Maintenance & Service Guide

HP ProOne 600 G4 21.5 inch All-in-One Business PC

Product notice

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

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

Software terms

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

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

About This Book

⚠ WARNING!   Text set off in this manner indicates that failure to follow directions could result in bodily harm or loss of life.

⚠ CAUTION: Text set off in this manner indicates that failure to follow directions could result in damage to equipment or loss of information.

📝 NOTE: Text set off in this manner provides important supplemental information.

Table of contents

1 Product features

Overview

NOTE: For the latest manuals on this product, go to http://www.hp.com/support. Select **Find your product**, and then follow the on-screen instructions.

Front components

	Component			Component
1	Webcam microphones (2) (optional)		4	Webcam/IR lens (optional)
2	IR LED (optional)		5	IR LED (optional)
3	Webcam LED (optional)		6	Speakers (2) (optional)

Side components
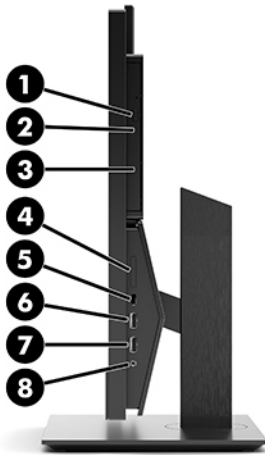
Component		Component	
1	Optical disc drive (optional)	5	USB 3.1 Type-C port
2	Optical disc drive light (optional)	6	USB 3.1 Type-A (charging) port
3	Optical disc drive eject button (optional)	7	USB 3.1 Type-A port
4	SD card reader (optional)	8	Audio-out (headphone)/Audio-in (microphone) combo jack

Rear components
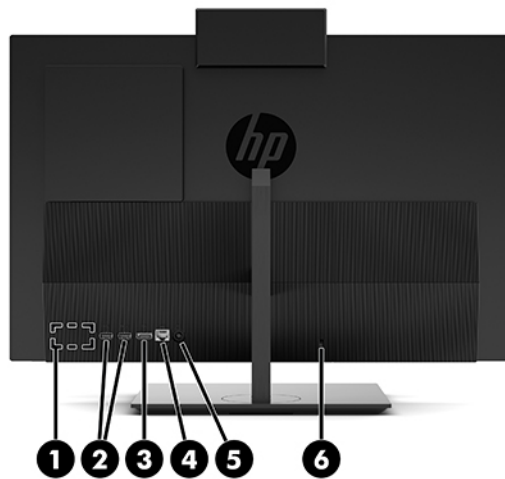
Component		Component	
1	DisplayPort port (optional)	4	RJ-45 (network) jack
	– or –		
	HDMI port (optional)		
	– or –		
	Serial port (optional)		
2	USB 3.1 Type-A ports (2)	5	Power connector
3	DisplayPort port	6	Security cable slot

Bottom components
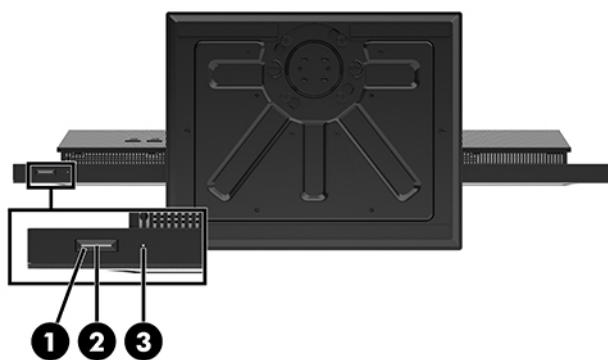
Component		Component	
1	Power button	3	Hard drive activity light
2	Power light		

Labels

The labels affixed to the computer provide information you may need when you troubleshoot system problems or travel internationally with the computer.

IMPORTANT: All labels described in this section will be located under the stand or affixed to the bottom of the computer.

1. You may need the Product Key to update or troubleshoot the operating system. HP platforms preinstalled with Windows do not have the physical label, but have a Digital Product Key electronically installed.

    NOTE: This Digital Product Key is automatically recognized and activated by Microsoft Operating Systems on a reinstall of the Windows operating system with HP-approved recovery methods.

2. Service label—Provides important information to identify your computer. When contacting support, you will probably be asked for the serial number, and possibly for the product number or the model number. Locate these numbers before you contact support.

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

3. Look for the serial number label in the following locations:
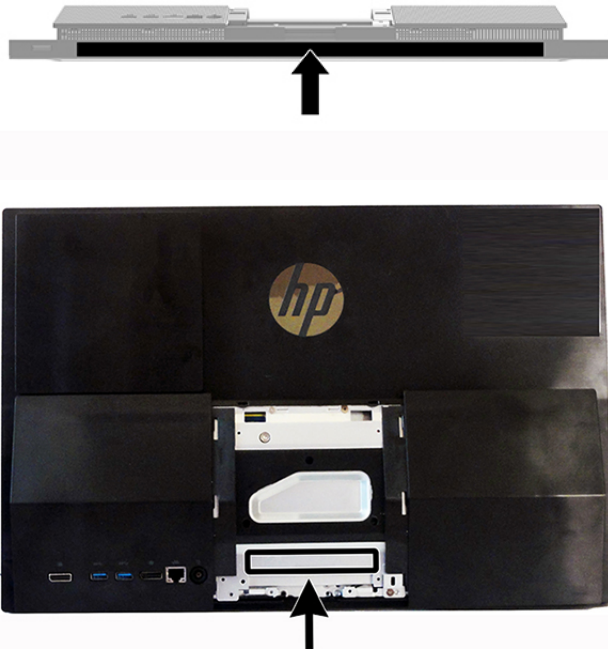
2   Illustrated parts catalog

Component appearance may vary.

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

System parts
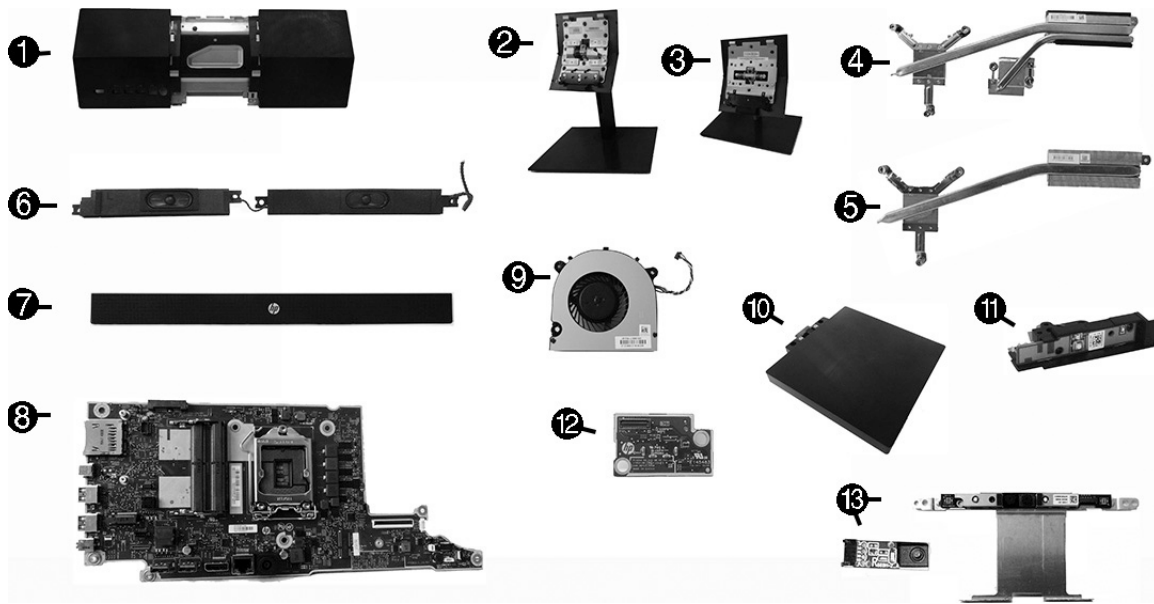
Item	Description
(1)	**Rear port cover** (available for models with the following expansion port: DisplayPort, HDMI, serial, or no expansion port)
(2)	**Adjustable height stand**
(3)	**Fixed height stand**
	Heat sink (thermal module) (includes replacement thermal material)
(4)	For use in models with discrete graphics memory
(5)	For use in models with UMA graphics memory and up to 65 W processors
	For use in models with UMA graphics memory and 35 W processors
(6)	**Speakers** (left and right)
(7)	**Speaker cover**
(8)	**System board**
	For use in models with UMA graphics memory
	For use in models with discrete graphics memory

Item	Description
(9)	**Fan**
(10)	**Optical drive carrier**
*	**Optical drive**
	BD writer drive
	DVD±RW drive
	DVD-ROM drive
(11)	**Power button board** (includes holder)
(12)	**Option board**
	DisplayPort
	HDMI
	Serial
(13)	**Webcam module and microphone module**
	Webcam modules available in FHD (1080p), FHD+IR (1080p), and HD (720p)
*	**Rear enclosure and display assembly** (includes display panel, back plastic panel, panel frame, system board basepan, camera frame assembly, webcam module, microphone modules, webcam cable, and wireless cables and antennas)
	NOTE: Different assemblies are required depending on whether the computer has a 35 W processor or a 65 W processor.
	Touch models:
	● For use in models with an HD webcam
	● For use in models with an FHD webcam
	● For use in models with an FHD+IR webcam
	● For use in models without a webcam
	Non-touch models:
	● For use in models with an HD webcam
	● For use in models with an FHD webcam
	● For use in models with an FHD+IR webcam
	● For use in models without a webcam
*	**RTC battery**
*	**Cables**
	Power button board cable
	Hard drive SATA cable
	DVI monitor cable
*	**AC adapter**
	120 W, PFC, 7.4 mm
	90 W, PFC, 7.4 mm
*	**WLAN modules**

Item	Description
	Intel Dual Band Wireless-AC 9560 802.11 AC 2x2 WiFi + Bluetooth 5.0 Combo Adapter (vPro)
	Intel Dual Band Wireless-AC 9560 802.11 AC 2x2 WiFi + Bluetooth 5.0 Combo Adapter (non-vPro)
	Realtek RTL8821CE 802.11 ac 1x1 WiFi + BT 4.2 Combo Adapter (MU-MIMO supported)
	Realtek RTL8822BE 802.11 ac 2x2 WiFi + BT 4.2 Combo Adapter (MU-MIMO supported)
*	**Hood sensor**
*	**Adapters**
	USB to serial adapter
	USB-C to USB 3.0 adapter
	DisplayPort to VGA
	DisplayPort to DVI
	DisplayPort to HDMI 2.0
*	**Optical drive blank** (for use in models without an optical drive)
*	**Covers**
	Optical drive cover (for use in models without an optical drive)
	Webcam cover (for use in models without a webcam)
	Card reader cover (for use in models without a card reader)
*	**VESA kit** (for use in models without a stand)
*	**USB-C to USB-A hub**
*	**Power cord**

Mass storage devices

Description
Optical drive
BD writer drive
DVD±RW drive
DVD-ROM drive
Hard drive
2 TB, 5400 rpm, hybrid SSD drive, 7 mm
2 TB, 5400 rpm, 7 mm
1 TB, 5400 rpm, hybrid SSD drive, 9.5 mm
1 TB, 7200 rpm, 9.5 mm
500 GB, 5400 rpm, hybrid SSD drive, 7 mm
500 GB, 7200 rpm hard drive, self-encrypting (SED), Opal 2, 7 mm
500 GB, 7200 rpm, 7 mm
500 GB, 7200 rpm hard drive, FIPS, 7 mm
Solid-state drive (SATA-3, TLC, 2.5-inch)
512-GB
512-GB, self-encrypting (SED), Opal 2
512-GB, FIPS 140-2
256-GB
256-GB, self-encrypting (SED), Opal 2
256-GB, FIPS 140-2
Solid-state drive (M.2, PCIe)
1-TB, TLC
512-GB, TLC
512-GB
512-GB, self-encrypting (SED), TLC
256-GB, TLC
256-GB, self-encrypting (SED), TLC
128-GB, TLC
128-GB
Optane memory module, 118 GB
Optane memory module, 16 GB

Processors and memory modules

Description
Memory modules (SODIMM; PC4-2400)
16-GB
8-GB
4-GB
Intel Processors (include replacement thermal material)
Intel Core i7-8700
Intel Core i7-8700T
Intel Core i5-8600
Intel Core i5-8600T
Intel Core i5-8500
Intel Core i5-8500T
Intel Core i3-8300T
Intel Core i3-8100T
Intel Core i3-8033
Intel Core i3-8011
Intel Pentium G5600
Intel Pentium G5500
Intel Pentium G5500T
Intel Pentium G5400
Intel Pentium G5400T
Intel Celeron G4900
Intel Celeron G4900T

Keyboards and mice

Description
Keyboard
Washable, USB PS2
USB, unbranded
USB
USB, essential
Conferencing
USB, slim

Description
Wireless, with mouse
USB, slim, smart card
Antimicrobial
USB, slim, gray
USB, collaboration
Wireless, collaboration
USB, wired, healthcare
Premium, wireless
USB, Katydid
Mouse
USB, healthcare
USB, gray
USB, antimicrobial
USB/PS2 Washable
Hardened
USB, optical
USB
USB, laser

3 Routine care, SATA drive guidelines, and disassembly preparation

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

⚠ **CAUTION:** When the computer is plugged into an AC power source, voltage is always 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.

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) may not appear to be affected at all and can work perfectly throughout a normal cycle. The device may 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.

Generating static

The following table shows that:

- Different activities generate different amounts of static electricity.

- Static electricity increases as humidity decreases.

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

These are then multi-packaged inside plastic tubes, trays, or Styrofoam.

📝 **NOTE:** 700 volts can degrade a product.

Preventing electrostatic damage to equipment

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

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

Personal grounding methods and equipment

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

- **Wrist straps** are flexible straps with a maximum of one-megohm ± 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 one-megohm ± 10% resistance between the operator and ground.

Static Shielding Protection Levels

Method	Voltage
Antistatic plastic	1,500
Carbon-loaded plastic	7,500
Metallized laminate	15,000

Grounding the work area

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

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

Recommended materials and equipment

Materials and equipment that are recommended for use in preventing static electricity include:

- 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 one-megohm +/- 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 one-megohm +/- 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

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 display 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 re-circulated 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 above will still apply.
- Keep liquids away from the computer and keyboard.

- Never cover the ventilation slots on the display with any type of material.

- Install or enable power management functions of the operating system or other software, including sleep states.

Routine care

General cleaning safety precautions

1. Never use solvents or flammable solutions to clean the computer.

2. Never immerse any parts in water or cleaning solutions; apply any liquids to a clean cloth and then use the cloth on the component.

3. Always unplug the computer when cleaning with liquids or damp cloths.

4. Always unplug the computer before cleaning the keyboard, mouse, or air vents.

5. Disconnect the keyboard before cleaning it.

6. Wear safety glasses equipped with side shields when cleaning the keyboard.

Cleaning the Computer Case

Follow all safety precautions in General cleaning safety precautions on page 15 before cleaning the computer.

To clean the computer case, follow the procedures described below:

- 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 as the alcohol will evaporate quickly and 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

Follow all safety precautions in General cleaning safety precautions on page 15 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 15.

When cleaning debris from under the keys, review all rules in General cleaning safety precautions on page 15 before following these procedures:

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

- Visible debris underneath or between the keys may be removed by vacuuming or shaking.

- Canned, pressurized air may be used to clean debris from under the keys. Caution should be used as 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.

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

- Cleaning under a key may be done 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 display

- Wipe the display screen with a clean cloth moistened with water or with a towelette designed for cleaning displays. Do not use sprays or aerosols directly on the screen; the liquid may seep into the housing and damage a component. Never use solvents or flammable liquids on the display.

- To clean the display body follow the procedures in Cleaning the Computer Case on page 15.

Cleaning the mouse

Before cleaning the mouse, ensure that the power to the computer is turned off.

- 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 15.

Service considerations

Listed below are some of the considerations that you should keep in mind during the disassembly and assembly of the computer.

Tools and software requirements

To service the computer, you need the following:

- Torx T-15 screwdriver

- Flat-bladed screwdriver (may sometimes be used in place of the Torx screwdriver)

- Phillips #2 screwdriver

Screws

The screws used in the computer are not interchangeable. They may have standard or metric threads and may be of different lengths. If an incorrect screw is used during the reassembly process, it can damage the unit. HP strongly recommends that all screws removed during disassembly be kept with the part that was removed, then returned to their proper locations.

⚠ **CAUTION:**   Metric screws have a black finish. U.S. screws have a silver finish and are used on hard drives only.

CAUTION: As each subassembly is removed from the computer, it should be placed away from the work area to prevent damage.

Cables and connectors

Most cables used throughout the unit are flat, flexible cables. These cables must be handled with care to avoid damage. 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 ensure that the cables are routed in such a way that they cannot be caught or snagged by parts being removed or replaced.

⚠ **CAUTION:**   When servicing this computer, ensure that cables are placed in their proper location during the reassembly process. Improper cable placement can damage the computer.

Hard Drives

Handle hard drives as delicate, precision components, avoiding all physical shock and vibration. This applies to failed drives as well as replacement spares.

- If a drive must be mailed, place the drive in a bubble-pack mailer or other suitable protective packaging and label the package "Fragile: Handle With Care."

- Do not remove hard drives from the shipping package for storage. Keep hard drives in their protective packaging until they are actually mounted in the CPU.

- Avoid dropping drives from any height onto any surface.

- If you are inserting or removing a hard drive, turn off the computer. Do not remove a hard drive while the computer is on or in standby mode.

- Before handling a drive, ensure that you are discharged of static electricity. While handling a drive, avoid touching the connector. For more information about preventing electrostatic damage, refer to Electrostatic discharge information on page 12

- Do not use excessive force when inserting a drive.

- Avoid exposing a hard drive to liquids, temperature extremes, or products that have magnetic fields such as displays or speakers.

Lithium coin cell battery

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

See the appropriate removal and replacement chapter for the chassis you are working on in this guide 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 in water or fire, or expose it to temperatures higher than 140ºF (60ºC). Do not attempt to recharge the battery.

