



Maintenance & Service Guide

HP 406 G1 Microtower

© Copyright 2014 Hewlett-Packard Development Company, L.P. The information contained herein is subject to change without notice.

Microsoft and Windows are U.S. registered trademarks of the Microsoft group of companies.

The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

This document contains proprietary information that is protected by copyright. No part of this document may be photocopied, reproduced, or translated to another language without the prior written consent of Hewlett-Packard Company.

Maintenance & Service Guide

First Edition (September 2014)

Document Part Number: 759736-001


Product notice


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

Not all features are available on all editions of Windows 8. This computer may require upgraded and/or separately purchased hardware, drivers, and/or software to take full advantage of Windows 8 functionality. See <http://www.microsoft.com> for details.

This computer may require upgraded and/or separately purchased hardware and/or a DVD drive to install the Windows 7 software and take full advantage of Windows 7 functionality. See <http://windows.microsoft.com/en-us/windows7/get-know-windows-7> for details.

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 description	1
2 Product features	4
Front components	4
Rear components	5
3 Activating and Customizing the Software	6
Activating and customizing the software in Windows 7	6
Activating the Windows operating system	6
Downloading Windows 7 updates	7
Installing or upgrading device drivers	7
Customizing the monitor display	7
Activating and customizing the software in Windows 8	7
Activating the Windows Operating System	7
Downloading Windows 8 updates	8
Customizing the monitor display	8
4 Illustrated parts catalog	9
Computer Major Components	9
Drives	10
Misc Parts	11
Cables	12
Sequential Part Number Listing	12
5 Routine care, SATA drive guidelines, and disassembly preparation	14
Electrostatic discharge information	14
Generating static	15
Preventing electrostatic damage to equipment	15
Personal grounding methods and equipment	16
Grounding the work area	16
Recommended materials and equipment	16

Operating guidelines	17
Routine care	18
General cleaning safety precautions	18
Cleaning the Computer Case	18
Cleaning the keyboard	18
Cleaning the monitor	19
Cleaning the mouse	19
Service considerations	19
Power supply fan	19
Tools and software Requirements	20
Screws	20
Cables and connectors	20
Hard Drives	20
SATA hard drives	21
SATA hard drive cables	21
SATA data cable	21
SMART ATA drives	21
Cable management	22

6 Removal and replacement procedures 23

Serviceability features	23
Preparation for disassembly	23
Access panel	24
Front bezel	25
Memory	26
DDR3/DDR3L-SDRAM UDIMMs or SODIMMs	26
Populating DIMM sockets	27
Removing memory modules	28
Cable management	29
Cable connections	30
Expansion cards	31
Drives	34
Installing additional drives	35
System board drive connections	36
Removing an optical drive	37
Removing a hard drive	38
Front I/O and USB panel housing assembly	39
Power switch/LED assembly	41
System fan	44
Speaker	46
Fan sink assembly	49

Processor	51
Power supply	52
System board	55
Appendix A Computer Setup (F10) Utility	57
Computer Setup (F10) Utilities	57
Using Computer Setup (F10) Utilities	58
Computer Setup—File	59
Computer Setup—Storage	60
Computer Setup—Security	61
Computer Setup—Power	64
Computer Setup—Advanced	64
Appendix B Power cord set requirements	66
General requirements	66
Japanese power cord requirements	66
Country-specific requirements	67
Appendix C POST Error Messages	68
POST Numeric Codes and Text Messages	69
Interpreting POST Diagnostic Front Panel LEDs and Audible Codes	76
Appendix D Password Security and Resetting CMOS	77
Resetting the Password Jumper	78
Clearing and Resetting the CMOS	79
Appendix E Troubleshooting without diagnostics	81
Safety and comfort	81
Before you call for technical support	81
Helpful hints	82
Solving general problems	84
Solving power problems	88
Solving hard drive problems	89
Solving media card reader problems	92
Solving display problems	93
Solving audio problems	99
Solving printer problems	101
Solving keyboard and mouse problems	102
Solving Hardware Installation Problems	104
Solving Network Problems	107

Solving memory problems	110
Solving processor problems	112
Solving CD-ROM and DVD problems	113
Solving USB flash drive problems	115
Solving front panel component problems	116
Solving Internet access problems	116
Solving software problems	118
Appendix F HP PC Hardware Diagnostics	120
Why run HP PC Hardware Diagnostics	120
How to access and run HP PC Hardware Diagnostics	120
Downloading HP PC Hardware Diagnostics to a USB device	121
Appendix G System backup and recovery	122
Backing up, restoring, and recovering in Windows 8.1 or Windows 8	122
Creating recovery media and backups	122
Restoring and recovering using Windows tools	123
Using Reset when the system is not responding	123
Recovery using the Windows recovery USB flash drive	124
Recovery using Windows operating system media (purchased separately)	124
Backing up, restoring, and recovering in Windows 7	125
Creating recovery media	125
Creating recovery media using HP Recovery Manager (select models only) ...	126
Creating recovery discs with HP Recovery Disc Creator (select models only) ..	127
Creating recovery discs	127
Backing up your information	128
System Restore	128
System Recovery	129
System Recovery when Windows is responding	129
System Recovery when Windows is not responding	130
System Recovery using recovery media (select models only)	130
Using HP Recovery Disc operating system discs (select models only)	131
Appendix H Statement of Volatility	133
Appendix I Specifications	134
MT Specifications	134
Index	135

1 Product description

Category	Description
Product Name	HP 406 G1 Microtower Business Desktop PC
Processors	Intel Core i7-4770 (3.4 GHz, 8 MB cache); Intel HD Graphics 4600 Intel Core i5-4570 (3.2 GHz, 6 MB cache); Intel HD Graphics 4600 Intel Core i3-4130 (3.4 GHz, 3 MB cache); Intel HD Graphics 4400 Intel Pentium Dual Core G3220 (3.0 GHz, 3 MB cache); Intel HD Graphics
Chipset	Intel Q85
Graphics	Intel HD Graphics; varies by processor
Memory	Four customer-accessible/upgradable memory module slots 1600MHz – 12800 DDR3, dual channel support Supports up to 8 GB of system RAM integrated into the system board in the following options: <ul style="list-style-type: none">• 8 GB (4 GB x 2)• 4 GB (4 GB x 1)• 2 GB (2 GB x 1)
Hard drive	Supports the following 3.5-inch, 6 Gb/s, SATA hard drives: <ul style="list-style-type: none">• 1-TB, 7200 rpm• 500-GB, 7200 rpm
Optical drive	Supports the following 5.25-inch SATA optical drives: <ul style="list-style-type: none">• SuperMulti DVD±RW• DVD-ROM (8x) Supports no optical drive option
Audio	Integrated high definition audio Standard internal speaker Internal amplifier - Realtek ALC221

Category	Description
Ethernet	10/100/1000M GbE local area network (LAN) Realtek RTL8111G
Internal expansion	(1) 3.5-inch hard drive bay (1) 2.5-inch hard drive/solid-state drive bay (1) 5.25-inch optical drive bay (1) PCIe x1 slot (1) PCIe x16 slot (1) PCI 2.3 slot
Ports	Rear IO: (4) USB 3.0 ports (2) USB 2.0 ports Audio out connector Audio in connector Microphone in connector RJ-45 connector VGA connector PS/2 connector Front IO: 2 USB 2.0 ports Headphone connector Microphone connector
Keyboard and mouse	Universal USB wired Windows 8 keyboard Universal USB wired optical mouse HP PS/2 keyboard HP PS/2 mouse
Power requirements	Internal power supply unit 300W aPFC 300W EStar

Category	Description
Operating system	Preinstalled:
	Windows 8.1 downgrade to Windows 7
	Windows 8.1 Professional 64 bit
	Windows 7 Professional 64 bit
	Ubuntu Linux CR 64 bit
	Ubuntu Linux
	SoftPkg
Serviceability	Windows 7 driver (64 bit)
	Windows 8.1 driver (64 bit)
	End user replaceable part:
	Hard drive
	Optical drive
	Memory

2 Product features

Front components



1	Hard Disk Drive Indicator Light	5	Optical drive activity light
2	Power Indicator Light	6	Microphone In Port
3	Power button	7	Audio Line Out Port
4	Optical Disk Drive Ejection Button	8	Two USB 2.0 Ports

Rear components



1	Power Cord Connector	7	Two (2) USB 3.0 Ports
2	Access Panel Screw	8	VGA Video Output Connection
3	Audio Line In Connector	9	PS/2 Mouse Connector (green)
4	Audio Line Out Connector	10	PS/2 Keyboard Connector (purple)
5	Microphone In Connector	11	RJ-45 Network Connection Port
6	Two (2) USB 3.0 Ports	12	Two (2) USB 2.0 Ports

3 Activating and Customizing the Software



NOTE: This chapter provides information for both Windows 7 and Windows 8.

Activating and customizing the software in Windows 7

If your computer was not shipped with a Windows® operating system, some portions of this documentation do not apply. Additional information is available in online help after you activate the operating system.



CAUTION: Do not add optional hardware or third-party devices to the computer until the operating system is successfully activated. Doing so may cause errors and prevent the operating system from installing properly.



NOTE: Be sure there is a 10.2 cm (4 inch) clearance at the back of the unit and above the monitor to permit the required airflow.

Activating the Windows operating system

The first time you turn on the computer, the operating system is set up and activated automatically. This process takes about 5 to 10 minutes. Carefully read and follow the instructions on the screen to complete the activation.

We recommend that you register your computer with HP during operating system setup so you can receive important software updates, facilitate support questions, and sign up for special offers.



CAUTION: After the activation process has begun, DO NOT TURN OFF THE COMPUTER UNTIL THE PROCESS IS COMPLETE. Turning off the computer during the activation process may damage the software that runs the computer or prevent its proper installation.



NOTE: If the computer shipped with more than one operating system language on the hard drive, the activation process could take up to 60 minutes.

Downloading Windows 7 updates

Microsoft may release updates to the operating system. To help keep the computer running optimally, HP recommends checking for the latest updates during the initial installation and periodically throughout the life of the computer.

1. To set up your Internet connection, click **Start > Internet Explorer** and follow the instructions on the screen.
2. After an Internet connection has been established, click the **Start > All Programs > Windows Update**.
3. Run Windows Update monthly thereafter.

Installing or upgrading device drivers

When installing optional hardware devices after the operating system installation is complete, you must also install the drivers for each of the devices.

In Windows 7, if prompted for the i386 directory, replace the path specification with C:\i386, or use the **Browse** button in the dialog box to locate the i386 folder. This action points the operating system to the appropriate drivers.

Obtain the latest support software, including support software for the operating system, from <http://www.hp.com/support>. Select your country and language, select **Download drivers and software (and firmware)**, enter the model number of the computer, and press **Enter**.

Customizing the monitor display


If you wish, you can select or change the monitor refresh rates, screen resolution, color settings, font sizes, and power management settings.

For more information, refer to the online documentation provided with the graphics controller utility or the documentation that came with your monitor.

Right-click on the Windows desktop, then click **Personalize** to change display settings.

Activating and customizing the software in Windows 8


Additional information is available in online help after you activate the operating system.

 **NOTE:** Be sure there is a 10.2 cm (4 inch) clearance at the back of the unit and above the monitor to permit the required airflow.

Activating the Windows Operating System

The first time you turn on the computer, the operating system is set up and activated automatically. This process takes about 5 to 10 minutes. Carefully read and follow the instructions on the screen to complete the activation.

We recommend that you register your computer with HP during operating system set up so you can receive important software updates, facilitate support questions, and sign up for special offers. You can also register your computer with HP using the **Register with HP** app on the Start screen.

 **CAUTION:** After the activation process has begun, DO NOT TURN OFF THE COMPUTER UNTIL THE PROCESS IS COMPLETE. Turning off the computer during the activation process may damage the software that runs the computer or prevent its proper installation.

Downloading Windows 8 updates

Microsoft may release updates to the operating system. To help keep the computer running optimally, HP recommends checking for the latest updates during the initial installation and periodically throughout the life of the computer.

Run Windows Update as soon as possible after you set up your computer.

1. Point to the upper-right or lower-right corner of the Start screen to display the charms.
2. Click **Settings > Change PC Settings > Windows Update**.
3. Run Windows Update monthly thereafter.

Customizing the monitor display

You can customize display settings for Windows 8 separately for the Start screen and the Desktop.

To customize the Start screen:


1. Point to the upper-right or lower-right corner of the Start screen to display the charms.
2. Click **Settings > Change PC Settings**.
3. Click **Personalize** to change the display settings.

To customize the Desktop:

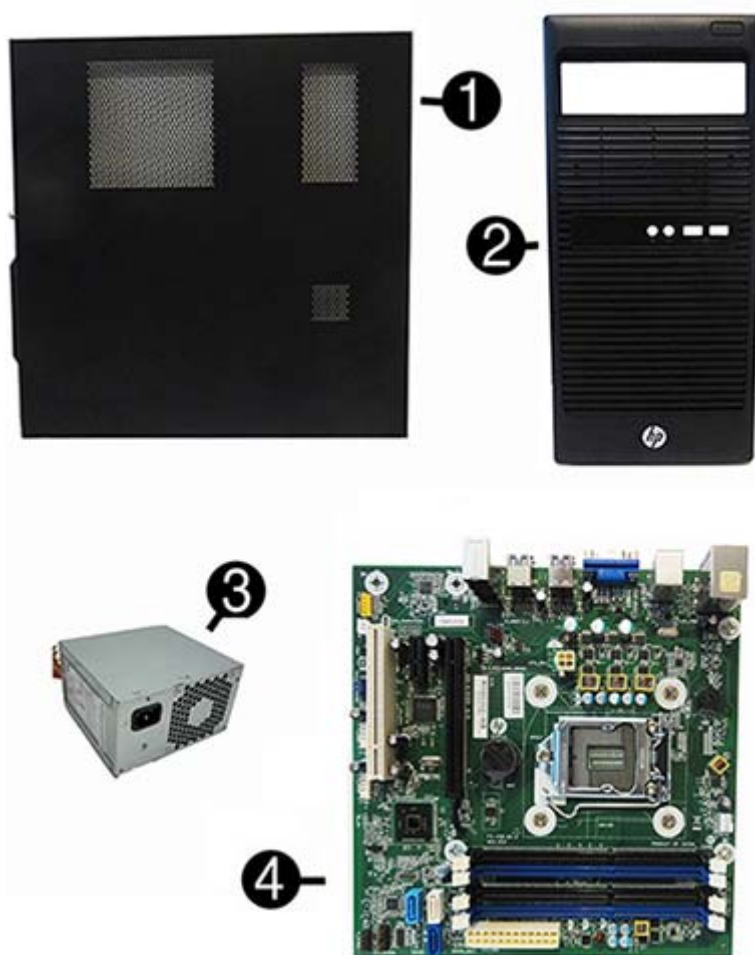
1. Click the Desktop app on the Start screen.
2. Right-click on the desktop, and then click **Personalize** to change display settings.

4 Illustrated parts catalog

This chapter provides spare part information for all chassis.

 **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.

Computer Major Components



Item	Description	Spare part number
(1)	Access panel	787797-001
(2)	Front bezel	787795-001
(3)	Power supply , 300W	
	300W, EStar	712298-001
	300W, for use only in India and Southeast Asia	689005-001
(4)	System board (includes replacement thermal material)	
	For use in non-Windows 8 models	787304-001
	For use in models with Windows 8 Standard	787304-501
	For use in models with Windows 8 Professional	787304-601
	Memory modules , PC3-12800, 1666-MHz (not illustrated)	
	8-GB	689375-001
	4-GB	671613-001
	2-GB	671612-001
	Processors (include replacement thermal material; not illustrated)	
	Intel Core i7-4770, 3.4 GHz, 8-MB L3 cache, 86W	727373-001
	Intel Core i5-4570, 3.2 GHz, 6-MB L3 cache, 86W	727380-001
	Intel Core i3-4130, 3.4 GHz, 3-MB L3 cache, 54W	742560-001
	Intel Pentium G3220, 3.0 GHz, 3-MB L3 cache, 54W	742564-001
	Intel Celeron G1810, 2.7 GHz, 2-MB L3 cache, 54W	758756-001

Drives

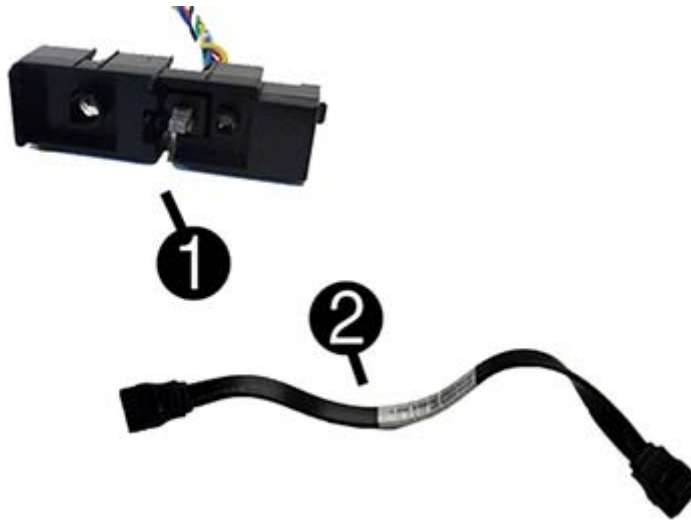
Description	Spare part number
Hard drive	
1-TB, 7200-rpm	667719-001
500-GB, 7200-rpm	667720-001
Optical drive	
DVD-ROM drive	581599-001
SuperMulti DVD±RW drive	690418-001

Misc Parts



Item	Description	Spare part number
(1)	Fan sink (includes replacement thermal material)	667727-001
(2)	Front I/O and USB assembly	787798-001
(3)	Speaker	751593-001
(4)	System fan	657103-001
	Foot, rubber	530593-001
	Keyboards	
	USB, unbranded, English	709695-L31
	USB, HP Essential, for use in Taiwan	729339-AB1
	USB, HP Essential, for use in Thailand	729339-281
	PS/2 for use in India	724718-D61
	PS/2 for use in Taiwan	724718-AB1
	PS/2 for use in Thailand	724718-281
	PS/2 for use in the United States	724718-001
	Mouse (optical, USB; not illustrated)	
	PS/2	674315-001
	USB	719901-001

Cables



Item	Description	Spare part number
(1)	Power switch/LED assembly	787796-001
(2)	SATA cable , 254 mm, 2 straight ends	660147-001


Sequential Part Number Listing

Spare part number	Description
530593-001	Foot, rubber
581599-001	DVD-ROM drive
657103-001	System fan
660147-001	SATA cable, 254 mm, 2 straight ends
667719-001	1 TB, 7200-rpm hard drive
667720-001	500 GB, 7200-rpm hard drive
667727-001	Fan sink
671612-001	2-GB memory module, PC3-12800, 1666-MHz
671613-001	4-GB memory module, PC3-12800, 1666-MHz
674315-001	Mouse, PS/2
689005-001	Power supply, 300W, for use only in India and Southeast Asia
689375-001	8-GB memory module, PC3-12800, 1666-MHz
690418-001	SuperMulti DVD±RW drive

Spare part number	Description
692096-001	Power supply, 300W
709695-L31	Keyboard, unbranded, English
712298-001	Power supply, 300W, EStar
719901-001	Mouse, USB
724718-001	Keyboard, PS/2, for use in the United States
724718-281	Keyboard, PS/2, for use in Thailand
724718-AB1	Keyboard, PS/2, for use in Taiwan
724718-D61	Keyboard, PS/2, for use in India
727373-001	Intel Core i7 4770, 3.4 GHz, 8-MB L3 cache, 86W
727380-001	Intel Core i5-4570 processor, 3.2 GHz, 6-MB L3 cache, 86W
729339-281	Keyboard, USB, HP Essential, for use in Thailand
729339-AB1	Keyboard, USB, HP Essential, for use in Taiwan
742561-001	Intel Core i3-4130 processor, 3.4 GHz, 3-MB L3 cache, 54W
742564-001	Intel Pentium G3220 processor, 3.0 GHz, 3-MB L3 cache, 54W
751593-001	Speaker
758756-001	Intel Celeron G1810 (2.7 GHz, 2-MB L3 cache, 54W)
787304-001	System board for use in non-Windows 8 models (includes replacement thermal material)
787304-501	System board for use in models with Windows 8 Standard (includes replacement thermal material)
787304-601	System board for use in models with Windows 8 Professional (includes thermal material)
787795-001	Front bezel
787796-001	Power switch/LED assembly with cable
787797-001	Access panel
787798-001	Front I/O and USB assembly

5 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.

Event	Relative Humidity		
	55%	40%	10%
Walking across carpet	7,500 V	15,000 V	35,000 V
Walking across vinyl floor	3,000 V	5,000 V	12,000 V
Motions of bench worker	400 V	800 V	6,000 V
Removing DIPs from plastic tube	400 V	700 V	2,000 V
Removing DIPs from vinyl tray	2,000 V	4,000 V	11,500 V
Removing DIPs from Styrofoam	3,500 V	5,000 V	14,500 V
Removing bubble pack from PCB	7,000 V	20,000 V	26,500 V
Packing PCBs in foam-lined box	5,000 V	11,000 V	21,000 V
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 \pm 10% resistance in the ground cords. To provide proper ground, a strap must be worn snug against bare skin. The ground cord must be connected and fit snugly into the banana plug connector on the grounding mat or workstation.
- **Heel straps/Toe straps/Boot straps** can be used at standing workstations and are compatible with most types of shoes or boots. On conductive floors or dissipative floor mats, use them on both feet with a maximum of one-megohm \pm 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 \pm 10% resistance
- Static-dissipative table or floor mats with hard tie to ground
- Field service kits
- Static awareness labels
- Wrist straps and footwear straps providing one-megohm \pm 10% resistance
- Material handling packages
- Conductive plastic bags
- Conductive plastic tubes
- Conductive tote boxes
- Opaque shielding bags
- Transparent metallized shielding bags
- Transparent shielding tubes

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 monitor to permit the required airflow.
- Never restrict the airflow into the computer by blocking any vents or air intakes. Do not place the keyboard, with the keyboard feet down, directly against the front of the desktop unit as this also restricts airflow.
- Occasionally clean the air vents on all vented sides of the computer. Lint, dust, and other foreign matter can block the vents and limit the airflow. Be sure to unplug the computer before cleaning the air vents.
- Never operate the computer with the cover or side panel removed.
- Do not stack computers on top of each other or place computers so near each other that they are subject to each other's 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 monitor 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 18](#) 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 18](#) 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 18](#).

