Maintenance & Service Guide

HP RP7 Retail System Model 7100

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Second Edition (January 2013)

First Edition (December 2012)

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About This Book

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

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

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

Table of contents

1   Product Features

Standard Features

The HP RP7 Retail System features include:

- Designed for long-term deployment within general retail, hospitality, and other retail markets

- Choice of associate facing touchscreen:
    - 15" Resistive
    - 15" Projective Capacitive
    - 17" Projective Capacitive

- Cable management features

- Water and dust resistant, IP54 rated

- Flexible use with display tilt and height adjustments

- Three optional peripherals that can be integrated:
    - HP Retail Integrated Dual-Head MSR
    - HP Retail Integrated Fingerprint Reader
    - HP Retail Integrated Webcam

- Customer-facing two-line VFD (Vacuum Florescent Display); standard on select models (VFD can be mounted to the RP7 or mounted on a separate stand)

- Customer-facing 10.4" LCD Display; optional (cannot be used in conjunction with the two-line VFD)

- DDR3 memory

- Operating system choices

- Integrated NIC and WiFi (some models)

- USB+PWR ports

- Cash drawer port

- SSD choices

- RAID level 0,1 capable (RAID 1 can be HP factory preconfigured)

- Manageability tools

- Secure USB port (security screw provided)

- Energy Star 5 qualified, EU Compliant, RoHS2 Compliant

- 87% energy efficient internal power supply adapter

- HP Limited Warranty, 3/3/3 standard: 3 years parts, 3 years labor, and 3 years on-site services

Optional HP RP7 Accessories

The following HP RP7 accessories are available from HP.
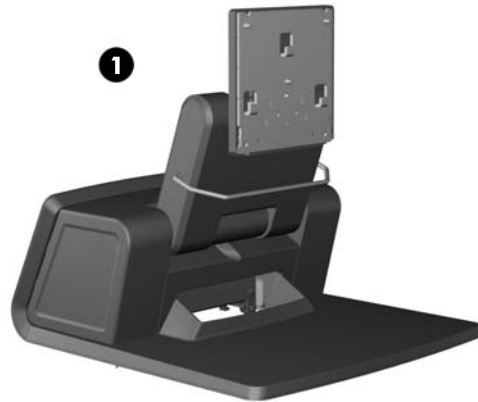
1	HP RP7 Adjustable Stand	4	HP Retail Integrated Webcam
2	HP Retail RP7 VFD Customer Display	5	HP Retail Integrated Fingerprint Reader
3	HP Retail RP7 10.4" Customer Display	6	HP Retail Integrated Dual-Head MSR

NOTE: A stand-alone VFD that is mounted on a separate stand is also available from HP (not pictured above).

Front Panel Controls
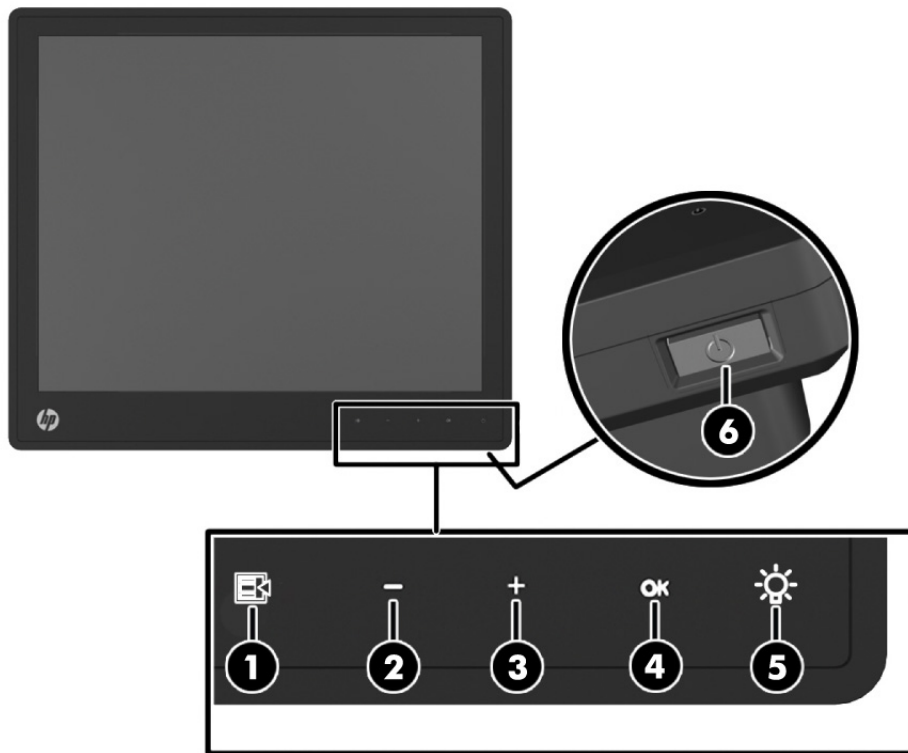
Control			Function
1		Menu	Opens the On-Screen Display (OSD) main menu.
2	—	– (Minus)	If the OSD menu is on, tap to navigate backward through the OSD menu and decrease adjustment levels.
3	+	+ (Plus)	If the OSD menu is on, tap to navigate forward through the OSD menu and increase adjustment levels.
4	OK	OK	If the OSD menu is on, tap to select a menu item.
5	☼	Power LED	Green = Fully powered. Flashing Green = Sleep mode Red = PC error condition (refer to Interpreting POST diagnostic front panel LEDs and audible codes on page 96 for more information). Off = Power is off
6		Power Button	Powers the system on and off, and sets the system to hibernate or sleep mode.

Using the On-Screen Display Menu

Use the On-Screen Display (OSD) to adjust the screen image based on your viewing preferences. To access the OSD, do the following:

1. If the system is not already on, press the Power button to turn on the unit.

2. To activate the OSD function, tap in the front bezel area just to the left of the power icon.

3. To access the OSD Menu, tap the Menu icon on the monitor's front panel.

4. To navigate through the OSD Menu, tap the + (Plus) icon on the monitor's front panel to scroll up, or the – (Minus) icon to scroll in reverse.

5. To select an item from the OSD Menu, use the + or – icons to scroll to and highlight your selection, then tap the OK icon to select that function.

6. Adjust the item using the + or – icons on the front panel to adjust the scale.

7. After adjusting the function, select **Save and Return**, or **Cancel** if you don't want to save the setting, then select **Exit** from the Main Menu.

The following table lists the OSD Main menu items with a brief descriptions of each item.

Table 1-1 **OSD Main Menu**

Icon	Main Menu	Description
	Brightness	Adjusts the brightness level of the screen.
	Contrast	Adjusts the contrast level of the screen.
	Color	Selects and adjusts the screen color.
	OSD Control	Adjusts the on-screen display (OSD) controls.
	Management	Turns mode display and DDC/CI support on or off, and adjusts volume on models with integrated speakers.
	Language	Selects the language in which the OSD menu is displayed. The factory default is English.
	Information	Selects and displays important information about the display.
	Factory Reset	Returns all OSD menu settings and DDC/CI controls to the factory default settings, except the Language.
	Exit	Exits the OSD menu screen.

Rear I/O Panel Components
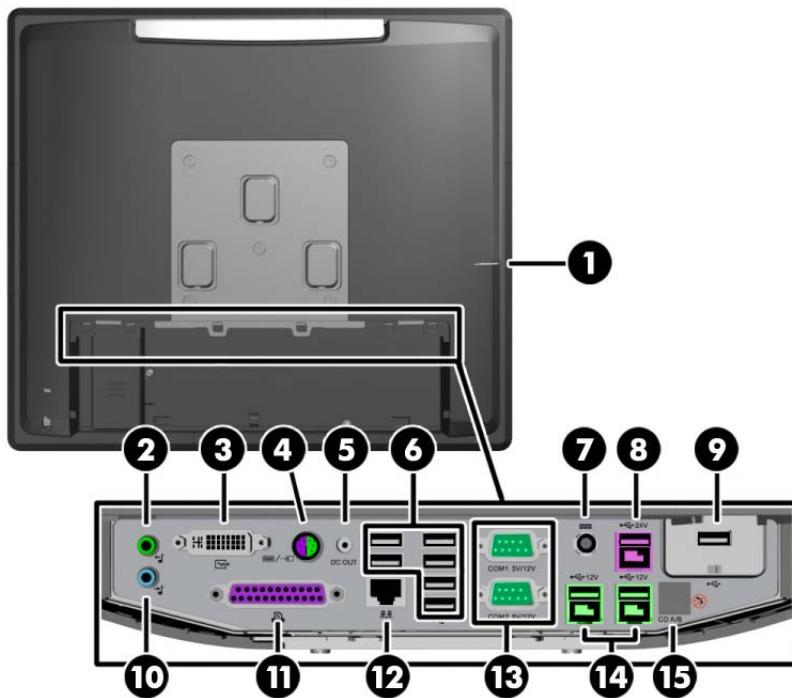
1	Hard Drive Activity Light	9	Secured USB Port
2	Line-Out Connector for powered audio devices (green)	10	Line-In Audio Connector (blue)
3	DVI-I Connector (for a secondary display or the optional HP Retail RP7 10.4" Customer Display)	11	Parallel Port
4	PS/2 Mouse/Keyboard Connector	12	RJ-45 Network Connector
5	DC Out Power Connector (for the optional HP Retail RP7 10.4" Customer Display only)	13	Serial Ports 5V/12V
6	USB Ports (6)	14	Powered USB 12V
7	DC In Power Connector	15	Cash Drawer Connector
8	Powered USB 24V		

NOTE: The serial ports can be configured as 5V or 12V powered serial ports. Refer to Configuring powered serial ports on page 89 for more information.