📝 **NOTE:**   Batteries, battery packs, and accumulators should not be disposed of together with the general household waste. In order to forward them to recycling or proper disposal, please use the public collection system or return them to HP, their authorized partners, or their agents.

SATA hard drive cables

SATA data cable

Always use an HP approved SATA 6.0 Gb/s cable as it is fully backwards compatible with the SATA 1.5 Gb/s drives.

Current HP desktop products ship with SATA 6.0 Gb/s hard drives.

SATA data cables are susceptible to damage if overflexed. Never crease a SATA data cable and never bend it tighter than a 30 mm (1.18 in) radius.

The SATA data cable is a thin, 7-pin cable designed to transmit data for only a single drive.

Cable management

Always follow good cable management practices when working inside the computer.

- Keep cables away from major heat sources like the heat sink.

- Do not jam cables on top of expansion cards or memory modules. Printed circuit cards like these are not designed to take excessive pressure on them.

- Keep cables clear of sliding or moveable parts to prevent them from being cut or crimped when the parts are moved.

- When folding a flat ribbon cable, never fold to a sharp crease. Sharp creases may damage the wires.

- Some flat ribbon cables come prefolded. Never change the folds on these cables.

- Do not bend any cable sharply. A sharp bend can break the internal wires.

- Never bend a SATA data cable tighter than a 30 mm (1.18 in) radius.

- Never crease a SATA data cable.

- Do not rely on components like the drive cage, power supply, or computer cover to push cables down into the chassis. Always position the cables to lay properly by themselves.

4 Removal and Replacement Procedures

The following sections provide information about disassembling various components of the computer.

Preparing to disassemble the computer

To avoid injury and equipment damage, always complete the following steps in order, when opening the HP All-in-One.

1. Remove all media from the computer.

2. Shut down the computer.

3. After the system has completely shut down, disconnect the power adapter from the back of the computer.

4. Disconnect all other attached cables from the back of the computer.

5. Place the computer face down on a soft flat surface. HP recommends that you set down a blanket, towel, or other soft cloth to protect the screen surface from scratches or other damage.

⚠ **WARNING!** Beware of sharp edges inside the chassis.

Stand

Two stands are available for the computer - a fixed height stand and an adjustable height stand. The removal procedure is the same for both stands.

To remove the stand:

1. Prepare the computer for disassembly (see).

2. Press the stand release latch.

3. Rotate the stand away from the computer (1).

4. Slide the stand hooks out of the computer (2).
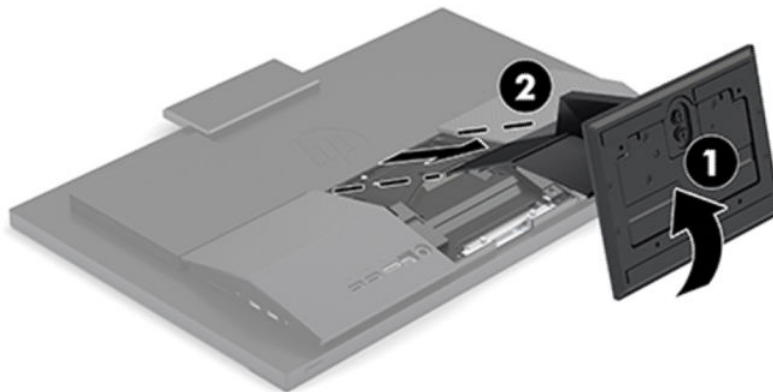
VESA bracket

A VESA mount option is available. A separate VESA bracket and cover install in place of the stand.

To remove the VESA bracket:

1. Prepare the computer for disassembly (see).

2. Remove the VESA cover from atop the bracket.

3. Remove the two screws (1) that secure the VESA bracket to the computer.

4. Lift the bottom of the bracket, and then remove the bracket (2).
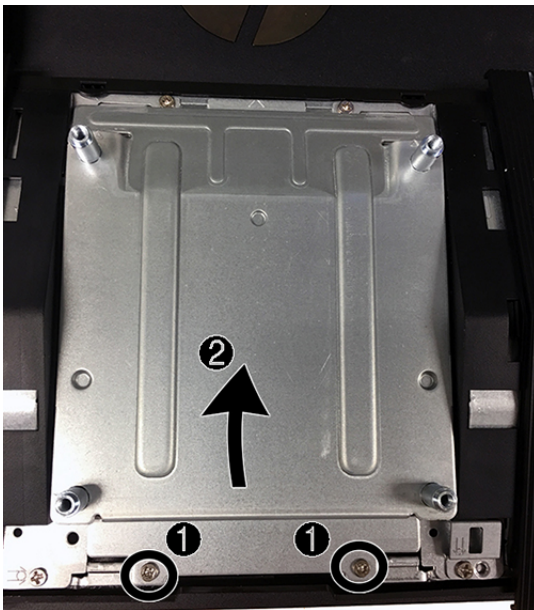
To install a VESA bracket, reverse the removal procedures.

Webcam

The webcam pops up from the top of the computer. You can remove the webcam module and microphone modules from the webcam frame assembly. The webcam frame is not removable and is spared with the rear enclosure and display assembly.

For a list of available webcams, see Illustrated parts catalog on page 6.

To remove the webcam:

1. Prepare the computer for disassembly (see Preparing to disassemble the computer on page 19).

2. Pull the edges of the webcam **(1)**, and then remove the cover from the webcam **(2)**.
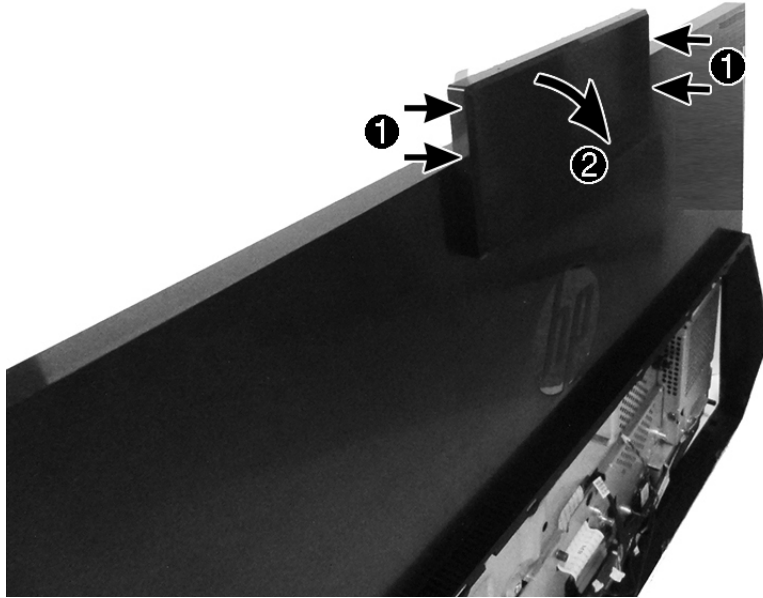
3. Locate the webcam components:

    (1) Microphone modules

    (2) Webcam module with bracket
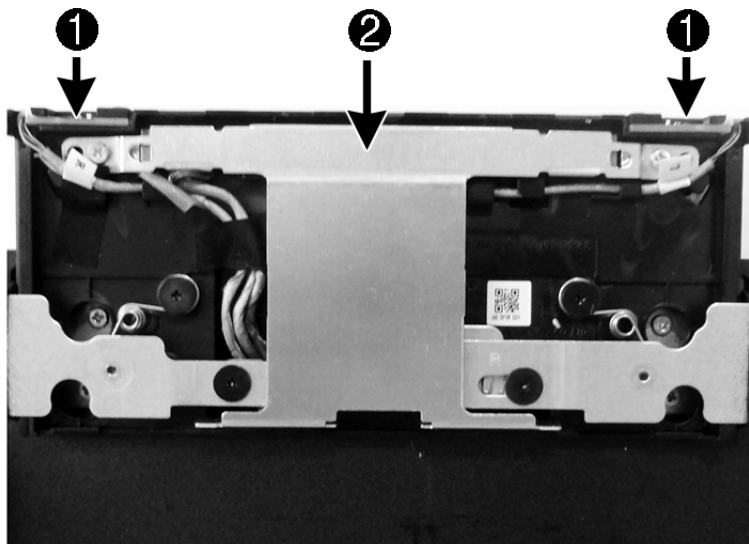
4. Peel the strip off from atop the webcam.
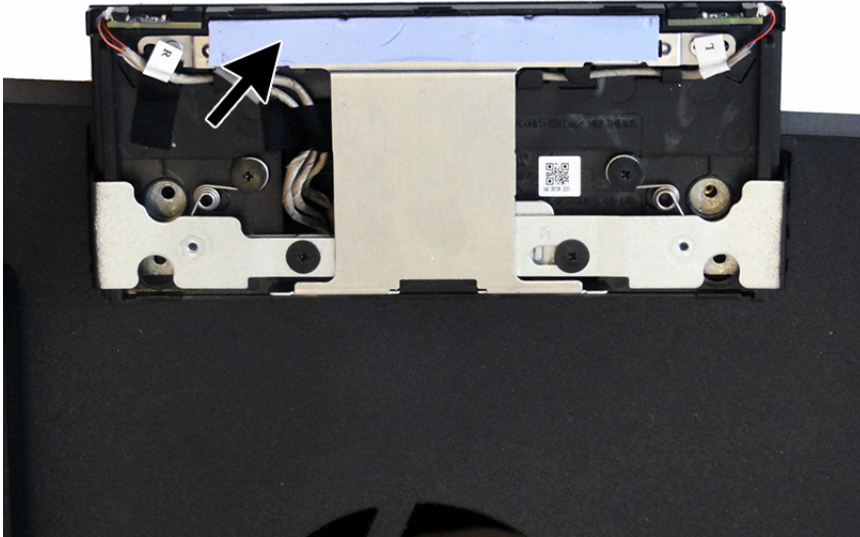
5. Remove the two Phillips screws **(1)** that secure the webcam, and then disconnect the cable from the webcam **(2)**.
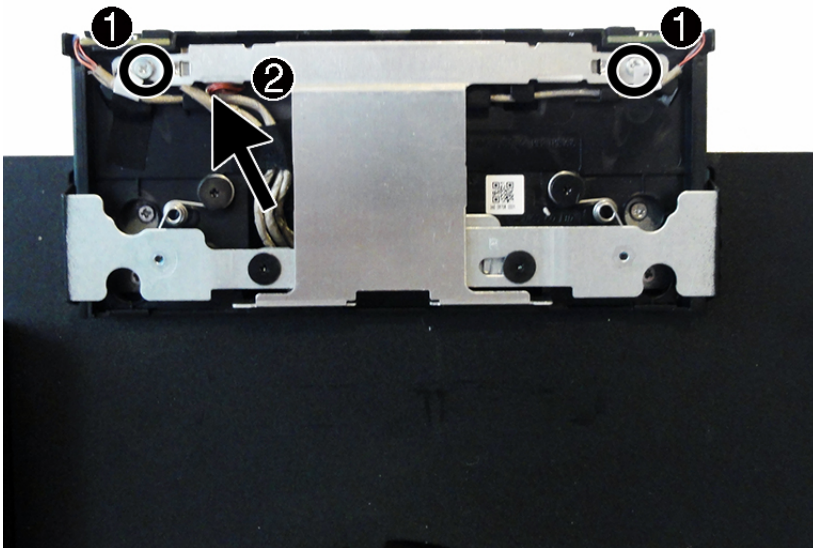
6. Remove the webcam and bracket from the computer.

7. If you need to remove the microphone modules, lift to disengage the modules from the webcam housing **(1)**, and the disconnect the cables from the modules **(2)**.
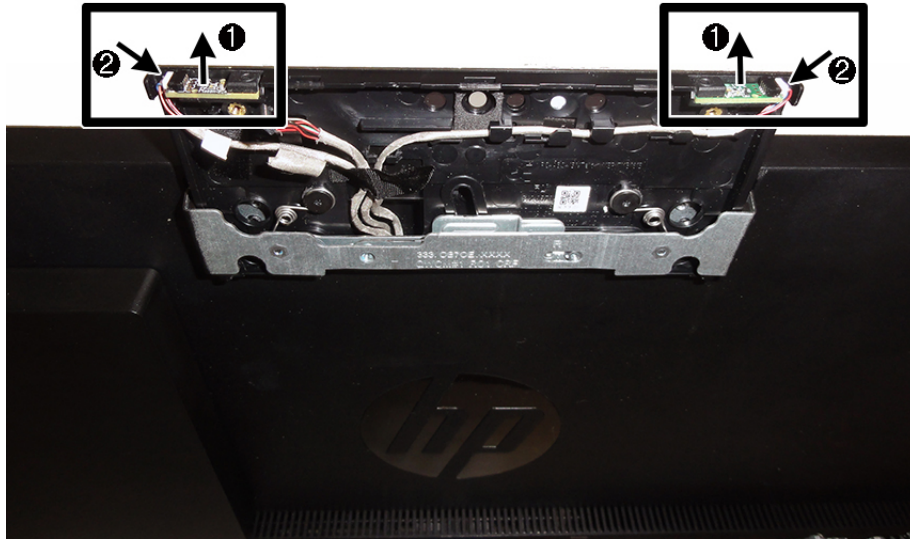
To install a webcam module, reverse the removal procedures.

Rear port cover

1. Prepare the computer for disassembly (see Preparing to disassemble the computer on page 19).

2. Remove the stand (see Stand on page 19).

3. Remove the four Phillips screws securing the back cover (1), and then lift the back cover to remove it from the computer (2).
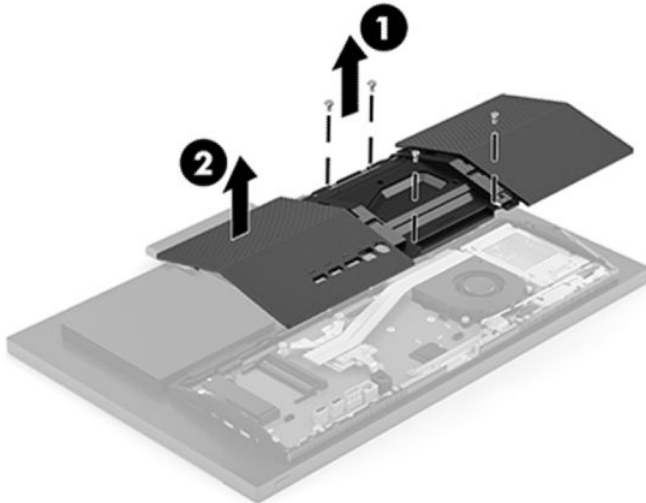
To install the rear port cover, reverse the removal procedures.

Locating internal components under the rear port cover

Component		Component	
1	Optical disc drive (optional)	3	RTC battery
2	Memory modules	4	Hard drive

Hard drive

For a list of available hard drives, see Mass storage devices on page 9.

1. Prepare the computer for disassembly (see Preparing to disassemble the computer on page 19).

2. Remove the stand (see Stand on page 19).

3. Remove the rear port cover (see Rear port cover on page 24).

4. Remove the rear port cover (see Rear port cover on page 24).

5. Remove the screw **(1)** that secures the hard drive to the computer.

6. Slide the hard drive away the edge of the computer and lift the hard drive out of the computer **(2)**. Note that a cable connects the rear of the hard drive to the system board.
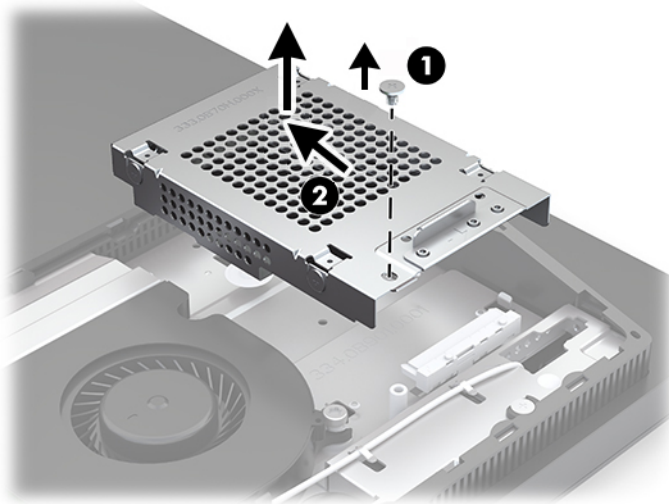
7. Position the hard drive upside-down to access the connector on the back, and the disconnect the cable from the rear of the drive.

8. Disconnect the power and data cables from the hard drive. There is a tab you can pull to disconnect these cables.

9. Remove the four mounting screws from the 2.5 inch hard drive cage (1). Be sure to keep the screws to use to install a replacement drive. Remove the hard drive (2).
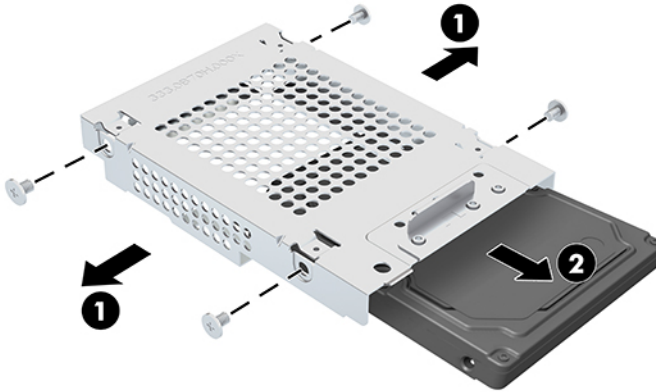
Reverse the removal procedures to install a hard drive.

Optical drive

The optical drive mounts on the exterior, rear of the computer. It is secured with two screws.

For a list of available optical drives, see Mass storage devices on page 9.

1. Prepare the computer for disassembly (see Preparing to disassemble the computer on page 19).

2. Remove the rear port cover (see Rear port cover on page 24).

3. Remove the stand (see Stand on page 19).

4. Remove the rear cover (see Rear port cover on page 24).

5. Remove the two Phillips screws **(1)** that secure the drive to the computer, move the drive back and forth **(2)**, and then slide the drive away from the connector to remove it **(3)**.