When cleaning debris from under the keys, review all rules in [General cleaning safety precautions on page 18](#) 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 monitor

- Wipe the monitor screen with a clean cloth moistened with water or with a towelette designed for cleaning monitors. Do not use sprays or aerosols directly on the screen; the liquid may seep into the housing and damage a component. Never use solvents or flammable liquids on the monitor.
- To clean the monitor body follow the procedures in [Cleaning the Computer Case on page 18](#).

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 18](#).

Service considerations

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

Power supply fan

The power supply fan is a variable-speed fan based on the temperature in the power supply.

⚠ CAUTION: The cooling fan is always on when the computer is in the "On" mode. The cooling fan is off when the computer is in "Standby," "Suspend," or "Off" modes.

You must disconnect the power cord from the power source before opening the computer to prevent system board or component damage.


Tools and software Requirements

To service the computer, you need the following:

- Torx T-15 screwdriver
- Torx T-15 screwdriver with small diameter shank (for certain front bezel removal)
- Flat-bladed screwdriver (may sometimes be used in place of the Torx screwdriver)
- Phillips #2 screwdriver
- Diagnostics software
- Tamper-resistant T-15 wrench

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.
- 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 monitors or speakers.

SATA hard drives

Serial ATA Hard Drive Characteristics	
Number of pins/conductors in data cable	7/7
Number of pins in power cable	15
Maximum data cable length	39.37 in (100 cm)
Data interface voltage differential	400-700 mV
Drive voltages	3.3 V, 5 V, 12 V
Jumpers for configuring drive	N/A
Data transfer rate	6.0 Gb/s

SATA hard drive cables

SATA data cable

Always use an HP approved SATA 3.0 Gb/s cable as it is fully backwards compatible with the SATA 1.5 Gb/s drives.

Current HP desktop products ship with SATA 3.0 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.

SMART ATA drives


The Self Monitoring Analysis and Recording Technology (SMART) ATA drives for the HP Personal Computers have built-in drive failure prediction that warns the user or network administrator of an impending failure or crash of the hard drive. The SMART drive tracks fault prediction and failure indication parameters such as reallocated sector count, spin retry count, and calibration retry count. If the drive determines that a failure is imminent, it generates a fault alert.

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.

6 Removal and replacement procedures

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

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

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

Serviceability features

The computers include features that make them easy to upgrade and service. A Torx T-15, Phillips, or flat blade screwdriver is needed for many of the installation procedures described in this guide.


Preparation for disassembly


1. Close any open software applications.
2. Exit the operating system.
3. Remove any diskette or compact disc from the computer.
4. Turn off the computer and any peripheral devices that are connected to it.

 **CAUTION:** Turn off the computer before disconnecting any cables.

CAUTION: Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. In some systems the cooling fan is on even when the computer is in the "Standby," or "Suspend" modes. The power cord should always be disconnected before servicing a unit.

5. Disconnect the power cord from the electrical outlet and then from the computer.
6. Disconnect all peripheral device cables from the computer.


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

 **CAUTION:** The screws used in the computer are of different thread sizes and lengths; using the wrong screw in an application may damage the unit.

Access panel

Description	Spare part number
Access panel	787797-001

1. Prepare the computer for disassembly ([Preparation for disassembly on page 23](#)).
2. Loosen the captive Torx screw **(1)** on the back panel that secures the panel to the computer.
3. Slide the side panel toward the back **(2)**, and then pull it away from the computer.

 **NOTE:** Lay the computer on its side to install internal parts.



To replace the access panel, reverse the removal steps.

Front bezel

Description	Spare part number
Front bezel	787795-001

1. Prepare the computer for disassembly ([Preparation for disassembly on page 23](#)).
2. Remove the access panel ([Access panel on page 24](#)).
3. Press outward on the three latches **(1)** on the right side of the bezel.
4. Rotate the right side of the bezel off the chassis, and then remove the bezel from the chassis **(2)**.



To reinstall the front bezel, reverse the removal procedure.

Memory

Description	Spare part number
Memory module, 8-GB	689375-001
Memory module, 4-GB	671613-001
Memory module, 2-GB	671612-001

The computer comes with double data rate 3 synchronous dynamic random access memory (DDR3-SDRAM) dual inline memory modules (DIMMs).

DDR3/DDR3L-SDRAM UDIMMs or SODIMMs

The system board offers four memory sockets.

The memory sockets on the system board can be populated with up to four industry-standard DIMMs. These memory sockets are populated with at least one preinstalled DIMM. To achieve the maximum memory support, you can populate the system board with up to 8 GB of memory configured in a high performing dual channel mode.

For proper system operation, the DDR3/DDR3L UDIMMs or SODIMMs must be:

- industry-standard 240-pin
- unbuffered non-ECC PC3-12800 DDR3L-1600 MHz-compliant
- 1.5 volt DDR3/DDR3L

The DDR3/DDR3L UDIMMs or SODIMMs must also:

- support CAS latency 9 DDR3 1600 MHz (11-11-11 timing)
- contain the mandatory JEDEC SPD information

In addition, the computer supports:

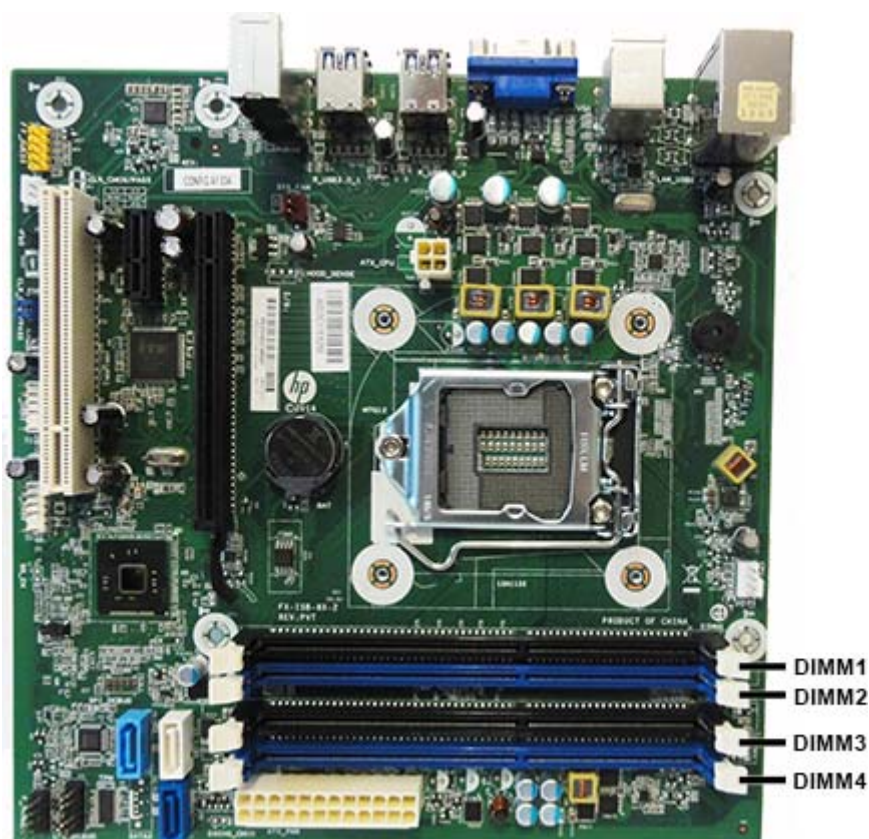
- 512-Mbit, 1-Gbit, 2-Gbit, and 4-Gbit non-ECC memory technologies
- single-sided and double-sided DIMMs
- UDIMMs or SODIMMs constructed with x8 and x16 DDR devices; UDIMMs constructed with x4 SDRAM are not supported



NOTE: The system will not operate properly if you install unsupported DIMMs.

Populating DIMM sockets

There are four DIMM sockets on the system board, with two sockets per channel. The sockets are labeled DIMM1, DIMM2, DIMM3, and DIMM4. Sockets DIMM1 and DIMM2 operate in memory channel B. Sockets DIMM3 and DIMM4 operate in memory channel A.



Description	Socket Color	Insertion Order
DIMM1 socket, Channel A (populate first)	Black	1
DIMM2 socket, Channel A	Blue	2
DIMM3 socket, Channel B	Black	3
DIMM4 socket, Channel B	Blue	4

NOTE: A memory module must occupy the DIMM1/Channel A socket.

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



NOTE: Single channel and unbalanced dual channel memory configurations will result in inferior graphics performance.

- The system will operate in single channel mode if the DIMM sockets are populated in one channel only.
- The system will operate in a higher-performing dual channel mode if the total memory capacity of the DIMMs in Channel A is equal to the total memory capacity of the DIMMs in Channel B. The technology and device width can vary between the channels. For example, if Channel A is populated with one 2-GB DIMM and Channel B is populated with one 4-GB DIMM, the system will operate in dual channel mode.
- The system will operate in flex mode if the total memory capacity of the DIMMs in Channel A is not equal to the total memory capacity of the DIMMs 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. For optimal speed, the channels should be balanced so that the largest amount of memory is spread between the two channels. If one channel will have more memory than the other, the larger amount should be assigned to Channel A. For example, if you are populating the sockets with one 4-GB DIMM, and one 2-GB DIMM, Channel A should be populated with the 4-GB DIMM, and Channel B should be populated with the 2-GB DIMM. With this configuration, 4 GB will run as dual channel and 2 GB will run as single channel.
- In any mode, the maximum operational speed is determined by the slowest DIMM in the system.

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

Removing memory modules



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

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

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

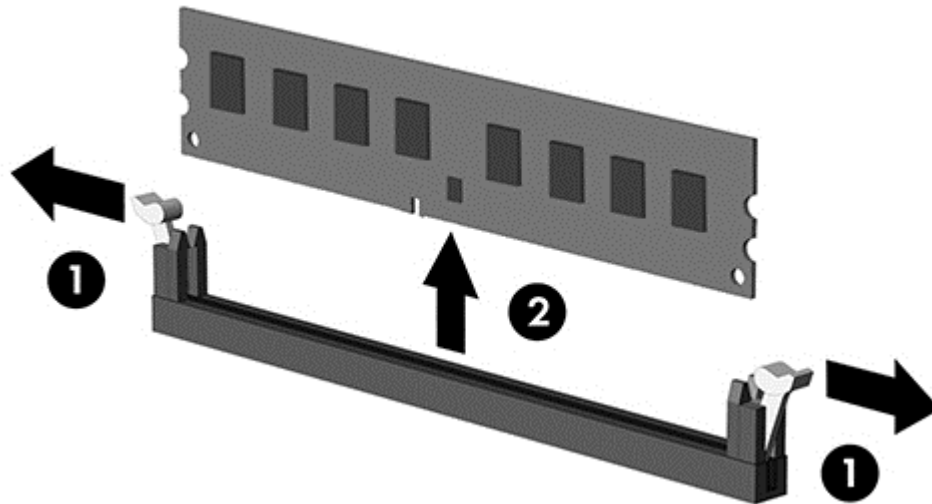
When handling a memory module, be careful not to touch any of the contacts. Doing so may damage the module.

1. Prepare the computer for disassembly ([Preparation for disassembly on page 23](#)).
2. Remove the access panel ([Access panel on page 24](#)).

3. Locate the memory module sockets on the system board.

⚠ WARNING! To reduce risk of personal injury from hot surfaces, allow the internal system components to cool before touching.

4. Open both latches **(1)** of the memory module socket , and remove the memory module from the socket **(2)**.



To install a memory module, reverse the removal procedures.

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

A DIMM must occupy the XMM1 socket.

To create a dual-channel memory configuration, the memory capacity of Channel A must equal the memory capacity of Channel B.

Cable management

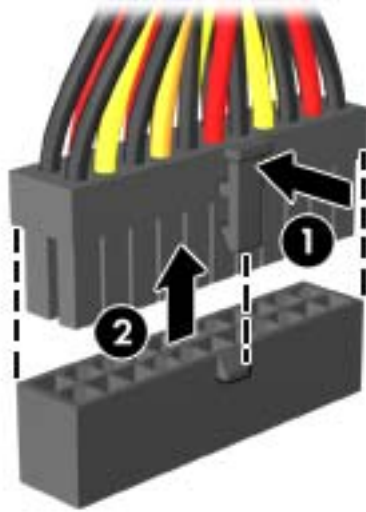
Always follow good cable management practices when working inside the computer.

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

When removing the power supply power cable from the ATX_PWR connector on the system board, always follow these steps:

1. Squeeze on the top of the retaining latch attached to the cable end of the connector **(1)**.
2. Grasp the cable end of the connector and pull it straight up **(2)**.

CAUTION: Always pull the connector - NEVER pull on the cable. Pulling on the cable could damage the cable and result in a failed power supply.



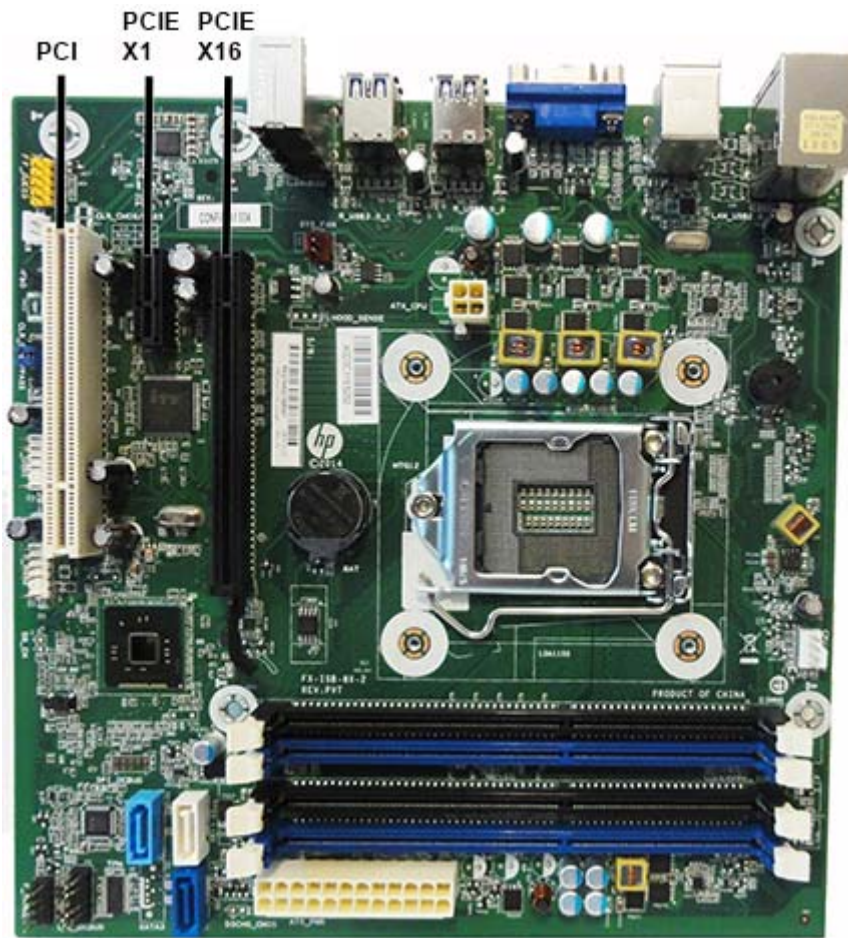
Cable connections

System board connectors are color-coded to make it easier to find the proper connection.

Connector Name	Connector Color	Description
ATX_POWER	white	Power supply, 24-pin
ATX_CPU	white	Power supply, 4-pin
CPU_FAN	white	Heat sink fan
INT_SPKR	white	Speaker
F_PANEL	black	Power switch
F_AUDIO	yellow	Front I/O audio
F_USB1	white	Front I/O USB
SATA0	dark blue	Primary hard drive
SATA1	white	Primary optical drive
SATA2	light blue	Secondary hard drive

Expansion cards

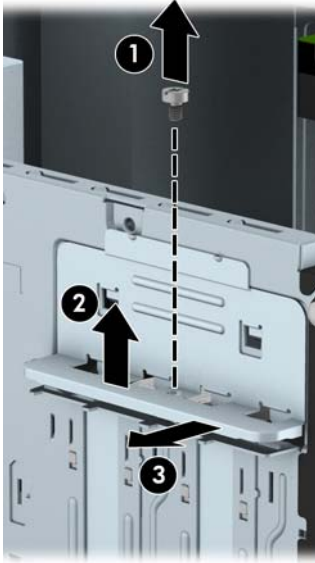
The computer has one PCI Express x1 slot.



To remove an expansion card:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 23](#)).
2. Remove the access panel ([Access panel on page 24](#))

3. Remove the screw that holds down the expansion card retention latch (1) then slide the latch up (2) and pull it off the rear of the chassis (3).



4. Locate the correct vacant expansion socket on the system board and the corresponding expansion slot on the back of the computer chassis.
5. Before installing an expansion card, remove the expansion slot cover or the existing expansion card.

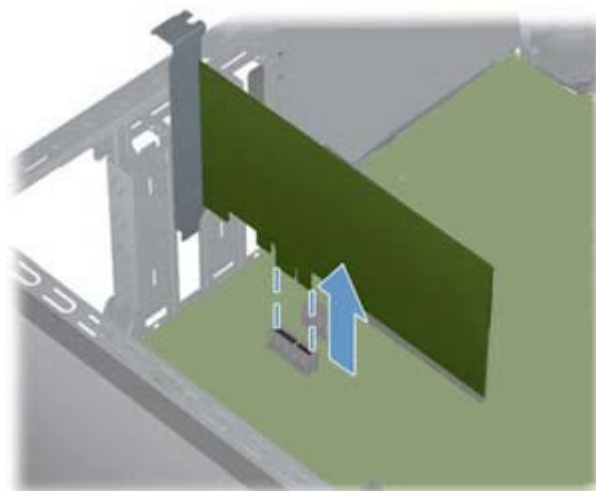


NOTE: Before removing an installed expansion card, disconnect any cables that may be attached to the expansion card.

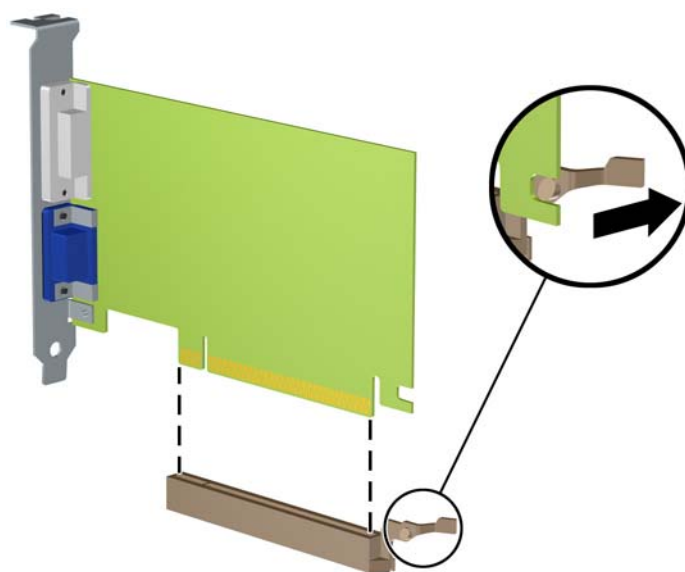
- a. If you are installing an expansion card in a vacant socket, you must use a flatblade screwdriver to pry out one of the metal shields on the rear panel that covers the expansion slot. Be sure to remove the appropriate shield for the expansion card you are installing.



- b. If you are removing a PCI Express x1 card, hold the card at each end and carefully rock it back and forth until the connectors pull free from the socket. Lift the card straight up then away from the inside of the chassis to remove it. Be sure not to scrape the card against other components.



- c. If you are removing a PCI Express x16 card, pull the retention arm on the back of the expansion socket away from the card and carefully rock the card back and forth until the connectors pull free from the socket. Lift the card straight up to remove it. Be sure not to scrape the card against other components.



6. Store the removed card in anti-static packaging.
7. If you are not installing a new expansion card, install an expansion slot cover to close the open slot.

CAUTION: After removing an expansion card, you must replace it with a new card or expansion slot cover for proper cooling of internal components during operation.

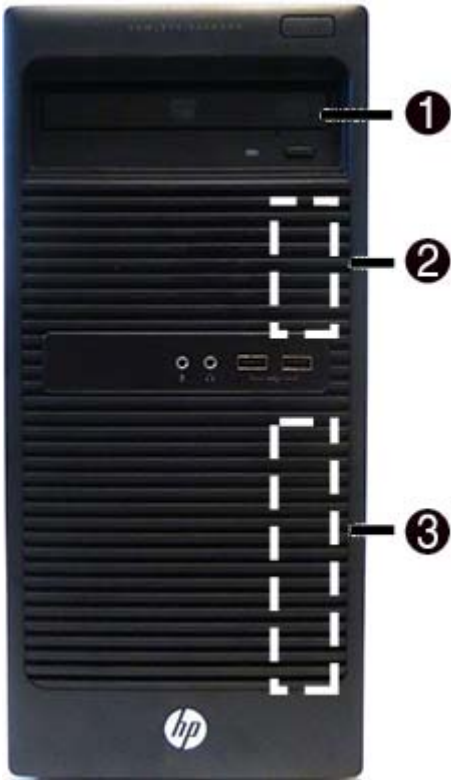
To install an expansion card, reverse the removal procedures.