NOTE: The 24-volt Powered USB connector and the 12-volt Powered USB connector are keyed differently as a precaution to prevent connection errors.

NOTE: Protective plastic caps to cover the rear I/O ports are included with the system.

NOTE: Peel off the metallic tape over the cash drawer connector to connect a cash drawer.

CAUTION: The cash drawer connector is similar in size and shape to a modem jack. To avoid damage to the computer, DO NOT plug a network cable into the cash drawer connector.

CAUTION: Do not connect any device other than the HP Retail RP7 10.4" Customer Display to the DC Out Power Connector.

2   Installing and Customizing the Software

Activating and customizing the software

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.

Turning off the computer

To properly turn off the computer, first shut down the operating system software.

▲ Click **Start** > **Shut down**.

Finding more information

NOTE: Some or all of the following documents are available on the computer hard drive.

● *Getting Started*—Helps you connect the computer and peripheral devices and set up factory-provided software; also includes basic troubleshooting information should you encounter any problems during initial startup.

● *Hardware Reference Guide*—Provides an overview of the product hardware, as well as instructions for upgrading this series of computers; includes information on RTC batteries, memory, and power supply.

- *Maintenance and Service Guide* (English only)—Provides information on parts removal and replacement, troubleshooting, Desktop Management, setup utilities, safety, routine care, connector pin assignments, POST error messages, diagnostic indicator lights and error codes.

- *Regulatory, Safety and Environmental Notices*—Provides safety and regulatory information that ensures compliance with U.S., Canadian, and various international regulations.

Accessing User Guides (Linux systems)

Double-click the **HP User Manuals** icon on your desktop. Select the folder for your language. Select the guide you wish to access.

3   Illustrated parts catalog

Misc parts
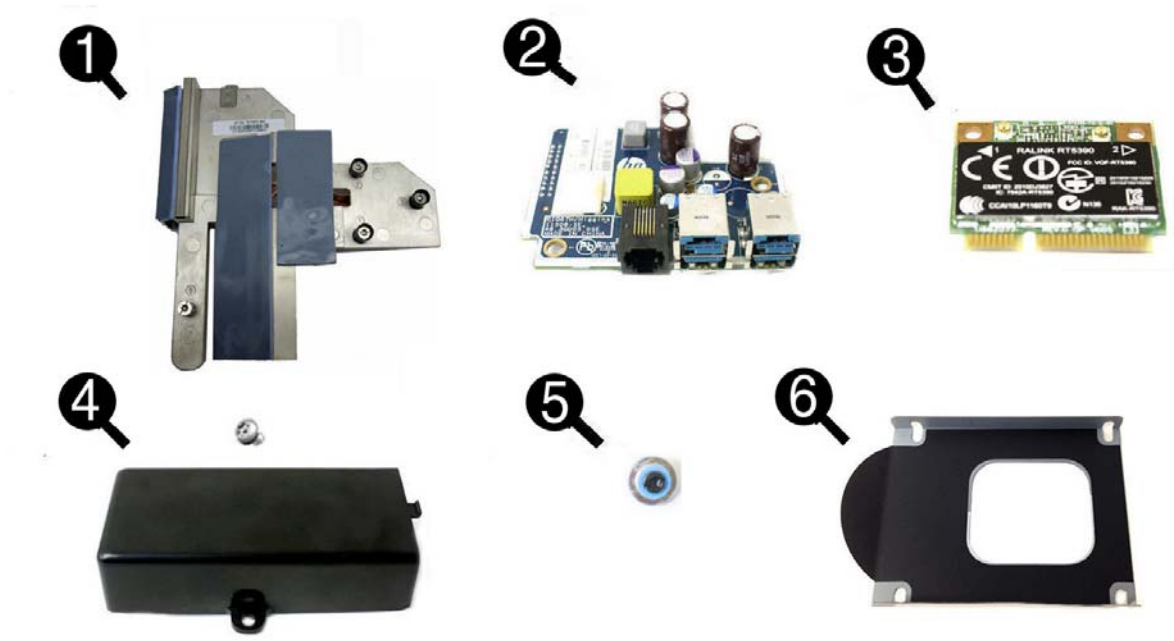
Item	Description	Spare part number
(1)	**Heat sink** (includes replacement thermal material)	712404-001
(2)	**USB+PWR 24V and Cash Drawer port daughter card**	702775-001
(3)	**Ralink RT5390R 802.11bgn 1x1 Wi-Fi Adapter**	701396-001
(4)	**USB security cover for secured USB port on I/O panel** (includes security screw)	702779-001
(5)	**Grommet, hard drive**	594220-001
(6)	**Hard drive carrier**	709677-001
	Rubber foot and screw kit (not illustrated)	702788-001
	Thermal pads (not illustrated)	712406-001

Plastics
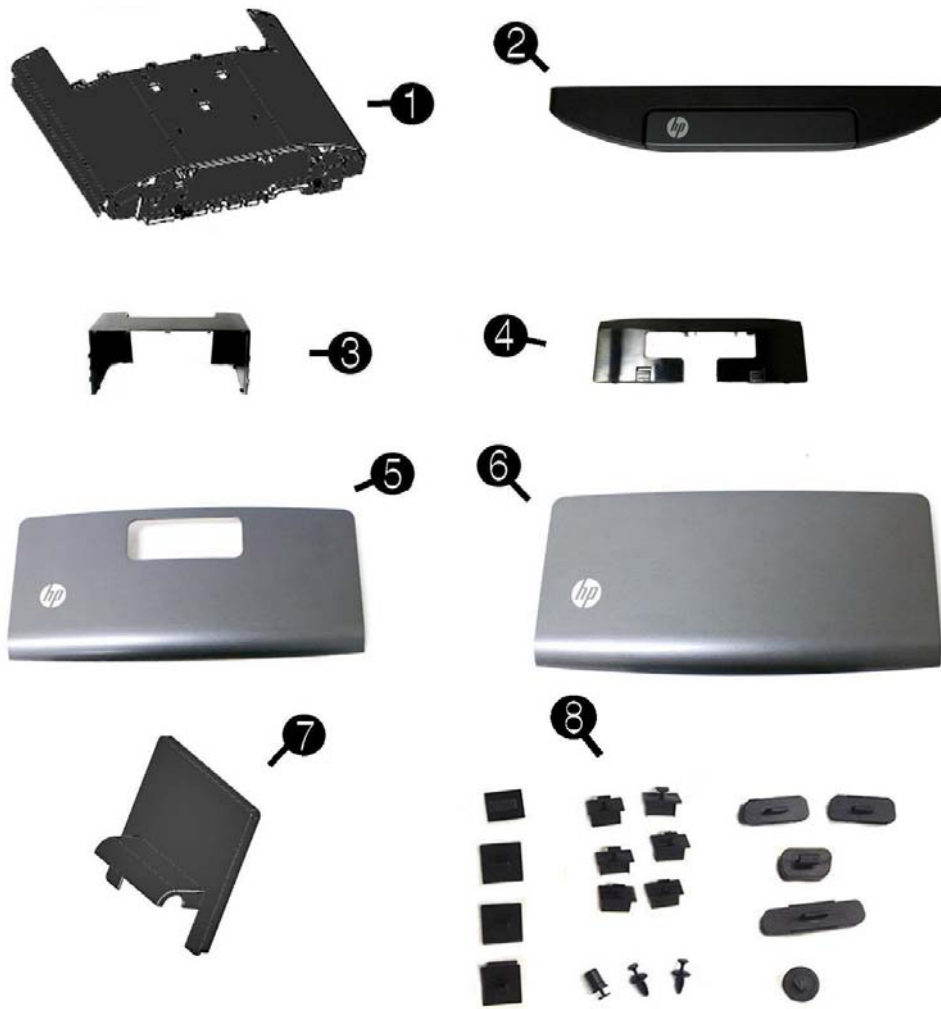
Item	Description	Spare part number
(1)	**Display head back panel**(includes top access door)	712401-001
(2)	**Top access door** (on top of display head back panel)	716986-001
(3)	**Power supply cover**	702787-001
(4)	**Rear I/O cover**	709678-001
	In Mold Decoration (IMD; customizable) covers:	
(5)	Panel with hole (for bottom rear on models with CFD/VFD)	702781-001
(6)	Panel without hole (for bottom rear on models without CFD/VFD)	702786-001
(7)	**VESA plate cover**	716045-001
(8)	**Rear I/O plastic covers**	712405-001
	NOTE: Be sure to install these covers over any port that is not in use.	
	USB port covers	
	15-inch USB port cover	713739-001