   IMPORTANT: Do not lift the drive as you remove it.
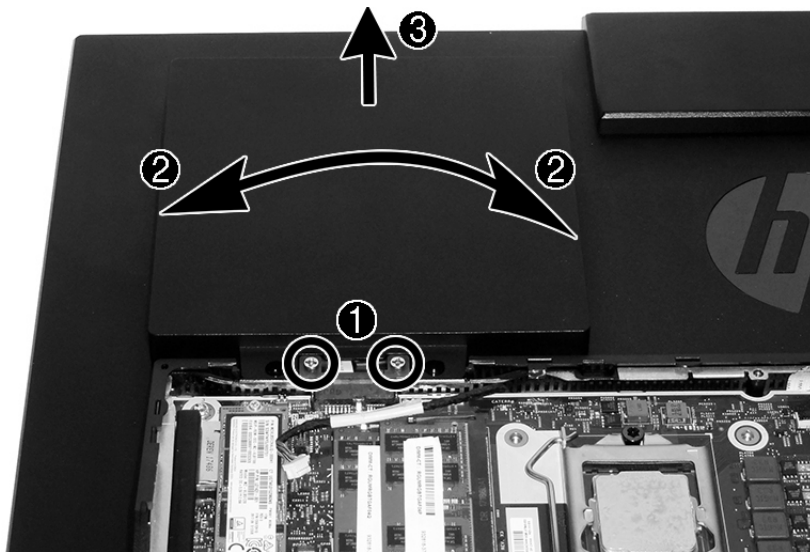
6. Remove the Phillips screw that secure the optical drive inside the carrier.

7. Slide the optical drive out of the carrier.
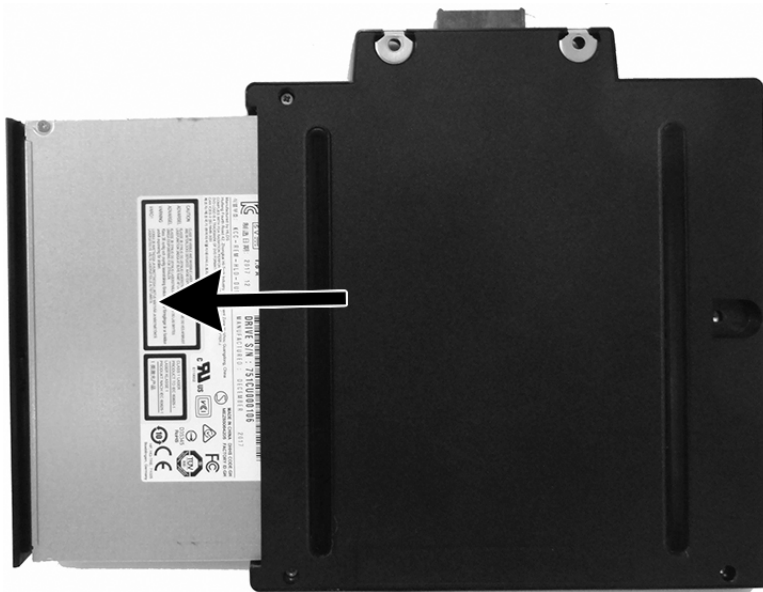
Reverse the removal procedures to install an optical drive.

M.2 solid-state drive

For a list of available solid-state drives, see Mass storage devices on page 9.

To remove the M.2 solid-state drive:

1. Prepare the computer for disassembly (see Preparing to disassemble the computer on page 19).

2. Remove the stand (see Stand on page 19).

3. Remove the rear port cover (see Rear port cover on page 24).

4. Remove the Phillips screw **(1)** that secures the drive to the computer.

5. Pull the drive away to remove it from the socket **(2)**.

To install the solid-state drive, reverse the removal procedures.

Memory

The memory slots on the system board can be populated with up to two industry-standard small outline dual inline memory modules (SODIMMs). These memory slots are populated with at least one preinstalled memory module. A metal shield protects the memory modules.

For proper system operation, the memory modules must meet the following qualifications:

Component	Specification
Memory modules	1.2 volt DDR4-SDRAM memory modules
Compliance	Unbuffered non-ECC DDR4-2666 MHz SODIMM compliant
Pins	Industry-standard 260 pins containing the mandatory Joint Electronic Device Engineering Council (JEDEC) specification
Support	Support CAS latency 19 DDR4 2666 MHz (19-19-19 timing)
Slots	2
Maximum Memory	16 GB per memory slot, 32 GB total
Supported	8 Gbit (base) non-ECC memory technologies single-sided and double-sided SODIMMs
Note	The system will not operate properly if you install unsupported SODIMM memory. SODIMMs constructed with x8 and x16 DDR devices are supported; memory modules constructed with x4 SDRAM are not supported.

The system will automatically operate in single channel mode, dual channel mode, or flex mode, depending on how the memory modules are installed. Refer to the following table to identify the memory module channel locations.

Location	System board label	Channel
Lower Socket	SODIMM1	Channel B
Upper Socket	SODIMM3	Channel A

The system will automatically operate in single channel mode, dual channel mode, or flex mode, depending on how the memory modules are installed.

- The system will operate in single channel mode if the memory module slots are populated in one channel only.

- The system will operate in a higher-performing dual channel mode if the memory capacity of the memory module in Channel A is equal to the memory capacity of the memory module in Channel B.

- The system will operate in flex mode if the memory capacity of the memory module in Channel A is not equal to the memory capacity of the memory module 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 will have more memory than the other, the larger amount should be assigned to channel A.

- In any mode, the maximum operational speed is determined by the slowest memory module in the system.

To remove a memory module:
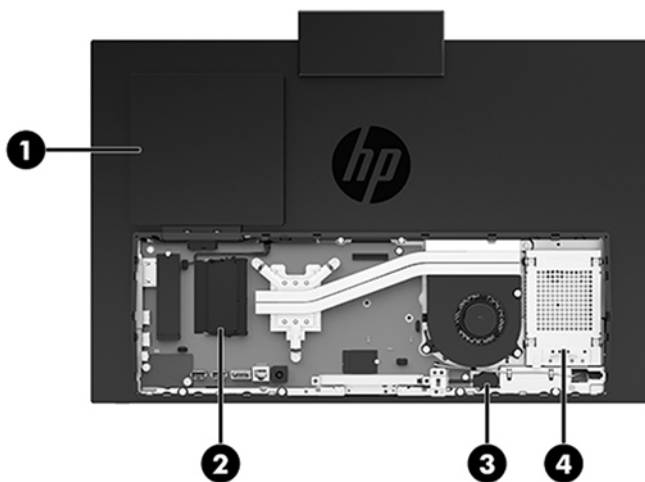
1. Prepare the computer for disassembly (see Preparing to disassemble the computer on page 19).

2. Remove the stand (see Stand on page 19).

3. Remove the rear port cover (see Rear port cover on page 24).

4. To remove a memory module, press outward on the two latches on each side of the memory module (1), then pull the memory module out of the slot (2).
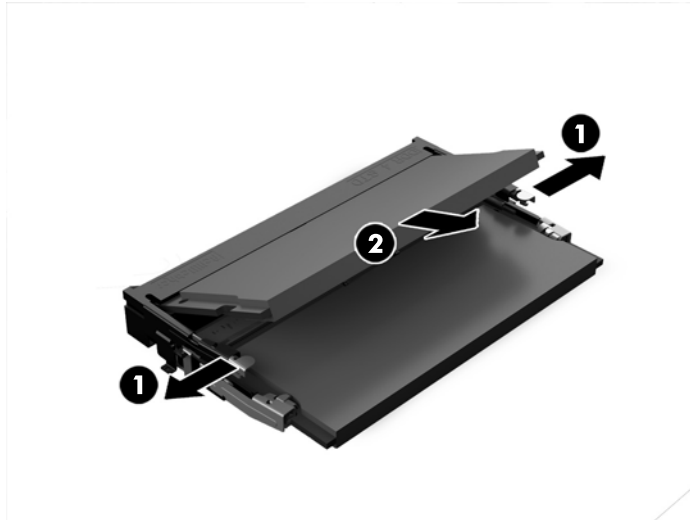
5. Slide the new memory module into the slot at approximately a 30° angle (1), then press the memory module down (2) so that the latches lock it in place.

NOTE: A memory module can be installed in only one way. Match the notch on the module with the tab on the memory slot.

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

Battery

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-volt 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 (140º F).

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

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

⚠ CAUTION: Before replacing the battery, it is important to back up the computer CMOS settings. When the battery is removed or replaced, the CMOS settings will be cleared.

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.

📝 NOTE: The lifetime of the lithium battery can be extended by plugging the computer into a live AC wall socket. The lithium battery is only used 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.

To locate the battery on the system board, see Locating internal components under the rear port cover on page 24.

1. Prepare the computer for disassembly (see Preparing to disassemble the computer on page 19).

2. Remove the stand (see Stand on page 19).

3. Remove the rear port cover (see Rear port cover on page 24).

4. To release the battery, disconnect the battery cable (1), and then lift the battery from the computer (2).
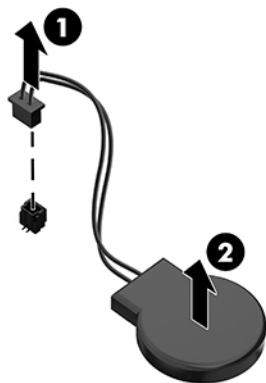
WLAN module

The WLAN module is located near the top of the system board. The WLAN module is secured with one Phillips screw and has two connected antennas.

For a list of available WLAN modules, see Illustrated parts catalog on page 6.

NOTE: The procedure to replace the WLAN module must be performed by an HP technician.

To remove the WLAN module:

1. Prepare the computer for disassembly (see Preparing to disassemble the computer on page 19).

2. Remove the stand (see Stand on page 19).

3. Remove the rear port cover (see Rear port cover on page 24).

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

5. Remove the Phillips screw **(2)** that secures the module to the computer.

6. Lift the module to a 45-degree angle, and then pull it away to remove it from the socket **(3)**.
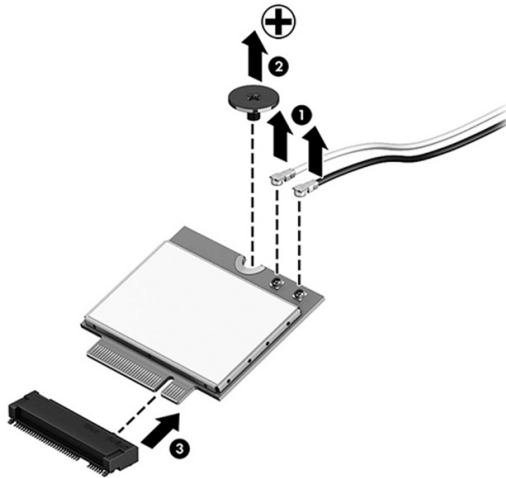
To install the WLAN module, reverse the removal procedures.

When connecting the antennas cables, connect the cable labeled "1" (black sticker) to the AUX "1" connector on the module and the cable labeled "2" (white sticker) to the MAIN "2" connector on the module.

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

Option board

The option board is connected to the bottom, left of the system board. Underneath the board is a connector that connects to the system board.

For a list of available option boards, see Illustrated parts catalog on page 6.

To remove the option board:

1. Prepare the computer for disassembly (see Preparing to disassemble the computer on page 19).

2. Remove the stand (see Stand on page 19).

3. Remove the rear port cover (see Rear port cover on page 24).

4. Remove the two Phillips screws **(1)** that secure the board to the system board.

5. Lift the board up to disengage it from the connector underneath, and then remove the board from the computer **(2)**.

    NOTE: DisplayPort option board shown. HDMI and serial port option boards are also available.
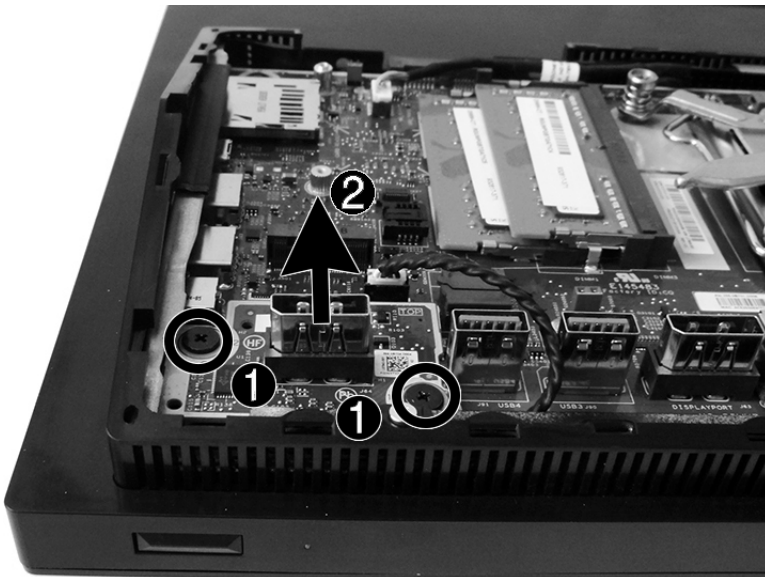
To install the option board, reverse the removal procedures.

Hood sensor

The hood sensor is located to the right of the system board.

To remove the hood sensor:

1. Prepare the computer for disassembly (see Preparing to disassemble the computer on page 19).

2. Remove the stand (see Stand on page 19).

3. Remove the rear port cover (see Rear port cover on page 24).

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

5. Remove the cable from the clips in the computer **(2)**.

6. Pry the sensor out of the slot to remove it **(3)**.
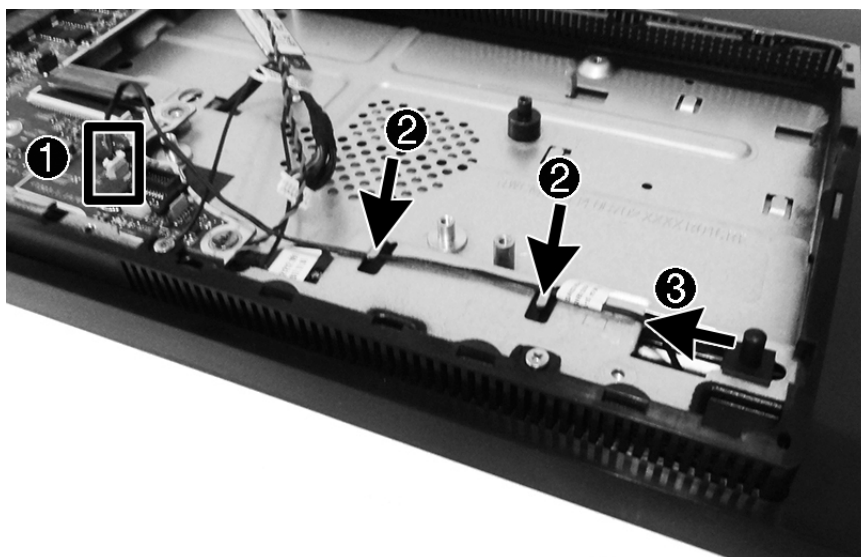
To install the hood sensor, reverse the removal procedures.

Fan assembly

To remove the fan assembly:

1. Prepare the computer for disassembly (see Preparing to disassemble the computer on page 19).

2. Remove the stand (see Stand on page 19).

3. Remove the rear port cover (see Rear port cover on page 24).

4. Remove the three Phillips screws that secure the fan to the computer **(1)**.

5. Disconnect the fan cable from the system board **(2)**.

6. Remove the fan from the computer **(3)**.
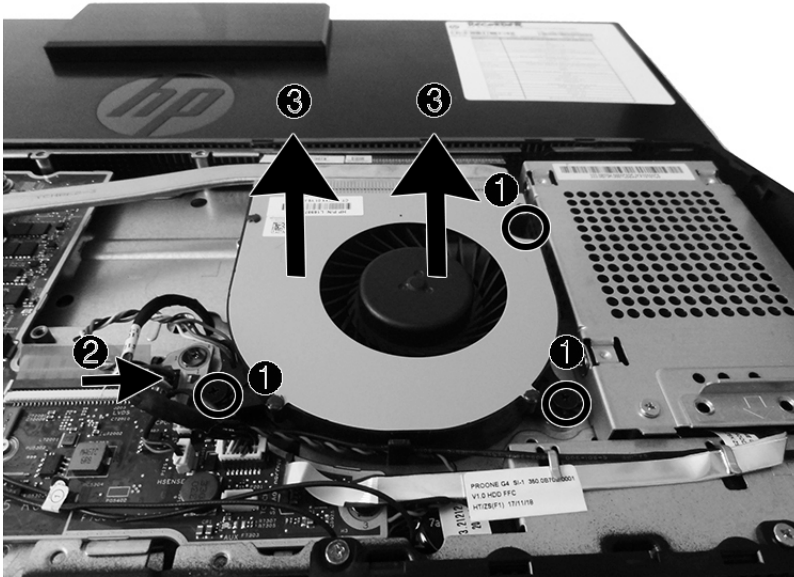
To install the fan assembly, reverse the removal procedures.

Heat sink

Different heat sinks are available for models with UMA graphics memory or discrete graphics memory.

You must remove the fan before you can remove the heat sink.

To remove the heat sink:

1. Prepare the computer for disassembly (see Preparing to disassemble the computer on page 19).

2. Remove the stand (see Stand on page 19).

3. Remove the rear port cover (see Rear port cover on page 24).

4. Remove the fan (see Fan assembly on page 36).

5. In the order indicated on the heat sink, loosen the three screws (UMA models) or five screws (discrete models) **(1)**.

6. Remove the non-captive screw **(2)** from the top, right extension of the heat sink.

7. Lift the heat sink out of the computer **(3)**.

> ⚠ **CAUTION:** To reduce a degradation in thermal performance, be sure not to touch the thermal grease on the surface of the processor or the heat sink.