Connect external cables to the installed card, if needed. Connect internal cables to the system board, if needed.

Drives

Description	Spare part number
SuperMulti DVD±RW drive	690418-001
DVD-ROM drive	581599-001
1 TB, 7200-rpm hard drive	667719-001
500 GB, 7200-rpm hard drive for use in all models	667720-001

The computer supports up to three drives that may be installed in various configurations.




Item	Description
1	Optical drive
2	Secondary 2.5-inch hard drive
3	Primary 3.5-inch hard drive

This section describes the procedure for replacing or upgrading the storage drives. A Torx T-15 screwdriver is needed to remove and install the guide screws on a drive.

Installing additional drives

When installing drives, follow these guidelines:

- The primary Serial ATA (SATA) hard drive must be connected to the dark blue primary SATA connector on the system board labeled SATA0.
- Connect an optical drive to the light blue SATA connector on the system board labeled SATA2.
- Connect a secondary hard drive to white SATA connector labeled SATA1.
- The power cables for the SATA drives connect directly to the power supply.

 **CAUTION:** To prevent loss of work and damage to the computer or drive:

If you are inserting or removing a drive, shut down the operating system properly, turn off the computer, and unplug the power cord. Do not remove a 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 14](#).

Handle a drive carefully; do not drop it.

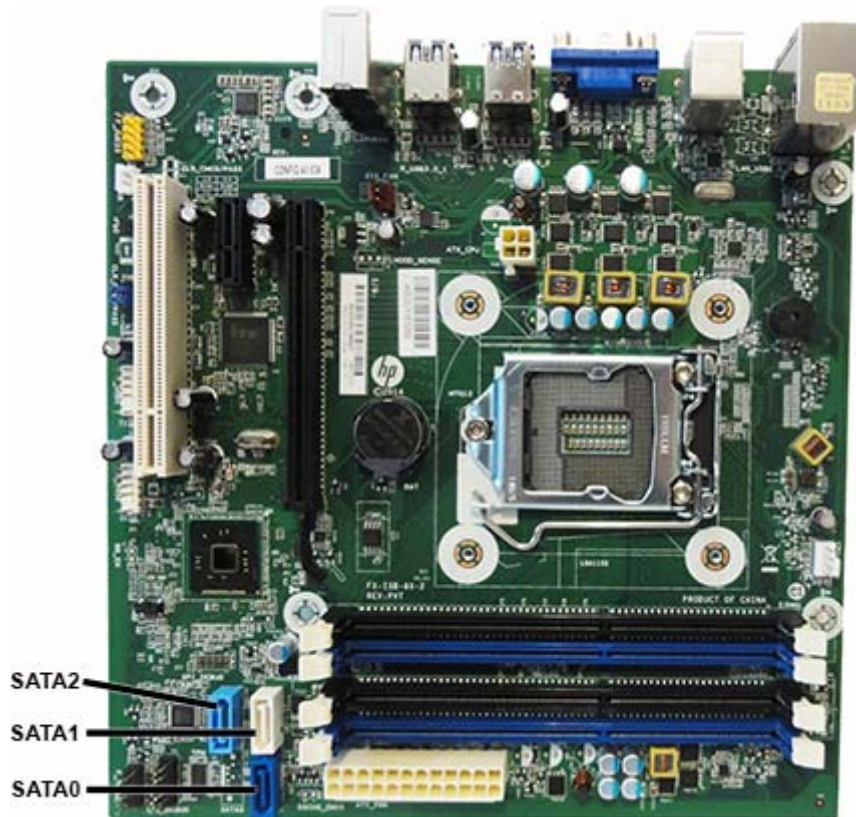
Do not use excessive force when inserting a drive.

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

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

System board drive connections

Refer to the following illustration and table to identify the system board drive connectors.



System Board Drive Connections

Drive	System Board Label	Color
Primary hard drive	SATA0	dark blue
Secondary hard drive	SATA1	white
Optical drive	SATA2	light blue

Removing an optical drive

⚠ CAUTION: All removable media should be taken out of a drive before removing the drive from the computer.


To remove an optical drive:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 23](#)).
2. Remove the access panel ([Access panel on page 24](#)).
3. Remove the front bezel ([Front bezel on page 25](#)).
4. Disconnect the power and data cables **(1)** from the rear of the optical drive.
5. Remove the two Torx screws **(2)** that secure the drive to the computer.
6. Slide the drive out of the computer **(3)**.

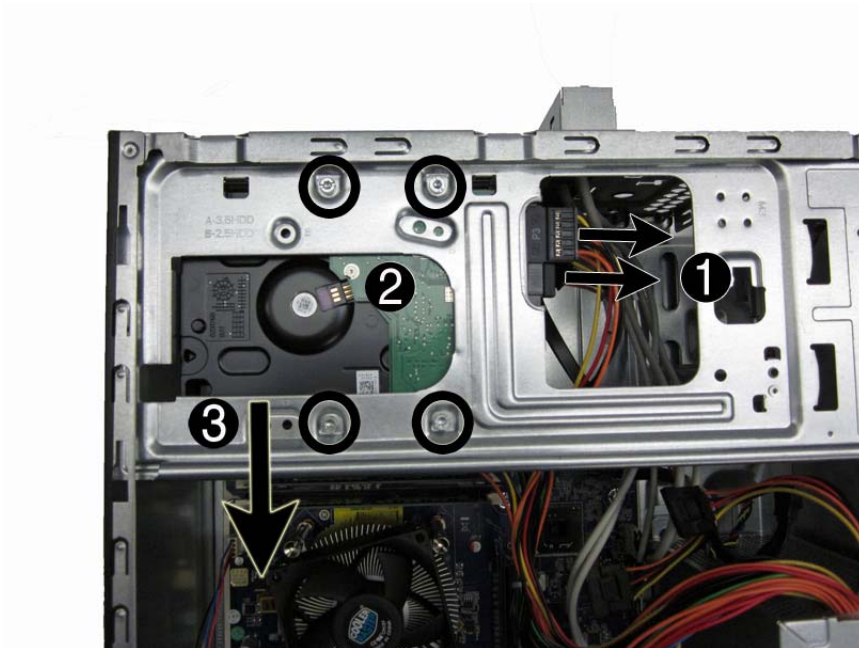


To install an optical drive, reverse the removal procedures.

Removing a hard drive

 **NOTE:** Before you remove the old hard drive, be sure to back up the data from the old hard drive so that you can transfer the data to the new hard drive. Also, if you are replacing the primary hard drive, make sure you have created a Recovery Disc Set to restore the operating system, software drivers, and any software applications that were preinstalled on the computer.

1. Prepare the computer for disassembly ([Preparation for disassembly on page 23](#)).
2. Remove the access panel ([Access panel on page 24](#)).
3. Disconnect the power and data cables **(1)** from the rear of the hard drive.
4. Remove the four Torx screws **(2)** that secure the drive to the computer.
5. Slide the hard drive toward the bottom of the computer **(3)**, and then remove it from the computer..

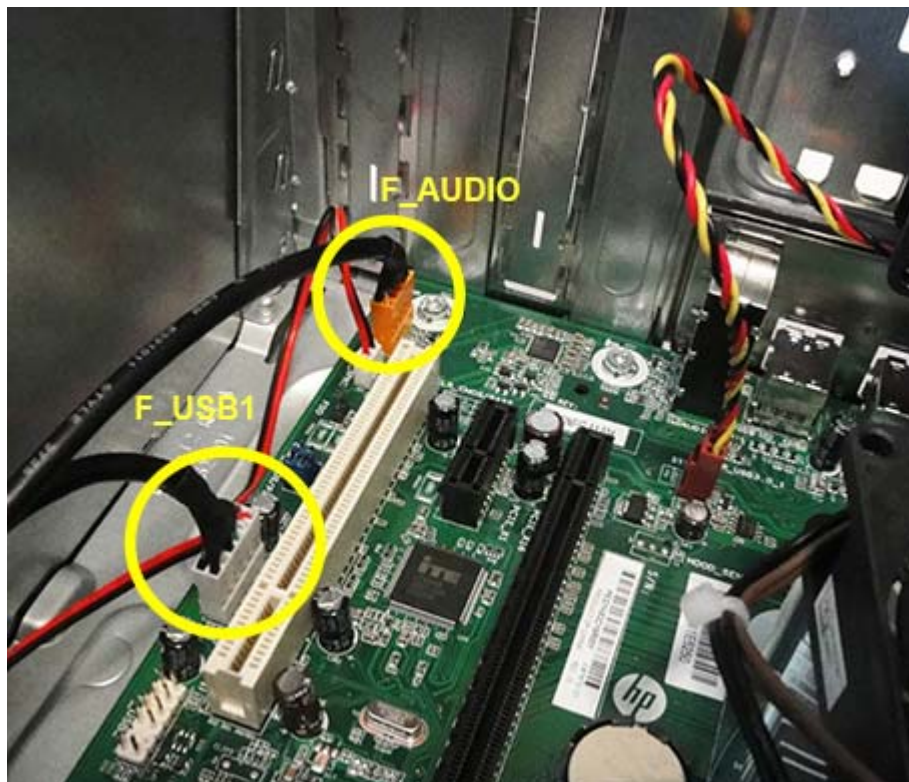


To install a hard drive, reverse the removal procedures.

Front I/O and USB panel housing assembly

Description	Spare part number
Front I/O and USB assembly	787798-001

1. Prepare the computer for disassembly ([Preparation for disassembly on page 23](#)).
2. Remove the access panel ([Access panel on page 24](#))
3. Lay the computer on its side with the front facing toward you.
4. Remove the front bezel ([Front bezel on page 25](#)).
5. Remove the cables from the metal clip built into the bottom of the chassis, and then unplug the two cables from the yellow F_AUDIO and white F_USB1 connectors.



6. Push in on the lever labeled 'PUSH'.



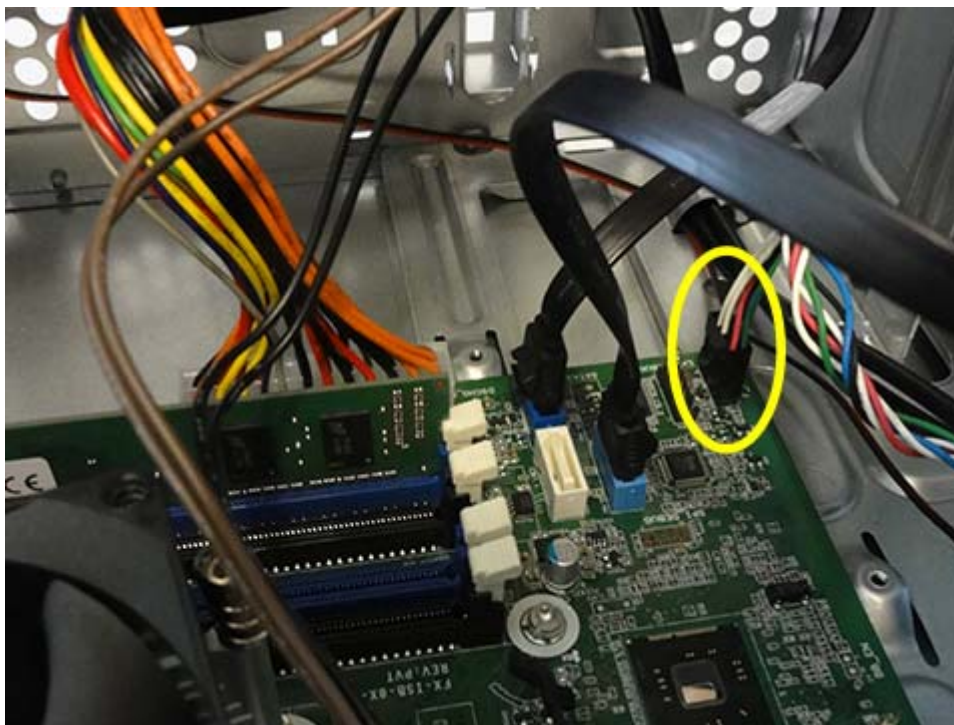
7. Pull the assembly outward away from the front of the chassis while guiding the cables through the hole in the chassis.

To install the housing assembly, reverse the removal procedures.

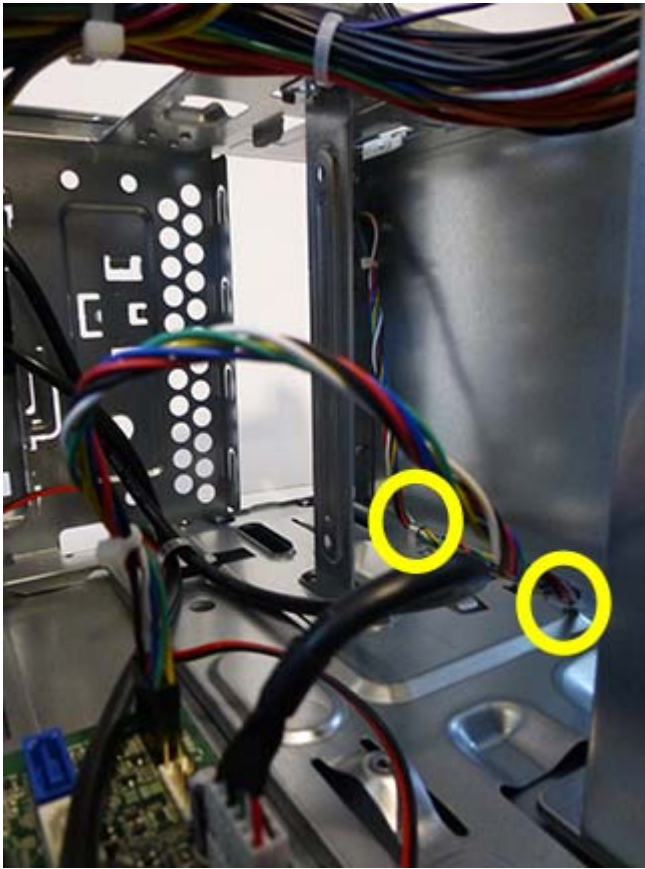
Power switch/LED assembly

Description	Spare part number
Power switch/LED assembly	787796-001

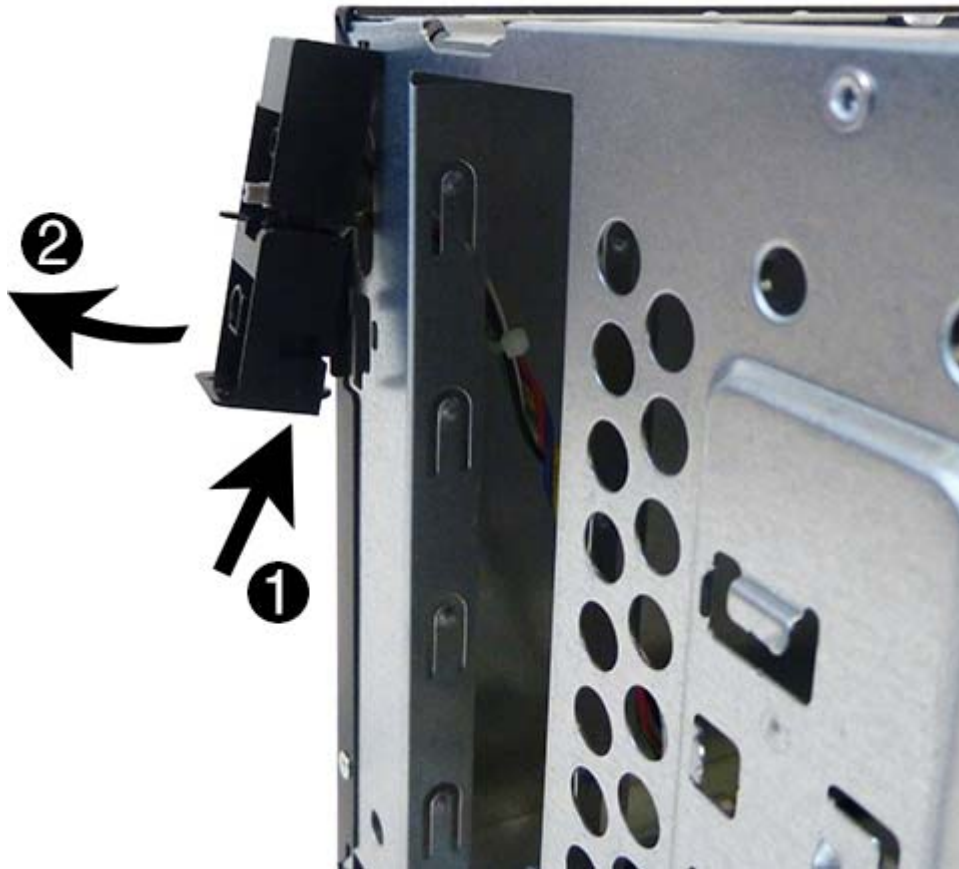
1. Prepare the computer for disassembly ([Preparation for disassembly on page 23](#)).
2. Remove the access panel ([Access panel on page 24](#)).
3. Remove the front bezel ([Front bezel on page 25](#)).
4. Remove the optical drive ([Removing an optical drive on page 37](#)).
5. Disconnect the braided cables from the black system board connector labeled F_PANEL.



6. Remove the cable from the metal clip built into the computer in the optical drive bay.



7. From the outside of the computer, push the tab on the bottom of the assembly **(1)** to disengage it from the computer, and then rotate the assembly upward **(2)**, and pull it away from the computer while threading the cable through the front of the chassis.



To install the power switch/LED assembly, reverse the removal procedures.

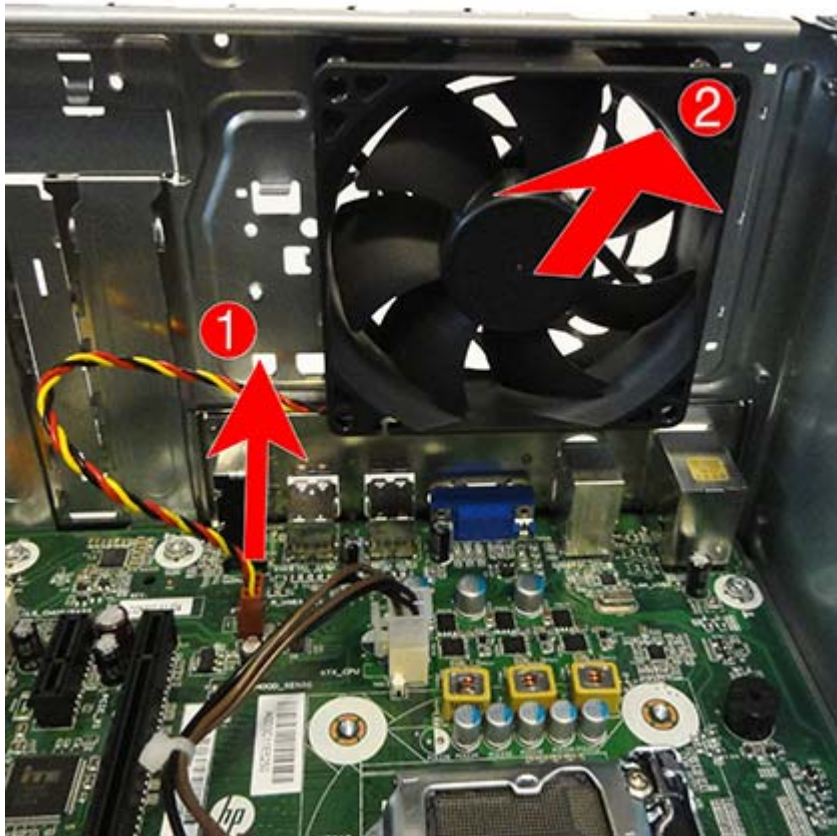
System fan

Description	Spare part number
System fan	657103-001

1. Prepare the computer for disassembly ([Preparation for disassembly on page 23](#)).
2. Remove the access panel ([Access panel on page 24](#)).
3. Remove the front bezel ([Front bezel on page 25](#)).
4. Remove the optical drive ([Removing an optical drive on page 37](#)).
5. From the back of the computer, remove the four Phillips screws that secure the fan to the inside of the computer.



6. From the inside of the computer, disconnect the cable from the red system board connector labeled SYS_FAN **(1)**, and then remove the fan from the computer **(2)**.



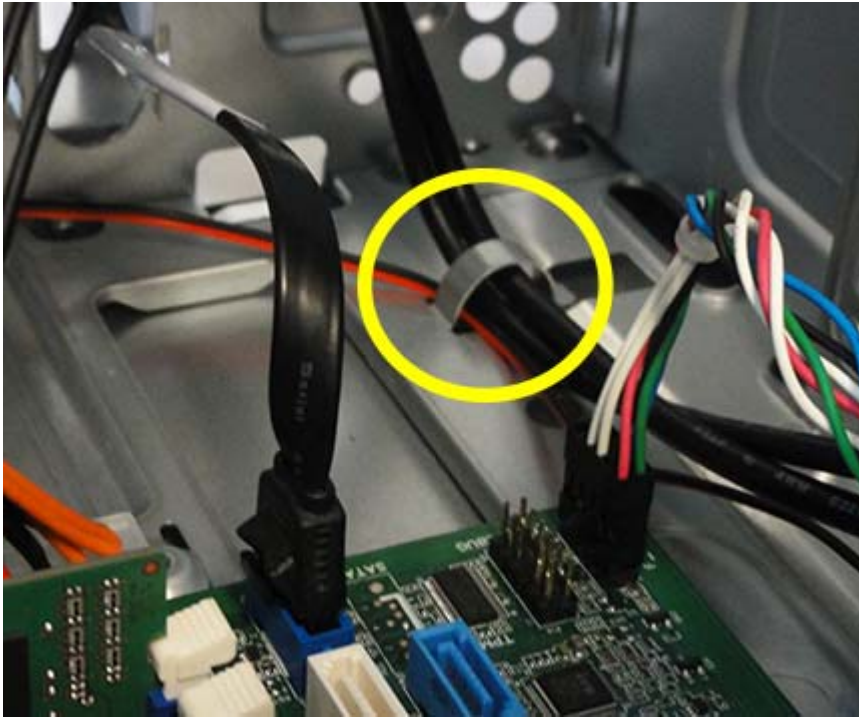
To install the system fan, reverse the removal procedures.