Item	Description	Spare part number
	17-inch top and bottom USB port cover	713740-001
	17-inch left and right USB port cover	713740-010
	USB port plug (for use only with AFD USB ports)	713741-001
	Power adapter 180-W, does not include power cord; not illustrated	702778-001

System board and memory
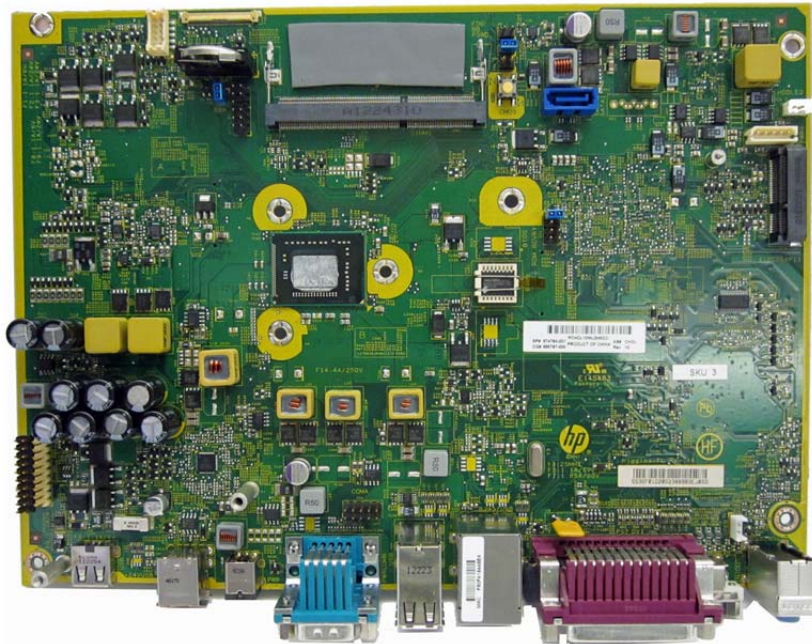
Description	Spare part number
System board (includes replacement thermal material)	674784-001
Memory modules (SODIMM, PC3-12800, 1666-MHz)	
8-GB	689374-001
4-GB	689373-001
2-GB	689372-001

Drives

Description	Spare part number
256 GB Solid State Drive (SSD)	661842-001
128 GB Solid State Drive (SSD)	665961-001
32 GB MLC Flash, 2.5-in	686616-001

Cables
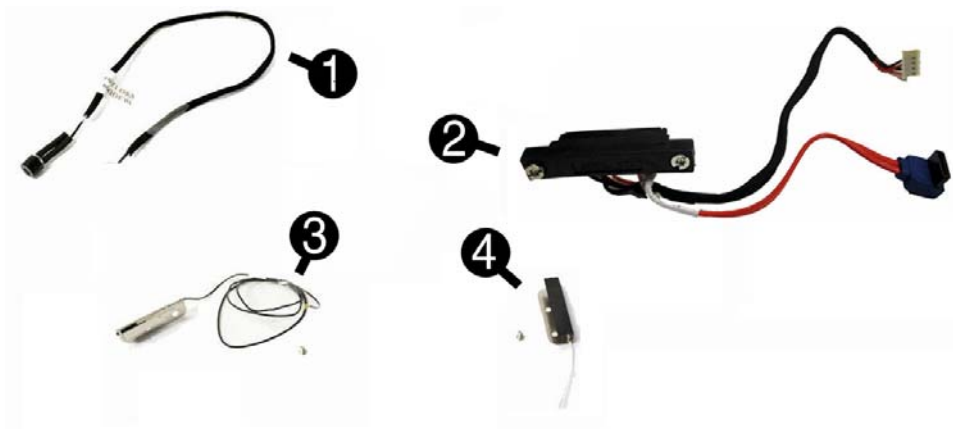
Description		Spare part number
(1)	**LED cable assembly**	702777-001
(2)	**Hard drive cable assembly**	712407-001
	Antenna kit	
(3)	Black, auxiliary	720146-001
(4)	White, main	712403-001

Accessories

Description	Spare part number
Accessories	
(1) **Base**	not spared
(2) **VFD customer display, pole**	702783-001
(3) **Retail integrated fingerprint reader to add security identification functions**	690684-001
(4) **Retail integrated webcam for live video functions**	695661-001
(5) **Retail integrated dual-head magnetic stripe reader for card data read**	690685-001
(6) **VFD customer display, bracket**	702784-001
(7) **Display, customer-facing (CFD), 10.4 inch**	667837-001
* **Display, associate-facing (AFD), 15 inch capacitive**	667839-001
* **Display, associate-facing (AFD), 15 inch resistive**	667838-001
(8) **Display, associate-facing (AFD), 17 inch capacitive**	667841-001
(9) **Bracket for HP Retail RP7 10.4" Customer Display**	703269-001
(10) **Cable kit for HP Retail RP7 10.4" Customer Display**, includes:	702782-001
● USB A cable	
● DC-in cable	
● DVI-D cable	
● Audio cable	

VFD Display Kit

Description		Spare part number
VFD Display Kit		695662-001
(1)	VFD customer display	
(2)	Display bracket	
(3)	Poles (2)	
(4)	IMD panel	
(5)	Screws	
(6)	Cable kit	

Stand-alone VFD Display Kit

Description	Spare part number
Stand-alone VFD Display Kit	695665-001
(1) VFD customer display	
(2) Poles (3)	
(3) Stand	
(4) Cable kit	

Sequential part number listing

Spare part number	Description
594220-001	Grommet, hard drive
661842-001	256 GB Solid State Drive (SSD)
665961-001	128 GB Solid State Drive (SSD)
667837-001	Display, customer-facing (CFD), 10.4 inch
667838-001	Display, associate-facing (AFD), 15 inch resistive
667839-001	Display, associate-facing (AFD), 15 inch capacitive
667841-001	Display, associate-facing (AFD), 17 inch capacitive
674784-001	System board (includes replacement thermal material)
686616-001	32 GB MLC Flash, 2.5-in
689372-001	2-GB memory module (PC3-12800, 1666-MHz, DODIMM)
689373-001	4-GB memory module (PC3-12800, 1666-MHz, DODIMM)
689374-001	8-GB memory module (PC3-12800, 1666-MHz, DODIMM)
690684-001	Retail integrated fingerprint reader to add security identification functions
695662-001	VFD Kit
695665-001	Stand-alone VFD Kit
701396-001	Ralink RT5390R 802.11bgn 1x1 Wi-Fi Adapter (WLAN module)
702775-001	USB+PWR 24V and Cash Drawer port daughter card
702777-001	LED cable assembly
702778-001	Power adapter, 180-W; does not include power cord
702788-001	Rubber foot and screw kit
702779-001	USB security cover for secured USB port on I/O panel
702781-001	VFD customer display
702782-001	Cable kit for HP Retail RP7 10.4" Customer Display
702783-001	VFD customer display, pole
702784-001	VFD customer display, bracket
702787-001	Power supply cover
703269-001	Bracket for HP Retail RP7 10.4" Customer Display
709677-001	Hard drive carrier
709678-001	Rear I/O cover
712401-001	Display head back panel (includes top access door)
712403-001	Antenna kit, white, main
712404-001	Heat sink (includes replacement thermal material)

Spare part number	Description
712405-001	Rear I/O plastic covers (install on any port not in use)
712406-001	Thermal pads
712407-001	Hard drive cable assembly
713739-001	15-inch USB port cover
713740-001	17-inch top and bottom USB port cover
713740-010	17-inch left and right USB port cover
713741-001	USB port plug (for use only with AFD USB ports)
716045-001	VESA plate cover
716986-001	Top access door (on top of back panel)
720146-001	Antenna kit, black, auxiliary

4 Removal and replacement procedures

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.