UMA models

Discrete models
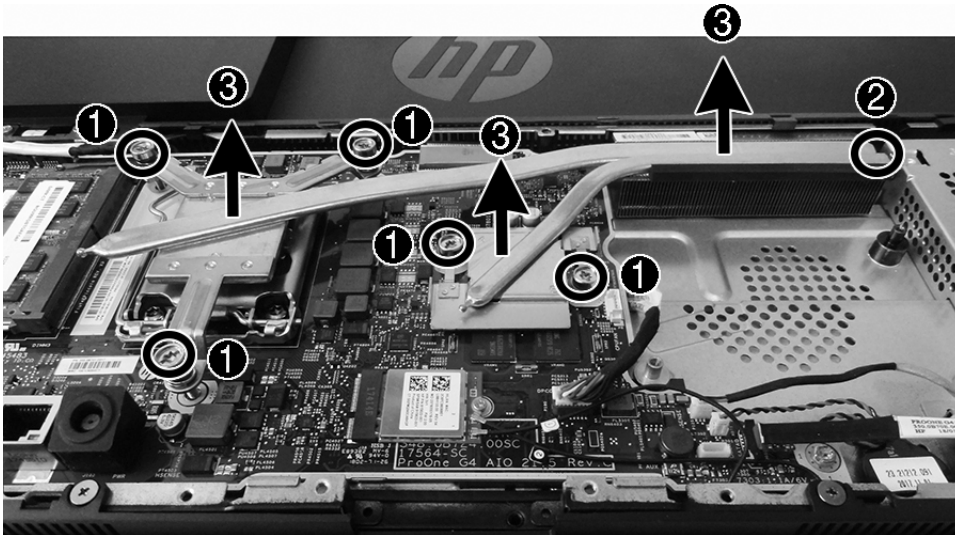
To replace the heat sink, reverse the removal procedures.

Processor

For a list of available processors, see .

1. Prepare the computer for disassembly (see).

2. Remove the stand (see).

3. Remove the rear port cover (see).

4. Remove the fan (see).

5. Remove the heat sink (see).

6. Rotate the locking lever to its full open position **(1)**.

7. Raise and rotate the microprocessor retainer to its fully open position **(2)**, and then carefully lift the processor from the socket **(3)**.

⚠ **CAUTION:** Do NOT handle the pins in the processor socket. These pins are very fragile and handling them could cause irreparable damage. Once pins are damaged it may be necessary 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.
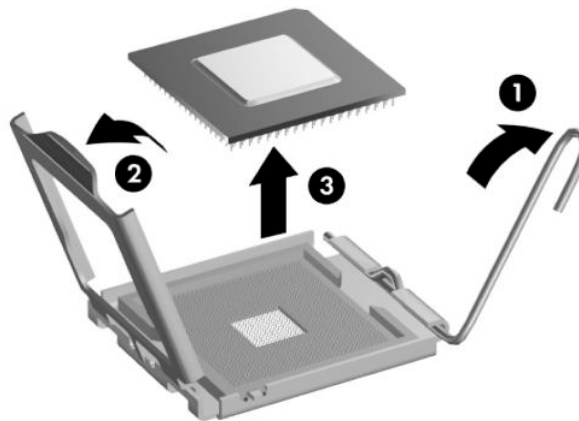
📝 **NOTE:** After installing a new processor onto the system board, always update the system ROM to ensure that the latest version of the BIOS is being used on the computer. The latest system BIOS can be found on the Web at: http://www.hp.com.

System board

The system board is secured with three screws.

To remove the system board:

1. Prepare the computer for disassembly (see Preparing to disassemble the computer on page 19).

2. Remove the stand (see Stand on page 19).

3. Remove the rear port cover (see Rear port cover on page 24).

4. Remove the fan (see Fan assembly on page 36).

5. Remove the heat sink (see Heat sink on page 37).

6. When replacing the system board, make sure the following components are removed from the defective system board and installed on the replacement system board:

    ●   Memory modules (Memory on page 30)

    ●   M.2 solid-state drive (M.2 solid-state drive on page 29)

    ●   WLAN module (WLAN module on page 33)

    ●   Processor (Processor on page 39)

    ●   Option board (Option board on page 34)

7. Disconnect all cables from the system board, noting their location for reinstallation.

    NOTE: If replacing the system board, you do not need to disconnect the RTC battery, as replacement boards come with a battery already connected.

    NOTE: Additional cables may be connected to the system board. The following illustration shows the most likely connected cables.
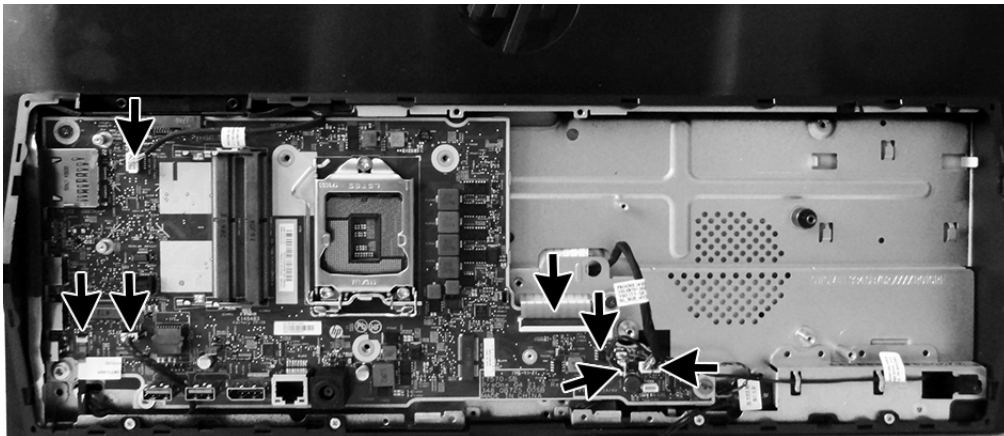
8. Remove the three screws **(1)** that secure the system board to the computer.

9. Lift the right side of the system board up slightly **(2)**.

10. Pull the system board to the right to disengage the ports from the chassis **(3)**, and then lift the system board up and out of the computer **(4)**.

To install the system board, reverse the removal procedures.

Replace the thermal pad below the system board.

Updating SMBIOS Information

When replacing the system board, you must reprogram the SMBIOS information on 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.

To update SMBIOS information in Computer Setup:

1. Turn on or restart the computer.

2. Press Esc while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

   📝 **NOTE:** If you do not press Esc at the appropriate time, you must restart the computer and again press Esc when the display light turns green to access the utility.

3. Press F10 to enter Computer Setup.

4. Go to **Main** > **Set Machine Unique Data**.

5. If necessary, press Ctrl+A to initiate edit mode.

6. Edit the fields listed. If the feature byte has data or is not editable, then it was not cleared and cannot be edited.

System ID Setup Page

Setup Field Name	Comment	Label
Product Name	Enter the Model name/number or marketing name.	Flexbuild
Serial Number	Enter the Serial Number of Unit.	Support
SKU Number	Enter the SKU or Product Number including Localization Code.	Support
Asset Tag	Enter the 18-byte identifier assigned to the computer.	Support
Feature Byte	Enter the Feature Byte string. The feature byte string is case sensitive.	Flexbuild

Setup Field Name	Comment	Label
	The label includes spaces after every four characters. You can enter or ignore these spaces – their only purpose is to help with data entry. There is a character limitation of 40 bytes per line. When you reach this limit, go to the next line to continue data entry. BIOS ignores the spaces and lines. If you make an error during data entry, the data will not validate, and the computer asks you to correct your data input.	
Build ID	The Build ID of the unit.	Flexbuild

System board callouts
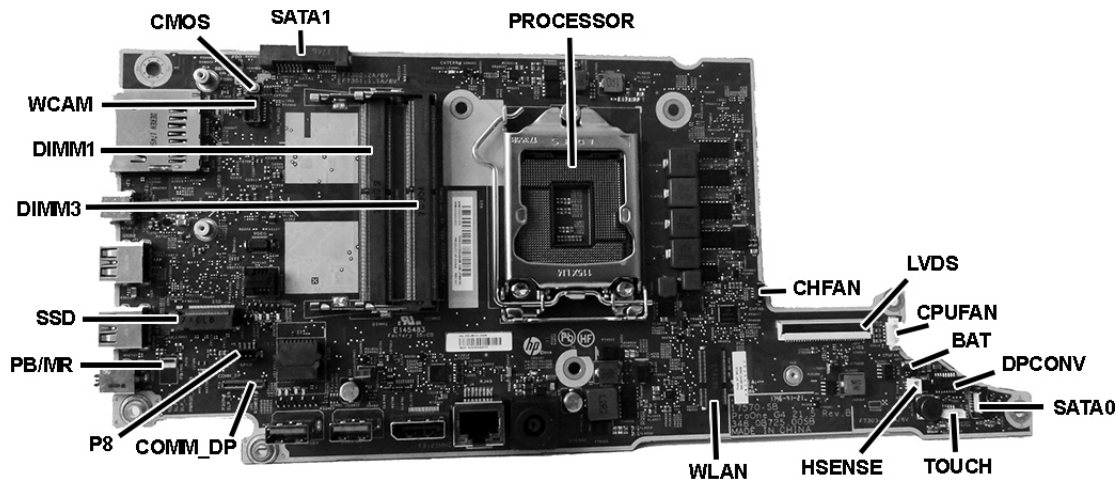
Sys Bd Label	Color	Component	Sys Bd Label	Color	Component
CMOS	Yellow	Reset CMOS	HSENSE	White	Hood sensor
SATA1	Black	Optical drive	WLAN	Black	WLAN module
PROCESSOR	Black	Processor socket	COMM_DP	Black	Option board
CHFAN	Black	Fan connector	SPKR P8	Black	Speaker
LVDS	White	Display connector	PB/MR	White	Power button
CPUFAN	White	Fan connector	SSD	Black	M.2 SSD drive
BAT	Black	RTC battery	DIMM3	Black	Memory module
DPCONV	Black	Display panel	DIMM1	Black	Memory module
SATA0	Black	Hard drive	WCAM	White	Webcam connector
TOUCH	White	Touch panel			

Speakers

The speakers are located at the bottom of the computer behind the speaker cover. Two separate speakers are each secured by two Phillips screws.
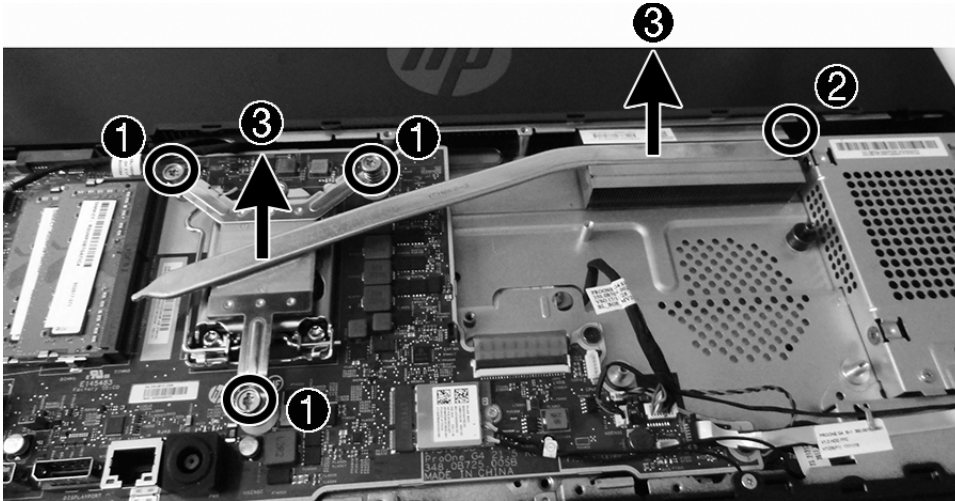
To remove the speakers:

1. Prepare the computer for disassembly (see Preparing to disassemble the computer on page 19).

2. Remove the stand (see Stand on page 19).

3. Remove the rear port cover (see Rear port cover on page 24).

4. Remove the system board (see System board on page 40).

5. Locate the speaker cover.

6. Rotate the top of the cover downward to disengage the snaps from the chassis, and then remove the cover.

7. From the rear of the computer, disconnect the speaker cable from the system board **(1)**, and then push the connector end of the cable through the hole **(2)** that allows the cable to route to the front of the chassis.

8. Remove two Phillips screws **(1)** that secure each speaker to the computer.

9. Pull the speaker cable through the hole in the chassis **(2)**.
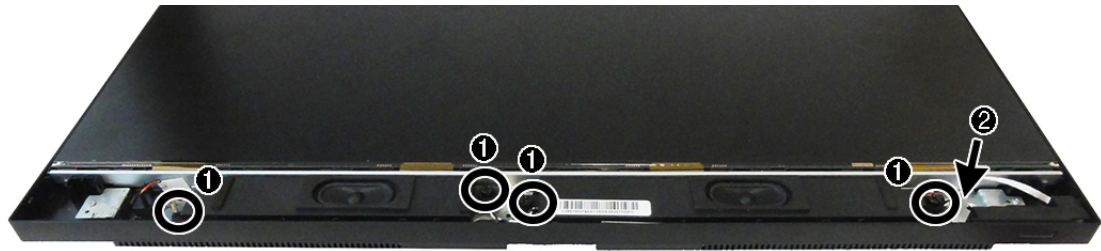
10. Remove the speakers from the computer.

To install the speakers, reverse the removal procedures.

Power button board

The power button board is located at the bottom, right of the computer. It is spared with a plastic holder.

To remove the power button board:

1. Prepare the computer for disassembly (see Preparing to disassemble the computer on page 19).

2. Remove the stand (see Stand on page 19).

3. Remove the rear port cover (see Rear port cover on page 24).

4. Remove the speaker cover (see Speakers on page 43).

5. Disconnect the power button board cable from the system board ZIF connector **(1)**, and then push the connector end of the cable through the hole **(2)** that allows the cable to route to the front of the chassis.
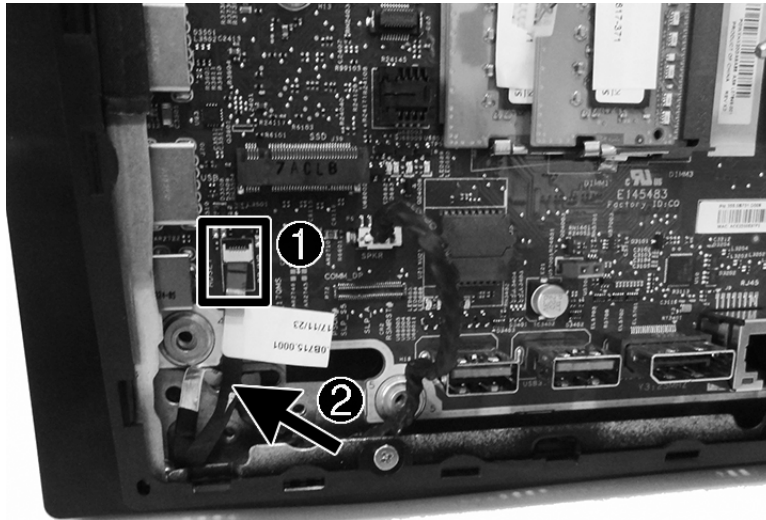
6. Locate the power button board under the speaker cover.
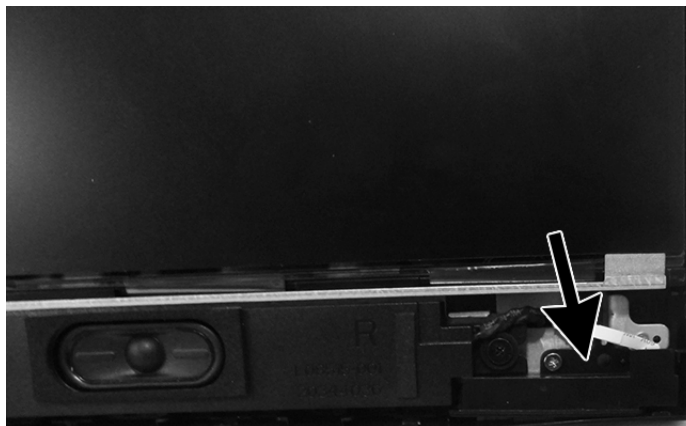
7. Remove Phillips screw **(1)** that secures the power button board to the computer.

8. Pull the power button board cable through the hole in the chassis **(2)**.

9. Remove the power button board from the computer.

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

Rear enclosure and display assembly

IMPORTANT: Removing the rear enclosure is a very involved process. To successfully disassemble, be sure to follow all steps in the correct order. If you break the clips or otherwise damage the rear cover during removal, a replacement cover is available. If you have to replace the cover, be sure to remove the webcam from the old cover and install on the new cover.

To remove the rear enclosure and main chassis:

1. Prepare the computer for disassembly (see).

2. Remove the stand (see).

3. Remove the rear port cover (see).

4. Remove the speaker cover (see).

5. Remove the system board (see).

6. Remove the four screws **(1)** that secure the webcam carrier to the computer.

7. Move the webcam carrier aside so you can access the screw underneath **(2)**.
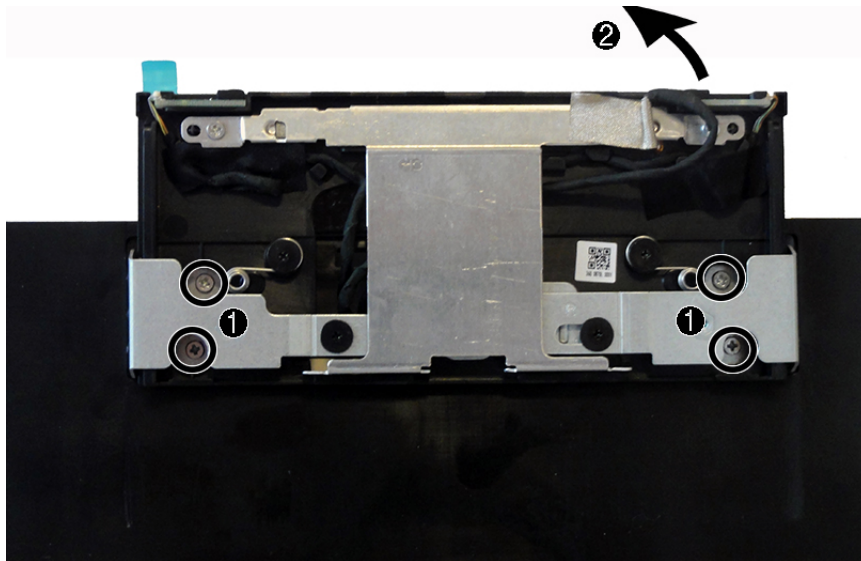
8. Remove the screw from under the webcam.