Speaker


Description	Spare part number
Speaker	751593-001

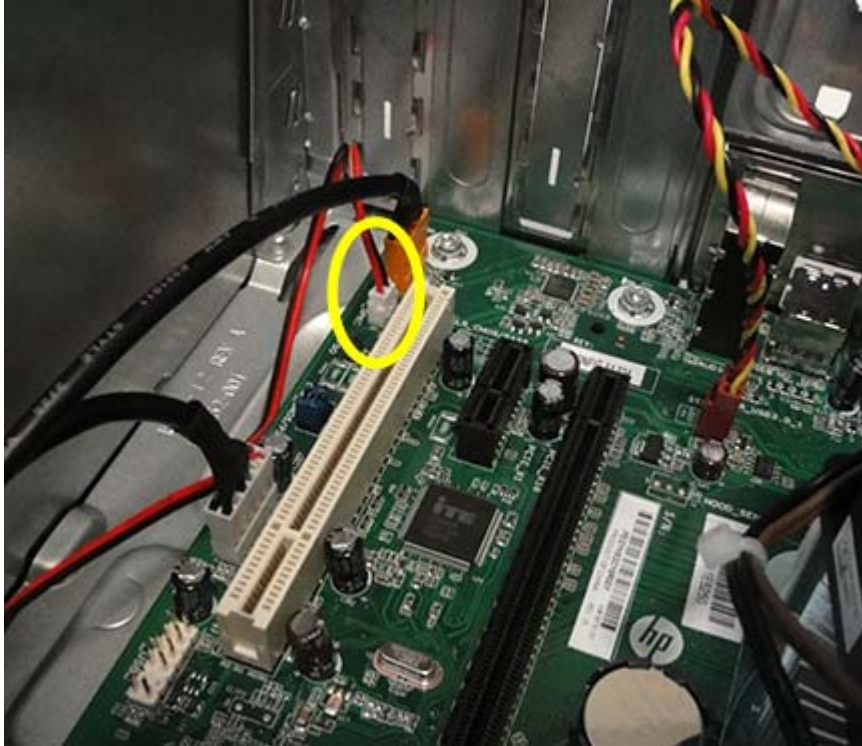
The speaker is attached to the front of the chassis under the rotating drive cage.

1. Prepare the computer for disassembly ([Preparation for disassembly on page 23](#)).
2. Remove the access panel ([Access panel on page 24](#)).
3. Remove the front bezel ([Front bezel on page 25](#)).
4. Lift the metal clip that secures the speaker cable.




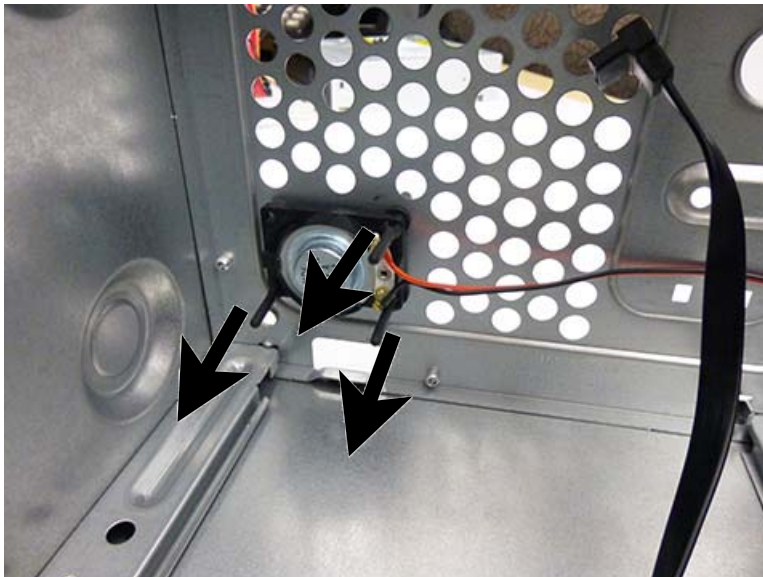
5. Disconnect the speaker wire from the white system board connector labeled INT_SPKR.

 **NOTE:** System board appearance may vary.



6. From the inside of the computer, pull the rubber posts into the computer to disengage them.

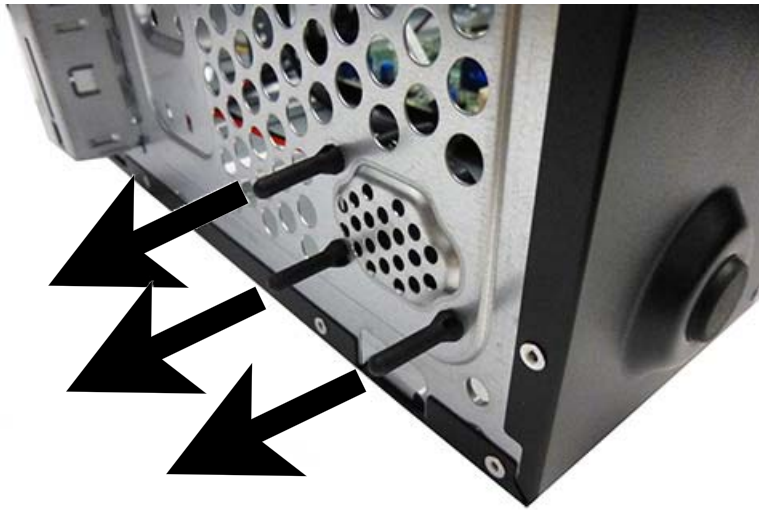
 **NOTE:** When attempting to disengage the rubber posts, it may help to move the posts back and forth as you pull them into the chassis.



7. Pull the speaker into the computer.

To install the speaker, reverse the removal procedures.

When installing the speaker, when you pull the rubber posts from the front of the chassis to secure the speaker, make sure to pull the posts until they click into place.

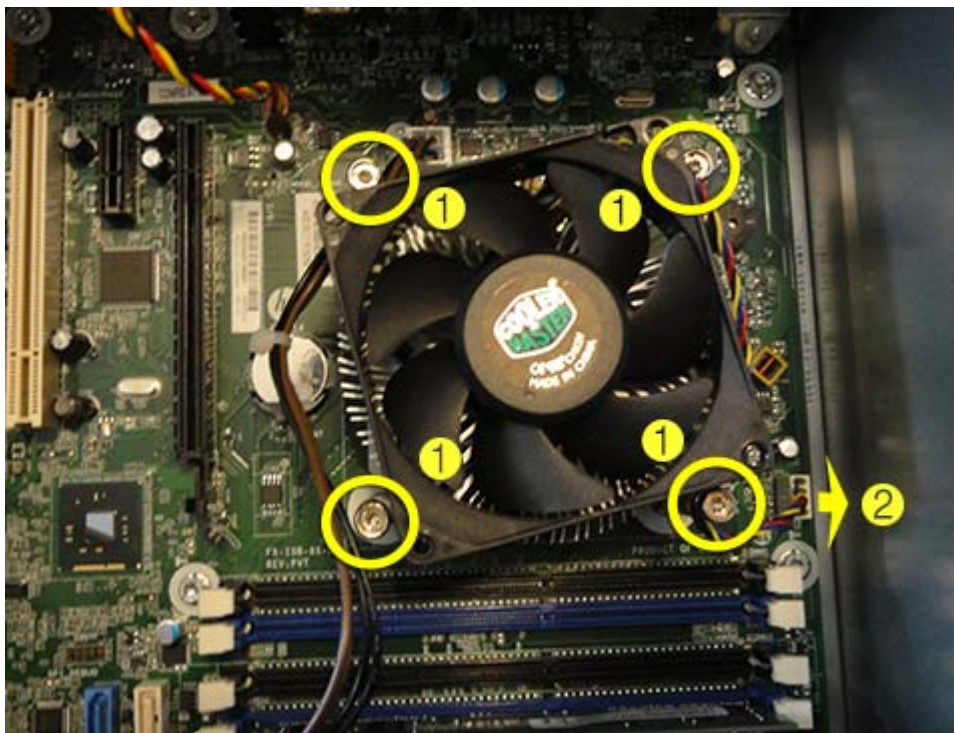


Fan sink assembly

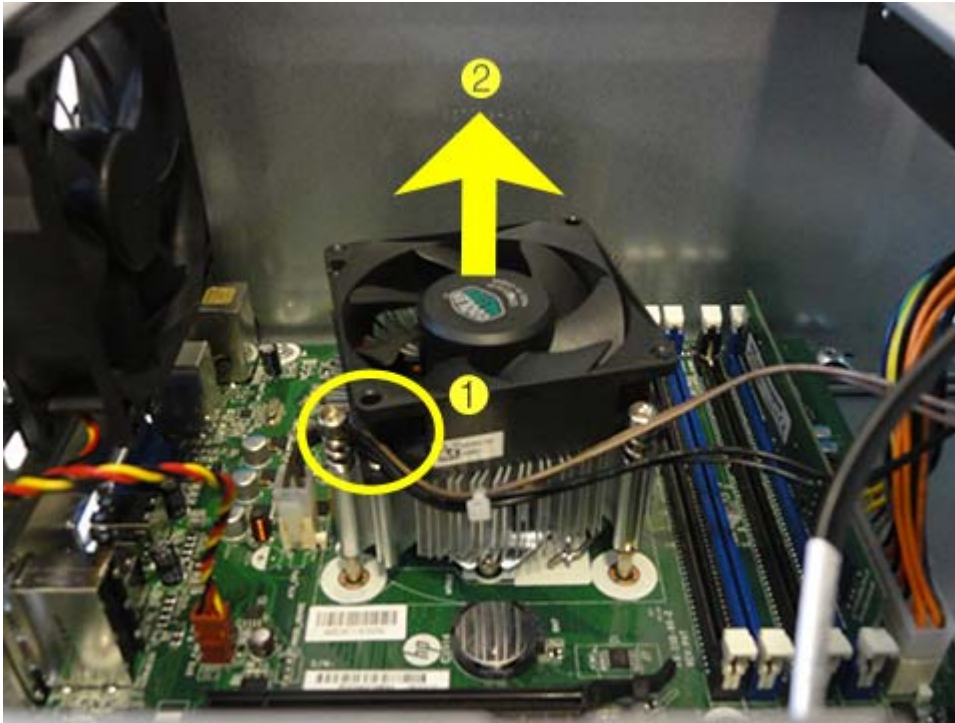
Description	Spare part number
Fan sink	667727-001

1. Prepare the computer for disassembly ([Preparation for disassembly on page 23](#)).
2. Remove the access panel ([Access panel on page 24](#)).
3. Disconnect the fan sink cable from the white system board connector labeled CPU_FAN **(1)**.
4. Loosen the four captive Torx screws **(2)** that secure the fan sink to the system board.

 **NOTE:** System board appearance may vary.



5. Lift the heat sink from the processor and set it on its side to keep from contaminating the work area with thermal grease.



Reverse the removal procedures to install a fan sink.

When reinstalling an existing heat sink, make sure that its bottom has been cleaned with an alcohol wipe and fresh thermal grease has been applied to the top of the processor. New heat sinks come from the factory with fresh thermal grease already applied.

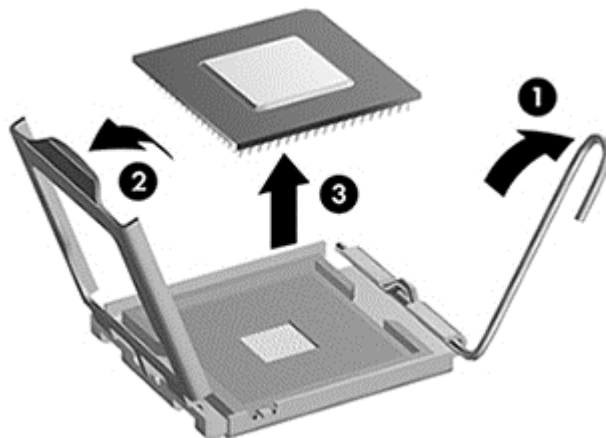
CAUTION: Heat sink retaining screws should be tightened in diagonally opposite pairs (as in an X) to evenly seat the heat sink to the processor. This is especially important as the pins on the socket are very fragile and any damage to them may require replacing the system board.

Processor

Description	Spare part number
Intel Core i7-4770 processor, 3.4 GHz, 8-MB L3 cache, 86W	727373-001
Intel Core i5-4570 processor, 3.2 GHz, 6-MB L3 cache, 86W	727380-001
Intel Core i3-4130 processor, 3.4 GHz, 3-MB L3 cache, 54W	742560-001
Intel Pentium G3220 processor, 3.0 GHz, 3-MB L3 cache, 54W	742564-001
Intel Celeron G1810 processor, 2.7 GHz, 2-MB L3 cache, 54W	758756-001

CAUTION: To avoid damage, do NOT handle the pins in the processor socket. Damaged may require system board replacement.

1. Prepare the computer for disassembly ([Preparation for disassembly on page 23](#)).
2. Remove the access panel ([Access panel on page 24](#)).
3. Remove the fan sink ([Fan sink assembly on page 49](#)).
4. Rotate the locking lever to its full open position **(1)**, raise and rotate the microprocessor retainer to its full open position **(2)**, and then carefully lift the processor from the socket **(3)**.



CAUTION: Heat sink retaining screws should be tightened in diagonally opposite pairs (as in an X) to evenly seat the heat sink on the processor. This is especially important as the pins on the socket are very fragile and any damage to them may require replacing the system board.

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 ROM BIOS can be found at: <http://h18000.www1.hp.com/support/files>

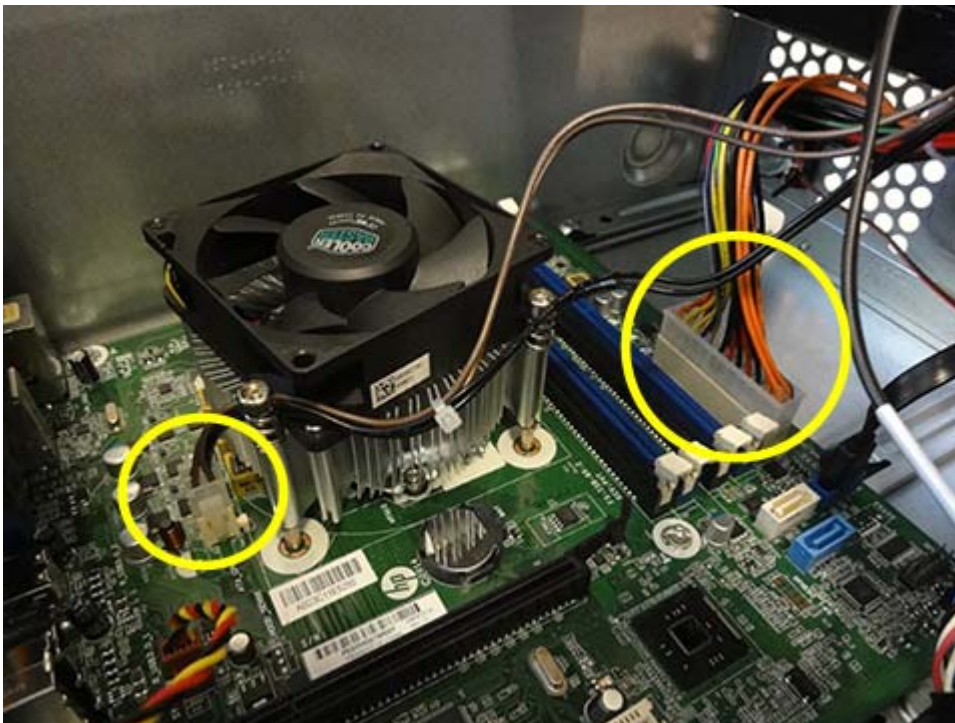
Power supply

Description	Spare part number
Power supply, 300W, EStar	712298-001
Power supply, 300W, for use only in India and Southeast Asia	689005-001

⚠ WARNING! Voltage is always present on the system board when the computer is plugged into an active AC outlet. To avoid possible personal injury and damage to the equipment the power cord should be disconnected from the computer and/or the AC outlet before opening the computer.

📝 NOTE: When installing a new power supply, be sure to set the red switch to the setting (230 V or 115 V) appropriate for the country in which the computer is used.

1. Prepare the computer for disassembly ([Preparation for disassembly on page 23](#)).
2. Remove the access panel ([Access panel on page 24](#)).
3. Disconnect the power cables from the system board connectors labeled ATX_CPU and ATX_PWR.



4. From the rear of the computer, remove the four Torx screws that secure the power supply to the chassis.

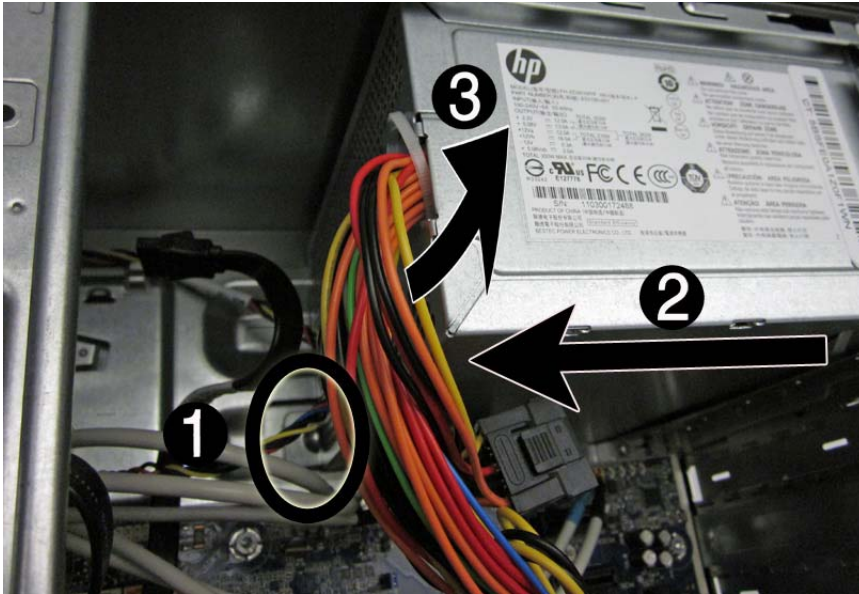


5. From the inside of the computer, cut the plastic tie that secures the power supply cables to the drive cage.



6. Inside of the unit, press the power supply release latch on the chassis base (1).

7. Slide the power supply toward the front of the computer **(2)**, then lift the power supply out of the computer **(3)**.



To install the power supply, reverse the removal procedure.

System board



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

Description	Spare part number
System board for use in non-Windows 8 models	787304-001
System board for use in models with Windows 8 Standard	787304-501
System board for use in models with Windows 8 Professional	787304-601

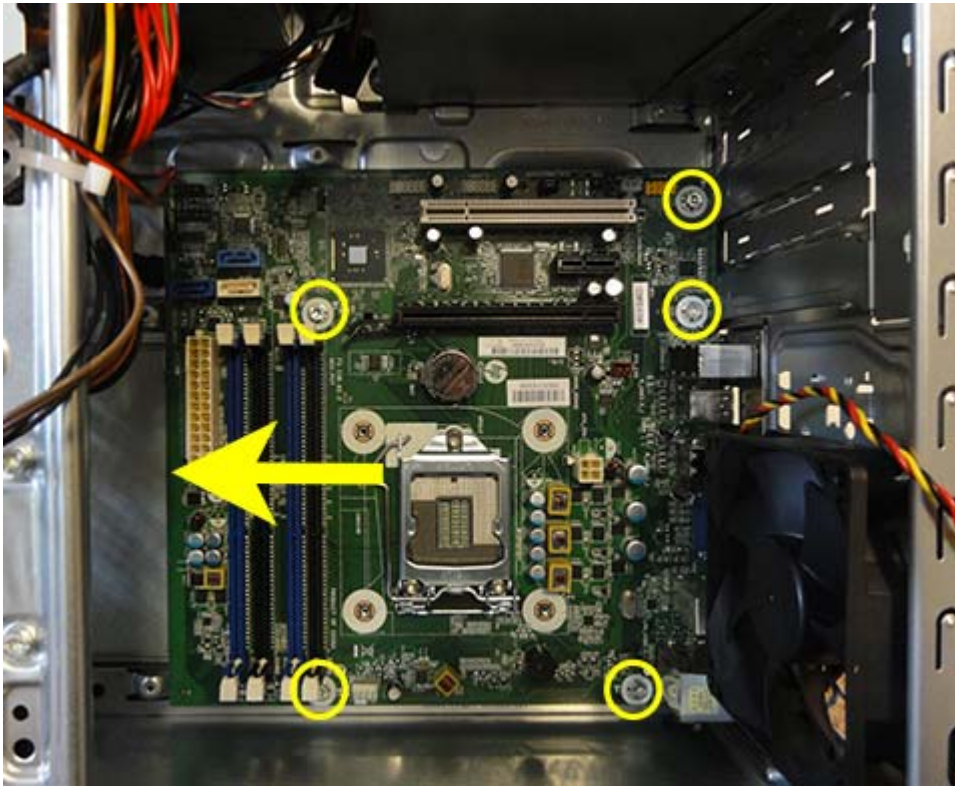
When replacing the system board, be sure that the following components are removed from the defective system board and installed on the replacement system board:

- Memory modules
- Expansion cards
- Fan sink
- Processor


To remove the system board:


1. Prepare the computer for disassembly ([Preparation for disassembly on page 23](#)).
2. Remove the access panel ([Access panel on page 24](#)).
3. Remove the front bezel ([Front bezel on page 25](#)).
4. Disconnect all cables from the system board.
5. Remove the five screws that secure the system board to the chassis.