Preparation for disassembly

See for initial safety procedures.

1. Close any open software applications.

2. Exit the operating system.

3. Turn off the computer and any peripheral devices that are connected to it.

4. Disconnect the power cord from the electrical outlet and then from the computer.

    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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. 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.

Power supply cover

Description	Spare part number
Power supply cover	702787-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Pull the power supply cover back then lift if up and off the unit.
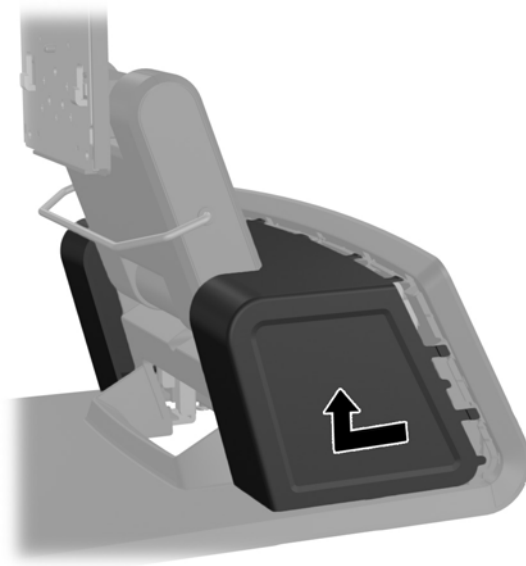
To install the power supply cover, reverse the removal procedure.

Decorative panel (IMD)

Description	Spare part number
IMD panel with hole (for bottom rear on models with VFD)	702781-001
IMD panel without hole (for bottom rear on models without VFD)	702786-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the power supply cover (Power supply cover on page 20).

3. Remove the decorative panel on the rear of the unit by gently prying the panel away from the base at the tab locations on the top and sides of the panel as indicated below **(1)**. Then pull the top of the panel away from the base **(2)** and push straight down on the panel to release the bottom tabs **(3)**.
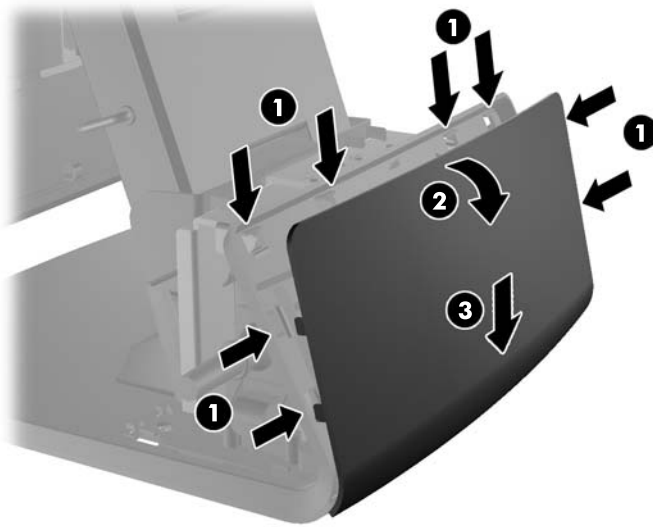
To replace the decorative panel, reverse the removal procedure.

Rear I/O panel

Description	Spare part number
Rear I/O panel	709678-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Slide down the two levers on the upper corners of the rear I/O panel **(1)** and rotate the cover off **(2)**.
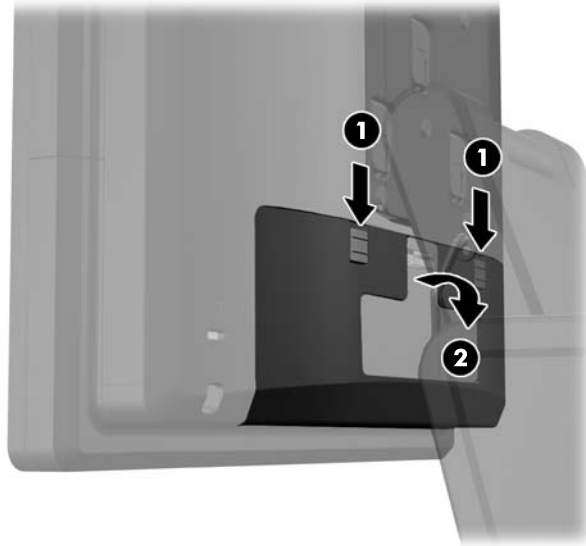
To remove the rear I/O panel, reverse the installation procedures.

VESA plate cover

Description	Spare part number
VESA plate cover	716045-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Slide the stand's VESA plate cover up and off the mounting bracket.
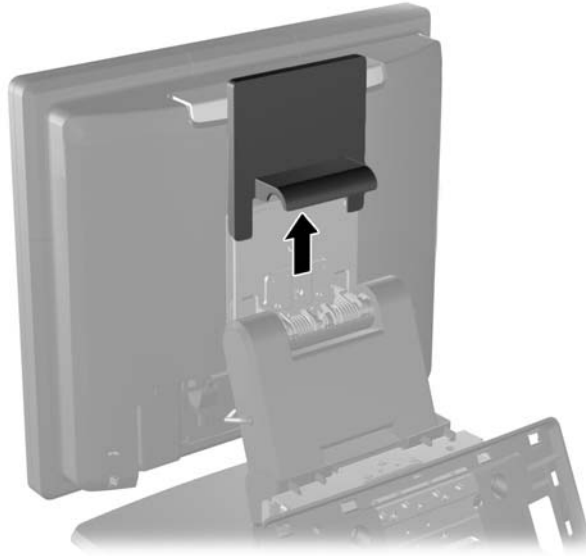
To remove the VESA plate cover, reverse the installation procedures.

Opening the top access door

Open the top access door to access internal components.

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Slide back the decorative panel on top of the access door **(1)** and loosen the captive security screw **(2)**.

    NOTE: This step is not necessary if the security screws were not previously tightened down.
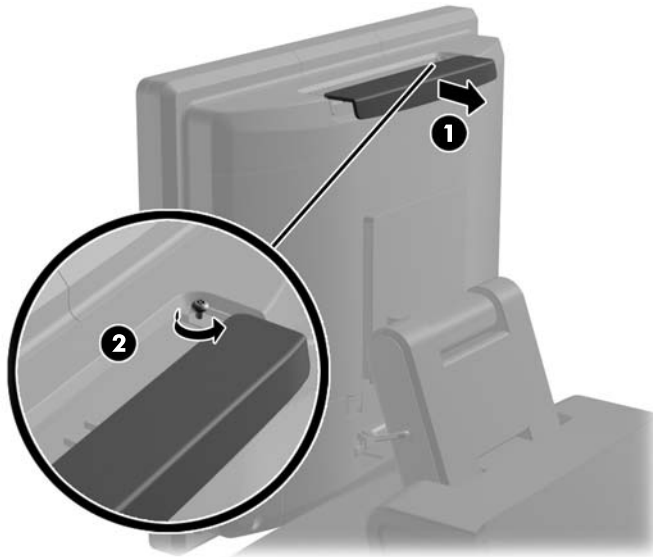
    NOTE: You must use a T-10 tamper-resistant Torx screwdriver available from HP to loosen the security screws.

3. Lift up the access door on top of the rear panel **(1)** and rotate it open **(2)**.
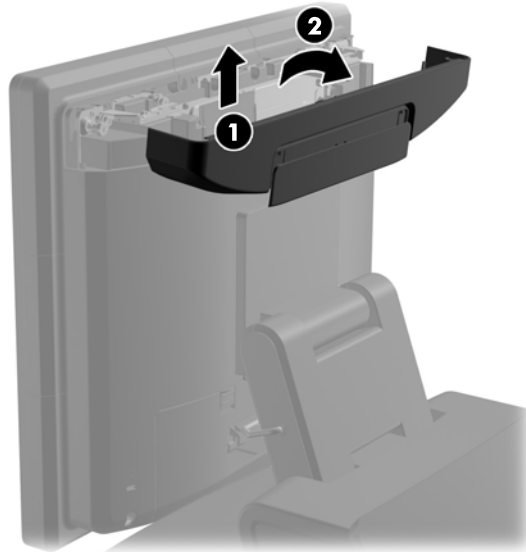
    To close the top access door, reverse the installation procedures.