9. From the front of the computer, remove the three Phillips screw located under the speaker cover that secure the rear enclosure to the computer.

10. From the rear of the computer, remove the four Phillips screw located along the bottom edge of the computer.
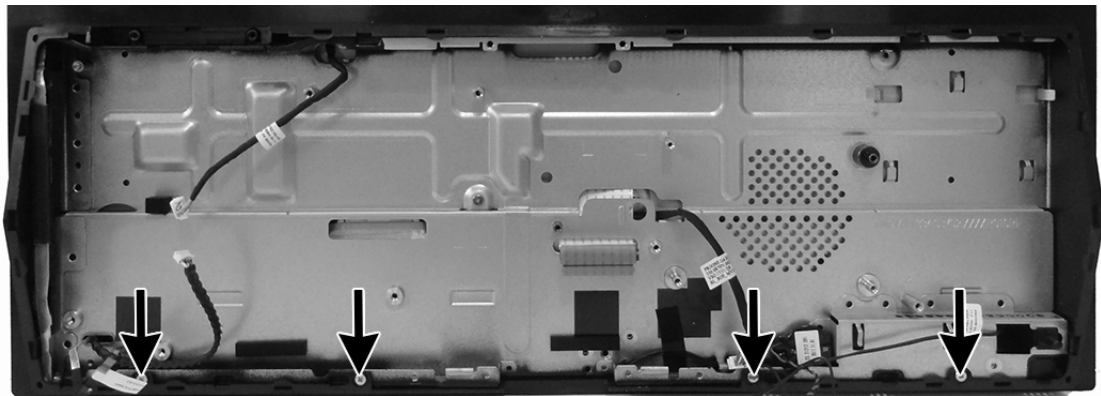
11. Starting near the bottom right (as viewed from the rear), pull the rear closure up to disengage it from the computer. Work upward, and then toward the left, lifting the enclosure up to disengage, and then lift the rear enclosure off the computer.

IMPORTANT: On models with a webcam, the webcam cable connects from the rear enclosure to the system board.

TIP: Release all the catches around the edges of the cover first, and then pull up on the center of the cover to release the center catches.
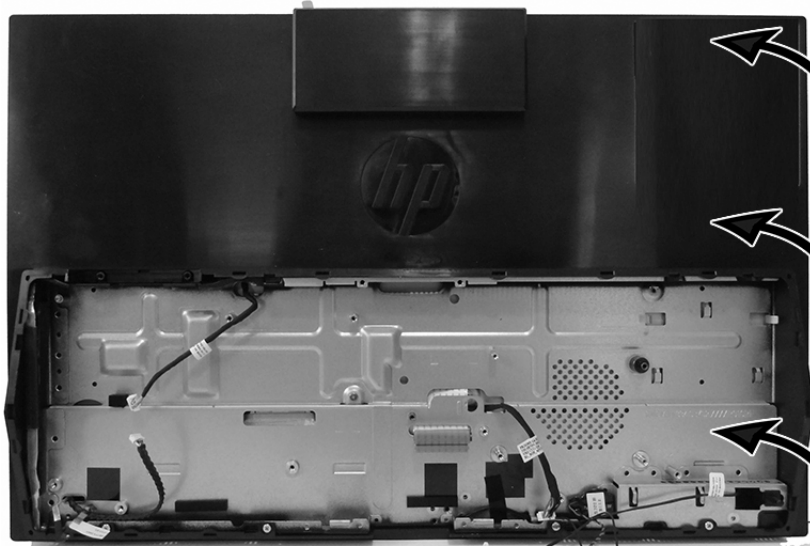
12. Position the rear enclosure next to the computer. Note proper webcam cable routing, as pointing out in the following image. The webcam cable routes across the display panel and then under the chassis. You must remove the chassis from the panel to remove the webcam cable.

13. To remove the main chassis, remove the four Phillips screws around the sides **(1)** and the Phillips screw in the middle **(2)** of the chassis.

14. Lift the chassis up, and then route the display cable **(3)** and the backlight cable **(4)** through the holes in the chassis.
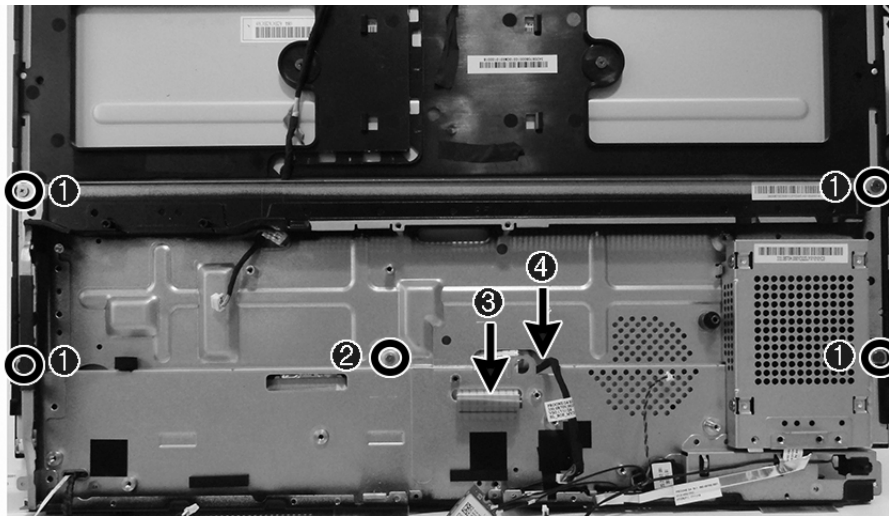
15. Remove the chassis from the display panel.

16. Remove the seven screws that secure the plastic frame from the display, and then lift the frame off the display.
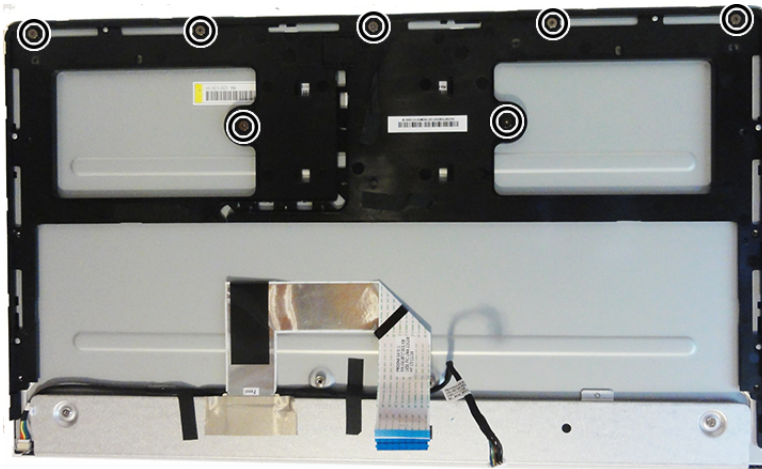
📝 **IMPORTANT:** Install the new display panel together with all other parts in the replacement kit. Do not reuse any old parts. Return all old parts to HP for warranty processing.

⚠ **CAUTION:** It is very important to use the exact cable that shipped with the replacement panel. Failure to use the correct cable may result in panel failure.

To replace the rear enclosure and main chassis, reverse the removal procedures.

Antennas

The antenna cables route from the WLAN module, through a hole in the main chassis, to antennas at the bottom of the computer. The antennas are secured to the computer with adhesive.

📝 **NOTE:** Because it is difficult to remove the antenna without damaging it or losing adhesion, a new antenna kit is available.

To remove the antennas:

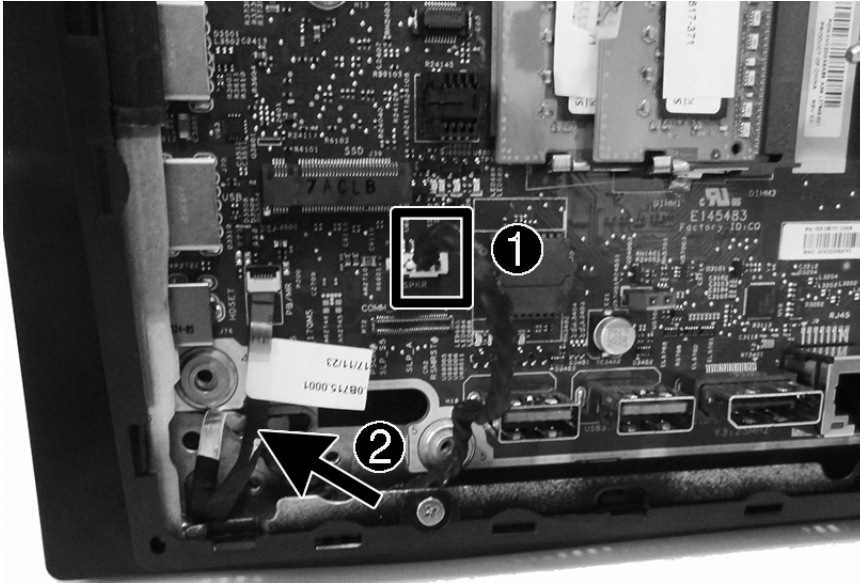1. Prepare the computer for disassembly (see Preparing to disassemble the computer on page 19).

2. Remove the stand (see Stand on page 19).

3. Remove the rear port cover (see Rear port cover on page 24).

4. Remove the speaker cover (see Speakers on page 43).

5. Remove the speaker cover and speakers (see Speakers on page 43).

6. Remove the system board (see System board on page 40).

7. Disconnect the antenna cables from the WLAN module (see WLAN module on page 33).

8. Remove the rear enclosure and main chassis (see Rear enclosure and display assembly on page 47).

9. Peel the antennas off the chassis **(1)**.

10. Pull the cables through the hole in the chassis **(2)**.

11. Remove the screw from under the webcam.
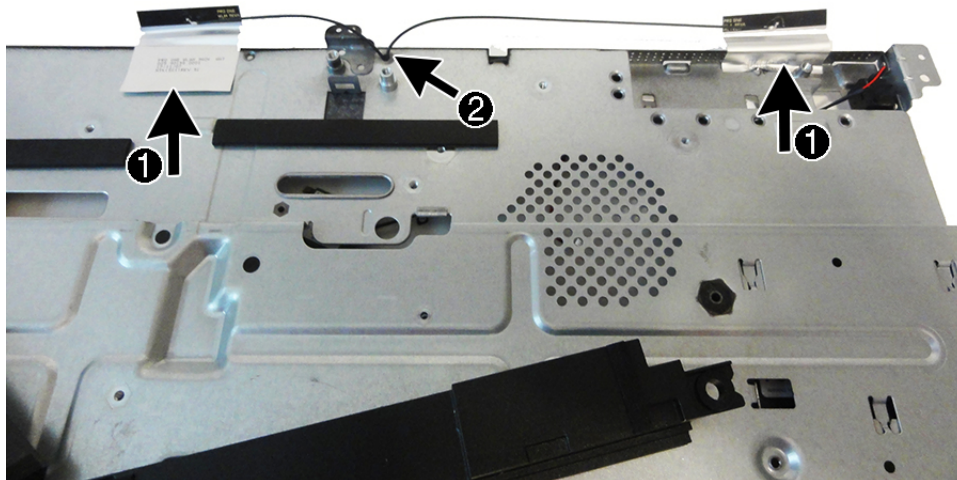
To install the antennas, reverse the removal procedures.

📝 **NOTE:** When connecting the antennas cables to the WLAN module, be sure to match the numbers on the cable with the same number printed on the WLAN module.

5   Computer Setup (F10) Utility

Computer Setup (F10) Utilities

Use Computer Setup (F10) Utility to do the following:

- 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 power-on.
- 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 on 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

Computer Setup can be accessed only by turning the computer on or restarting the system. To access the Computer Setup Utilities menu, complete the following 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 a menu that allows you to access different options available at startup, including the Computer Setup utility.

    > **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.

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

    > **NOTE:**   Selecting UEFI Drivers restarts the computer into the 3rd party option ROM management application. You can access this application directly by pressing F3 during startup.

4. 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, then press Enter. To return to the Computer Setup Utilities menu, press Esc.

5. 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: Settings in the **Security** menu are not modified by **Apply Defaults**. Those values are reset by **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

CAUTION: Do NOT turn the 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

Table 5-1 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 • Installed memory size • Processor type • Processor cache size (L1/L2/L3) • Processor speed • MicroCode revision • Processor stepping • Memory speed • DIMM size (for each installed module) • System BIOS version • ME Firmware version (Intel only) • 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 • Panel type • Panel serial number • Integrated MAC Address
System Diagnostics	If the hard drive has the HP Advanced Diagnostics installed, the application will launch. If HP Advanced Diagnostics is not installed, then a basic version built into the BIOS will provide the capability to perform the following functions: • Memory Test • Hard Drive Check

Table 5-1 Computer Setup—Main (continued)

Option	Description
	• Language
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 checked, the system is locked to the current BIOS version and updates are not allowed.
	• 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 can be rolled 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. Using a custom URL is recommended 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
	▪ Check for updates and prompt the user to accept or reject the update at that time
	▪ Check for updates and install all new versions
	▪ Check for updates and install only new versions marked important
	▪ BIOS Update Frequency
	▪ Daily
	▪ Weekly
	▪ Monthly (default)
	• Network Configuration Settings
	• Update BIOS Using Local Media
	Lets you access files on either USB storage or the hard drive. The HP BIOS Update and Recovery application included in BIOS Softpaqs at www.hp.com will copy the BIOS file to the correct location on the hard drive or USB device.
Change date and time	Lets you update system date and time.
Set machine unique data	Allows you to set/view data that is unique to each machine such as feature byte, build ID, serial number, SKU number, product family, system board CT number, and product name.
System IDs	Lets you set the following values:
	• Asset Tracking Number

Table 5-1 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

📝 **NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.

Table 5-2 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) • 3rd 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, it is required to 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.
Change POST Power-On Password (This selection is active only if a BIOS	Lets you change the POST power-on password. You must know the current password to be able to change it.

Table 5-2 Computer Setup—Security (continued)

Option	Description
administrator password is set.)	
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 upper case character
	● Requires at least one lower case 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'.
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.
	CAUTION: 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.
	● BIOS Data Recovery Policy – Select 'Automatic' or 'Manual' to determine data recovery process. Manual recovery is intended only for situations where forensic analysis is desired before HP SureStart recovery. When this policy is set to manual, HP SureStart will not correct any issues that are found until the manual recovery key sequence is input by the local user. This can result in a computer that is unable to boot until the manual recovery key sequence is input.
	● Dynamic Runtime Scanning of Boot Block. Verifies the integrity of the BIOS boot block region several times each hour while the system 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 non-volatile (flash) memory.
	NOTE: An administrator password must be set to activate this setting.

Table 5-2 Computer Setup—Security (continued)

Option	Description
	• 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 non-volatile (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 will power of the system upon detecting a HP Sure Start Security Event. Due to the potential for data loss, use of this setting is only recommended in situations where security integrity of the system is a higher priority than the risk of potential data loss.
	Secure Platform Management (SPM)
	• HP Sure Run Current State
	• SPM Current State
	Physical Presence Interference
	When selected, the user is notified at system power up when changes have been made to system security policy, and the user must manually agree to those changes before they are confirmed.
	Smart Cover
	Cover Removal Sensor (Disabled/Notify user/Administrator password)
	Lets you disable the cover sensor or configure what action is taken if the computer cover was 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.
	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 MBR of System Hard Drive**
	NOTE: Windows 10 systems are generally not formatted to include an MBR. Instead they use GUID Partition Table (GPT) format, which better supports large hard drives.
	Enabling this feature will save the Master Boot Record (MBR) of the system hard drive. If the MBR gets changed, the user will be prompted to restore the MBR. Default is disabled.
	The MBR contains information needed to successfully boot from a disk and to access the data stored on the disk. Master Boot Record Security may prevent unintentional or malicious changes to the MBR, such as those caused by some viruses or by the incorrect use of certain disk utilities. It also allows you to recover the "last known good" MBR, should changes to the MBR be detected when the system is restarted.

Table 5-2 Computer Setup—Security (continued)

Option	Description
	NOTE: Most operating systems control access to the MBR of the current bootable disk; the BIOS cannot prevent changes that may occur while the operating system is running.
	Restores the backup Master Boot Record to the current bootable disk. Default is disabled.
	Only appears if all of the following conditions are true:
	— MBR security is enabled
	— A backup copy of the MBR has been previously saved
	— The current bootable disk is the same disk from which the backup copy was saved
	CAUTION: Restoring a previously saved MBR after a disk utility or operating system has modified the MBR, may cause the data on the disk to become inaccessible. Only restore a previously saved MBR if you are confident that the current bootable disk's MBR has been corrupted or infected with a virus.
	• **Save/Restore GPT of System Hard Drive**
	Enabling this feature will save 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.
	• **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 will remain inaccessible until one of the passwords is successfully provided during a subsequent cold-boot sequence.
	NOTE: This selection will only appear when at least one drive that supports the DriveLock feature is attached to the system.
	CAUTION: Be aware that these settings take place immediately. A save is not necessary.
	CAUTION: 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.
	Once a hard drive has been erased with a program that utilizes Secure Erase firmware commands, no file recovery program, partition recovery program, or other data recovery method will be able to extract data from the drive.
	• **Allow OPAL Hard Drive SED Authentication**
	Default is disabled.
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

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

Table 5-3 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 up from a powered off state at a specified date and time.
Boot Options	Select the devices that the computer can boot from, as well as other options, including:

Under **Boot Options**:

- Startup Delay (sec). Enabling this feature will add 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 powered off when power is restored.

  - Power on—causes the computer to power on automatically as soon as power is restored.

  - Previous state—causes the computer to power 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.

- 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.

- Legacy Boot Order

  Specify the order in which legacy boot sources (such as a network interface card, internal hard drive, USB optical drive, or internal optical drive) are checked for a bootable operating system image.

  Specify the order of attached hard drives. The first hard drive in the order will have priority in the boot sequence and will be recognized as drive C (if any devices are attached).

NOTE: To drag a device to a preferred place, press Enter.

NOTE: MS-DOS drive lettering assignments may not apply after a non-MS-DOS operating system has started.

Shortcut to Temporarily Override Boot Order

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.

