page 67 for information about backing up the BIOS settings.

Changing a setup or power-on password

Use this procedure to change a password.

To change the power-on or setup password, complete the following steps:

1. Turn on or restart the computer.

   To change the setup password, go to step 2.

   To change the power-on password, go to step 3.

2. To change the setup password, as soon as the computer turns on:

   - Press esc while the “Press the ESC key for Startup Menu” message is displayed.

   - Press f10 to enter Computer Setup.

3. When the key icon appears, type your current password, a slash (/) or alternate delimiter character, your new password, another slash (/) or alternate delimiter character, and your new password again as shown:

   current password/new password/new password

   NOTE: Type the new password carefully because the characters do not appear on the screen.

4. Press enter.

The new password will take effect the next time the computer is restarted.

Deleting a setup or power-on password

Use this procedure to delete a password.

To delete the power-on or setup password, complete the following steps:

1. Turn on or restart the computer.

   To delete the Setup password, go to step 2.

To delete the Power-on password, go to step 3.

2. To delete the Setup password, as soon as the computer turns on:

   - Press esc while the “Press the ESC key for Startup Menu” message is displayed.

   - Press f10 to enter Computer Setup.

3. When the key icon appears, type your current password, a slash (/) or alternate delimiter character, your new password, another slash (/) or alternate delimiter character, and your new password again as shown:

   current password/

4. Press enter.

Clearing and resetting the CMOS

Use this procedure to clear and reset CMOS.

The computer’s configuration memory (CMOS) stores information about the computer’s configuration.

The CMOS button resets CMOS but does not clear the power-on and setup passwords.

1. Turn off the computer and any external devices, and disconnect the power cord from the power outlet.
2. Disconnect all external equipment connected to the computer.

CAUTION: To reduce the risk of personal injury from electrical shock, hot surfaces, or both, be sure to disconnect the power cord from the AC outlet, and allow the internal system components to cool before touching.

IMPORTANT: When the computer is plugged in, the power supply always has voltage applied to the system board even when the unit is turned off. Failure to disconnect the power cord can result in damage to the system.

Static electricity can damage the electronic components of the computer or optional equipment. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object. See the *Safety & Regulatory Information* guide for more information.

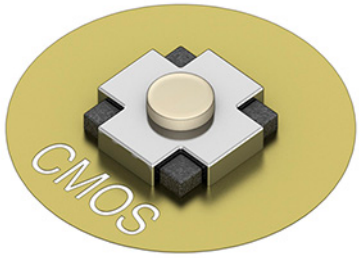
3. Remove the access panel.

IMPORTANT: Pushing the CMOS button resets CMOS values to factory defaults. It is important to back up the computer CMOS settings before resetting them in case they are needed later. Back up is easily done through Computer Setup. See Computer Setup (F10) Utility on page 67 for information on backing up the CMOS settings.

4. Remove the PCIe single-slot riser assembly.

5. Locate, press, and hold the CMOS button in for 5 seconds.

NOTE: Make sure you have disconnected the AC power cord from the AC outlet. The CMOS button will not clear CMOS if the power cord is connected.



6. Replace the access panel.
7. Reconnect the external devices.
8. Plug in the computer and turn on power.

NOTE: You will receive POST error messages after clearing CMOS and rebooting advising you that configuration changes have occurred. Use Computer Setup to reset any special system setups along with the date and time.

For instructions on Computer Setup, see Computer Setup (F10) Utility on page 67.

9 Using HP PC Hardware Diagnostics

You can use the HP PC Hardware Diagnostics utility to determine whether your computer hardware is running properly. The three versions are HP PC Hardware Diagnostics Windows, HP PC Hardware Diagnostics UEFI (Unified Extensible Firmware Interface), and (for select products only) Remote HP PC Hardware Diagnostics UEFI, a firmware feature.

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 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 92.

Using an HP PC Hardware Diagnostics Windows hardware failure ID code

When HP PC Hardware Diagnostics Windows detects a failure that requires hardware replacement, a 24-digit Failure ID code is generated.

▲ Depending on the instructions on the screen, choose one of these options:

- If failure ID link is displayed, select the link and follow the on-screen instructions.
- If instructions for calling support are displayed. Follow those instructions.

Accessing HP PC Hardware Diagnostics Windows

After HP PC Hardware Diagnostics Windows is installed, you can access it from HP Help and Support, HP Support Assistant, or the Start menu.

Accessing HP PC Hardware Diagnostics Windows from HP Help and Support (select products only)

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

1. Select the **Start** button, and then select **HP Help and Support**.
2. Select **HP PC Hardware Diagnostics Windows**.
3. When the tool opens, select the type of diagnostic test that you want to run, and then follow the on-screen instructions.

NOTE: To stop a diagnostic test, select **Cancel**.