Routing cables to external devices

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the rear I/O panel (Rear I/O panel on page 22).

3. Remove the power supply cover (Power supply cover on page 20).

4. Route the cables underneath the rear of the base, then through the hole in the center of the base, then up through the cable retainer on the neck of the stand and into the appropriate I/O port.

    CAUTION: Be sure that the power cord is secured by the retainer clip next to the DC In power connector on the rear I/O so that the cord does not get pulled out of the connector.
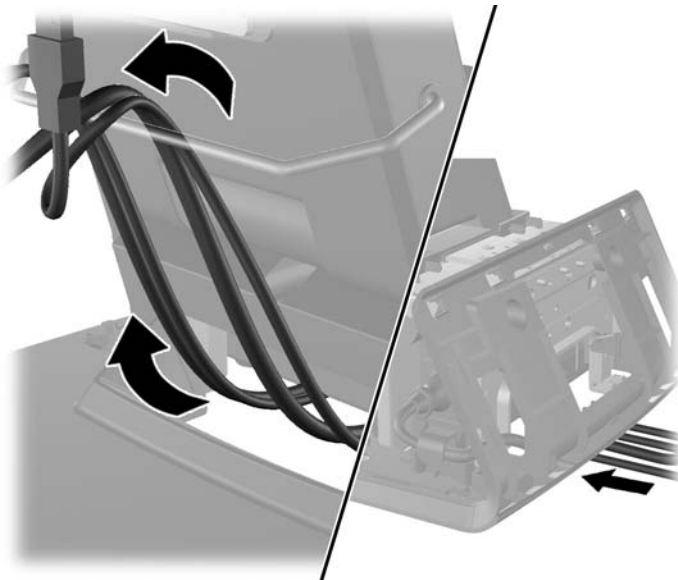
Using the USB security cover

Description	Spare part number
USB security cover	702779-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the rear I/O panel (Rear I/O panel on page 22).

3. Push inward on the tab at the bottom of the USB security cover **(1)** and rotate the bottom of the cover up **(2)** to remove it.
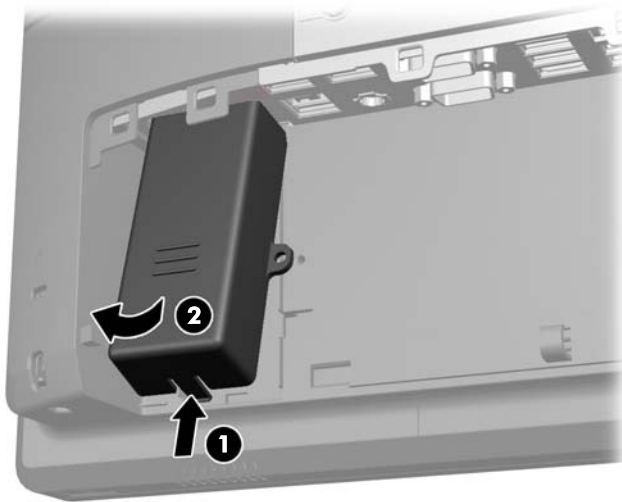
4. Insert the USB device into the USB port.
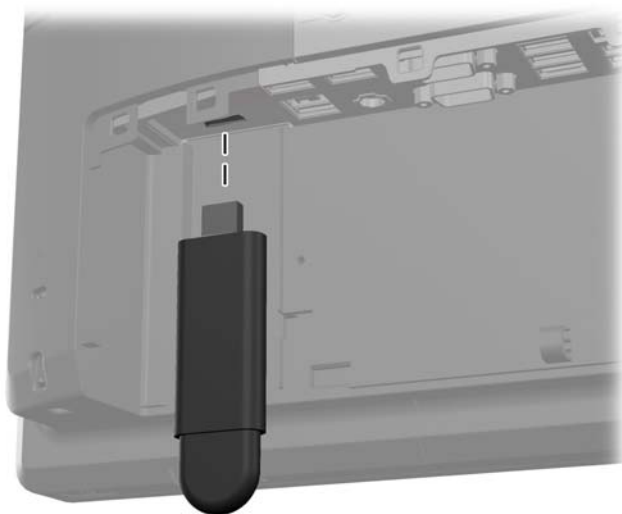
5. Insert the top of the USB security cover into the I/O panel at an angle with the bottom of the cover slightly raised **(1)**, then rotate the bottom down so that the cover snaps in place **(2)**.

> **NOTE:** If the USB device has a cable, place the cable in the channel on the side of the security cover.
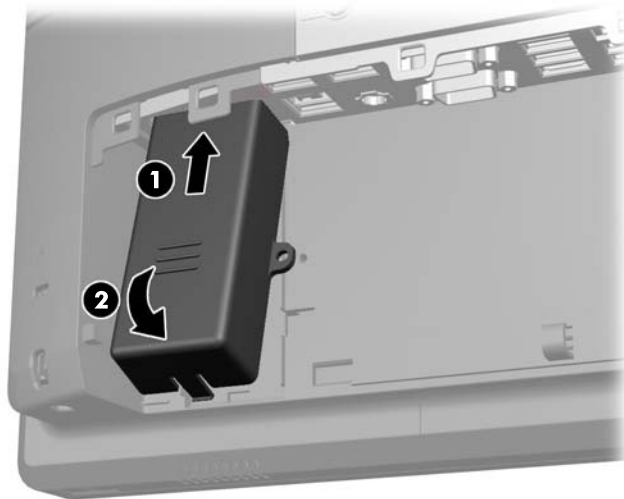
6. If you want to secure the USB port, remove the security screw from the inside of the rear I/O panel and install the screw in the screw hole on the side of the USB security cover.

> **NOTE:** You must use a T-10 tamper-resistant Torx screwdriver available from HP to install the security screw.
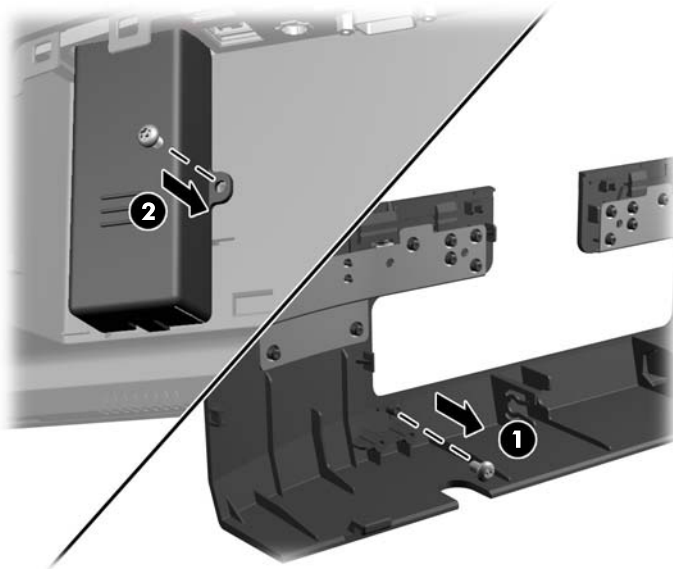
Monitor panel (Associate-Facing Display (AFD))

Description	Spare part number
Display, associate-facing (AFD), 15 inch capacitive	667839-001
Display, associate-facing (AFD), 15 inch resistive	667838-001
Display, associate-facing (AFD), 17 inch capacitive	667841-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the rear I/O panel (Rear I/O panel on page 22).

3. Open the top access door (Opening the top access door on page 24).

4. Disconnect the monitor panel DisplayPort cable **(1)** and power cable **(2)**.
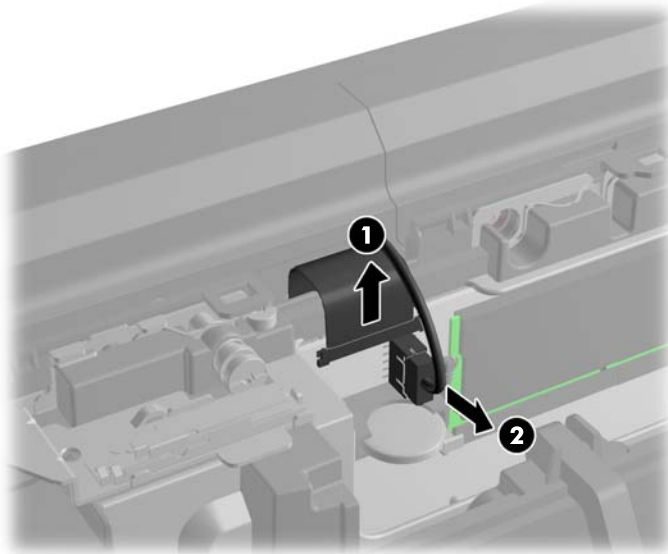
5. Loosen the two captive silver Torx screws that hold the monitor panel onto the computer panel **(1)**, then slide the monitor panel up to release it and pull it off the computer panel **(2)**.