Table 5-3 Computer Setup—Advanced (for advanced users) (continued)

Option	Heading
HP Sure Recover	**HP Sure Recover** When enabled the system firmware honors locate and remote requests to reinstall the operating system. When disabled all requests to reinstall the operating system are ignored. **Recover from Network** If enabled the system firmware gets the recovery agent from the network. If disabled the system firmware gets the recovery agent from a local drive. **Recover after Boot Failure** If enabled and no bootable UEFI operating system is found, the system firmware will launch HP Sure Recover.
Secure Boot Configuration	**Configure Legacy Support and Secure Boot** Lets you turn off all legacy support on the computer, including booting to DOS, running legacy graphics cards, booting to legacy devices, and so on. Lets you make sure an operating system is legitimate before booting to it, making Windows resistant to malicious modification from preboot to full operating system booting, preventing firmware attacks. UEFI and Windows Secure Boot only allow code signed by pre-approved digital certificates to run during the firmware and OS boot process. ● Legacy Support Enable and Secure Boot Disable ● Legacy Support Disable and Secure Boot Enable ● Legacy Support Disable and Secure Boot Disable Default is 'Legacy Support Disable and Secure Boot Disable'. **Secure Boot Key Management** Lets you manage the custom key settings. **Import Custom Secure Boot keys** Default is disabled. **Clear Secure Boot Keys** Lets you delete any previously loaded custom boot keys. Clearing keys will disable secure boot. Default is disabled. **Reset Secure Boot keys to factory defaults** Default is disabled. **Enable MS UEFI CA key** Disabling this setting 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 password to be configured and Secure Boot to be enabled.
System Options	**Configure storage controller for Intel Optane** Enables the Intel Optane memory module. **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.

Table 5-3 Computer Setup—Advanced (for advanced users) (continued)

Option	Heading
	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 disabled.
	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 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.
	Allow PCIe/PCI SERR# Interrupt (enable/disable)
	Allows PCI devices to report PCI/PCIe System Error signals, such as address parity errors, data parity errors, and critical errors other than parity. Default is enabled.
	Power Button Override (disable/4 sec/15 sec)
	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 power off. Default is '4 sec'.
	USB Type-C Connector System Software Interface (UCSI) (enable/disable)
	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.
	Allow No Panel configuration
	When enabled, POST blink and beep codes and error messages are not generated. Default is disabled.
	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.
	Integrated Camera
	Clear to disable the integrated camera. Default is enabled.
	Audio Device
	Select to show the device in the operating system. Default is enabled.
	Microphone
	Clear to disable the 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.
	Headphone Output
	Clear to disable the headphone jack. Default is enabled.

Table 5-3 Computer Setup—Advanced (for advanced users) (continued)

Option	Heading
	Increase Idle Fan Speed(%)
	Sets idle fan speed percentage. This setting only changes the minimum fan speed. The fan is still automatically controlled.
	M.2 USB/Bluetooth
	Select to enable the M.2 controller. 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.
	Collaboration Buttons
	Clear to disable the collaboration buttons. Default is enabled.
	Button Sensitivity
	Select from low, medium, or high. Default is low.
Port Options	**Rear USB ports**
	Lets you disable the ports. Default is enabled.
	Right USB ports
	Lets you disable the ports. Default is enabled.
	USB Legacy Port Charging
	Lets you enable USB charging port capability when the computer is in hibernate or shutdown mode. Default is enabled.
	USB Type-C Downstream Charging
	Lets you enable USB charging port capability when the computer is in hibernate or shutdown mode. Default is enabled.
	Thunderbolt Type-C Ports
	Lets you disable the ports. Default is enabled.
	Thunderbolt Mode
	Default is enabled.
	Require BIOS PW to change Thunderbolt Security Level
	Default is enabled.
	Thunderbolt Security Level
	Default is PCIe and DisplayPort - User Authorization.
	Native PCIe Hot Plug
	When enabled, Thunderbolt S4 Boot is disabled. Default is enabled.
	SATA0
	Lets you disable the connector. Default is enabled.
	Restrict USB Devices

Table 5-3 Computer Setup—Advanced (for advanced users) (continued)

Option	Heading
	Specify the following categories of USB devices to enable:
	● Allow all USB devices (default)
	● Allow only keyboard and mouse
	● Allow all but storage devices and hubs.
	When some devices are restricted, the system will disable USB ports that do not meet the allowed criteria. This feature is usually combined with similar policies within the operating system since USB devices can be moved to different ports. The ports disabled by the BIOS will remain disabled until the system is restarted.
Option ROM Launch Policy	These policies control whether Legacy Option ROMs or UEFI drivers are loaded. Default is 'All UEFI'.
	Configure Option ROM Launch Policy
	● All legacy
	● All UEFI
	● All UEFI except video
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.
	SATA Power Management (enable/disable)
	Enables or disables SATA bus and/or device power management. Default is enabled.
	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.
	Power On from Keyboard Ports (enable/disable)
	When enabled, this feature allows a key press to power on the system when it is off (S5 state). If using a USB keyboard, it must be plugged into one of the rear ports labeled with the keyboard icon. Default is disabled.
	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.
	S0 (On) = Solid white LED.
	S3 (Stand By)= 3 blinks at 1Hz (50% duty cycle) followed by a pause of 2 seconds (white LED) — repeated cycles of 3 blinks and a pause.
	S4 (Hibernation)= 4 blinks at 1Hz (50% duty cycle) followed by a pause of 2 seconds (white LED) — repeated cycles of 4 blinks and a pause.

Table 5-3 Computer Setup—Advanced (for advanced users) (continued)

Option	Heading
	S5 (Soft Off) = LED is off.
Electronic labels	Displays system labels.
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 terminal emulation mode is only activated during remote AMT 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.
	Verbose boot shows additional logging information during the boot. 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).

Recovering the configuration settings

This method of recovery requires that you first perform the **Save to Removable Media** command with the Computer Setup (F10) Utility before **Restore** is needed. (See in the Computer Setup—File table.)

The **Save to Removable Media** option creates a file named HPSETUP.TXT on an inserted USB flash media device. This file can be edited to change the settings on Restore. An asterisk (*) marks the selected option for a setting.

NOTE: It is recommended that you save any modified computer configuration settings to a USB flash media device and save the device for possible future use.

To restore the configuration, insert the USB flash media device with the saved configuration and perform the **Restore from Removable Media** command with the Computer Setup (F10) Utility. (See in the Computer Setup—File table.)

6 Using HP PC Hardware Diagnostics

Using HP PC Hardware Diagnostics Windows (select products only)

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

If HP PC Hardware Diagnostics Windows is not installed on your computer, first you must download and install it. To download HP PC Hardware Diagnostics Windows, see Downloading HP PC Hardware Diagnostics Windows on page 66.

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

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

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

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

   – or –

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

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

      – or –

      Select the question mark icon in the taskbar.

   b. Select **Troubleshooting and fixes**.

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

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

   NOTE: If you need to stop a diagnostic test at any time, select **Cancel**.

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

Downloading HP PC Hardware Diagnostics Windows

- The HP PC Hardware Diagnostics Windows download instructions are provided in English only.

- You must use a Windows computer to download this tool because only .exe files are provided.

Downloading the latest HP PC Hardware Diagnostics Windows version

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

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

2. In the **HP PC Hardware Diagnostics** section, select **Download**, and then select a location on your computer or a USB flash drive.

   The tool is downloaded to the selected location.

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

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

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

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

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

3. In the **HP PC Hardware Diagnostics** section, select **Download**, and then select a location on your computer or a USB flash drive.

   The tool is downloaded to the selected location.

Installing HP PC Hardware Diagnostics Windows

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

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

Using HP PC Hardware Diagnostics UEFI

📝 **NOTE:** For Windows 10 S computers, you must use a Windows computer and a USB flash drive to download and create the HP UEFI support environment because only .exe files are provided. For more information, see .

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

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

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

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

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

Starting HP PC Hardware Diagnostics UEFI

To start HP PC Hardware Diagnostics UEFI, follow these steps:

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

2. Press f2.

    The BIOS searches three places for the diagnostic tools, in the following order:

    a. Connected USB flash drive

    > **NOTE:** To download the HP PC Hardware Diagnostics UEFI tool to a USB flash drive, see Downloading the latest HP PC Hardware Diagnostics UEFI version on page 68.

    b. Hard drive

    c. BIOS

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

Downloading HP PC Hardware Diagnostics UEFI to a USB flash drive

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

- HP PC Hardware Diagnostics UEFI is not included in the preinstall image.

- HP PC Hardware Diagnostics UEFI is not included in the HP Tool partition.

- The hard drive is damaged.

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

Downloading the latest HP PC Hardware Diagnostics UEFI version

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

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

2. In the **HP PC Hardware Diagnostics UEFI** section, select **Download UEFI Diagnostics**, and then select **Run**.

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

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

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

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

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

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

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

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

Downloading Remote HP PC Hardware Diagnostics UEFI

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

Downloading the latest Remote HP PC Hardware Diagnostics UEFI version

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

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

2. In the **HP PC Hardware Diagnostics UEFI** section, select **Download Remote Diagnostics**, and then select **Run**.

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

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

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

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

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

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

Customizing Remote HP PC Hardware Diagnostics UEFI settings

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

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

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

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

- Display status information about the diagnostics run previously.

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

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

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

3. Make your customization selections.

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

Your changes take effect when the computer restarts.

7   Troubleshooting without diagnostics

This chapter provides information on how to identify and correct minor problems, such as USB devices, hard drive, optical drive, graphics, audio, memory, and software problems. If you encounter problems with the computer, refer to the tables in this chapter for probable causes and recommended solutions.

📝 **NOTE:**   For information on specific error messages that may appear on the screen during Power-On Self-Test (POST) at startup, refer to POST error messages and diagnostic front panel LEDs and audible codes on page 95.

Safety and comfort

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

Before you call for technical support

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

- Run the HP diagnostic tool.

- Run the hard drive self-test in Computer Setup. Refer to Computer Setup (F10) Utility on page 52 for more information.

- Check the Power LED on the front of the computer to see if it is flashing red. The flashing lights are error codes that will help you diagnose the problem. Refer to POST error messages and diagnostic front panel LEDs and audible codes on page 95 for more information.

- If you are working on a network, plug another computer with a different cable into the network connection. There may 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."

- Refer to the comprehensive online technical support at http://www.hp.com/support.

- Refer to Helpful hints on page 72 in this guide.

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 to ensure that your service call is handled properly:

- Be in front of your computer when you call.

- Write down the computer serial number and product ID number before calling.

- 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).

⚠ **CAUTION:** 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 the following 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 LED on the front of the computer to see if it is flashing red. The flashing lights are error codes that will help you diagnose the problem. Refer to POST error messages and diagnostic front panel LEDs and audible codes on page 95 for more information.

- 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 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, then plug it in again. The computer will restart if it is set to power 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.

⚠ **CAUTION:** 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 may be able to easily resolve the general problems described in this section. If a problem persists and you are unable to resolve it yourself or if you feel uncomfortable about performing the operation, contact an authorized dealer or reseller.

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

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

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

Computer will not respond to keyboard or mouse.

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

Computer date and time display is incorrect.

Cause	Solution
RTC (real-time clock) battery may need to be replaced. **NOTE:** Connecting the computer to a live AC outlet prolongs the life of the RTC battery.	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.

Computer date and time display is incorrect.

Cause	Solution
	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.

Cause	Solution
System volume may 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 make sure the internal system speaker is not muted (this setting does not affect the external speakers).
	3. Make sure 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 make sure the speakers are not muted or to increase the volume.

Cannot remove computer cover or access panel.

Cause	Solution
Smart Cover Lock, featured on some computers, is locked.	Unlock the Smart Cover Lock using Computer Setup.
	In case of forgotten password, power loss, or computer malfunction, you must manually disable the Smart Cover lock . A key to unlock the Smart Cover Lock is not available from HP. Keys are typically available from a hardware store.

Poor performance.

Cause	Solution
Processor is too hot.	1. Make sure 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. Make sure fans are connected and working properly (some fans only operate when needed).
	3. Make sure 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.

Poor performance.

Cause	Solution
Virus resident on the hard drive.	Run virus protection program.
Too many applications running.	1. Close unnecessary applications to free up memory.
	2. Add more memory.
	3. Some applications run in the background and can be closed by right-clicking on their corresponding icons in the task tray. To prevent these applications from launching at startup:
	In Windows 10:
	a. Type msconfig in the taskbar search box, and then select **msconfig**.
	b. On the **Startup** tab of the System Configuration Utility, click **Open Task Manager**.
	c. Select applications that you do not want to launch automatically, and the click **Disable**.
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 LED flashes red four times and then white two times.

Cause	Solution
Processor thermal protection activated: A fan may be blocked or not turning. OR The heat sink is not properly attached to the processor.	1. Ensure 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, make sure the fan cable is plugged onto the system board header.
	3. If fan a plugged in and not spinning, replace it.

System does not power on and the LEDs on the front of the computer are not flashing.

Cause	Solution
System unable to power on.	Press and hold the power button for less than 4 seconds. If the hard drive LED turns white, then:
	1. If equipped with 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.

System does not power on and the LEDs on the front of the computer are not flashing.

Cause	Solution
	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 seconds. If the hard drive LED does not turn on white then:
	1. Check that 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

Common causes and solutions for power problems are listed in the following table.

Power supply shuts down intermittently.

Cause	Solution
If equipped with a voltage selector, voltage selector switch on rear of computer chassis (some models) not switched to correct line voltage (115V or 230V).	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 powered off automatically and the Power LED flashes Red two times, once every second, followed by a two second pause, and the computer beeps two times. (Beeps stop after fifth iteration but LEDs continue flashing.)

Computer powered off automatically and the Power LED flashes red four times and then white two times.

Cause	Solution
Processor thermal protection activated: A fan may be blocked or not turning. OR The heat sink is not properly attached to the processor.	**1.** Ensure 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, make sure the fan cable is plugged onto the system board header. **3.** If fan a plugged in and not spinning, replace it.

Power LED flashes Red four times, once every second, followed by a two second pause, and the computer beeps four times. (Beeps stop after fifth iteration but LEDs continue flashing.)

Computer powered off automatically and the Power LED flashes red three times and then white four times.

Cause	Solution
Power failure (power supply is overloaded).	1. If equipped with 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 ensure the power supply cable is seated into the connector on the system board.
	3. Check if a device is causing the problem by removing ALL attached devices (such as hard drives or optical drives and expansion cards). Power 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 hard drive problems

Hard drive error occurs.

Cause	Solution
Hard disk has bad sectors or has failed.	1. In Windows 10, type `file` in the taskbar search box, and then select **File Explorer** from the list of applications. In the left column, expand **This PC**, right-click on a drive, select **Properties**, and then select the **Tools** tab. Under **Error checking** click **Check**.
	2. Use a utility to locate and block usage of bad sectors. If necessary, reformat the hard disk.

Disk transaction problem.

Cause	Solution
Either the directory structure is bad or there is a problem with a file.	In Windows 10, type `file` in the taskbar search box, and then select **File Explorer** from the list of applications. In the left column, expand **This PC**, right-click on a drive, select **Properties**, and then select the **Tools** tab. Under **Error checking** click **Check**.

Drive not found (identified).

Cause	Solution
Cable could be loose.	Check cable connections.
The system may not have automatically recognized a newly installed device.	See reconfiguration directions in the Solving hardware installation problems on page 82 section. If the system still does not

Drive not found (identified).

Cause	Solution
	recognize the new device, check to see if the device is listed within Computer Setup. If it is listed, the probable cause is a driver problem. If it is not listed, the probable cause is a hardware problem.
	If this is a newly installed drive, run the Computer Setup utility and try adding a POST delay under **Advanced** > **Boot Options**.
The device is attached to a SATA port that has been hidden in Computer Setup.	Run the Computer Setup utility and ensure **Device Available** is selected for the device's SATA port in **Advanced** > **Port Options**.
Drive responds slowly immediately after power-up.	Run Computer Setup and increase the POST Delay in **Advanced** > **Boot Options**.

Nonsystem disk/NTLDR missing message.

Cause	Solution
The system is trying to start from the hard drive but the hard drive may have been damaged.	▲ Perform Drive Protection System (DPS) testing in system ROM.
System files missing or not properly installed.	1. Insert bootable media and restart the computer.
	2. Boot to the windows installation media and select the recovery option. If only a restore kit is available, then select the **File Backup Program** option, and then restore the system.
	3. Install system files for the appropriate operating system.
Hard drive boot has been disabled in Computer Setup.	Run the Computer Setup utility and enable the hard drive entry in the **Advanced** > **Boot Options** list.
Bootable hard drive is not attached as first in a multi-hard drive configuration.	If attempting to boot from a hard drive, ensure it is attached to the system board dark blue SATA connector.
Bootable hard drive is not listed first in the Boot Order.	Run the Computer Setup utility and select **Advanced** > **Boot Options** and ensure the bootable hard drive is listed immediately under the **Hard Drive** entry.

Computer will not boot from hard drive.

Cause	Solution
The device is attached to a SATA port that has been hidden in Computer Setup.	1. Check SATA cable connections.
	2. Run the Computer Setup utility and ensure **Device Available** is selected for the device's SATA port in **Advanced** > **Port Options**.
Boot order is not correct.	Run the Computer Setup utility and change boot sequence in **Advanced** > **Boot Options**.
Hard drive is damaged.	Observe if the front panel Power LED is blinking RED and if any beeps are heard. See POST error messages and diagnostic front panel LEDs and audible codes on page 95 to determine possible causes for the blinking red and beep codes.
	See the Worldwide Limited Warranty for terms and conditions.

Computer seems to be locked up.

Cause	Solution
Program in use has stopped responding to commands.	1. Use the task manager to close programs that do not respond. 2. Attempt the normal Windows "Shut Down" procedure. If this fails, press the power button for four or more seconds to turn off the power. To restart the computer, press the power button again.

Solving audio problems

If the computer has audio features and you encounter audio problems, see the common causes and solutions listed in the following table.

Sound cuts in and out.

Cause	Solution
Processor resources are being used by other open applications.	Shut down all open processor-intensive applications.

Sound does not come out of the speaker or headphones.