6. Slide the system board toward the front of the chassis, and then lift it up and out of the chassis.



To install the system board, reverse the removal procedure.

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

 **NOTE:** After installing a new 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 ROM BIOS can be found at: <http://h18000.www1.hp.com/support/files>.

A Computer Setup (F10) Utility

Computer Setup (F10) Utilities

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

- Change factory default settings.
- Set the system date and time.
- Set, view, change, or verify 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, optical drives, or USB flash media devices.
- Enable Quick Boot, which is faster than Full Boot but does not run all of the diagnostic tests run during a Full Boot. You can set the system to:
 - ☐ always Quick Boot (default);
 - ☐ periodically Full Boot (from every 1 to 30 days); or
 - ☐ always Full Boot.
- Select Post Messages Enabled or Disabled to change the display status of Power-On Self-Test (POST) messages. Post Messages Disabled suppresses most POST messages, such as memory count, product name, and other non-error text messages. If a POST error occurs, the error is displayed regardless of the mode selected. To manually switch to Post Messages Enabled during POST, press any key (except [F1](#) through [F12](#)).
- 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 a setup password that controls access to the Computer Setup (F10) Utility and the settings described in this section.
- Secure integrated I/O functionality, including the serial, USB, or parallel ports, audio, or embedded NIC, so that they cannot be used until they are unsecured.
- Enable or disable removable media boot ability.


- Solve system configuration errors detected but not automatically fixed during the Power-On Self-Test (POST).
- Execute self-tests on a specified ATA hard drive (when supported by drive).
- Enable or disable DriveLock security (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 monitor light turns green 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 monitor light turns green to access the utility.

3. A choice of five headings appears in the Computer Setup Utilities menu: File, Storage, Security, Power, and Advanced.
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 **File > Save Changes and Exit**.
 - If you have made changes that you do not want applied, select **Ignore Changes and Exit**.
 - To reset to factory settings or previously saved default settings (some models), select **Apply Defaults and Exit**. This option will restore the original factory system defaults.

 **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 CMOS could become corrupted. It is safe to turn off the computer only after exiting the F10 Setup screen.

Computer Setup—File



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

Table A-1 Computer Setup—File

Option	Description
System Information	Lists: <ul style="list-style-type: none">• Manufacturer• Product name• SKU number• Serial Number• Asset Tag• Born on Date• System Board ID• Product Configuration ID• System Board CT Number• BIOS Revision• BIOS Date• Processor Type• Processor Speed• Memory Size
About	Displays copyright notice.
Set Time and Date	Allows you to set system time and date.
Apply Defaults and Exit	Applies the currently selected default settings and clears any established passwords.
Ignore Changes and Exit	Exits Computer Setup without applying or saving any changes.
Save Changes and Exit	Saves changes to system configuration or default settings and exits Computer Setup.

Computer Setup—Storage



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

Table A-2 Computer Setup—Storage

Option	Description
Device Configuration	<p>Lists all installed BIOS-controlled storage devices.</p> <p>When a device is selected, detailed information and options are displayed. The following options may be presented:</p> <ul style="list-style-type: none">• Hard Disk: Size, model, firmware version, serial number.• CD-ROM: Model, firmware version, serial number.
Storage Options	<p>SATA Emulation</p> <p>Allows you to choose how the SATA controller and devices are accessed by the operating system. There are three supported options: IDE and AHCI (default).</p> <p>CAUTION: SATA emulation changes may prevent access to existing hard drive data and degrade or corrupt established volumes.</p> <p>IDE - This is the most backwards-compatible setting of the options. Operating systems usually do not require additional driver support in IDE mode.</p> <p>AHCI (default option) - Allows operating systems with AHCI device drivers loaded to take advantage of more advanced features of the SATA controller.</p>

Table A-2 Computer Setup—Storage (continued)

Boot Order	<p>Allows you to:</p> <ul style="list-style-type: none">• EFI Boot Sources: Specify the order in which EFI 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. Each device on the list may be individually excluded from or included for consideration as a bootable operating system source. <p>EFI boot sources always have precedence over legacy boot sources.</p> <ul style="list-style-type: none">• Legacy Boot Sources: 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. Each device on the list may be individually excluded from or included for consideration as a bootable operating system source. <p>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).</p> <p>NOTE: To drag a device to a preferred place, press Enter. To remove the device from consideration as a bootable device, press F5.</p> <p>You can use F5 to disable individual boot items, as well as disable EFI boot and/or legacy boot.</p> <p>NOTE: MS-DOS drive lettering assignments may not apply after a non-MS-DOS operating system has started.</p> <p>Shortcut to Temporarily Override Boot Order</p> <p>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 boot menu) and then F9 (Boot Order), or only F9 (skipping the boot menu) when the monitor light turns green. 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.</p>
-------------------	---

Computer Setup—Security


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

Table A-3 Computer Setup—Security

Option	Description
Setup Password	<p>Allows you to set and enable a setup (administrator) password.</p> <p>NOTE: If the setup password is set, it is required to change Computer Setup options, flash the ROM, and make changes to certain plug and play settings under Windows.</p>
Power-On Password	<p>Allows you to set and enable a 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.</p>
Device Security	<p>Allows you to set Device Available/Device Hidden (default is Device Available) for:</p> <ul style="list-style-type: none">• System audio• Network controller• SATA ports (varies by model)

Table A-3 Computer Setup—Security (continued)

USB Security	Allows you to set Enabled/Disabled (default is Enabled) for: <ul style="list-style-type: none">• Front USB Ports• Rear USB Ports• Accessory USB Ports
Slot Security	Allows you to disable any PCI or PCI Express slot. Default is enabled.
Network Boot	Enables/disables the computer's ability to boot from an operating system installed on a network server. (Feature available on NIC models only; the network controller must be either a PCI expansion card or embedded on the system board.) Default is enabled.
System IDs	read-only unless entered using Ctrl+A . Allows you to set: <ul style="list-style-type: none">• Product Name• Serial Number• Universal Unique Identifier (UUID) number. The UUID can only be updated if the current chassis serial number is invalid. (These ID numbers are normally set in the factory and are used to uniquely identify the system.)• SKU Number• Family Name (always read-only)• Asset tag (18-byte identifier), a property identification number assigned by the company to the computer.• Feature Byte• Build ID• Keyboard locale setting for System ID entry.

Table A-3 Computer Setup—Security (continued)

System Security (these options are hardware dependent)	<p>Data Execution Prevention (enable/disable) - Helps prevent operating system security breaches. Default is enabled.</p> <p>Virtualization Technology (enable/disable) - Controls the virtualization features of the processor. Changing this setting requires turning the computer off and then back on. Default is disabled.</p>
Secure Boot Configuration	<p>This is a feature of Windows 8.</p> <ul style="list-style-type: none">• Legacy Support—Enable/Disable. Allows you to turn off all legacy support on the computer, including booting to DOS, running legacy graphics cards, booting to legacy devices, and so on. If set to disable, legacy boot options in Storage > Boot Order are not displayed. Default is enabled.• Secure Boot—Enable/Disable. Allows you to make sure an operating system is legitimate before booting to it, making Windows resistant to malicious modification from preboot to full OS 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. Default is disabled, except for Windows 8 systems which have this setting enabled. Secure Boot enabled also sets Legacy Support to disabled.• Key Management—This option lets you manage the custom key settings.<ul style="list-style-type: none">◦ Clear Secure Boot Keys—Don't Clear/Clear. Allows you to delete any previously loaded custom boot keys. Default is Don't Clear.◦ Key Ownership—HP Keys/Custom Keys. Selecting Custom Mode allows you to modify the contents of the secure boot signature databases and the platform key (PK) that verifies kernels during system start up, allowing you to use alternative operating systems. Selecting HP Keys causes the computer boot using the preloaded HP-specific boot keys. Default is HP Keys.• Fast Boot—Enable/Disable. Fast boot disables the ability to interrupt boot, such as pressing f keys to access items before the operating system loads. Default is disabled. <p>NOTE: If Windows 8 detects a serious error, it will interrupt the boot process automatically and display advanced boot options.</p> <p>From Windows 8, you can press Shift and select Restart to access the screen that lets you boot to a device or troubleshoot your computer.</p>

Computer Setup—Power



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

Table A-4 Computer Setup—Power

Option	Description
Hardware Power Management	SATA Power Management – Enables or disables SATA bus and/or device power management. Default is enabled.
	S5 Wake on LAN – Enables or disables remotely waking up the computer from S5 (power is off) power state. Default is disabled.
Thermal	CPU Fan Speed - Display the CPU fan speed in rpm.
	CPU Fan Check (<CTRL-A>/Advanced Mode only) – Enable/Disable the CPU Fan Check.

Computer Setup—Advanced

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

Option	Heading
Power-On Options	Allows you to set:
	<ul style="list-style-type: none">• POST messages (enable/disable). Enabling this feature will cause the system to display POST error messages, which are error messages displayed on the monitor during the Power On Self Test if the BIOS encounters some kind of problem while starting the PC. A POST error message will only display on screen if the computer is capable of booting this far. If the POST detects an error before this point, a beep code is generated instead. Default is disabled.• After Power Loss (off/on/previous state). Default is Power off. Setting this option to:<ul style="list-style-type: none">◦ 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. <p>NOTE: If you turn off power to the computer using the switch on a power strip, you will not be able to use the suspend/sleep feature or the Remote Management features.</p> <ul style="list-style-type: none">• POST Delay (in seconds). Enabling this feature will add a user-specified delay to the POST process. This delay is sometimes needed for hard disks on some PCI cards that spin up very slowly, so slowly that they are not ready to boot by the time POST is finished. The POST delay also gives you more time to select F10 to enter Computer (F10) Setup. Default is None.
BIOS Power-On	Allows you to set the computer to turn on automatically at a time you specify.

Bus Options

Allows you to enable or disable:

- PCI SERR# Generation. Default is enabled.
- PCI VGA Palette Snooping, which sets the VGA palette snooping bit in PCI configuration space; only needed when more than one graphics controller is installed. Default is disabled.

Device Options

Allows you to set:

- Num Lock State at Power-On (off/on). Default is on.
 - Internal Speaker (does not affect external speakers). Default is enabled.
 - NIC PXE Option ROM Download (enabled, disabled). Default is enable.
This option will be hidden when the Network Controller device security is set to Disable.
 - Multi-Processor (enable/disable). Use this option to disable multi-processor support under the OS. Default is enabled.
 - Hyper threading (enable/disable). Use this option to disable processor hyper-threading.
 - Processor Frequency Multiplier - Available only via <CTRL-A>/Advanced Mode
-

B 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 mm² 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, 0.75mm² 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 mm² conductor size. Wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7A, 125V) configuration.

C POST Error Messages

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 57](#).

POST Numeric Codes and Text Messages

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


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

Table C-1 Numeric Codes and Text Messages

Control panel message	Description	Recommended action
101-Option ROM Checksum Error	System ROM or expansion board option ROM checksum.	<ol style="list-style-type: none">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 Appendix B, Password Security and Resetting CMOS on page 77.)5. If the message disappears, there may be a problem with the expansion card.6. Replace the system board.
103-System Board Failure	DMA or timers.	<ol style="list-style-type: none">1. Clear CMOS. (See Appendix B, Password Security and Resetting CMOS on page 77.)2. Remove expansion boards.3. Replace the system board.
110-Out of Memory Space for Option ROMs	Recently added PCI expansion card contains an option ROM too large to download during POST.	<ol style="list-style-type: none">1. If a PCI expansion card was recently added, remove it to see if the problem remains.2. In Computer Setup, set Advanced > Device Options > NIC PXE Option ROM Download to DISABLE to prevent PXE option ROM for the internal NIC from being downloaded during POST to free more memory for an expansion card's option ROM. Internal PXE option ROM is used for booting from the NIC to a PXE server.

Table C-1 Numeric Codes and Text Messages (continued)

Control panel message	Description	Recommended action
162-System Options Not Set	Configuration incorrect. RTC (real-time clock) battery may need to be replaced.	Run Computer Setup and check the configuration in Advanced > Onboard Devices . Reset the date and time under Control Panel . 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.
163-Time & Date Not Set	Invalid time or date in configuration memory. RTC (real-time clock) battery may need to be replaced.	Reset the date and time under Control Panel (Computer Setup can also be used). If the problem persists, replace the RTC battery. See the Removal and Replacement section for instructions on installing a new battery, or contact an authorized dealer or reseller for RTC battery replacement.
163-Time & Date Not Set	CMOS jumper may not be properly installed.	Check for proper placement of the CMOS jumper if applicable.
164-MemorySize Error	Memory amount has changed since the last boot (memory added or removed).	Press the F1 key to save the memory changes.
164-MemorySize Error	Memory configuration incorrect.	<ol style="list-style-type: none"> 1. Run Computer Setup or Windows utilities. 2. Make sure the memory module(s) are installed properly. 3. If third-party memory has been added, test using HP-only memory. 4. Verify proper memory module type.
201-Memory Error	RAM failure.	<ol style="list-style-type: none"> 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.
213-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.	<ol style="list-style-type: none"> 1. Verify proper memory module type. 2. Try another memory socket. 3. Replace DIMM with a module conforming to the SPD standard.
214-DIMM Configuration Warning	Populated DIMM Configuration is not optimized.	Rearrange the DIMMs so that each channel has the same amount of memory.

Table C-1 Numeric Codes and Text Messages (continued)

Control panel message	Description	Recommended action
219-ECC Memory Module Detected ECC Modules not supported on this Platform	Recently added memory module(s) support ECC memory error correction.	<ol style="list-style-type: none"> 1. If additional memory was recently added, remove it to see if the problem remains. 2. Check product documentation for memory support information.
301-Keyboard Error	Keyboard failure.	<ol style="list-style-type: none"> 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.
303-Keyboard Controller Error	I/O board keyboard controller.	<ol style="list-style-type: none"> 1. Reconnect keyboard with computer turned off. 2. Replace the system board.
304-Keyboard or System Unit Error	Keyboard failure.	<ol style="list-style-type: none"> 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.
501-Display Adapter Failure	Graphics display controller.	<ol style="list-style-type: none"> 1. Reseat the graphics card (if applicable). 2. Clear CMOS. (See Appendix B, Password Security and Resetting CMOS on page 77.) 3. Verify monitor is attached and turned on. 4. Replace the graphics card (if possible).
510-Flash Screen Image Corrupted	Flash Screen image has errors.	Reflash the system ROM with the latest BIOS image.
511-CPU, CPUA, or CPUB Fan not Detected	CPU fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> 1. Reseat CPU fan. 2. Reseat fan cable. 3. Replace CPU fan.
512-Chassis, Rear Chassis, or Front Chassis Fan not Detected	Chassis, rear chassis, or front chassis fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> 1. Reseat chassis, rear chassis, or front chassis fan. 2. Reseat fan cable. 3. Replace chassis, rear chassis, or front chassis fan.

Table C-1 Numeric Codes and Text Messages (continued)

Control panel message	Description	Recommended action
513-Front Chassis fan not detected	Front chassis fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> 1. Reseat front chassis fan. 2. Reseat fan cable. 3. Replace front chassis fan.
514-CPU or Chassis Fan not Detected	CPU or chassis fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> 1. Reseat CPU or chassis fan. 2. Reseat fan cable. 3. Replace CPU or chassis fan.
515-Power Supply fan not detected	Power supply fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> 1. Reseat power supply fan. 2. Reseat fan cable. 3. Replace power supply fan.
660-Display cache is detected unreliable	Integrated graphics controller display cache is not working properly and will be disabled.	Replace system board if minimal graphics degrading is an issue.
912-Computer Cover Has Been Removed Since Last System Startup	Computer cover was removed since last system startup.	No action required.
917-Front Audio Not Connected	Front audio harness has been detached or unseated from motherboard.	Reconnect or replace front audio harness.
918-Front USB Not Connected	Front USB harness has been detached or unseated from motherboard.	Reconnect or replace front USB harness.
921-Device in PCI Express slot failed to initialize	There is an incompatibility/problem with this device and the system or PCI Express Link could not be retrained to an x1.	Try rebooting the system. If the error reoccurs, the device may not work with this system
1796-SATA Cabling Error	One or more SATA devices are improperly attached. For optimal performance, the SATA 0 and SATA 1 connectors must be used before SATA 2 and SATA 3.	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.
1797-SATA Drivelock is not supported in RAID mode.	Drivelock is enabled on one or more SATA hard drives, and they cannot be accessed while the system is configured for RAID mode.	Either remove the Drivelocked SATA device or disable the Drivelock feature. To disable the Drivelock feature, enter Computer Setup, change Storage > Storage Options > SATA Emulation to IDE , and select File > Save Changes and Exit . Reenter Computer Setup and select Security > Drivelock Security . For each listed Drivelock-capable SATA device, ensure Drivelock is Disabled . Lastly, change Storage > Storage Options > SATA Emulation back to RAID and select File > Save Changes and Exit .
1801-Microcode Patch Error	Processor is not supported by ROM BIOS.	<ol style="list-style-type: none"> 1. Upgrade BIOS to proper version. 2. Change the processor.

Table C-1 Numeric Codes and Text Messages (continued)

Control panel message	Description	Recommended action
2200-PMM Allocation Error during MEBx Download	Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM.	<ol style="list-style-type: none">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.
2201-MEBx Module did not checksum correctly	Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM.	<ol style="list-style-type: none">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.
2202-PMM Deallocation Error during MEBx cleanup	Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM.	<ol style="list-style-type: none">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.
2203-Setup error during MEBx execution	MEBx selection or exit resulted in a setup failure.	<ol style="list-style-type: none">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.

Table C-1 Numeric Codes and Text Messages (continued)

Control panel message	Description	Recommended action
2204-Inventory error during MEBx execution	BIOS information passed to the MEBx resulted in a failure.	<ol style="list-style-type: none"> 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.
2205-Interface error during MEBx execution	MEBx operation experienced a hardware error during communication with ME.	<ol style="list-style-type: none"> 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.
2211-Memory not configured correctly for proper MEBx execution.	DIMM1 or XMM1 is not installed.	Make sure there is a memory module in the black DIMM1 socket and that it is properly seated.
2212-USB Key Provisioning failure writing to device	USB device used for USB key provisioning will not allow BIOS to update provision file properly.	<ol style="list-style-type: none"> 1. Try a different USB key device for provisioning. 2. If the error persists, update to the latest BIOS version and ME firmware version. 3. If the error still persists, replace the system board.
2217-ME Firmware Version request failure	ME firmware is not properly responding to BIOS query for version information.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version and ME firmware version. 3. If the error still persists, replace the system board.
2218-ME Firmware Version should be updated	ME firmware must be updated to match current functionality contained in the system BIOS.	<ol style="list-style-type: none"> 1. Update to the latest ME firmware version. 2. If the error persists and system BIOS has been recently updated, restore previous system BIOS version. 3. If the error still persists, replace the system board.
2219-USB Key Provisioning file has invalid header identifier	Provisioning file contained on the USB key has been corrupted or is not a valid version for the current ME firmware.	<ol style="list-style-type: none"> 1. Recreate the provisioning file using third party management console software. 2. If the error persists and system BIOS has been recently updated, restore previous system BIOS version. Otherwise, update the ME firmware version. 3. If the error still persists, replace the system board.

Table C-1 Numeric Codes and Text Messages (continued)

Control panel message	Description	Recommended action
2220-USB Key Provisioning file has mismatch version	Provisioning file contained on the USB key is not a valid version for the current ME firmware.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists and system BIOS has been recently updated, restore previous system BIOS version. Otherwise, update the ME firmware version. 3. If the error still persists, replace the system board.
2230-General error during MEBx execution	Error occurred during MEBx execution which fails into the "General" grouping. Status information displayed along with the error provides further clarity into the failure. MEBx handles transference of information between the system BIOS and ME firmware.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version and ME firmware version. 3. If the error still persists, replace the system board.
2231-ME error during MEBx execution	Error occurred during MEBx execution which fails into "ME" grouping.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version and ME firmware version. 3. If the error still persists, replace the system board.
2232-AMT error during MEBx execution	Error occurred during MEBx execution which fails into "AMT" grouping.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version and ME firmware version. 3. If the error still persists, replace the system board.
2233-HECI error during MEBx execution	Error occurred during MEBx execution which fails into "MEI or HECI" grouping.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version and ME firmware version. 3. If the error still persists, replace the system board.
2239-ME image lock failure	Special system configurations with reduced ME firmware image require BIOS control of ME firmware upgrading. A failure has occurred after the ME firmware update process in which the BIOS could not relock the ME firmware region.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version and ME firmware version. 3. If the error still persists, replace the system board.
2240-ME image unlock failure	Special system configurations with reduced ME firmware image require BIOS control of ME firmware upgrading. A failure has occurred prior to the ME firmware update process in which the BIOS could not unlock the ME firmware region.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version and ME firmware version. 3. If the error still persists, replace the system board.

Table C-1 Numeric Codes and Text Messages (continued)

Control panel message	Description	Recommended action
Invalid Electronic Serial Number	Electronic serial number is missing.	Enter the correct serial number in Computer Setup.
Network Server Mode Active and No Keyboard Attached	Keyboard failure while Network Server Mode enabled.	<ol style="list-style-type: none"> 1. Reconnect keyboard with computer turned off. 2. Check connector for bent or missing pins. 3. Ensure that none of the keys are depressed. 4. Replace keyboard.
Parity Check 2	Parity RAM failure.	Run Computer Setup and Diagnostic utilities.