Accessing HP PC Hardware Diagnostics Windows from Support Assistant

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

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 **Troubleshooting and fixes**.
3. Select **Diagnostics**, and then select **HP PC Hardware Diagnostics Windows**.
4. When the tool opens, select the type of diagnostic test that you want to run, and then follow the on-screen instructions.

NOTE: To stop a diagnostic test, select **Cancel**.

Accessing HP PC Hardware Diagnostics Windows from the Start menu (select products only)

After HP PC Hardware Diagnostics Windows is installed, follow these steps to access it from the Start menu.

1. Select the **Start** button.
2. Right-click **HP PC Hardware Diagnostics for Windows**, select **More**, and then select **Run as administrator**.
3. When the tool opens, select the type of diagnostic test that you want to run, and then follow the on-screen instructions.

NOTE: To stop a diagnostic test, select **Cancel**.

Downloading HP PC Hardware Diagnostics Windows

The HP PC Hardware Diagnostics Windows downloading 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 from HP

To download HP PC Hardware Diagnostics Windows from HP, 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 downloads to the selected location.

Downloading the HP PC Hardware Diagnostics Windows from the Microsoft Store

You can download the HP PC Hardware Diagnostics Windows from the Microsoft Store.

1. Select the Microsoft Store app on your desktop or enter `Microsoft Store` in the taskbar search box.
2. Enter `HP PC Hardware Diagnostics Windows` in the **Microsoft Store** search box.
3. Follow the on-screen directions.

The tool downloads to the selected location.

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

You can download HP PC Hardware Diagnostics Windows by product name or number.

NOTE: For some products, you might have to download the software to a USB flash drive by using the product name or number.

1. Go to http://www.hp.com/support.
2. Select **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 downloads to the selected location.

Installing HP PC Hardware Diagnostics Windows

To install HP PC Hardware Diagnostics Windows, navigate to the folder on your computer or the USB flash drive where the .exe file downloaded, double-click the .exe file, and then follow the on-screen instructions.

Using HP PC Hardware Diagnostics UEFI

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

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 94.

If your PC does not start in Windows, you can use HP PC Hardware Diagnostics UEFI to diagnose hardware issues.

Using an HP PC Hardware Diagnostics UEFI hardware failure ID code

When HP PC Hardware Diagnostics UEFI detects a failure that requires hardware replacement, a 24-digit Failure ID code is generated.

For assistance in solving the problem:

- Select **Contact HP**, accept the HP privacy disclaimer, and then use a mobile device to scan the Failure ID code that appears on the next screen. The HP Customer Support - Service Center page appears 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 this procedure.

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 94.

   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 some situations.

- HP PC Hardware Diagnostics UEFI is not included in the preinstallation 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 downloading 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, follow this procedure.

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)

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

NOTE: For some products, you might have to download the software to a USB flash drive by using the product name or number.

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 might 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

HP Remote PC Hardware Diagnostics UEFI is also available as a SoftPaq that you can download to a server.

Downloading the latest Remote HP PC Hardware Diagnostics UEFI version

You can 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 Remote Diagnostics**, and then select **Run**.

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

You can download HP Remote PC Hardware Diagnostics UEFI by product name or number.

NOTE: For some products, you might have to download the software by using the product name or number.

1. Go to http://www.hp.com/support.
2. Select **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 several 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 hard 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 that you use for uploads.
- Display status information about the diagnostics run previously.

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

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

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

Your changes take effect when the computer restarts.

10 Backing up, restoring, and recovering

You can use Windows tools or HP software to back up your information, create a restore point, reset your computer, create recovery media, or restore your computer to its factory state. Performing these standard procedures can return your computer to a working state faster.

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

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

Backing up information and creating recovery media

These methods of creating recovery media and backups are available on select products only.

Using Windows tools for backing up

HP recommends that you back up your information immediately after initial setup. You can do this task either using Windows Backup locally with an external USB drive or using online tools.

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

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

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

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

For details:

- Go to http://www.hp.com/support, search for HP Cloud Recovery, and then select the result that matches the type of computer that you have.

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

IMPORTANT: HP recommends that you follow the Restoring and recovery methods on page 98 to restore your computer before you obtain and use the HP recovery discs. Using a recent backup can return your machine to a working state sooner than using the HP recovery discs. After the system is restored, reinstalling all the operating system software released since your initial purchase can be a lengthy process.

Restoring and recovering your system

You have several tools available to recover your system both within and outside of Windows if the desktop cannot load.

HP recommends that you attempt to restore your system using the Restoring and recovery methods on page 98.

Creating a system restore

System Restore is available in Windows. The System Restore software can automatically or manually create restore points, or snapshots, of the system files and settings on the computer at a particular point.

When you use System Restore, it returns your computer to its state at the time you made the restore point. Your personal files and documents should not be affected.