Cause	Solution
Software volume control is turned down or muted.	Double-click the **Speaker** icon on the taskbar, then make sure that **Mute** is not selected and use the volume slider to adjust the volume. This can also be performed using the touch-sensitive buttons on the front of the computer.
Audio is hidden in Computer Setup.	Enable the audio in Computer Setup: **Advanced** > **Built-in Device Options**.
The external speakers are not turned on.	Turn on the external speakers.
Headphones or devices connected to the line-out connector mute the internal speaker.	Turn on and use headphones or external speakers, if connected, or disconnect headphones or external speakers.
Computer is in Sleep state.	Press the power button to resume from Sleep state. **CAUTION:** When attempting to resume from Sleep state, do not hold down the power button for more than four seconds. Otherwise, the computer will shut down and you will lose any unsaved data.
Internal speaker is disabled in Computer Setup.	Enable the internal speaker in Computer Setup. Select **Advanced** > **Built-in Device Options**.
Some applications can select which audio output device is used.	Make sure the application has selected the correct audio device.
The operating system controls may be set to use a different audio device as the default output device than what is expected.	Set the operating system to use the correct audio device.

Computer appears to be locked up while recording audio.

Cause	Solution
The hard disk may be full.	Before recording, make sure there is enough free space on the hard disk. You can also try recording the audio file in a compressed format.

Line-in jack is not functioning properly.

Cause	Solution
Jack has been reconfigured in the audio driver or application software.	In the audio driver or application software, reconfigure the jack or set the jack to its default value.

Solving printer problems

If you encounter printer problems, see the documentation that came with the printer and to the common causes and solutions listed in the following table.

Printer will not print.

Cause	Solution
Printer is not turned on and online.	Turn the printer on and make sure it is online.
The correct printer drivers for the application are not installed.	1. Install the correct printer driver for the application. 2. Try printing using the MS-DOS command: `DIR C:\ > [printer port]` where `[printer port]` is the address of the printer being used. If the printer works, reload the printer driver. To run MS-DOS commands, press the Windows key + r, type `cmd` in the **Open** box, and then click **OK**.
If you are on a network, you may not have made the connection to the printer.	Make the proper network connections to the printer.
Printer may have failed.	Run printer self-test.

Printer will not turn on.

Cause	Solution
The cables may not be connected properly.	Reconnect all cables and check the power cord and electrical outlet.

Printer prints garbled information.

Cause	Solution
The correct printer driver for the application is not installed.	Install the correct printer driver for the application.

Printer prints garbled information.

Cause	Solution
The cables may not be connected properly.	Reconnect all cables.
Printer memory may be overloaded.	Reset the printer by turning it off for one minute, then turn it back on.

Printer will not print.

Cause	Solution
The printer may be out of paper.	Check the paper tray and refill it if it is empty.

Solving keyboard and mouse problems

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

Keyboard commands and typing are not recognized by 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 Sleep state.	Press the power button to resume from Sleep state. **CAUTION:** When attempting to resume from Sleep date, do not hold down the power button for more than four seconds. Otherwise, the computer will shut down and you will lose any unsaved data.

Mouse does not respond to movement or is too slow.

Cause	Solution
Mouse connector is not properly plugged into the back of the computer.	Shut down the computer using the keyboard. Windows 10: 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.

Mouse does not respond to movement or is too slow.

Cause	Solution
Program in use has stopped responding to commands.	Shut down the computer using the keyboard then restart the computer.
Mouse may need repair.	See the Worldwide Limited Warranty for terms and conditions.
Computer is in Sleep state.	Press the power button to resume from Sleep state. **CAUTION:** When attempting to resume from Sleep state, do not hold down the power button for more than four seconds. Otherwise, the computer will shut down and you will lose any unsaved data.
If using a wireless mouse, you may need resynchronize the mouse with the computer.	Follow the instructions that came with the mouse.

Solving hardware installation problems

You may 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 open hdwwiz.exe.

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

A new device is not recognized as part of the system.

Cause	Solution
Cable(s) of new external device are loose or power cables are unplugged.	Ensure 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, 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 may not automatically configure when added if the default configuration conflicts with other devices.	Use Windows Device Manager to deselect 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.

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 LED lights on the front of the computer. Beeps and flashing LEDs are codes for specific problems. 3. If you still cannot resolve the issue, contact Customer Support.

Power LED flashes Red three times and then white two times.

Cause	Solution
Memory is installed incorrectly or is bad.	**CAUTION:** 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. Power 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 the following table. These guidelines do not discuss the process of debugging the network cabling.

Network driver does not detect network controller.

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 Web site.

Network status link light never flashes.

NOTE: The network status light is supposed to flash 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.
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 auto-sensing capabilities and force the system into the correct operating mode.

Diagnostics reports a failure.

Cause	Solution
The cable is not securely connected.	Ensure that the cable is securely attached to the network connector and that the other end of the cable is securely attached to the correct device.
The cable is attached to the incorrect connector.	Ensure that the cable is attached to the correct connector.
There is a problem with the cable or a device at the other end of the cable.	Ensure that the cable and device at the other end are operating correctly.
The network controller is defective.	Contact an authorized service provider.

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

Cause	Solution
Network drivers are not loaded, or driver parameters do not match current configuration.	Make sure the network drivers are loaded and that the driver parameters match the configuration of the network controller.
	Make sure 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.

Network controller stopped working when an expansion board was added to the computer.

Cause	Solution
The network controller requires drivers.	Verify that the drivers were not accidentally deleted when the drivers for a new expansion board were installed.

Network controller stops working without apparent cause.

Cause	Solution
The files containing the network drivers are corrupted.	Reinstall the network drivers. If necessary, download the softpaq from the web (from a different computer).
The cable is not securely connected.	Ensure that the cable is securely attached to the network connector and that the other end of the cable is securely attached to the correct device.
The network controller is defective.	Contact an authorized service provider.

Cannot connect to network server when attempting Remote System Installation.

Cause	Solution
The network controller is not configured properly.	Verify Network Connectivity, that a DHCP Server is present, and that the Remote System Installation Server contains the NIC drivers for your NIC.

System setup utility reports unprogrammed EEPROM.

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 the following table.

⚠ **CAUTION:** Power may 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 8MB of system memory in single channel mode or 16MB 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.

Cause	Solution
A memory module is not installed in the DIMM1 or XMM1 socket.	Ensure 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.

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.

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

Insufficient memory error during operation.

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 LED flashes Red five times, once every second, followed by a two second pause, and the computer beeps five times. (Beeps stop after fifth iteration but LEDs continue flashing.)

Cause	Solution
Memory is installed incorrectly or is bad.	1. Reseat DIMMs. Power 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 USB flash drive problems

If you encounter USB flash drive problems, common causes and solutions are listed in the following table.

USB flash drive is not seen as a drive letter in Windows.

Cause	Solution
The drive letter after the last physical drive is not available.	Change the default drive letter for the flash drive in Windows.

USB flash drive not found (identified).

Cause	Solution
The device is attached to a USB port that has been hidden in Computer Setup.	Run the Computer Setup utility and enable USB ports in **Advanced** > **Port Options**.
The device was not properly seated before power-up.	Ensure the device is fully inserted into the USB port before applying power to the system

System will not boot from USB flash drive.

Cause	Solution
Boot order is not correct.	Run the Computer Setup utility and change boot sequence in **Advanced** > **Boot Options**.
Removable Media Boot is disabled in the Computer Setup utility.	Run the Computer Setup utility and enable booting to removable media in **Advanced** > **Boot Options**. Ensure USB is enabled in **Storage** > **Boot Order**.

The computer boots to DOS after making a bootable flash drive.

Cause	Solution
Flash drive is bootable.	Install the flash drive only after the operating system boots.
Flash drive is defective.	Try a different flash drive.

Solving Internet access problems

If you encounter Internet access problems, consult your Internet Service Provider (ISP) or refer to the common causes and solutions listed in the following table.

Unable to connect to the Internet.

Cause	Solution
Internet Service Provider (ISP) account is not set up properly.	Verify Internet settings or contact your ISP for assistance.
Web browser is not set up properly.	Verify that the Web browser is installed and set up to work with your ISP.
Cable/DSL modem is not plugged in.	Plug in cable/DSL modem. You should see a "power" LED light on the front of the cable/DSL modem.

Unable to connect to the Internet.

Cause	Solution
Cable/DSL service is not available or has been interrupted due to bad weather.	Try connecting to the Internet at a later time or contact your ISP. (If the cable/DSL service is connected, the "cable" LED light on the front of the cable/DSL modem will be on.)
The CAT5 UTP cable is disconnected.	Connect the CAT5 UTP cable between the cable modem and the computers's RJ-45 connector. (If the connection is good, the "PC" LED light on the front of the cable/DSL modem will be on.)
IP address is not configured properly.	Contact your ISP for the correct IP address.
Cookies are corrupted. (A "cookie" is a small piece of information that a Web server can store temporarily with the Web browser. This is useful for having the browser remember some specific information that the Web server can later retrieve.)	Windows 10: 1. Type `control panel` in the taskbar search box, and then select **Control Panel** from the list of applications. 2. Click **Internet Options**. 3. In the **Browsing history** section, click the **Delete** button. 4. Select the **Cookies and website data** check box and click the **Delete** button.

Cannot automatically launch Internet programs.

Cause	Solution
You must log on to your ISP before some programs will start.	Log on to your ISP and launch the desired program.

Solving software problems

Most software problems occur as a result of the following:

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

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

Computer will not continue and the HP logo does not display.

Cause	Solution
ROM issue - POST error has occurred.	Observe the beeps and LED lights on the front of the computer. See POST error messages and diagnostic front panel LEDs and audible codes on page 95 to determine possible causes. See the Worldwide Limited Warranty for terms and conditions.

"Illegal Operation has Occurred" error message is displayed.

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.

8 Backing up, restoring, and recovering

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

- **Backing up your personal information**—You can use Windows tools to back up your personal information (see Using Windows tools on page 90).

- **Creating a restore point**—You can use Windows tools to create a restore point (see Using Windows tools on page 90).

- **Creating recovery media** (select products only)—You can use HP Recovery Manager or HP Cloud Recovery Download Tool (select products only) to create recovery media (see Creating HP Recovery media (select products only) on page 90).

- **Restoring and recovery**—Windows offers several options for restoring from backup, refreshing the computer, and resetting the computer to its original state (see Using Windows tools on page 90).

- **Removing the Recovery Partition**—To remove the Recovery partition to reclaim hard drive space (select products only), select the **Remove Recovery Partition** option of HP Recovery Manager. For more information, see Removing the HP Recovery partition (select products only) on page 94.

Using Windows tools

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

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

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

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

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

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

Creating HP Recovery media (select products only)

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

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

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

On select products, you can use the HP Cloud Recovery Download Tool to create HP Recovery media on a bootable USB flash drive. For more information, see Using the HP Cloud Recovery Download Tool to create recovery media on page 92.

Using HP Recovery Manager to create recovery media

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

Before you begin

Before you begin, note the following:

- Only one set of recovery media can be created. Handle these recovery tools carefully, and keep them in a safe place.

- HP Recovery Manager examines the computer and determines the required media storage capacity.

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

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

  - If your computer has an optical drive with DVD writer capability, be sure to use only high-quality blank DVD-R, DVD+R, DVD-R DL, or DVD+R DL discs. Do not use rewritable discs such as CD±RW, DVD±RW, double-layer DVD±RW, or BD-RE (rewritable Blu-ray) discs, which are not compatible with HP Recovery Manager software.

  - If your computer does not include an integrated optical drive with DVD writer capability, you can use an external optical drive (purchased separately) to create recovery discs, as described above. If an external optical drive is used, you must connect it directly to a USB port on the computer. It cannot be connected to a USB port on an external device, such as a USB hub.

  - To create a recovery flash drive, use a high-quality blank USB flash drive.

- Be sure that the computer is connected to AC power before you begin creating the recovery media.

- The creation process can take an hour or more. Do not interrupt this process.

- If necessary, you can exit the program before you have finished creating all of the recovery media. HP Recovery Manager will finish the current DVD or flash drive. The next time you start HP Recovery Manager, you will be prompted to continue.

Creating the recovery media

To create HP Recovery media using HP Recovery Manager:

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

1. Type `recovery` in the taskbar search box, and then select **HP Recovery Manager**.

2. Select **Create recovery media**, and then follow the on-screen instructions.

If you need to recover the system, see Recovering using HP Recovery Manager on page 92.

Using the HP Cloud Recovery Download Tool to create recovery media

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

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

2. Select **Software and Drivers**, and then follow the on-screen instructions.

Restoring and recovery

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

IMPORTANT: Not all methods are available on all products.

Restoring, resetting, and refreshing using Windows tools

Windows offers several options for restoring, resetting, and refreshing the computer. For details, see Using Windows tools on page 90.

Restoring using HP Recovery Manager and the HP Recovery partition

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

- **Resolving problems with preinstalled applications or drivers**—To correct a problem with a preinstalled application or driver:

  1. Type `recovery` in the taskbar search box, and then select **HP Recovery Manager**.

  2. Select **Reinstall drivers and/or applications**, and then follow the on-screen instructions.

- **Using System Recovery**—To recover the Windows partition to original factory content, select the **System Recovery** option from the HP Recovery partition (select products only) or use the HP Recovery media. For more information, see Recovering using HP Recovery Manager on page 92. If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 90.

- **Using Factory Reset** (select products only)—Restores the computer to its original factory state by deleting all information from the hard drive and recreating the partitions and then reinstalling the operating system and the software that was installed at the factory (select products only). To use the **Factory Reset** option, you must use HP Recovery media. If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 90.

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

Recovering using HP Recovery Manager

You can use HP Recovery Manager software to recover the computer to its original factory state by using the HP Recovery media that you either created or that you obtained from HP, or by using the HP Recovery partition (select products only).

If you have not already created HP Recovery media, see Creating HP Recovery media (select products only) on page 90.

IMPORTANT: HP Recovery Manager does not automatically provide backups of your personal data. Before beginning recovery, back up any personal data that you want to retain. See Using Windows tools on page 90.

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

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

Before you begin, note the following:

- HP Recovery Manager recovers only software that was installed at the factory. For software not provided with this computer, you must either download the software from the manufacturer's website or reinstall the software from the media provided by the manufacturer.

- If the computer hard drive fails, HP Recovery media must be used. This media is created using HP Recovery Manager. See Creating HP Recovery media (select products only) on page 90.

- If your computer does not allow the creation of HP Recovery media or if the HP Recovery media does not work, contact support to obtain recovery media. Go to http://www.hp.com/support, select your country or region, and then follow the on-screen instructions.

Recovering using the HP Recovery partition (select products only)

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

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

To start HP Recovery Manager from the HP Recovery partition:

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

1. Type `recovery` in the taskbar search box, select **HP Recovery Manager**, and then select **Windows Recovery Environment**.

    – or –

    For computers or tablets with keyboards attached:

    ▲   Press f11 while the computer boots, or press and hold f11 as you press the power button.

    For tablets without keyboards:

    ▲   Turn on or restart the tablet, quickly hold down the volume up button, and then select **f11**.

2. Select **Troubleshoot** from the boot options menu.

3. Select **Recovery Manager**, and then follow the on-screen instructions.

    NOTE: If your computer does not automatically restart in HP Recovery Manager, change the computer boot order, and then follow the on-screen instructions. See Changing the computer boot order on page 94.

Recovering using HP Recovery media

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

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

Changing the computer boot order

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

To change the boot order:

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

1. Insert the HP Recovery media.

2. Access the system **Startup** menu.

   For computers or tablets with keyboards attached:

   ▲ Turn on or restart the computer or tablet, quickly press esc, and then press f9 for boot options.

   For tablets without keyboards:

   ▲ Turn on or restart the tablet, quickly hold down the volume up button, and then select **f9**.

      – or –

      Turn on or restart the tablet, quickly hold down the volume down button, and then select **f9**.

3. Select the optical drive or USB flash drive from which you want to boot, and then follow the on-screen instructions.

Removing the HP Recovery partition (select products only)

HP Recovery Manager software allows you to remove the HP Recovery partition (select products only) to free up hard drive space.

IMPORTANT: After you remove the HP Recovery partition, you will not be able to perform System Recovery or create HP Recovery media. Before removing the Recovery partition, create HP Recovery media. See Creating HP Recovery media (select products only) on page 90.

Follow these steps to remove the HP Recovery partition:

1. Type `recovery` in the taskbar search box, and then select **HP Recovery Manager**.

2. Select **Remove Recovery Partition**, and then follow the on-screen instructions.

9 POST error messages and diagnostic front panel LEDs and audible codes

This appendix 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 speed at which the computer loads the operating system and the extent to which it is tested are determined by the POST mode selection.

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.

Full Boot may also be enabled 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 on Computer Setup, see Computer Setup (F10) Utility on page 52.

POST numeric codes and text messages

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

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

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. (See Password security and resetting CMOS on page 102.)
		5. If the message disappears, there may be a problem with the expansion card.
		6. Replace the system board.
003-System Board Failure	DMA or timers.	1. Clear CMOS. (See Password security and resetting CMOS on page 102.)
		2. Remove expansion boards.
		3. Replace the system board.
005-Real-Time Clock Power Loss	Invalid time or date in configuration memory.	Reset the date and time under **Control Panel** (Computer Setup can also be used). If the

Control panel message	Description	Recommended action
	RTC (real-time clock) battery may need to be replaced.	problem persists, replace the RTC battery. See the Removal and Replacement section for instructions on installing a new battery.
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, re-seat the memory modules, and reboot the computer. 3. If the memory configuration was recently changed, unplug the computer, 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, re-seat 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, re-seat 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, re-seat 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.

Control panel message	Description	Recommended action
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. If this message persists, verify that the memory modules are installed correctly.
2E2-Memory Error	Memory module configuration failed during boot up.	1. Ensure memory modules are correctly installed. 2. Verify proper memory module type. 3. Remove and replace the identified faulty memory module(s). 4. If the error persists after replacing memory modules, replace the system board.
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	The current memory 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 module(s) 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	The storage device configuration will be updated as shown.	Not applicable
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.)