NOTE: There are also two captive black Torx screws at the top of the computer. These screws secure the display head panel to the computer.
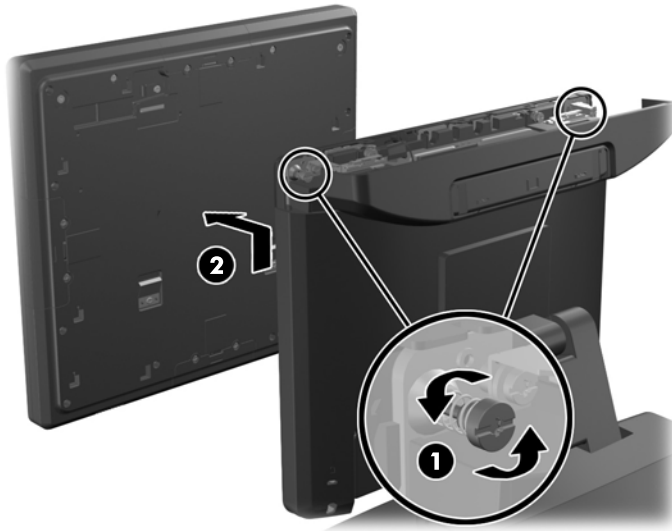
To install the monitor panel, reverse the removal procedures.

Installing an optional HP Retail RP7 10.4" customer display

Description	Spare part number
VFD Kit	695662-001
Stand-alone VFD Kit	695665-001
Bracket for HP Retail RP7 10.4" Customer Display	703269-001
Cable kit for HP Retail RP7 10.4" Customer Display	702782-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the rear I/O panel (Rear I/O panel on page 22).

3. Remove the power supply cover (Power supply cover on page 20).

4. Remove the decorative panel (Decorative panel (IMD) on page 21).

5. Connect the audio, DVI, USB, and power cables to the customer display. Insert the DVI cable into the retainer clip at the base of the display head.
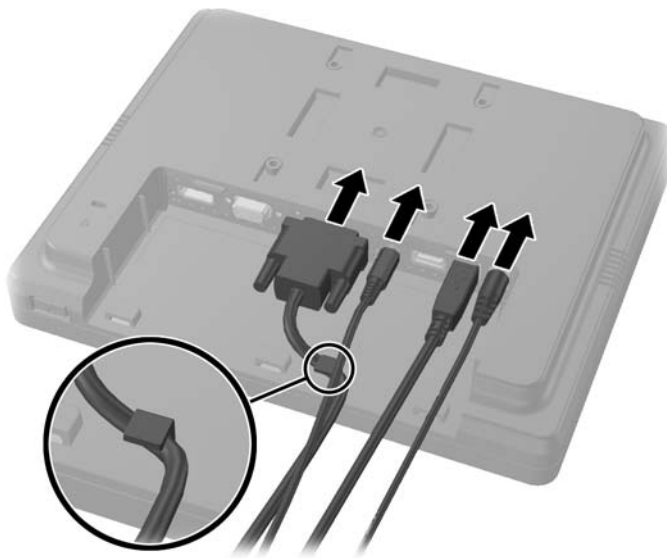
6. Route the audio, DVI, USB, and power cables through the hole in the customer display back plate **(1)**. Connect the back plate to the customer display by aligning the hooks on the back plate with the slots on the back of the display and sliding the back plate up **(2)** so that the screw holes on the back plate are aligned with the screw holes on the display. Install the two screws to secure the back plate to the display **(3)**.
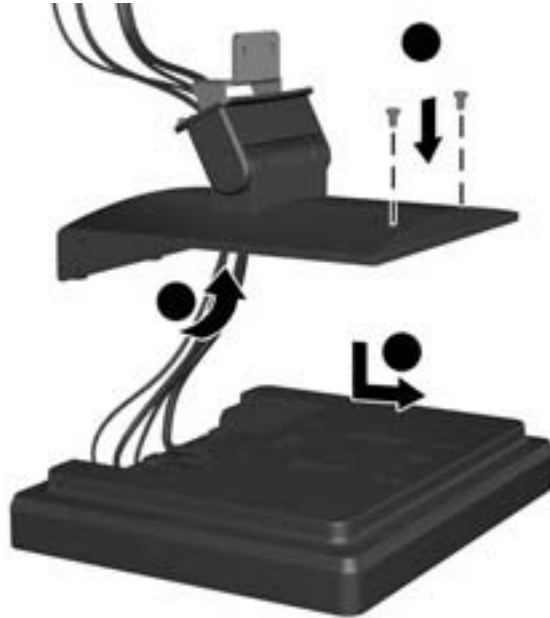
7. Slide the cable ends through the hole in the center of the decorative panel that was included with the customer display.
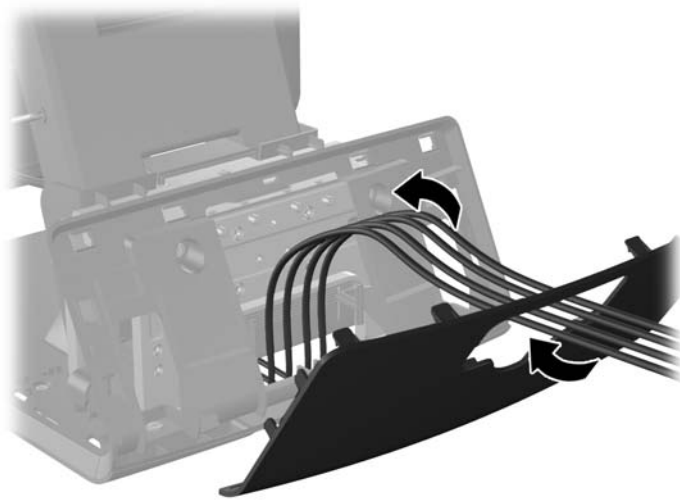
8. Route the audio, DVI, USB, and power cables through the rear of the base and out the front of the base, then up through the cable retainer on the neck of the RP7 stand and connect the cables to the RP7 I/O ports.
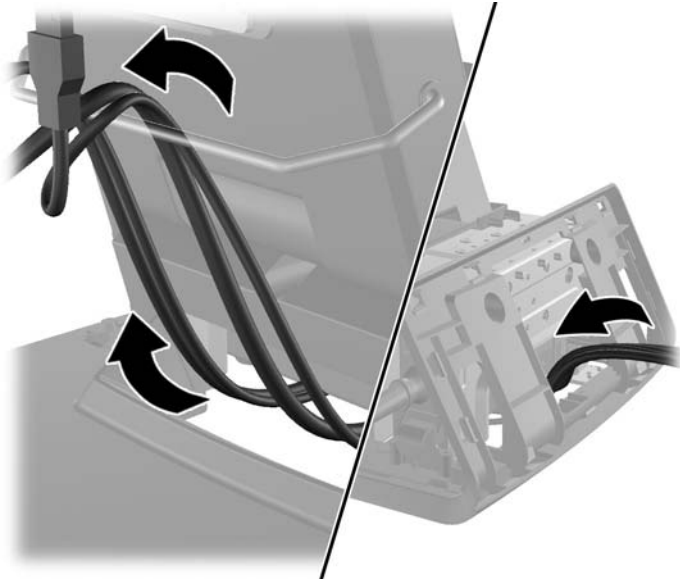
9. Snap the decorative panel onto the rear of the base.
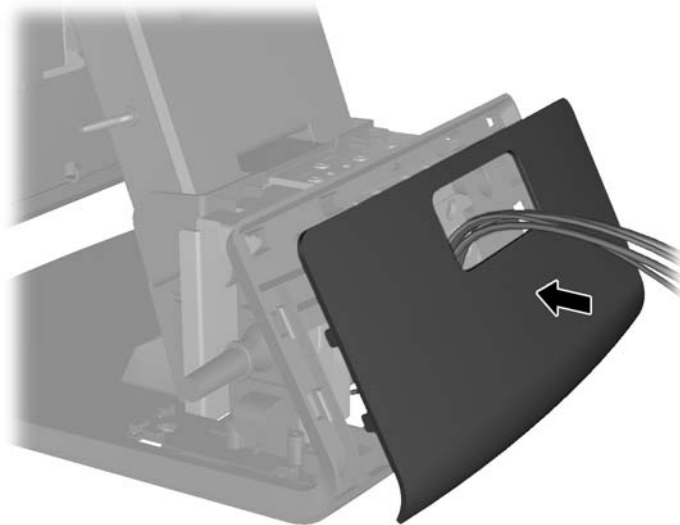
10. Slide the back plate mounting bracket into the mounting hole on the rear of the RP7 base **(1)**, and install the two screws included with the customer display into the screw holes on top of the mounting bracket **(2)**.
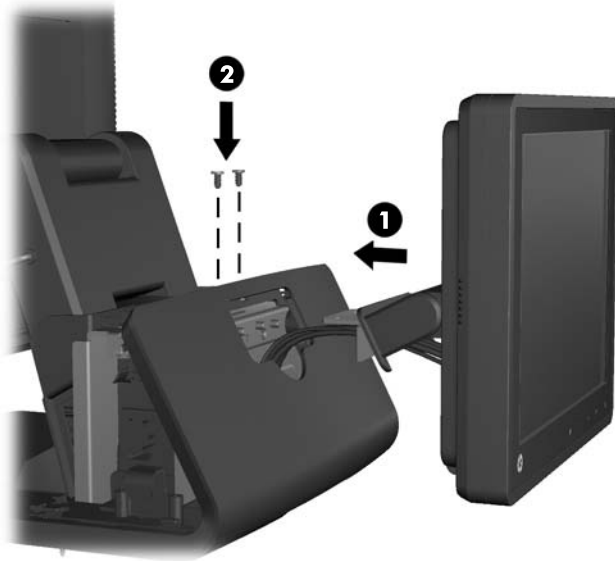
11. Replace the power supply cover by lowering it down over the neck of the base then sliding it back until it snaps in place.
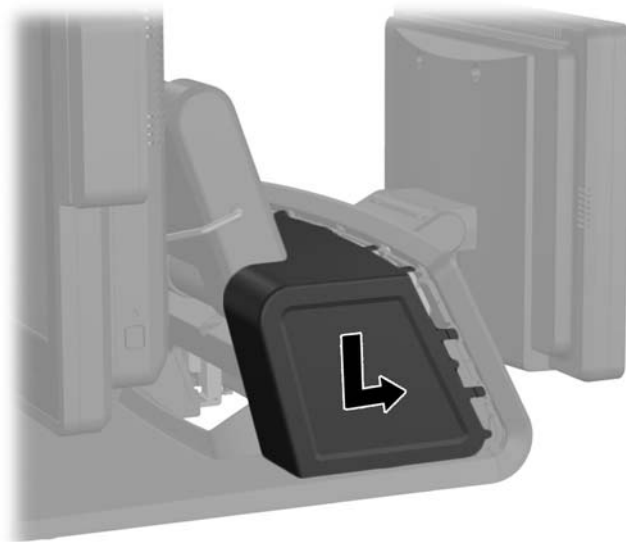
12. Replace the rear I/O cover by placing the hooks on the bottom of the cover into the slots on the bottom of the chassis **(1)**. Then rotate the top of the I/O cover up so that it snaps securely onto the chassis **(2)**.
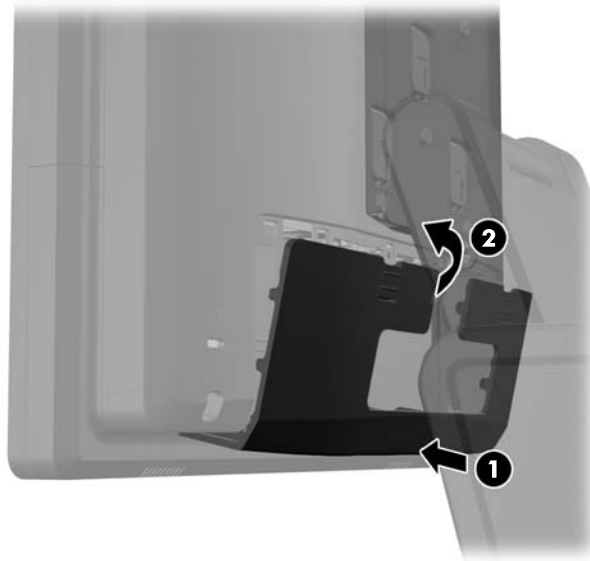
Installing an optional HP Retail RP7 VFD customer display