Restoring and recovery methods

After you run the first method, test to see whether the issue still exists before you proceed to the next method, which might now be unnecessary.

1. Run a Microsoft System Restore.
2. Run Reset this PC.

   NOTE: The options **Remove everything** and then **Fully clean the drive** can take several hours to complete and leave no information on your computer. It is the safest way to reset your computer before you recycle it.

3. Recover using HP Recovery media. For more information, see Recovering using HP Recovery media on page 98.

For more information about the first two methods, see the Get Help app:

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

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

Recovering using HP Recovery media

You can use HP Recovery media to recover the original operating system and software programs that were installed at the factory. On select products, it can be created on a bootable USB flash drive using the HP Cloud Recovery Download Tool.

For details, see Using the HP Cloud Recovery Download Tool to create recovery media (select products only) on page 97.

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

To recover your system:

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

NOTE: HP recommends that you follow the Restoring and recovery methods on page 98 to restore your computer before you obtain and use the HP recovery discs. Using a recent backup can return your machine to a working state sooner than using the HP recovery discs. After the system is restored, reinstalling all the operating system software released since your initial purchase can be a lengthy process.

Changing the computer boot order

If your computer does not restart using the HP Recovery media, you can change the computer boot order, the order of devices listed in BIOS for startup information. You can select an optical drive or a USB flash drive, depending on the location of your HP Recovery media.

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

To change the boot order:

1. Insert the HP Recovery media.
2. Access the system **Startup** menu.
   - For computers or tablets with keyboards attached, turn on or restart the computer or tablet, quickly press esc, and then press f9 for boot options.
   - For tablets without keyboards, turn on or restart the tablet, quickly press and hold the volume up button, and then select **f9**.

     – or –

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

Using HP Sure Recover (select products only)

Select computer models are configured with HP Sure Recover, a PC operating system (OS) recovery solution built into the hardware and software. HP Sure Recover can fully restore the HP OS image without installed recovery software.

Using HP Sure Recover, an administrator or user can restore the system and install:

- Latest version of the operating system
- Platform-specific device drivers
- Software applications, in the case of a custom image

To access the latest documentation for HP Sure Recover, go to http://www.hp.com/support. Follow the on-screen instructions to find your product and locate your documentation.

11 Statement of memory volatility

For general information regarding nonvolatile memory in HP business computers, and to restore nonvolatile memory that can contain personal data after the system has been turned off and the hard drive has been removed, use these instructions.

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, with the following assumptions:

- No subsequent modifications were made to the system.
- No applications, features, or functionality were 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 also remains in nonvolatile memory. Use the following steps 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

Use these instructions to restore nonvolatile memory.

1. Follow these steps 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 quickly press esc.

   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 restarts.

   c. During the restart, 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 reboots.

   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**, and 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**. Select **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:

If you clear data using Secure Erase, you cannot recover it.

a. Turn on or restart the computer, and then quickly press esc.

b. Select the **Security** menu and scroll down to the esc 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:

   i. Turn on or restart the computer, and then quickly press esc.

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

   iii. Select **Hard Drive Utilities**.

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

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.

Nonvolatile memory usage

Use this table to troubleshooting nonvolatile memory usage.

Table 11-1 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 products only) on page 105.	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 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

Table 11-1 Troubleshooting steps for nonvolatile memory usage (continued)

Nonvolatile memory type	Amount (Size)	Does this memory store customer data?	Does this memory retain data when power is removed?	What is the purpose of this memory?	How is data entered into this memory?	How is this memory write-protected?
						on the HP website; go to http://www.hp.com/support. Select **Find your product**, and then follow the on-screen instructions.
Intel Management Engine Firmware (present only in select Elite or Z models. For more information, go to http://www.hp.com/support. Select **Identify your product for manuals and specific product information**, 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 megabits	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 kilobits to 8 kilobits	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.
Camera (select products only)	64 kilobits	No	Yes	Stores camera configuration and firmware.	Camera 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

Use this section to answer your questions about nonvolatile memory.

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

   IMPORTANT: The restore defaults feature does not securely erase any information on your hard drive. See question and answer 6 for steps to securely erase information.

   The restore defaults feature 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 quickly press esc.

   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 replaces 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 runtime 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 runtime 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 is the UEFI BIOS located?**

   The UEFI BIOS is located on a flash memory chip. You must use a utility 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 and timing, voltage, and thermal information. This information is written by the module manufacturer and stored on an EEPROM. You cannot write to this EEPROM 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 erase the data?**

IMPORTANT: Resetting results in the loss of information.

These steps do 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 quickly press esc.

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, disabling Secure Boot does not clear the keys. You must also select to clear the Custom Secure Boot Keys. Use the same Secure Boot access procedure that you used to create the Custom Secure Boot Keys, but select to clear or delete all Secure Boot Keys.

a. Turn on or restart the computer, and then quickly press esc.