Control panel message	Description	Recommended action
		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. (See Password security and resetting CMOS on page 102.)
		3. Replace the hard disk drive.
3F2–Hard Disk 2 Error	Hard disk 2 error.	1. Check and/or replace cables.
		2. Clear CMOS. (See Password security and resetting CMOS on page 102.)
		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. (See Password security and resetting CMOS on page 102.)
		3. Reconfigure card resources and/or run Computer Setup or Windows utilities.
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. (See Password security and resetting CMOS on page 102.)
		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. (See Password security and resetting CMOS on page 102.)
		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. (See Password security and resetting CMOS on page 102.)

Control panel message	Description	Recommended action
		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.
41B-Device in PCI Express Slot Failed To Initialize	There is an incompatibility or problem with a PCIe device and the system or PCIe link could not be configured to a valid bus width or speed.	Try rebooting the system. If the error reoccurs, the device may not work with this system
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.
43B-More Than One USB type-C Cards Are Installed	More than one USB type-C card is installed.	Remove USB type-C card so only one is installed.
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. Ensure 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. Ensure 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 CPU fan. 2. Reseat fan cable. 3. Replace CPU fan.
901-Chassis, Rear Chassis, or Front Chassis Fan not Detected	Chassis, rear chassis, or front chassis fan is not connected or may have malfunctioned.	1. Reseat chassis, rear chassis, or front chassis fan. 2. Reseat fan cable. 3. Replace chassis, rear chassis, or front chassis fan.
903-Computer Cover Has Been Removed Since Last System Startup		N/A
904-SATA Cabling Error	One or more SATA devices are improperly attached. For optimal performance, the SATA 0 and SATA 1 ports should be used for hard drives before other ports.	Ensure SATA connectors are used in ascending order. For one device, use SATA 0. For two devices, use SATA 0 and SATA 1. For three devices, use SATA 0, SATA 1, and SATA 2.

Control panel message	Description	Recommended action
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.
90E-Power Supply Fan Not detected	Power supply fan is not connected or may have malfunctioned.	1. Reseat power supply fan. 2. Reseat fan cable. 3. Replace power supply fan.
910–Filter Warning	Airflow filter is dirty.	Replace the airflow filter.

Interpreting system validation diagnostic front panel LEDs and audible codes

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

- AC adapter

- System board power

- Processor failure

- BIOS corruption

- Memory failure

- Graphics failure

- System board failure

- BIOS authentication failure

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

- Major – the category of the error

- Minor – the specific error within the category

NOTE: Single beep/blink codes are not used.

Number of long beeps/blinks	Error category
1	Not used
2	BIOS
3	Hardware

Number of long beeps/blinks	Error category
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.

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.
	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.

10 Password security and resetting CMOS

This computer supports security password features, which can be established through the Computer Setup Utilities menu.

This computer supports two security password features that are established 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, the administrator password can also be used in place of the power-on password as an override to log in to the computer. This is a useful feature for a network administrator.

If you forget one or both passwords, you can clear all passwords by powering off the system, opening the cover, temporarily removing the PSWD jumper, and booting once. This will erase the administrator and power-on passwords. You must restore the jumper to create new passwords.

⚠ **CAUTION:** Pushing the CMOS button with power removed will reset the BIOS settings to factory defaults. It may be useful to back up the BIOS settings or save them as custom defaults before resetting them in case they are needed later. Back up can be performed in Computer Setup or using the BiosConfigUtility tool available from www.hp.com. See Computer Setup (F10) Utility on page 52 for information on backing up the BIOS settings.

Resetting the password jumper

⚠ **CAUTION:** Stringent security is a mode where there is no physical bypass of the password function. If enabled, removing the password jumper will be ignored. To enable this mode, change the security setting **Clear Password Jumper** in Password Policies to **Ignore**.

If you lose or forget the password when in stringent security mode, the system can only be reset by System Management Command. This is a way for HP Service and Support to provide a secure method to access the BIOS and command a password reset for a specifically identified unit under the direction of the owner. This scenario may not be covered under warranty.

To prevent needing a customer service event to restore access to the system, record your configured administrator and power-on passwords in a safe place away from your computer.

To disable the power-on or administrator password features, or to clear the power-on or administrator passwords, complete the following steps:

1. Shut down the operating system properly, then turn off the computer and any external devices, and disconnect the power cord from the power outlet.

2. With the power cord disconnected, press the power button again to drain the system of any residual power.

   ⚠ **WARNING!**   To reduce the risk of personal injury from electrical shock and/or hot surfaces, be sure to disconnect the power cord from the wall outlet, and allow the internal system components to cool before touching.

   ⚠ **CAUTION:**   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.

4. Locate the header and jumper.

   📝 **NOTE:**   The password jumper is green so that it can be easily identified. For assistance locating the password jumper and other system board components, see the system board components image at .

5. Remove the jumper from pins 1 and 2.

6. Place the jumper on either pin 1 or 2, but not both, so that it does not get lost.

7. Replace the access panel and reconnect the external equipment.

8. Plug in the computer and turn on power. Allow the operating system to start. This clears the current passwords and disables the password features.

9. Shut down the computer, unplug the power, and disconnect the external equipment.

10. Remove the access panel.

11. Place the jumper on pins 1 and 2.

12. Replace the access panel.

13. Reconnect the external equipment and plug in the computer.

Clearing and resetting the BIOS

The CMOS button resets BIOS settings to default, but does not clear the passwords or affect any of the other Security settings. On Intel systems with advanced manageability features, the CMOS button will also partially unprovision AMT.

1. Turn off the computer and any external devices, and disconnect the power cord from the power outlet.

2. Disconnect the keyboard, display, and any other external equipment connected to the computer.

    ⚠ WARNING!   To reduce the risk of personal injury from electrical shock and/or hot surfaces, be sure to disconnect the power cord from the wall outlet, and allow the internal system components to cool before touching.

    ⚠ CAUTION: 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.

    ⚠ CAUTION: Pushing the CMOS button will reset 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 for information on backing up the CMOS settings.

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

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

    📝 NOTE: For assistance locating the CMOS button and other system board components, see the system board components image at .

5. Replace the access panel.

6. Reconnect the external devices.

7. 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 .

A   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 between 100-120 or 220-240 volts 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

The requirements listed below 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 or 250 volts 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 feet) and 3.6 m (12 feet).

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.

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

Country-specific requirements

Additional requirements specific to a country are shown in parentheses and explained below.

Country	Accrediting Agency	Country	Accrediting Agency
Australia (1)	EANSW	Italy (1)	IMQ
Austria (1)	OVE	Japan (3)	METI
Belgium (1)	CEBC	Norway (1)	NEMKO
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 wall 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 wall plug must be a two-pole grounding type with a NEMA 5-15P (15A, 125V) or NEMA 6-15P (15A, 250V) configuration.

3. Appliance coupler, flexible cord, and wall 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. Wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7A, 125V) configuration.

B Statement of memory volatility

The purpose of this chapter is to provide general information regarding nonvolatile memory in HP Business computers. This chapter also provides general instructions for restoring nonvolatile memory that can contain personal data after the system has been powered off and the hard drive has been removed.

HP Business computer products that use Intel®-based or AMD®-based system boards contain volatile DDR memory. The amount of nonvolatile memory present in the system depends upon the system configuration. Intel-based and AMD-based system boards contain nonvolatile memory subcomponents as originally shipped from HP, assuming that no subsequent modifications have been made to the system and assuming that no applications, features, or functionality have been added to or installed on the system.

Following system shutdown and removal of all power sources from an HP Business computer system, personal data can remain on volatile system memory (DIMMs) for a finite period of time and will also remain in nonvolatile memory. Use the steps below to remove personal data from the computer, including the nonvolatile memory found in Intel-based and AMD-based system boards.

> **NOTE:** If your tablet has a keyboard base, connect to the keyboard base before beginning steps in this chapter.

Current BIOS steps

1. Follow steps (a) through (l) below to restore the nonvolatile memory that can contain personal data. Restoring or reprogramming nonvolatile memory that does not store personal data is neither necessary nor recommended.

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

   > **NOTE:** If the system has a BIOS administrator password, enter the password at the prompt.

   b. Select **Main**, select **Apply Factory Defaults and Exit**, and then select **Yes** to load defaults.

   The computer will reboot.

   c. During the reboot, press esc while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

   > **NOTE:** If the system has a BIOS administrator password, enter the password at the prompt.

   d. Select the **Security** menu, select **Restore Security Settings to Factory Defaults**, and then select **Yes** to restore security level defaults.

   The computer will reboot.

   e. During the reboot, press esc while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

   > **NOTE:** If the system has a BIOS administrator password, enter the password at the prompt.

   f. If an asset or ownership tag is set, select the **Security** menu and scroll down to the **Utilities** menu. Select **System IDs**, and then select **Asset Tracking Number**. Clear the tag, and then make the selection to return to the prior menu.

g.   If a DriveLock password is set, select the **Security** menu, and scroll down to **Hard Drive Utilities** under the **Utilities** menu. Select **Hard Drive Utilities**, select **DriveLock**, then uncheck the checkbox for **DriveLock password on restart**. Select **OK** to proceed.

h.   Select the **Main** menu, and then select **Reset BIOS Security to factory default**. Click **Yes** at the warning message.

The computer will reboot.

i.   During the reboot, press esc while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

> **NOTE:**   If the system has a BIOS administrator password, enter the password at the prompt.

j.   Select the **Main** menu, select **Apply Factory Defaults and Exit**, select **Yes** to save changes and exit, and then select **Shutdown**.

k.   Reboot the system. If the system has a Trusted Platform Module (TPM) and/or fingerprint reader, one or two prompts will appear—one to clear the TPM and the other to Reset Fingerprint Sensor; press or tap F1 to accept or F2 to reject.

l.   Remove all power and system batteries for at least 24 hours.

2.   Complete one of the following:

- Remove and retain the storage drive.

– or –

- Clear the drive contents by using a third party utility designed to erase data from an SSD.

– or –

- Clear the contents of the drive by using the following BIOS Setup Secure Erase command option steps:

> **IMPORTANT:**   If you clear data using Secure Erase, it cannot be recovered.

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

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

c.   Select **Hard Drive Utilities**.

d.   Under **Utilities**, select **Secure Erase**, select the hard drive storing the data you want to clear, and then follow the on-screen instructions to continue.

Nonvolatile memory usage

Nonvolatile Memory Type	Amount (Size)	Does this memory store customer data?	Does this memory retain data when power is removed?	What is the purpose of this memory?	How is data input into this memory?	How is this memory write-protected?
HP Sure Start flash (select models only)	8 MBytes	No	Yes	Provides protected backup of critical System BIOS code, EC firmware, and critical computer configuration data for select platforms that support HP Sure Start. For more information, see Using HP Sure Start (select models only) on page 112.	Data cannot be written to this device via the host processor. The content is managed solely by the HP Sure Start Embedded Controller.	This memory is protected by the HP Sure Start Embedded Controller.
Real Time Clock (RTC) battery backed-up CMOS configuration memory	256 Bytes	No	Yes	Stores system date and time and noncritical data.	RTC battery backed-up CMOS is programmed using the Computer Setup (BIOS), or changing the Microsoft Windows date & time.	This memory is not write-protected.
Controller (NIC) EEPROM	64 KBytes (not customer accessible)	No	Yes	Stores NIC configuration and NIC firmware.	NIC EEPROM is programmed using a utility from the NIC vendor that can be run from DOS.	A utility is required to write data to this memory and is available from the NIC vendor. Writing data to this ROM in an inappropriate manner will render the NIC non-functional.
DIMM Serial Presence Detect (SPD) configuration data	256 Bytes per memory module, 128 Bytes programmable (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 MBytes	Yes	Yes	Stores system BIOS code and computer configuration data.	System BIOS code is programmed at the factory. Code is updated when the system BIOS is updated. Configuration data and settings are input using the Computer Setup (BIOS) or a custom utility.	**NOTE:** Writing data to this ROM in an inappropriate manner can render the computer non-functional. A utility is required for writing data to this memory and is available on the HP website; go to http://www.hp.com/support. Select **Find your**

Nonvolatile Memory Type	Amount (Size)	Does this memory store customer data?	Does this memory retain data when power is removed?	What is the purpose of this memory?	How is data input into this memory?	How is this memory write-protected?
						product, and then follow the on-screen instructions.
Intel Management Engine Firmware (present only in select Elite or Z models. For more information, go to http://www.hp.com/support. Select **Find your product**, and then follow the on-screen instructions.)	1.5 MBytes or 7 MBytes	Yes	Yes	Stores Management Engine Code, Settings, Provisioning Data and iAMT third-party data store.	Management Engine Code is programmed at the factory. Code is updated via Intel secure firmware update utility. Unique Provisioning Data can be entered at the factory or by an administrator using the Management Engine (MEBx) setup utility. The third party data store contents can be populated by a remote management console or local applications that have been registered by an administrator to have access to the space.	The Intel chipset is configured to enforce hardware protection to block all direct read/write access to this area. An Intel utility is required for updating the firmware. Only firmware updates digitally signed by Intel can be applied using this utility.
Bluetooth flash (select products only)	2 Mbit	No	Yes	Stores Bluetooth configuration and firmware.	Bluetooth flash is programmed at the factory. Tools for writing data to this memory are not publicly available but can be obtained from the silicon vendor.	A utility is required for writing data to this memory and is made available through newer versions of the driver whenever the flash requires an upgrade.
802.11 WLAN EEPROM	4 Kbit to 8 Kbit	No	Yes	Stores configuration and calibration data.	802.11 WLAN EEPROM is programmed at the factory. Tools for writing data to this memory are not made public.	A utility is required for writing data to this memory and is typically not made available to the public unless a firmware upgrade is necessary to address a unique issue.
Webcam (select products only)	64 Kbit	No	Yes	Stores webcam configuration and firmware.	Webcam memory is programmed using a utility from the device manufacturer that can be run from Windows.	A utility is required for writing data to this memory and is typically not made available to the public unless a firmware upgrade is necessary to address a unique issue.
Fingerprint reader (select products only)	512 KByte flash	Yes	Yes	Stores fingerprint templates.	Fingerprint reader memory is programmed by user enrollment in HP ProtectTools Security Manager.	Only a digitally signed application can make the call to write to the flash.

Questions and answers

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

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

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

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

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

    c.   Follow the on-screen instructions.

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

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

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

    Like the legacy BIOS, the UEFI BIOS provides an interface to display the system information and configuration settings and to change the configuration of your computer before an OS is loaded. BIOS provides a secure run-time environment that supports a Graphic User Interface (GUI). In this environment, you can use either a pointing device (Touchscreen, TouchPad, pointing stick, or USB mouse) or the keyboard to navigate and make menu and configuration selections. The UEFI BIOS also contains basic system diagnostics.

    The UEFI BIOS provides functionality beyond that of the legacy BIOS. In addition, the UEFI BIOS works to initialize the computer's hardware before loading and executing the OS; the run-time environment allows the loading and execution of software programs from storage devices to provide more functionality, such as advanced hardware diagnostics (with the ability to display more detailed system information) and advanced firmware management and recovery software.

    HP has provided options in Computer Setup (BIOS) to allow you to run in legacy BIOS, if required by the operating system. Examples of this requirement would be if you upgrade or downgrade the OS.

3. **Where does the UEFI BIOS reside?**

    The UEFI BIOS resides on a flash memory chip. A utility is required to write to the chip.

4. **What kind of configuration data is stored on the DIMM Serial Presence Detect (SPD) memory module? How would this data be written?**

    The DIMM SPD memory contains information about the memory module, such as size, serial number, data width, speed/timing, voltage, and thermal information. This information is written by the module manufacturer and stored on an EEPROM. This EEPROM cannot be written to when the memory module is installed in a computer. Third-party tools do exist that can write to the EEPROM when the memory module is not installed in a computer. Various third-party tools are available to read SPD memory.

5. **What is meant by "Restore the nonvolatile memory found in Intel-based system boards"?**

    This message relates to clearing the Real Time Clock (RTC) CMOS memory that contains computer configuration data.

6. **How can the BIOS security be reset to factory defaults and data erased?**

> **IMPORTANT:** Resetting will result in the loss of information.
>
> These steps will not reset Custom Secure Boot Keys. See question and answer 7 for information about resetting the keys.

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

   b. Select **Main**, and then select **Reset Security to Factory Defaults**.

   c. Follow the on-screen instructions.

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

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

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

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

   b. Select the **Security** menu, select **Secure Boot Configuration**, and then follow the on-screen instructions.

   c. At the **Secure Boot Configuration** window, select **Secure Boot**, select **Clear Secure Boot Keys**, and then follow the on-screen instructions to continue.

Using HP Sure Start (select models only)

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

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

C Specifications

Item			
Dimensions	**Without stand**	**Fixed stand**	**Adjustable Height Stand**
Width	19.26 in (489.1 mm)	19.26 in (489.1 mm)	19.26 in (489.1 mm)
Depth	2.04 in (51.9 mm)	5.9 in (149.97 mm)	8.21 in (208.47 mm)
Height	12.64 in (321 mm)	14.35 in (364.4 mm)	14.32 in (363.69 mm)
Approximate Weight			
Non-touch	8.61 lb (3.91 kg) – 10.36 lbs (4.7 kg)	10.93 lb (4.96 kg)– 12.68 lbs (5.75 kg)	12.74 lb (5.78 kg)– 14.48 lbs (6.57 kg)
Touch	8.64 lb (3.92 kg) – 10.19 lbs (4.62 kg)	10.96 lb (4.97 kg)– 12.5 lbs (5.67 kg)	12.76 lb (5.79 kg)– 14.31 lbs (6.49 kg)
Temperature Range			
Operating	41° to 113°F (5° to 45℃)		
Nonoperating	-40° to 150.8°F (-40° to 66℃)		
Relative Humidity (non-condensing)			
Operating	5-90% at max inlet temperature		
Non-operating	5-90% at max inlet temperature		
Maximum Altitude (unpressurized)			
Operating	16,404 ft (5,000 m)		
Non-operating	50,000 ft (15.240 m)		
Power Supply			
Rated Voltage Range	100-240 V		
Rated Line Frequency	50-60 Hz		
Rated Input Current	120 W $\leqq$ 1.2A		
	90 W $\leqq$ 2.2A		

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