The integrated VFD customer display can be installed with no poles attached, or with one or two poles attached, depending on the desired height of the VFD.

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the rear I/O panel (Rear I/O panel on page 22).

3. Remove the power supply cover (Power supply cover on page 20).

4. Remove the decorative panel (Decorative panel (IMD) on page 21).

5. If you are installing the VFD with no poles attached, insert the VFD cable through the center of the mounting bracket (1) and slide the VFD onto the mounting bracket (2).

6. If you are installing the VFD with poles attached. slide either one or two poles onto the mounting bracket, depending on the desired height of the VFD. Thread the VFD cable through the top of the pole assembly and out the bottom of the mounting bracket (1), then slide the VFD onto the pole assembly (2).
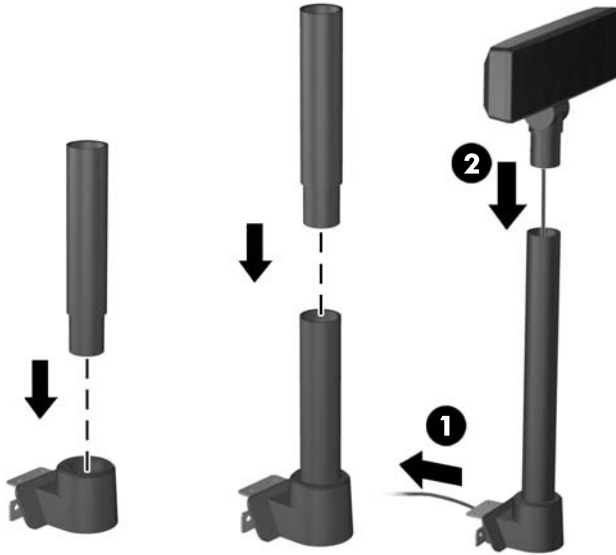
7. Route the VFD cable through the hole in the decorative panel that was included with the VFD, then through the rear of the base (1) and out the front of the base. Continue to route the extension cable up through the cable retainer (2) and connect the VFD cable to the 12V USB port on the RP7 (3).
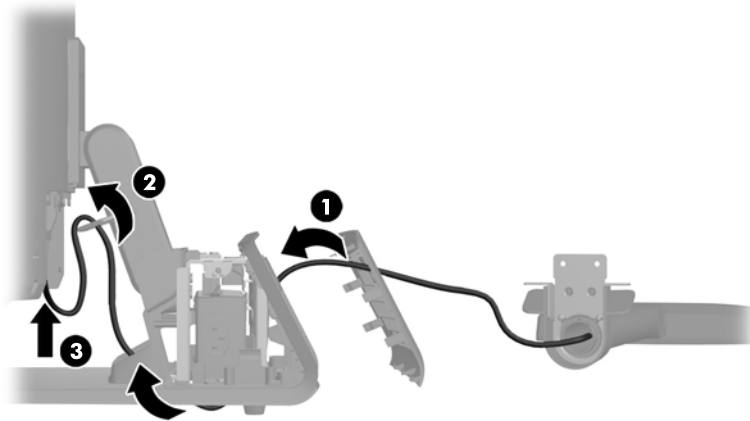
8. Wrap the excess extension cable around the hooks on the rear of the base.
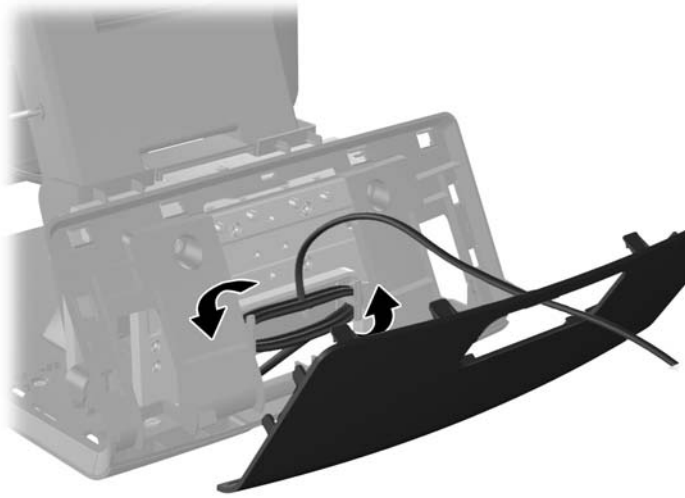
9. Snap the decorative plate onto the rear of the base.
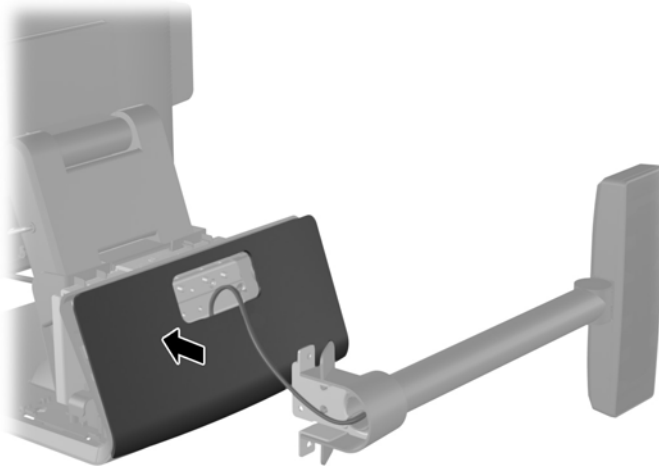
10. Slide the VFD mounting bracket into the mounting hole on the rear of the RP7 base (1), and install the two screws included with the VFD into the screw holes on top of the mounting bracket (2).
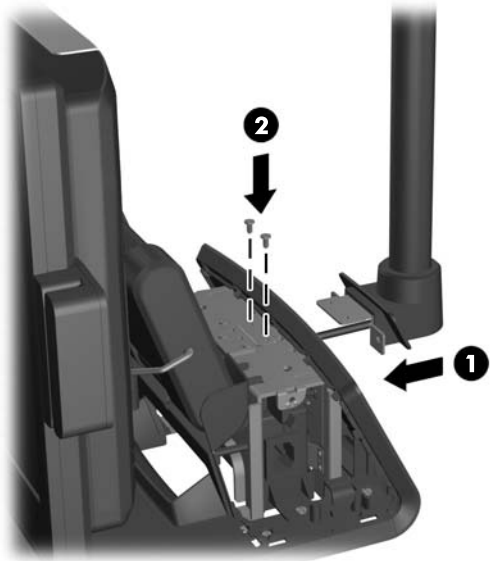
11. Replace the power supply cover by lowering it down over the neck of the base then sliding it back until it snaps in place.
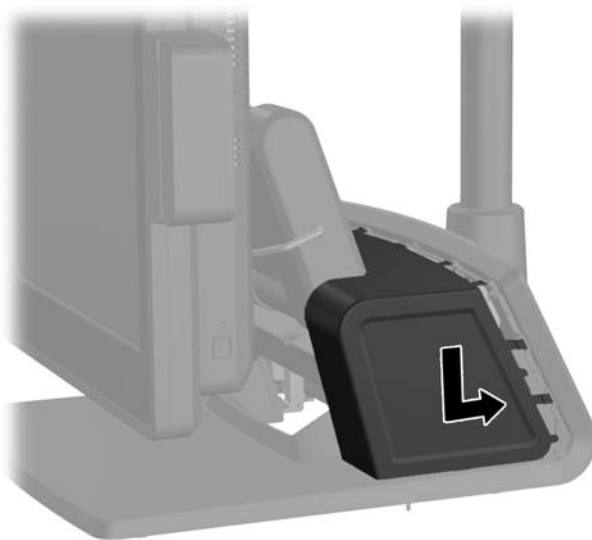
12. Replace the rear I/O cover by placing the hooks on the bottom of the cover into the slots on the bottom of the chassis (1). Then rotate the top of the I/O cover up so that it snaps securely onto the chassis (2).
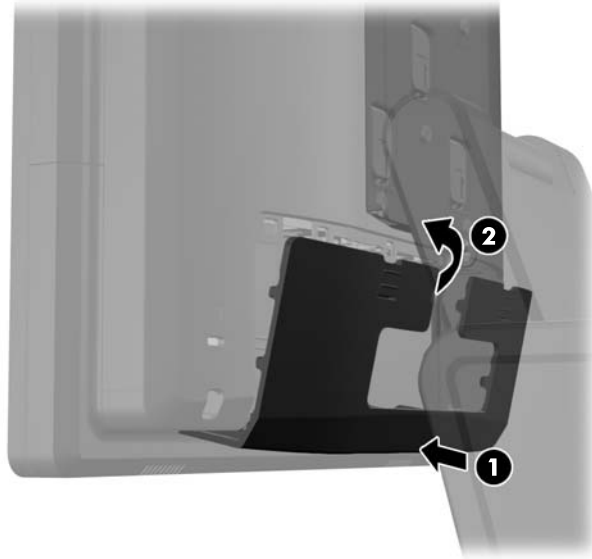
13. Reconnect the power cord and press the power button.

Cable management

Proper routing of the internal cables is critical to the operation of the computer. 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.

- 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.