Interpreting POST Diagnostic Front Panel LEDs and Audible Codes

During the system validation phase, the BIOS will validate the functionality of the CPU, memory, graphics, system board and all other platform components. Since the display may not be functional, the power button LED and the speaker will be used to indicate an error. The speaker will be used so that a support agent can detect the error code over the phone. The pattern of the blink/beep error indicator will be 1 blink/beep per second followed by a 2 second pause at the end of the sequence. The sequence will repeat for 5 cycles. After the 5 cycles are complete, only the blink will continue.

⚠ 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.

Test	Failure	Power button LED	Speaker
CPU	CPU not functional	1 blink	1 beep
BIOS	BIOS corruption	2 blinks	2 beeps
Memory	Module error	3 blinks	3 beeps
Graphics	No controller	4 blinks	4 beeps
System board	Other failure	5 blinks	5 beeps
BIOS	Authentication failure, if supported	6 blinks	6 beeps


D 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: setup password and power-on password. When you establish only a setup 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 setup password will give you access to Computer Setup.

When both passwords are set, the setup 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 the password for the computer, you can clear that password so you can gain access to the information on the computer by resetting the password jumper.


 **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 [Computer Setup \(F10\) Utility on page 57](#) for information on backing up the CMOS settings.

Resetting the Password Jumper

To disable the power-on or setup password features, or to clear the power-on or setup 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 labeled CLR_CMOS/PASS.

 **NOTE:** The password jumper is blue so that it can be easily identified.

5. Remove the top jumper from pins 2 and 3.
6. Place the jumper on pins 1 or 2.
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. Put the jumper back on pins 2 or 3.
12. Replace the access panel.
13. Reconnect the external equipment.
14. Plug in the computer and turn on power. Allow the operating system to start. This clears the current passwords and disables the password features.
15. To establish new passwords, use Computer Setup.


Clearing and Resetting the CMOS


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

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

Clearing CMOS will clear the Active Management Technology (AMT) settings in the Management Engine BIOS Extension (MEBx), including the password. The password will default to "admin" and will need to be reset. The AMT settings will also need to be reset. To access the MEBx, press **Ctrl+P** during POST.


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.

3. Remove the access panel.
4. Locate the header and jumper labeled CLR_CMOS/PASS.

 **NOTE:** The password jumper is blue so that it can be easily identified.

5. Remove the bottom jumper from pins 2 and 3.
6. Place the jumper on pins 1 or 2.
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 CMOS.
9. Shut down the computer, unplug the power, and disconnect the external equipment.
10. Remove the access panel.
11. Put the jumper back on pins 2 or 3.
12. Replace the access panel.

13. Reconnect the external equipment.

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



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


For instructions on Computer Setup, see [Computer Setup \(F10\) Utility on page 57](#).

E 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 Appendix A, [POST Error Messages on page 68](#).

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 57](#) 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 Appendix A, [POST Error Messages on page 68](#) for more information.
- If the screen is blank, plug the monitor into a different video port on the computer if one is available. Or, replace the monitor with a monitor that you know is functioning properly.
- 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 82](#) 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, product ID number, and monitor serial 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, monitor, or software, see the following list of general suggestions before taking further action:

- Check that the computer and monitor are plugged into a working electrical outlet.
- Check that the voltage select switch (some models) is set to the appropriate voltage for your region (115V or 230V).
- Check that the computer is turned on and the white power light is on.
- Check that the monitor is turned on and the green monitor 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 Appendix A, [POST Error Messages on page 68](#) for more information.
- Turn up the brightness and contrast controls of the monitor if the monitor is dim.
- 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.
- Reconfigure the computer after installing a non-plug and play expansion board or other option. See [Solving Hardware Installation Problems on page 104](#) for instructions.
- 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 (CD/DVD or 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.
- If the system has multiple video sources (embedded, PCI, or PCI-Express adapters) installed (embedded video on some models only) and a single monitor, the monitor must be plugged into the monitor connector on the source selected as the primary VGA adapter. During boot, the other monitor connectors are disabled and if the monitor is connected into these ports, the monitor will not function. You can select which source will be the default VGA source in Computer Setup.

 **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.

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.	<ol style="list-style-type: none">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.

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. To access Control Panel in Windows 7, select Start , and then select Control Panel . To access Control Panel in Windows 8, from the Start screen, type c , and then select Control Panel from the list of applications.

Cursor will not move using the [arrow](#) keys on the keypad.

Cause	Solution
The Num Lock key is turned on.	Press the Num Lock key. The Num Lock light must be off if you want to use the arrow keys on the keypad. You can also disable or enable the Num Lock key in Computer Setup at Advanced > Device Options .

There is no sound or sound volume is too low.

Cause	Solution
System volume may be set low or muted.	<ol style="list-style-type: none">1. Check the Computer Setup settings to make sure the internal system speaker is not muted (this setting does not affect the external speakers).2. Make sure the external speakers are properly connected and powered on and that the speakers' volume control is set correctly.3. 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.	<ol style="list-style-type: none">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 and above the monitor 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.

Poor performance.

Cause	Solution
Hard drive fragmented.	Defragment hard drive.
Program previously accessed did not release reserved memory back to the system.	Restart the computer.
Virus resident on the hard drive.	Run virus protection program.
Too many applications running.	<ol style="list-style-type: none">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 7:<ol style="list-style-type: none">a. Go to Start > All Programs > Accessories > Runb. Type <code>msconfig</code>, and then press Enter.c. On the Startup tab of the System Configuration Utility, clear applications that you do not want to launch automatically, and then click OK. In Windows 8:<ol style="list-style-type: none">a. On the Start screen, right-click, and then select the All apps icon.b. Under Windows System, click Run.c. Type <code>msconfig</code>, and then press Enter.d. On the Startup tab of the System Configuration Utility, clear applications that you do not want to launch automatically, and then click OK.
Some software applications, especially games, are stressful on the graphics subsystem.	<ol style="list-style-type: none">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 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).

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.	<ol style="list-style-type: none"> 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 is 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.	<p>Press and hold the power button for less than 4 seconds. If the hard drive LED turns white, then:</p> <ol style="list-style-type: none"> 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. 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. <p>OR</p> <p>Press and hold the power button for less than 4 seconds. If the hard drive LED does not turn on white then:</p> <ol style="list-style-type: none"> 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.)

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.	<ol style="list-style-type: none">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 is 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.)

Cause	Solution
Power failure (power supply is overloaded).	<ol style="list-style-type: none">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.	<ol style="list-style-type: none">1. In Windows 7, click Start, click Computer, and right-click on a drive. Select Properties, and then select the Tools tab. Under Error-checking click Check Now. In Windows 8, on the Start screen type e, and then select File Explorer from the list of applications. In the left column, expand Computer, 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.	<p>In Windows 7, click Start, expand Computer, and right-click on a drive. Select Properties, and then select the Tools tab. Under Error-checking click Check Now.</p> <p>In Windows 8, on the Start screen type e, and then click File Explorer from the list of applications. In the left column, expand Computer, right-click on a drive, select Properties, and then select the Tools tab. Under Error checking click Check.</p>

Drive not found (identified).

Cause	Solution
Cable could be loose.	Check cable connections.
The system may not have automatically recognized a newly installed device.	<p>See reconfiguration directions in the Solving Hardware Installation Problems on page 104 section. If the system still does not 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.</p> <p>If this is a newly installed drive, run the Computer Setup utility and try adding a POST delay under Advanced > Power-On Options.</p>
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 Security > Device Security .
Drive responds slowly immediately after power-up.	Run Computer Setup and increase the POST Delay in Advanced > Power-On 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.	<ol style="list-style-type: none">1. Perform Drive Protection System (DPS) testing in F2 Diagnostics (reboot the computer and press F2 before the operating system starts).
System files missing or not properly installed.	<ol style="list-style-type: none">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 Storage > Boot Order list.

Nonsystem disk/NTLDR missing message.

Cause	Solution
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 Storage > Boot Order 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.	<ol style="list-style-type: none">1. Check SATA cable connections.2. Run the Computer Setup utility and ensure Device Available is selected for the device's SATA port in Security > Device Security.
Boot order is not correct.	Run the Computer Setup utility and change boot sequence in Storage > Boot Order .
Hard Drive's "Emulation Type" is set to "None." (some models)	Run the Computer Setup utility and change the "Emulation Type" to "Hard Disk" in the device's details under Storage > Device Configuration .
Hard drive is damaged.	<p>Observe if the front panel Power LED is blinking RED and if any beeps are heard. See Appendix A, POST Error Messages on page 68 to determine possible causes for the blinking red and beep codes.</p> <p>See the Worldwide Limited Warranty for terms and conditions.</p>

Computer seems to be locked up.

Cause	Solution
Program in use has stopped responding to commands.	<ol style="list-style-type: none">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 media card reader problems

Media card will not work in a digital camera after formatting it in Windows.

Cause	Solution
By default, Windows will format any media card with a capacity greater than 32MB with the FAT32 format. Some digital cameras use the FAT (FAT16 & FAT12) format and can not operate with a FAT32 formatted card.	Either format the media card in the digital camera or select FAT file system to format the media card in a computer with Windows.

A write-protected or locked error occurs when attempting to write to the media card.

Cause	Solution
Media card is locked. Locking the media card is a safety feature that prevents writing to and deleting from an SD/Memory Stick/PRO card.	If using an SD card, make sure that the lock tab located on the right of the SD card is not in the locked position. If using a Memory Stick/PRO card, make sure that the lock tab located on the bottom of the Memory Stick/PRO card is not in the locked position.

Can not write to the media card.

Cause	Solution
The media card is a read-only memory (ROM) card.	Check the manufacturer's documentation included with your card to see if it writable. Refer to the previous section for a list of compatible cards.
Media card is locked. Locking the media card is a safety feature that prevents writing to and deleting from an SD/Memory Stick/PRO card.	If using an SD card, make sure that the lock tab located on the right of the SD card is not in the locked position. If using a Memory Stick/PRO card, make sure that the lock tab located on the bottom of the Memory Stick/PRO card is not in the locked position.

Unable to access data on the media card after inserting it into a slot.

Cause	Solution
The media card is not inserted properly, is inserted in the wrong slot, or is not supported.	Ensure that the card is inserted properly with the gold contact on the correct side. The green LED will light if inserted properly.

Do not know how to remove a media card correctly.

Cause	Solution
The computer's software is used to safely eject the card.	<p>In Windows 7, click Start, select Computer, right-click on the corresponding drive icon, and then select Eject. Pull the card out of the slot.</p> <p>In Windows 8, on the Start screen, type e, and then click File Explorer from the list of applications. Expand Computer, right-click on the corresponding drive icon, and then select Eject. Pull the card out of the slot.</p> <p>NOTE: Never remove the card when the green LED is flashing</p>

After installing the media card reader and booting to Windows, the reader and the inserted cards are not recognized by the computer.

Cause	Solution
The operating system needs time to recognize the device if the reader was just installed into the computer and you are turning the PC on for the first time.	Wait a few seconds so that the operating system can recognize the reader and the available ports, and then recognize the media inserted in the reader.

After inserting a media card in the reader, the computer attempts to boot from the media card.

Cause	Solution
The inserted media card has boot capability.	<ol style="list-style-type: none">1. If you do not want to boot from the media card, remove it during boot or do not select the option to boot from the inserted media card during the boot process.2. During POST (Power On Self-Test), press F9 to modify the boot menu.3. Change the boot sequence in F10 Computer Setup.

Solving display problems

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

Blank screen (no video).

Cause	Solution
Monitor is not turned on and the monitor light is not on.	Turn on the monitor and check that the monitor light is on.
Bad monitor.	Try a different monitor.
The cable connections are not correct.	Check the cable connection from the monitor to the computer and to the electrical outlet.

Blank screen (no video).

Cause	Solution
You may have a screen blanking utility installed or energy saver features are enabled.	Press any key or click the mouse button and type your password (if set).
System ROM is corrupted; system is running in Boot Block Emergency Recovery Mode (indicated by eight beeps).	Reflash the system ROM with the latest BIOS image.
You are using a fixed-sync monitor and it will not sync at the resolution chosen.	Be sure that the monitor can accept the same horizontal scan rate as the resolution chosen.
Computer is in Sleep state.	<p>Press the power button to resume from Sleep state.</p> <p>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.</p>
Monitor cable is plugged into the wrong connector.	Systems may have a monitor connection on both the motherboard or an add-in card. Try moving the monitor connection to a different connector on the back of the computer.
Monitor settings in the computer are not compatible with the monitor.	<ol style="list-style-type: none">1. In Control Panel, select Category from the View by list, then under Appearance and Personalization, select Adjust screen resolution. To access Control Panel in Windows 7, click Start, and then select Control Panel. To access Control Panel in Windows 8, from the Start screen, type c, and then select Control Panel from the list of applications.2. Expand the Resolution box, and then use the sliding control to reset the resolution.
Monitor is configured to use an input that is not active.	Use the monitor's on-screen menu controls to select the input that is being driven by the system. Refer to the monitor's user documentation for more information on the on-screen controls and settings.

Blank screen and the 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
Pre-video memory error.	<ol style="list-style-type: none">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.

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

Cause	Solution
Pre-video graphics error.	For systems with a graphics card: <ol style="list-style-type: none">1. Reseat the graphics card (if applicable). Power on the system.2. Replace the graphics card (if applicable).3. Replace the system board. For systems with integrated graphics, replace the system board.

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

Cause	Solution
System board failure (ROM detected failure prior to video).	Replace the system board.

Monitor does not function properly when used with energy saver features.

Cause	Solution
Monitor without energy saver capabilities is being used with energy saver features enabled.	Disable monitor energy saver feature.

Dim characters.

Cause	Solution
The brightness and contrast controls are not set properly.	Adjust the monitor brightness and contrast controls.
Cables are not properly connected.	Check that the graphics cable is securely connected to the graphics card (if applicable) or video connector and the monitor.

Blurry video or requested resolution cannot be set.

Cause	Solution
If the graphics controller was upgraded, the correct graphics drivers may not be loaded.	Install the video drivers included in the upgrade kit.
Monitor is not capable of displaying requested resolution.	Change requested resolution.
Graphics card is bad.	Replace the graphics card.

The picture is broken up, rolls, jitters, or flashes.

Cause	Solution
The monitor connections may be incomplete or the monitor may be incorrectly adjusted.	<ol style="list-style-type: none">1. Be sure the monitor cable is securely connected to the computer.2. In a two-monitor system or if another monitor is in close proximity, be sure the monitors are not interfering with each other's electromagnetic field by moving them apart.3. Fluorescent lights or fans may be too close to the monitor.
Monitor needs to be degaussed.	Degauss the monitor. Refer to the documentation that came with the monitor for instructions.

Image is not centered.

Cause	Solution
Position may need adjustment.	Press the monitor's Menu button to access the OSD menu. Select ImageControl/ Horizontal Position or Vertical Position to adjust the horizontal or vertical position of the image.

"No Connection, Check Signal Cable" displays on screen.

Cause	Solution
Monitor video cable is disconnected.	Connect the video cable between the monitor and computer. CAUTION: Ensure that the computer power is off while connecting the video cable.

“Out of Range” displays on screen.

Cause	Solution
Video resolution and refresh rate are set higher than what the monitor supports.	<p>Restart the computer and enter Safe Mode. Change the settings to a supported setting then restart the computer so that the new settings take effect.</p> <p>To enter Safe Mode in Windows 7:</p> <ol style="list-style-type: none">1. Restart the computer.2. Press and hold the F8 key as your computer restarts, before the Windows logo appears. If the Windows logo appears, you must restart the computer and try again.3. On the Advanced Boot Options screen, use the arrow keys to highlight the safe mode option you want, and then press Enter.4. Log on to your computer with a user account that has administrator rights. <p>When your computer is in safe mode, Safe Mode displays in the corners of your monitor. To exit safe mode, restart your computer and let Windows start normally.</p> <p>To enter Safe Mode in Windows 8:</p> <ol style="list-style-type: none">1. Press the Windows logo + I to open the Settings charm.2. Select Change PC Settings, select General, and then under Advanced startup, click Restart now.3. Select Troubleshoot, select Advanced options, select Startup Settings, and then click Restart.4. Use the function keys or number keys to select the safe mode option you want. <p>When your computer is in safe mode, Safe Mode displays in the corners of your monitor. To exit safe mode, restart your computer and let Windows start normally.</p>

High pitched noise coming from inside a flat panel monitor.

Cause	Solution
Brightness and/or contrast settings are too high.	Lower brightness and/or contrast settings.

Fuzzy focus; streaking, ghosting, or shadowing effects; horizontal scrolling lines; faint vertical bars; or unable to center the picture on the screen (flat panel monitors using an analog VGA input connection only).

Cause	Solution
Flat panel monitor's internal digital conversion circuits may be unable to correctly interpret the output synchronization of the graphics card.	<ol style="list-style-type: none"> 1. Select the monitor's Auto-Adjustment option in the monitor's on-screen display menu. 2. Manually synchronize the Clock and Clock Phase on-screen display functions. To download a SoftPak that will assist you with the synchronization, go to the following Web site, select the appropriate monitor, and download either SP32347 or SP32202: http://www.hp.com/support
Graphics card is not seated properly or is bad (some models).	<ol style="list-style-type: none"> 1. Reseat the graphics card. 2. Replace the graphics card.

Certain typed symbols do not appear correct.

Cause	Solution
The font you are using does not support that particular symbol.	<p>Use the Character Map to locate and select the appropriate symbol. You can copy the symbol from the Character Map into a document.</p> <p>In Windows 7, click Start, select All Programs, select Accessories, select System Tools, and then select Character Map.</p> <p>In Windows 8, on the Start screen, type ch, and then select Character Map from the list of applications.</p>

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. NOTE: In Windows 8, the taskbar is available at the bottom of the Desktop screen.
Audio is hidden in Computer Setup.	Enable the audio in Computer Setup: Security > Device Security > System Audio .
The external speakers are not turned on.	Turn on the external speakers.
The audio device may be connected to the wrong jack.	Ensure that the device is connected to the correct jack on the computer. The rear audio jack output is the green receptacle. The speakers should be plugged into the line-out jack and the headphones should be plugged into the headphone jack.
External speakers plugged into the wrong audio jack on a recently installed sound card.	See the sound card documentation for proper speaker connection. The rear audio jack output is the green receptacle.
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 > Device Options > Internal Speaker .

Sound does not come out of the speaker or headphones.

Cause	Solution
The application is set to use a different audio device than speakers.	<p>Some graphics cards support audio over the DisplayPort connection (if applicable), so multiple audio devices may be listed in Device Manager. Make sure the correct device is being used.</p> <p>To access Device Manager in Windows 7, click Start, select Control Panel, and then select Device Manager.</p> <p>To access Device Manager in Windows 8, from the Start screen, type c, select Control Panel from the list of applications, and then select Device Manager.</p>
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.

Sound from headphones is not clear or muffled.

Cause	Solution
Headphones are plugged into the rear audio output connector. The rear audio output connector is for powered audio devices and is not designed for headphone use.	Plug the headphones into the headphone connector on the front of the computer.

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.

There is no sound or sound volume is too low.

Cause	Solution
The application is set to use a different audio device than speakers.	<p>Some graphics cards support audio over the DisplayPort connection (if applicable), so multiple audio devices may be listed in Device Manager. Make sure the correct device is being used.</p> <p>To access Device Manager in Windows 7, click Start, select Control Panel, and then select Device Manager.</p> <p>To access Device Manager in Windows 8, from the Start screen, type c, select Control Panel from the list of applications, and then select Device Manager.</p>
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.

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.	<ol style="list-style-type: none">1. Install the correct printer driver for the application.2. Try printing using the MS-DOS command: <code>DIR C:\ > [printer port]</code> 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.
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.

A wireless keyboard/mouse is not working correctly. Symptoms include lagging mouse movement, jumpy mouse/keyboard, or no function of mouse/keyboard and external drive.

Cause	Solution
If your computer is equipped with USB 3.0 ports, connected USB 3.0 devices can interfere with the wireless keyboard USB receiver.	Connect the wireless keyboard USB receiver to a USB 2.0 port that is separated from ports with USB 3.0 devices. If you still experience interference, you may have to place the connectors farther apart using an external USB hub.

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 to the back of the computer, 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 commands and typing are not recognized by the computer.

Cause	Solution
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 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.

Cursor will not move using the **arrow** keys on the keypad.

Cause	Solution
The Num Lock key is on.	Press the Num Lock key. The Num Lock light should be off if you want to use the arrow keys on the keypad. You can disable or enable the Num Lock key in Computer Setup at Advanced > Device Options .

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 7: <ol style="list-style-type: none">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 select Shut Down and then press Enter.3. After the shutdown is complete, plug the mouse connector into the back of the computer (or the keyboard) and restart. Windows 8: <ol style="list-style-type: none">1. Press the Windows logo + I to open the Settings charm.2. Use the arrow keys to select Power, and then press Enter.3. Use the arrow keys to select Shut Down, and then press Enter.4. After the shutdown is complete, plug the mouse connector into the back of the computer (or the keyboard) and restart.
Program in use has stopped responding to commands.	Shut down the computer using the keyboard then restart the computer.

Mouse does not respond to movement or is too slow.

Cause	Solution
Mouse may need cleaning.	Remove the roller ball cover on the mouse and clean the internal components.
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.

Mouse will only move vertically, horizontally, or movement is jerky.

Cause	Solution
Mouse roller ball or the rotating encoder shafts that make contact with the ball are dirty.	Remove roller ball cover from the bottom of the mouse and clean the internal components with a mouse cleaning kit available from most computer stores.

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.