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 products 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. Advanced users can customize the default configuration.

To access the latest documentation on HP Sure Start, go to http://www.hp.com/support.

12 Power cord set requirements

The power supplies on some computers have external power switches.

The voltage select switch feature on the computer permits it to operate from any line voltage of 100 V ac–120 V ac or 220 V ac–240 V ac. Power supplies on those computers that do not have external power switches are equipped with internal switches that sense the incoming voltage and automatically switch to the proper voltage.

The power cord set received with the computer meets the requirements for use in the country where you purchased the equipment.

Power cord sets for use in other countries must meet the requirements of the country where you use the computer.

General requirements

These requirements are applicable to all countries.

1. The power cord must be approved by an acceptable accredited agency responsible for evaluation in the country where the power cord set will be installed.
2. The power cord set must have a minimum current capacity of 10A (7A Japan only) and a nominal voltage rating of 125 V ac or 250 V ac, as required by each country's power system.
3. The diameter of the wire must be a minimum of 0.75 mm^2 or 18AWG, and the length of the cord must be between 1.8 m (6 ft) and 3.6 m (12 ft).

The power cord should be routed so that it is not likely to be walked on or pinched by items placed upon it or against it. Particular attention should be paid to the plug, electrical outlet, and the point where the cord exits from the product.

⚠ **WARNING!** Do not operate this product with a damaged power cord set. If the power cord set is damaged in any manner, replace it immediately.

Japanese power cord requirements

For use in Japan, use only the power cord received with this product.

IMPORTANT: Do not use the power cord received with this product on any other products.

Country-specific requirements

This information provides additional requirements specific to a country.

Table 12-1 Power cord country-specific requirements

Country	Accrediting Agency	Country	Accrediting Agency
Australia (1)	EANSW	Italy (1)	IMQ
Austria (1)	OVE	Japan (3)	METI
Belgium (1)	CEBC	Norway (1)	NEMKO

Table 12-1 Power cord country-specific requirements (continued)

Country	Accrediting Agency	Country	Accrediting Agency
Canada (2)	CSA	Sweden (1)	SEMKO
Denmark (1)	DEMKO	Switzerland (1)	SEV
Finland (1)	SETI	United Kingdom (1)	BSI
France (1)	UTE	United States (2)	UL
Germany (1)	VDE		

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

13 Specifications

This section provides specifications for your computer.

Table 13-1 Specifications

	Metric	U.S.
Dimensions, 60.5 cm (23.8 inch) models		
Height	29.4 mm	1.2 in
Width (landscape)	576.4 mm	22.7 in
Width (portrait)	570.4 mm	22.5 in
Depth	339.9 mm	13.4 in
Dimensions, 49.5 cm (19.5 inch) models (without stand)		
Height	29.4 mm	1.2 in
Width (landscape)	494.8 mm	19.5 in
Width (portrait)	488.8 mm	19.2 in
Depth	292.6 mm	11.5 in
Dimensions, 39.5 cm (15.6 inch) models (without stand)		
Height	26.4 mm	1.0 in
Width (landscape)	397.6 mm	15.7 in
Width (portrait)	397.6 mm	15.7 in
Depth	241.0 mm	9.5 in
Weight, 60.5 cm (23.8 inch) models	6.8 kg	15.0 lbs
Weight, 49.5 cm (19.5 inch) models	5.7 kg	12.6 lb
Weight, 39.5 cm (15.6 inch) models	3.37 kg	7.4 lbs
Temperature range		
Operating	10°C to 35°C	50°C to 95°F
Nonoperating	–20°C to 60°C	–4°F to 140°F
NOTE: Operating temperature is derated 1.0°C per 300 m (1000 ft) to 3000 m (10,000 ft) above sea level; no direct sustained sunlight. Maximum rate of change is 10°C/hr. The upper limit might be limited by the type and number of options installed.		
Maximum altitude (unpressurized)		
Operating	3,048 m	10,000 ft
Nonoperating	9,144 m	30,000 ft
Relative humidity (noncondensing)		
Operating	10% to 90%	
Nonoperating (38.7°C max wet bulb)	5% to 95%	

Table 13-1 Specifications (continued)

	Metric	U.S.
Power supply		
Operating voltage range	90 V ac to 264 V ac	
Rated voltage range[1]	100 V ac to 240 V ac	
Rated line frequency	50 Hz to 60 Hz	
Operating line frequency	47 Hz to 63 Hz	
Power supply	280 W	
	230 W	

[1] This system uses an active power factor-corrected power supply. This allows the system to pass the CE mark requirements for use in the countries of the European Union. The active power factor-corrected power supply also has the added benefit of not requiring an input-voltage range select switch.

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