Table E-1 Solving Hardware Installation Problems

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

Cause	Solution
Device is not seated or connected properly.	Ensure that the device is properly and securely connected and that pins in the connector are not bent down.
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.

Table E-1 Solving Hardware Installation Problems (continued)**A new device is not recognized as part of the system.**

Cause	Solution
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.	<p>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.</p> <p>To access Device Manager in Windows 7, click Start, select Control Panel, and then select Device Manager.</p> <p>To access Device Manager in Windows 8, from the Start screen, type c, select Control Panel from the list of applications, and then select Device Manager.</p>
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 Security > USB Security .

Computer will not start.

Cause	Solution
Wrong memory modules were used in the upgrade or memory modules were installed in the wrong location.	<ol style="list-style-type: none">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 DIMM2, and DIMM3 must be installed before DIMM4.2. 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 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.	<p>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.</p> <ol style="list-style-type: none">1. Reseat DIMMs. Power on the system.2. Replace DIMMs one at a time to isolate the faulty module. <p>NOTE: DIMM1 or XMM1 must always be installed. DIMM1 must be installed before DIMM2, and DIMM3 must be installed before DIMM4</p> <ol style="list-style-type: none">3. Replace third-party memory with HP memory.4. Replace the system board.

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

Cause	Solution
Graphics card (some models) is not seated properly or is bad, or system board is bad.	<p>For systems with a graphics card:</p> <ol style="list-style-type: none">1. Reseat the graphics card. Power on the system.2. Replace the graphics card.3. Replace the system board. <p>For systems with integrated graphics, replace the system board.</p>

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

Cause	Solution
Bad option card.	<ol style="list-style-type: none">1. Check each option card by removing the cards one at time (if multiple cards), then power on the system to see if fault goes away.2. Once bad card is identified, remove and replace bad option card.3. 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.

Table E-2 Solving Network Problems

Wake-on-LAN feature is not functioning.

Cause	Solution
S5 Maximum Power Saving feature is enabled.	Disable the S5 Maximum Power Saving option in Computer Setup. Select Power > Hardware Power Management > S5 Maximum Power Savings .
S5 Wake on LAN is disabled (some models).	Enable the S5 Wake on LAN option in Computer Setup. Select Advanced > Device Options > S5 Wake on LAN .
Wake-on-LAN is not enabled.	<p>To enable Wake-on-LAN in Windows 7:</p> <ol style="list-style-type: none">1. Select Start > Control Panel > Network and Sharing Center.2. Under Tasks, select Manage network connections.3. Click Local Area Connection.4. Click the Properties button.5. Click the Configure button.6. Click the Power Management tab, then select Allow this device to wake the computer. <p>To enable Wake-on-LAN in Windows 8:</p> <ol style="list-style-type: none">1. From the Start screen, type c, and then select Control Panel from the list of applications.2. Select Network and Sharing Center, and then click the Ethernet link next to the connection.3. Click the Properties button.4. Click the Configure button.5. Click the Power Management tab, then enable the appropriate Wake-on LAN option.

Network driver does not detect network controller.

Cause	Solution
Network controller is disabled.	<ol style="list-style-type: none">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 7, click Start, select Control Panel, and then select Device Manager. To access Device Manager in Windows 8, from the Start screen, type c, select Control Panel from the list of applications, and then select Device Manager.
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.	<p>Check for the device status within Windows, such as Device Manager for driver load and the Network Connections applet within Windows for link status.</p> <p>To access Device Manager in Windows 7, click Start, select Control Panel, and then select Device Manager.</p> <p>To access Device Manager in Windows 8, from the Start screen, type c, select Control Panel from the list of applications, and then select Device Manager.</p>
Network controller is disabled.	<ol style="list-style-type: none">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 7, click Start, select Control Panel, and then select Device Manager. To access Device Manager in Windows 8, from the Start screen, type c, select Control Panel from the list of applications, and then select Device Manager.
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.
Network controller interrupt is shared with an expansion board.	Under the Computer Setup Advanced menu, change the resource settings for the board.
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 7, click Start , and then select Control Panel . To access Control Panel in Windows 8, from the Start screen, type c , and then select Control Panel .

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

Cause	Solution
Network controller interrupt is shared with an expansion board.	Under the Computer Setup Advanced menu, change the resource settings for the board.
The network controller requires drivers.	Verify that the drivers were not accidentally deleted when the drivers for a new expansion board were installed.
The expansion board installed is a network card (NIC) and conflicts with the embedded NIC.	Under the Computer Setup Advanced menu, change the resource settings for the board.

Network controller stops working without apparent cause.

Cause	Solution
The files containing the network drivers are corrupted.	Reinstall the network drivers using the Recovery Disc Set in Windows 7 or Windows recovery tools in Windows 8. 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.

New network card will not boot.

Cause	Solution
New network card may be defective or may not meet industry-standard specifications.	Install a working, industry-standard NIC, or change the boot sequence to boot from another source.

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.	<ol style="list-style-type: none">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 processor problems

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

Poor performance is experienced.

Cause	Solution
Processor is hot.	<ol style="list-style-type: none">1. Make sure the airflow to the computer is not blocked.2. Make sure the fans are connected and working properly (some fans only operate when needed).3. Make sure the processor heat sink is installed properly.

Power LED flashes Red three times, once every second, followed by a two second pause.

Cause	Solution
Processor is not seated properly or not installed.	<ol style="list-style-type: none">1. Check to see that the processor is present.2. Reseat the processor.

Power LED flashes Red eleven times, once every second, followed by a two second pause.

Cause	Solution
The current processor does not support a feature previously enabled on this system.	<ol style="list-style-type: none">1. Install a TXT (Trusted Execution Technology) capable processor.2. Disable TXT in the Computer Setup (F10) utility.3. Reinstall the original processor.

Solving CD-ROM and DVD problems

If you encounter CD-ROM or DVD problems, see the common causes and solutions listed in the following table or to the documentation that came with the optional device.

System will not boot from CD-ROM or DVD drive.

Cause	Solution
The device is attached to a SATA port that has been hidden in the Computer Setup utility.	Run the Computer Setup utility and ensure Device Available is selected for the device's SATA port in Security > Device Security .
Removable Media Boot is disabled in the Computer Setup utility.	Run the Computer Setup utility and enable booting to removable media in Storage > Storage Options . Ensure CD-ROM is enabled in Storage > Boot Order .
Network Boot is enabled in Computer Setup.	Run the Computer Setup utility and disable Network Boot in Security > Network Boot .
Non-bootable CD in drive.	Try a bootable CD in the drive.
Boot order not correct.	Run the Computer Setup utility and change boot sequence in Storage > Boot Order .

Drive not found (identified).

Cause	Solution
Cable could be loose.	Check cable connections.
The system may not have automatically recognized a newly installed device.	<p>See reconfiguration directions in the Solving Hardware Installation Problems on page 104 section. If the system still does not 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.</p> <p>If this is a newly installed drive, run the Computer Setup utility and try adding a POST delay under Advanced > Power-On Options.</p>
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 Security > Device Security .
Drive responds slowly immediately after power-up.	Run Computer Setup and increase the POST Delay in Advanced > Power-On Options .

CD-ROM or DVD devices are not detected or driver is not loaded.

Cause	Solution
Drive is not connected properly or not properly configured.	See the documentation that came with the optional device.

Movie will not play in the DVD drive.

Cause	Solution
Movie may be regionalized for a different country.	See the documentation that came with the DVD drive.
Decoder software is not installed.	Install decoder software.
Damaged media.	Replace media.
Movie rating locked out by parental lock.	Use DVD software to remove parental lock.
Media installed upside down.	Reinstall media.

Cannot eject compact disc (tray-load unit).

Cause	Solution
Disc not properly seated in the drive.	Turn off the computer and insert a thin metal rod into the emergency eject hole and push firmly. Slowly pull the tray out from the drive until the tray is fully extended, then remove the disc.

CD-ROM, CD-RW, DVD-ROM, or DVD-R/RW drive cannot read a disc or takes too long to start.

Cause	Solution
Media is corrupt.	Try different media to confirm whether media is valid.
Media has been inserted upside down.	Re-insert the media with the label facing up.
The DVD-ROM drive takes longer to start because it has to determine the type of media played, such as audio or video.	Wait at least 30 seconds to let the DVD-ROM drive determine the type of media being played. If the disc still does not start, read the other solutions listed for this topic.
CD or DVD disc is dirty.	Clean CD or DVD with a CD cleaning kit, available from most computer stores.
Windows does not detect the CD-ROM or DVD-ROM drive.	<ol style="list-style-type: none">1. Use Device Manager to remove or uninstall the device. To access Device Manager in Windows 7, click Start, select Control Panel, and then select Device Manager. To access Device Manager in Windows 8, from the Start screen, type c, select Control Panel from the list of applications, and then select Device Manager.2. Restart the computer and let Windows detect the CD or DVD driver.

Recording or copying CDs is difficult or impossible.

Cause	Solution
Wrong or poor quality media type.	<ol style="list-style-type: none">1. Try using a slower speed when recording.2. Verify that you are using the correct media for the drive.3. Try a different brand of media. Quality varies widely between manufacturers.

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 Security > USB Security .
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 Storage > Boot Order .
Removable Media Boot is disabled in the Computer Setup utility.	Run the Computer Setup utility and enable booting to removable media in Storage > Storage 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 front panel component problems

If you encounter problems with devices connected to the front panel, refer to the common causes and solutions listed in the following table.

A USB device, headphone, or microphone is not recognized by the computer.

Cause	Solution
Device is not properly connected.	<ol style="list-style-type: none">1. Turn off the computer.2. Reconnect the device to the front of the computer and restart the computer.
The device does not have power.	If the USB device requires AC power, be sure one end is connected to the device and one end is connected to a live outlet.
The correct device driver is not installed.	<ol style="list-style-type: none">1. Install the correct driver for the device.2. You might need to reboot the computer.
The cable from the device to the computer does not work.	<ol style="list-style-type: none">1. If possible, replace the cable.2. Restart the computer.
The device is not working.	<ol style="list-style-type: none">1. Replace the device.2. Restart the computer.
USB ports on the computer are disabled in Computer Setup.	Run the Computer Setup utility and ensure that the USB ports are set to Enabled in Security > USB Security .

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.
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.)

Unable to connect to the Internet.

Cause	Solution
The CAT5 UTP cable is disconnected.	Connect the CAT5 UTP cable between the cable modem and the computer'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.)	<p>Windows 7:</p> <ol style="list-style-type: none">1. Select Start > Control Panel.2. Click Internet Options.3. In the Browsing history section on the General tab, click the Delete button.4. Select the Cookies check box and click the Delete button. <p>Windows 8:</p> <ol style="list-style-type: none">1. From the Start screen, type c, and then select Control Panel from the list of applications..2. Click Internet Options.3. In the Browsing history section on the General tab, click the Delete button.4. Select the Cookies 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 Appendix A, POST Error Messages on page 68 to determine possible causes. See the Worldwide Limited Warranty for terms and conditions.

Computer will not continue after HP logo screen displays.

Cause	Solution
System files may be damaged.	<p>In Windows 7, use recovery media to scan hard drive for errors, or use Windows Startup Repair to fix problems that might prevent Windows from starting correctly. Windows Startup Repair is one of the recovery tools in the System Recovery Options menu. You can also create a system repair disc that contains the System Recovery Options menu. If the problem is severe enough that Startup Repair doesn't start on its own and you can't access the System Recovery Options menu on your computer's hard disk, you can get to the menu and start Startup Repair by using the Windows installation disc or a system repair disc that you created earlier.</p> <p>In Windows 8, use Automatic Repair to fix problems that might prevent Windows from starting correctly.</p> <p>To access Automatic Repair:</p> <ol style="list-style-type: none">1. Press the Windows logo + I to open the Settings charm.2. Select Change PC Settings, select General, and then under Advanced startup, click Restart now.3. Select Troubleshoot, select Advanced options, and then select Automatic Repair. <p>Windows starts Automatic Repair.</p> <ol style="list-style-type: none">4. Select the account to use to begin Automatic Repair, and type the password for the account. <p>Windows diagnoses the computer and attempts the repair it.</p>

"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.

F HP PC Hardware Diagnostics

To help troubleshoot and diagnose failures, use the UEFI-based hardware diagnostic solution that HP includes on all products. This tool can even be used if the computer will not boot to the operating system.

Why run HP PC Hardware Diagnostics

The HP PC Hardware Diagnostic tools simplify the process of diagnosing hardware issues and expedite the support process when issues are found. The tools save time by pinpointing the component that needs to be replaced.

- **Isolate true hardware failures:** The diagnostics run outside of the operating system so they effectively isolate hardware failures from issues that may be caused by the operating system or other software components.
- **Failure ID:** When a failure is detected that requires hardware replacement, a 24-digit Failure ID is generated. This ID can then be provided to the call agent, who will either schedule support or provide replacement parts.

How to access and run HP PC Hardware Diagnostics

You can run the diagnostics from one of three places, depending on your preference and the health of the computer.

1. Turn on the computer and press **Esc** repeatedly until the BIOS Boot Menu appears.
2. Press **F2** or select **Diagnostics (F2)**.

Pressing **F2** signals the system to search for the diagnostics in the following locations:

- a. A connected USB drive (to download the diagnostics tools to a USB drive, see the instructions in [Downloading HP PC Hardware Diagnostics to a USB device on page 121](#)).
- b. The hard disk drive.
- c. A core set of diagnostics in the BIOS (for memory and hard disk drive) that are accessible only if the USB or hard disk drive versions are not detected.

Downloading HP PC Hardware Diagnostics to a USB device

There are two options to download HP PC Hardware Diagnostics to USB device.

Option 1: HP PC Diagnostics homepage—Provides access to the latest UEFI version.

1. Go to <http://www.hp.com>.
2. Click the **UEFI Download** link, and then select **Run**.

Option 2: Support and Drivers pages—Provides downloads for a specific product for earlier and later versions.

1. Go to <http://www.hp.com>.
2. Point to Support, located at the top of the page, and then click **Download Drivers**.
3. In the text box, enter the product name, and then click **Go**.

– or –

Click **Find Now** to let HP automatically detect your product.

4. Select your computer model, and then select your operating system.
5. In the **Diagnostic** section, click **HP UEFI Support Environment**.
6. Click **Download**, and then select **Run**.

G System backup and recovery

Backing up, restoring, and recovering in Windows 8.1 or Windows 8

Your computer includes tools provided by HP and Windows to help you safeguard your information and retrieve it if you ever need to. These tools will help you return your computer to a proper working state or even back to the original factory state, all with simple steps.

This section provides information about the following processes:

- Creating recovery media and backups
- Restoring and recovering your system




NOTE: This section describes an overview of backing up, restoring, and recovering options. For more details about the tools provided, see Help and Support. From the Start screen, type `help`, and then select **Help and Support**.

Creating recovery media and backups

Recovery after a system failure is only as good as your most recent backup.

1. After you successfully set up the computer, create recovery media. This step creates a backup of the recovery partition on the computer. The backup can be used to reinstall the original operating system in cases where the hard drive is corrupted or has been replaced.

You will use a USB flash drive to create a bootable recovery drive that can be used to troubleshoot a computer that is unable to start. The USB flash drive can be used to reinstall the original operating system and the programs that were installed at the factory.


 **NOTE:** Any information on the USB flash drive will be erased before the recovery media is created.


- To create the Windows 8.1 recovery media, from the Start screen, type `recovery drive`, then click on **Create a recovery drive**. Follow the on-screen instructions to continue.
 - To create the Windows 8 recovery media, from the Start screen, type `recovery drive`, and then click on **Settings**, then click on **Create a recovery drive**. Follow the on-screen instructions to continue.
2. Use the Windows tools to create system restore points and create backups of personal information. For more information and steps, see Help and Support. From the Start screen, type `help`, and then select **Help and Support**.

Restoring and recovering using Windows tools

Windows offers several options for restoring from backup, refreshing the computer, and resetting the computer to its original state. For more information and steps, see Help and Support. From the Start screen, type `help`, and then select **Help and Support**.


Using Reset when the system is not responding

 **NOTE:** You may be prompted by User Account Control for your permission or password when you perform certain tasks. To continue a task, select the appropriate option. For information about User Account Control, see Help and Support. From the Start screen, type `help`, and then select **Help and Support**.

 **IMPORTANT:** Reset does not provide backups of your information. Before using Reset, back up any personal information you wish to retain.

If Windows recovery steps are not working and the system is not responding, use these steps to start Reset:

1. If possible, back up all personal files.
2. If possible, check for the presence of the HP Recovery partition:
 - For Windows 8.1, from the Start screen, type `pc`, and then select **This PC**.
 - For Windows 8, from the Start screen, type `c`, and then select **Computer**.

 **NOTE:** If the HP Recovery partition is not listed, or you cannot check for its presence, you must recover using the recovery media you created; see [Recovery using the Windows recovery USB flash drive on page 124](#). Or you must use the Windows operating system media and the *Driver Recovery* media (purchased separately); see [Recovery using Windows operating system media \(purchased separately\) on page 124](#).

3. If the HP Recovery partition is listed, restart the computer, and then press `esc` while the HP logo is displayed. The computer Startup Menu displays.
4. Press `f11` to select the System Recovery option.
5. Choose your keyboard layout.

6. Select **Troubleshoot**.
7. Select **Reset**.
8. Follow the on-screen instructions to continue.

Recovery using the Windows recovery USB flash drive

To recover your system using the recovery USB flash drive you previously created:



NOTE: If you did not create a recovery USB flash drive or the one you created does not work, see [Recovery using Windows operating system media \(purchased separately\) on page 124](#).

1. If possible, back up all personal files.
2. Insert the recovery USB flash drive you created into a USB port on your computer.
3. Restart the computer and as soon as you see the HP logo screen, press **F9** to display a list of boot devices. Use the arrow keys to select your USB flash drive from the UEFI Boot Sources list. Press **Enter** to boot from that device.
4. Choose your keyboard layout.
5. Select **Troubleshoot**.
6. Select **Refresh your PC**.
7. Follow the on-screen instructions.

Recovery using Windows operating system media (purchased separately)

To order a Windows operating system DVD, contact support. Go to <http://www.hp.com/support>, select your country or region, and follow the on-screen instructions.



CAUTION: Using Windows operating system media completely erases the hard drive contents and reformats the hard drive. All files that you have created and any software that you have installed on the computer are permanently removed. When reformatting is complete, the recovery process helps you restore the operating system, as well as drivers, software, and utilities.

To initiate recovery using Windows operating system media:



NOTE: This process takes several minutes.

1. If possible, back up all personal files.
2. Restart the computer, and then follow the instructions provided with the Windows operating system media to install the operating system.
3. When prompted, press any keyboard key.
4. Follow the on-screen instructions.

After the repair is completed and the Windows desktop appears:


1. Remove the Windows operating system media, and then insert the *Driver Recovery* media.
2. Install the Hardware Enabling Drivers first, and then install Recommended Applications.

Backing up, restoring, and recovering in Windows 7

Your computer includes tools provided by HP and Windows to help you safeguard your information and retrieve it if you ever need to. These tools will help you return your computer to a proper working state or even back to the original factory state, all with simple steps.


This section provides information about the following processes:

- Creating recovery media and backups
- Restoring and recovering your system

 **NOTE:** This section describes an overview of backing up, restoring, and recovering options. For more details about the Windows Backup and Restore tools provided, see Help and Support. To access Help and Support, select **Start > Help and Support**.

Recovery after a system failure is only as good as your most recent backup.

1. After you successfully set up the computer, create recovery media. This media can be used to reinstall the original operating system in cases where the hard drive is corrupted or has been replaced. See [Creating recovery media on page 125](#).
2. As you add hardware and software programs, create system restore points. A system restore point is a snapshot of certain hard drive contents saved by Windows System Restore at a specific time. A system restore point contains information that Windows uses, such as registry settings. Windows creates a system restore point for you automatically during a Windows update and during other system maintenance (such as a software update, security scanning, or system diagnostics). You can also manually create a system restore point at any time. For more information and steps for creating specific system restore points, see Help and Support. To access Help and Support, select **Start > Help and Support**.
3. As you add photos, video, music, and other personal files, create a backup of your personal information. If files are accidentally deleted from the hard drive and they can no longer be restored from the Recycle Bin, or if files become corrupted, you can restore the files that you backed up. In case of system failure, you can use the backup files to restore the contents of your computer. See [Backing up your information on page 128](#).

 **NOTE:** HP recommends that you print the recovery procedures and save them for later use, in case of system instability.

Creating recovery media


After you successfully set up the computer, create recovery media. The media can be used to reinstall the original operating system in cases where the hard drive is corrupted or has been replaced.

There are two types of recovery media. To determine which steps to follow for your computer:


1. Click the **Start** button.
2. Click **All Programs**.
 - If **Security and Protection** is listed, continue with the steps in [Creating recovery media using HP Recovery Manager \(select models only\) on page 126](#).
 - If **Productivity and Tools** is listed, continue with the steps in [Creating recovery discs with HP Recovery Disc Creator \(select models only\) on page 127](#).


Creating recovery media using HP Recovery Manager (select models only)

- To create recovery discs, your computer must have a DVD writer. Use DVD+R or DVD-R discs (purchased separately). The discs you use will depend on the type of optical drive you are using.

 **NOTE:** DVD+R DL, DVD-R DL, or DVD±RW disc are not supported.

- You have the option of creating a recovery USB flash drive instead, using a high-quality USB drive.
- If you are creating recovery discs, be sure to use high-quality discs. It is normal for the system to reject defective discs. You will be prompted to insert a new blank disc to try again.
- The number of discs in the recovery-disc set depends on your computer model (typically 3 to 6 DVDs). The Recovery Media Creation program tells you the specific number of blank discs needed to make the set. If you are using a USB flash drive, the program will tell you the size of the drive required to store all the data (minimum of 8 GB).


 **NOTE:** The process of creating recovery media is lengthy. You can quit the process at any time. The next time you initiate the process, it resumes where it left off.


 **NOTE:** Do not use media cards for creating recovery media. The system may not be able to boot up from a media card and you may not be able to run system recovery.

To create recovery discs:

1. Close all open programs.
2. Click the **Start** button, click **All Programs**, click **Security and Protection**, click **Recovery Manager**, and then click **HP Recovery Media Creation**. If prompted, click **Yes** to allow the program to continue.
3. Click **Create recovery media using blank DVD(s)**, and then click **Next**.
4. Follow the on-screen instructions. Label each disc after you make it (for example, Recovery 1, Recovery 2), and then store the discs in a secure place.

To create a recovery USB flash drive:

 **NOTE:** You must use a USB flash drive with a capacity of at least 8 GB.

 **NOTE:** Recovery Media Creation formats the USB flash drive, deleting any files on it.

1. Close all open programs.
2. Insert the USB flash drive into a USB port on the computer.
3. Click the **Start** button, click **All Programs**, click **Security and Protection**, click **Recovery Manager**, and then click **Recovery Media Creation**.
4. Click **Create recovery media with a USB flash drive**, and then click **Next**.
5. Select the USB flash drive from the list of media. The program will let you know how much storage is required to create the recovery drive. If the USB flash drive does not have enough storage capacity, it will appear grayed out, and you must replace it with a larger USB flash drive. Click **Next**.
6. Follow the on-screen instructions. When the process is complete, label the USB flash drive and store it in a secure place.


Creating recovery discs with HP Recovery Disc Creator (select models only)

HP Recovery Disc Creator is a software program that offers an alternative way to create recovery discs on select models. After you successfully set up the computer, you can create recovery discs using HP Recovery Disc Creator. The recovery discs allow you to reinstall your original operating system as well as select drivers and applications if the hard drive becomes corrupted. HP Recovery Disc Creator creates two kinds of recovery discs:

- Windows 7 operating system DVD—Installs the operating system without additional drivers or applications.
- *Driver Recovery* DVD—Installs specific drivers and applications only, in the same way that the HP Software Setup utility installs drivers and applications.

To create recovery discs, your computer must have a DVD writer. Use any of the following types of discs (purchased separately): DVD+R, DVD+R DL, DVD-R, DVD-R DL, or DVD±RW. The discs you use will depend on the type of optical drive you are using.

Creating recovery discs

 **NOTE:** The Windows 7 operating system DVD can be created only once. The option to create that media will not be available after you create a Windows DVD.

To create the Windows DVD:

1. Select **Start > All Programs > Productivity and Tools > HP Recovery Disc Creator**.
2. Select **Windows disk**.
3. From the drop-down menu, select the drive for burning the recovery media.
4. Click the **Create** button to start the burning process. Label the disc after you create it, and store it in a secure place.

After the Windows 7 operating system DVD has been created, create the *Driver Recovery* DVD:

1. Select **Start > All Programs > Productivity and Tools > HP Recovery Disc Creator**.
2. Select **Driver disk**.
3. From the drop-down menu, select the drive for burning the recovery media.
4. Click the **Create** button to start the burning process. Label the disc after you create it, and store it in a secure place.


Backing up your information


You should create your initial backup immediately after initial system setup. As you add new software and data files, you should continue to back up your system on a regular basis to maintain a reasonably current backup. Your initial and subsequent backups allow you to restore your data and settings if a failure occurs.

You can back up your information to an optional external hard drive, a network drive, or discs.


Note the following when backing up:

- Store personal files in the Documents library, and back it up regularly.
- Back up templates that are stored in their associated directories.
- Save customized settings that appear in a window, toolbar, or menu bar by taking a screen shot of your settings. The screen shot can be a time-saver if you have to reset your preferences.
- When backing up to discs, number each disc after removing it from the drive.

 **NOTE:** For detailed instructions on various backup and restore options, perform a search for these topics in Help and Support. To access Help and Support, select **Start > Help and Support**.

 **NOTE:** You may be prompted by User Account Control for your permission or password when you perform certain tasks. To continue a task, select the appropriate option. For information about User Account Control, see Help and Support: Select **Start > Help and Support**.


To create a backup using Windows Backup and Restore:

 **NOTE:** The backup process may take over an hour, depending on file size and the speed of the computer.

1. Select **Start > All Programs > Maintenance > Backup and Restore**.
2. Follow the on-screen instructions to set up your backup.

System Restore


If you have a problem that might be due to software that you installed on your computer, or if you want to restore the system to a previous state without losing any personal information, use System Restore to return the computer to a previous restore point.

 **NOTE:** Always use this System Restore procedure before you use the System Recovery feature.

To start System Restore:


1. Close all open programs.
2. Click the **Start** button, right-click **Computer**, and then click **Properties**.
3. Click **System protection**, **System Restore**, click **Next**, and then follow the on-screen instructions.

System Recovery

 **WARNING!** This procedure will delete all user information. To prevent loss of information, be sure to back up all user information so you can restore it after recovery.

System Recovery completely erases and reformats the hard disk drive, deleting all data files that you have created, and then reinstalls the operating system, programs, and drivers. However, you must reinstall any software that was not installed on the computer at the factory. This includes software that came on media included in the computer accessory box, and any software programs you installed after purchase. Any personal files must be restored from backups you made.


If you were not able to create system recovery DVDs or USB flash drive, you can order a recovery disc set from support. Go to <http://www.hp.com/support>, select your country or region, and follow the on-screen instructions.


 **NOTE:** Always use the System Restore procedure before you use the System Recovery program. See [System Restore on page 128](#).

You must choose one of the following methods to perform a System Recovery:

- Recovery image — Run System Recovery from a recovery image stored on your hard disk drive. The recovery image is a file that contains a copy of the original factory-shipped software. To perform a System Recovery from a recovery image, see [System Recovery when Windows is responding on page 129](#) or [System Recovery when Windows is not responding on page 130](#).
- Recovery media — Run System Recovery from recovery media that you have created from files stored on your hard disk drive or purchased separately. See [System Recovery using recovery media \(select models only\) on page 130](#).

System Recovery when Windows is responding

 **CAUTION:** System Recovery deletes all data and programs you created or installed. Before you begin, back up any important data to a CD or DVD or to a USB flash drive.


 **NOTE:** In some cases, you must use recovery media for this procedure. If you have not already created this media, follow the instructions in [Creating recovery media on page 125](#).

If the computer is working and Windows 7 is responding, use these steps to perform a System Recovery:

1. Turn off the computer.
2. Disconnect all peripheral devices from the computer except the monitor, keyboard, and mouse.
3. Turn on the computer.

4. When Windows has loaded, click the **Start** button, and then click **All Programs**.
 - If **Security and Protection** is listed, continue with step 5.
 - If **Productivity and Tools** is listed, follow the steps in [System Recovery when Windows is not responding on page 130](#).
5. Click **Security and Protection**, click **Recovery Manager**, and then click **Recovery Manager**. If prompted, click **Yes** to allow the program to continue.
6. Under **I need help immediately**, click **System Recovery**.
7. Select **Yes**, and then click **Next**. Your computer restarts.
8. When the computer restarts, you will see the Recovery Manager welcome screen again. Under **I need help immediately**, click **System Recovery**. If you are prompted to back up your files, and you have not done so, select **Back up your files first (recommended)**, and then click **Next**. Otherwise, select **Recover without backing up your files**, and then click **Next**.
9. System Recovery begins. After System Recovery is complete, click **Finish** to restart the computer.
10. When Windows has loaded, shut down the computer, reconnect all peripheral devices, and then turn the computer back on.

System Recovery when Windows is not responding


 **CAUTION:** System Recovery deletes all data and programs you created or installed.

If Windows is not responding, but the computer is working, follow these steps to perform a System Recovery.

1. Turn off the computer. If necessary, press and hold the power button until the computer turns off.
2. Disconnect all peripheral devices from the computer, except the monitor, keyboard, and mouse.
3. Press the power button to turn on the computer.
4. As soon as you see the HP logo screen, repeatedly press the **F11** key on your keyboard until the *Windows is Loading Files...* message appears on the screen.
5. At the HP Recovery Manager screen, follow the on-screen instructions to continue.
6. When Windows has loaded, shut down the computer, reconnect all peripheral devices, and then turn the computer back on.

System Recovery using recovery media (select models only)

Use the steps provided in this section if you created recovery media using [Creating recovery media using HP Recovery Manager \(select models only\) on page 126](#). If you used HP Recovery Disc Creator to create a Windows 7 operating system DVD and a *Driver Recovery* DVD, use the steps in [Using HP Recovery Disc operating system discs \(select models only\) on page 131](#).

 **CAUTION:** System Recovery deletes all data and programs you have created or installed. Back up any important data to a CD or DVD or to a USB flash drive.

To perform a System Recovery using recovery media:

1. If you are using a set of DVDs, insert the first recovery disc into the DVD drive tray, and close the tray. If you are using a recovery USB flash drive, insert it into a USB port.
2. Click the **Start** button, and then click **Shut Down**.

or


If the computer is not responding, press and hold the power button for approximately 5 seconds or until the computer turns off.
3. Disconnect all peripheral devices from the computer except the monitor, keyboard, and mouse.
4. Press the power button to turn on the computer, and press **Esc** as the computer is powering on to display the startup menu.
5. Use the arrow keys to select the boot menu, and press **Enter**. Use the arrow keys to select the location where the recovery media is inserted (USB or DVD). Press **Enter** to boot from that device.
6. If Recovery Manager asks if you want to run System Recovery from Media or Hard Drive, select **Media**. On the Welcome screen, under **I need help immediately**, click **Factory Reset**.
7. If you are prompted to back up your files, and you have not done so, select **Back up your files first (recommended)**, and then click **Next**. Otherwise, select **Recover without backing up your files**, and then click **Next**.
8. If you are prompted to insert the next recovery disc, do so.
9. When Recovery Manager is finished, remove the recovery disc or the recovery USB flash drive from the system.
10. Click **Finish** to restart the computer.

Using HP Recovery Disc operating system discs (select models only)

Use the steps provided in this section if you used HP Recovery Disc Creator to create a Windows 7 operating system DVD and a *Driver Recovery* DVD. If you created recovery media using [Creating recovery media using HP Recovery Manager \(select models only\) on page 126](#), use the steps in [System Recovery using recovery media \(select models only\) on page 130](#).

If you cannot use the recovery discs you previously created using the HP Recovery Disc Creator (select models only), you must purchase a Windows 7 operating system DVD to reboot the computer and repair the operating system.

To order a Windows 7 operating system DVD, contact support. Go to <http://www.hp.com/support>, select your country or region, and follow the on-screen instructions.

 **CAUTION:** Using a Windows 7 operating system DVD completely erases the hard drive contents and reformats the hard drive. All files that you have created and any software that you have installed on the computer are permanently removed. When reformatting is complete, the recovery process helps you restore the operating system, as well as drivers, software, and utilities.

To initiate recovery using a Windows 7 operating system DVD:



NOTE: This process takes several minutes.

1. If possible, back up all personal files.
2. Restart the computer, and then insert the Windows 7 operating system DVD into the optical drive before the Windows operating system loads.



NOTE: If the computer does not boot to the DVD, restart the computer and press **Esc** as the computer is powering on to see the startup menu. Use the arrow keys to select the boot menu and press **Enter**. Use the arrow keys to select the location where the recovery DVD is inserted. Press **Enter** to boot from that device.

3. When prompted, press any keyboard key.
4. Follow the on-screen instructions.
5. Click **Next**.
6. Select **Install now**.
7. Follow the on-screen instructions.

After the repair is completed:

1. Eject the Windows 7 operating system DVD and then insert the *Driver Recovery* DVD.
2. Follow the on-screen instructions to install the Hardware Enabling Drivers first, and then install Recommended Applications.

H Statement of Volatility

HP confirms that Intel-based HP 406 G1 MT personal computer contains DDR RAM volatile memory (memory amount depends on the customer configuration). In addition, the motherboard in the condition originally shipped without subsequent modification or the addition or installation of any applications, features, or functionality, contain the following non-volatile memory: PCH Real Time Clock (RTC) battery backed-up configuration memory (256 Bytes), DIMM Serial Presence Detect (SPD) configuration data (256 Bytes per module, 128 Bytes programmable), and Serial Flash IC for System BIOS (64M Bits).

The volatile memory is cleared by removing power from the system for greater than 30 seconds. The non-volatile memory on the motherboard is restored by following the steps below:

1. Download the latest BIOS for this system and operating system off of the HP website.
2. Follow the instructions on the website to flash the BIOS.
3. Enter F10 setup.
4. Select **Default Setup > Reset Factory Settings as Default**, and then select **Apply Defaults and Exit**. Setup and Power-on password can be cleared by the BIOS Password Clear jumper.
5. Power down the system and remove the AC power card. The RTC and Super I/O battery backed-up memory is cleared by removing the battery found on the motherboard, allowing the board to sit for greater than 60 seconds, and then replacing the battery.

The DIMM SPD EEPROM is not readily available to the user, however there are tools publicly available to read and write this part. To eliminate the possibility that it could contain sensitive information, remove the DIMMs or use one of these tools.

I Specifications

MT Specifications

Table I-1 Specifications

Chassis		
Height	14.05 in	357 mm
Width	7.2 in	182.88 mm
Depth	15.82 in	402mm
Approximate Weight	15.75 lb	7.148 kg
Temperature Range		
Operating	50° to 95°F	10° to 35°C
Nonoperating	-22° to 140°F	-30° to 60°C
Relative Humidity (noncondensing)		
Operating	10-90%	10-90%
Non-operating	5-95%	5-95%
Maximum Altitude (unpressurized)		
Operating	10,000 ft	3048 m
Nonoperating	30,000 ft	9144 m
Power Supply		
Standard Efficiency	300W active PFC	
High Efficiency	300W active PFC EStar 6	
Operating Voltage Range	90 – 264 VAC	
Rated Line Frequency	50/60 Hz	
Operating Line Frequency Range	47 – 63 Hz	
Rated Input Current	4A	
Rated Voltage Range	200-240 VAC (300W active PFC)	

Index

A

- access panel
 - locked 85
 - removal and replacement 24
 - spare part number 10, 13, 24
- audible codes 76
- audio problems 99
- audio, product description 1

B

- backup and recovery, Windows 7 125
- Backup and Restore, Windows 7 128
- backups
 - creating Windows 7 125, 128
- beep codes 76
- booting options
 - Full Boot 68
 - Quick Boot 68

C

- cable connections 30
- cable management 22, 29
- cable pinouts, SATA data 21
- cautions
 - AC power 14
 - cables 20
 - cooling fan 19
 - electrostatic discharge 14
 - keyboard cleaning 19
 - keyboard keys 19
- CD-ROM or DVD problems 113
- chassis types, illustrated 14
- chipset, product description 1
- cleaning
 - computer 18

- mouse 19
- safety precautions 18
- CMOS
 - backing up 77
 - clearing and resetting 79
- computer cleaning 18
- connecting drive cables 35
- connections
 - system board 30
- country power cord set requirements 67
- Customer Support 81

D

- disassembly preparation 23
- drive connectors 36
- Driver Recovery DVD,
 - creating 127
 - using for restore 131
- Driver Recovery media,
 - Windows 124
- Driver Recovery media, Windows 8.1 124
- drives
 - connecting cables 35
 - installing 35
 - removal and replacement 34

E

- electrostatic discharge (ESD) 14
 - preventing damage 15
- error
 - codes 68, 76
 - messages 69
- expansion card
 - microtower installation 31
 - microtower removal 31

F

- f11 recovery, Windows 8 123
- f11 recovery, Windows 8.1 123
- fan sink
 - removal and replacement 49
 - spare part number 11, 49
- fan, power supply 19
- fan, system
 - removal and replacement 44
 - spare part number 11, 12, 44
- flash drive problems 115
- flashing LEDs 76
- foot, spare part number 11, 12
- front bezel
 - removal and replacement 25
 - spare part number 10, 25
- front bezel,
 - spare part number 13
- front components 4
- front I/O and USB assembly
 - removal 39
 - spare part number 11, 13, 39
- front panel problems 116

G

- general problems 84
- graphics, product description 1
- grounding methods 16

H

- hard drive
 - product description 1
 - proper handling 20
 - removing 38
 - SATA characteristics 21
 - spare part numbers 10
- hard drive problems 89
- hard drive recovery
 - Windows 123

- Windows 7 129
- Windows 8.1 123
- hardware installation problems 104
- heat sink
 - removal and replacement 49
- Help and Support
 - Windows 7 125
- helpful hints 82
- HP Recovery Disc Creator, using 127

I

- installing
 - drive cables 35
 - microtower expansion card 31
- Internet access problems 116

K

- keyboard
 - cleaning 18
 - product description 2
- keyboard problems 102
- keyboards
 - spare part number 11

M

- media card reader
 - problems 92
- memory
 - populating sockets 27
 - problems 110
 - removal and replacement 26
 - specifications 26
- memory module
 - product description 1
- memory modules
 - spare part number 10
- model name 1
- monitor problems 93
- mouse
 - cleaning 19
 - problems 102
 - spare part number 11

N

- network problems 107
- numeric error codes 69

O

- operating guidelines 17

- operating system media, Windows 8 124
- operating system media, Windows 8.1 124
- operating system, product
 - description 3
- optical drive
 - problems 113
 - removing 37
 - spare part numbers 10, 12
- optical drive, product description 1
- overheating, prevention 17

P

- password
 - clearing 77
 - power-on 77
 - setup 77
- pointing device, product
 - description 2
- ports
 - product description 2
- POST error messages 68
- power cord set requirements
 - country specific 67
- power problems 88
- power requirements, product
 - description 2
- power supply
 - fan 19
 - operating voltage range 134
 - removal and replacement 52
 - spare part number 10
- power switch/LED
 - removal and replacement 41
- power switch/LED assembly
 - spare part number 12, 13, 41
- power-on password 77
- preparation for disassembly 23
- printer problems 101
- problems
 - audio 99
 - CD-ROM or DVD 113
 - flash drive 115
 - front panel 116
 - general 84
 - hard drive 89
 - hardware installation 104
 - Internet access 116

- keyboard 102
- Media Card Reader 92
- memory 110
- monitor 93
- mouse 102
- network 107
- power 88
- printer 101
- processor 112
- software 118
- processor
 - product description 1
 - removal and replacement 46, 51
 - spare part number 10
- processor problems 112
- product description
 - audio 1
 - chipset 1
 - ethernet 2
 - graphics 1
 - hard drive 1
 - keyboard 2
 - memory module 1
 - operating system 3
 - optical drive 1
 - pointing device 2
 - ports 2
 - power requirements 2
 - processors 1
 - product name 1
 - serviceability 3
- product name 1

R

- rear components 5
- recovery discs, steps for creating Windows 7 126
- recovery discs, using for restore 131
- recovery media, creating 127
- recovery media, creating Windows 7 125
- recovery partition, Windows 8 123
- recovery partition, Windows 8.1 123
- recovery USB flash drive, steps for creating Windows 7 126

- recovery using Windows 8
 - operating system media 124
- recovery using Windows 8.1
 - operating system media 124
- removal and replacement
 - access panel 24
 - drives 34
 - fan sink 49
 - fan, system 44
 - front bezel 25
 - heat sink 49
 - memory 26
 - power supply 52
 - power switch 41
 - processor 46, 51
 - speaker 46
 - system board 55
- removing
 - hard drive 38
 - microtower expansion card 31
 - optical drive 37
- resetting
 - CMOS 77
 - password jumper 77
- restoring the hard drive, Windows 123
- restoring the hard drive, Windows 8.1 123

S

- safety and comfort 81
- safety precautions
 - cleaning 18
- SATA
 - connectors on system board 21
 - data cable pinouts 21
 - hard drive characteristics 21
- screws, correct size 20
- SDRAM (synchronous dynamic random access memory) 26
- service considerations 19
- serviceability features 23
- serviceability, product description 3
- setup password 77
- software
 - problems 118
 - servicing computer 20

- spare part number
 - tamper-resistant wrench 20
 - Torx T-15 screwdriver 20
- speaker
 - removal and replacement 46
 - spare part number 11, 13, 46
- specifications
 - computer 134
 - memory 26
- Statement of Volatility (SOV) 133
- static electricity 15
- system board
 - removal and replacement 55
 - SATA connectors 21
 - spare part number 10, 55
- system board drive connections 36
- system board,
 - spare part number 13
- System Recovery using Windows 7 recovery media 130
- System Recovery, Windows 7 129
- system restore points, creating Windows 7 125
- System Restore, Windows 7 128

T

- tamper-proof screws
 - tool 20
- temperature control 17
- tools, servicing 20
- Torx T15 screwdriver 20

V

- ventilation, proper 17

W

- Wake-on-LAN feature 107
- Windows 7
 - backing up information 128
 - backup and recovery 125
 - Backup and Restore 128
 - creating backups 125
 - creating recovery media 125
 - creating system restore points 125
 - hard drive recovery 129
 - Help and Support 125

- steps for creating recovery discs 126
- steps for creating recovery media 126
- steps for creating recovery USB flash drive 126
- System Recovery 129
- System Recovery using recovery media 130
- System Restore 128
- Windows 7 operating system discs using for restore 131
- Windows 7 operating system DVD creating 127
- using for restore 131
- Windows 7 operating system media
 - creating 127
- Windows 8
 - backup and restore 122
 - Driver Recovery media 124
 - f11 recovery 123
 - hard drive recovery 123
 - operating system DVD 124
 - recovery partition 123
 - restoring the hard drive 123
- Windows 8.1
 - backup and restore 122
 - Driver Recovery media 124
 - f11 recovery 123
 - hard drive recovery 123
 - operating system DVD 124
 - recovery partition 123
 - restoring the hard drive 123