⚠ **CAUTION:** When disconnecting cables, always pull the connector - NEVER pull on the cable. Pulling on the cable could damage the cable.

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

Cable	PCA Designator
Hard drive data	SATA0 (Dark Blue)
Hard drive power	SATA PWR0
X1PCIEXP11	WLAN module
HDDLED	Hard drive LED
Speaker	SPKR
USB+PWR 24V and Cash Drawer port daughter card	F4.1.1A/6V
Display	P181
Display	P182

Memory

Description	Spare part number
8-GB, PC3-12800	689374-001
4-GB, PC3-12800	689373-001
2-GB, PC3-12800	689372-001

The computer comes with one double data rate 3 synchronous dynamic random access memory (DDR3-SDRAM) small outline dual inline memory module (SODIMM).

DDR3-SDRAM SODIMM

△ **CAUTION:** This product DOES NOT support DDR3 Ultra Low Voltage (DDR3U) memory. The processor is not compatible with DDR3U memory and if you plug DDR3U memory into the system board, it can cause the physical damage to the SODIMM or invoke system malfunction.

For proper system operation, the SODIMM must be:

●   industry-standard 204-pin

●   unbuffered non-ECC PC3-12800 DDR3-1600 MHz-compliant

●   1.5 volt DDR3-SDRAM SODIMM

The DDR3-SDRAM SODIMM must also:

●   support CAS latency 11 DDR3 1600 MHz (11-11-11 timing)

●   contain the mandatory Joint Electronic Device Engineering Council (JEDEC) specification

In addition, the computer supports:

●   512-Mbit, 1-Gbit, 2-Gbit, 4-Gbit, and 8-Gbit non-ECC memory technologies

●   single-sided and double-sided SODIMMS

●   SODIMMs constructed with x8 and x16 devices; SODIMMs constructed with x4 SDRAM are not supported

📝 **NOTE:** The system will not operate properly if you install unsupported SODIMMs.

Installing SODIMMs

⚠ **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. For more information, refer to Electrostatic discharge information on page 134.

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 19).

2. Open the top access door (Opening the top access door on page 24).

3. To remove a SODIMM, press outward on the two latches on each side of the SODIMM **(1)** then pull the SODIMM out of the socket **(2)**.
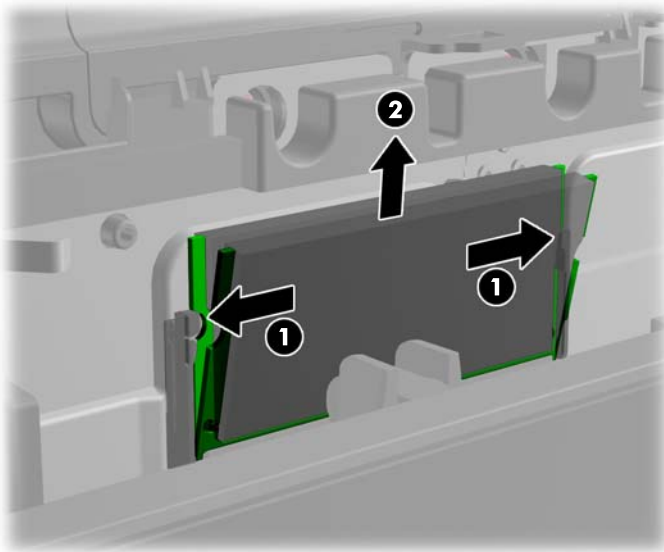
⚠ **CAUTION:** Be careful not to pull the thermal pad off of the system board when removing the memory module. If the thermal pad does come off, be sure to replace it.

4. To install a SODIMM, slide the new SODIMM into the socket at approximately a 30° angle **(1)** then press the SODIMM down into the socket **(2)** so that the latches lock it in place.
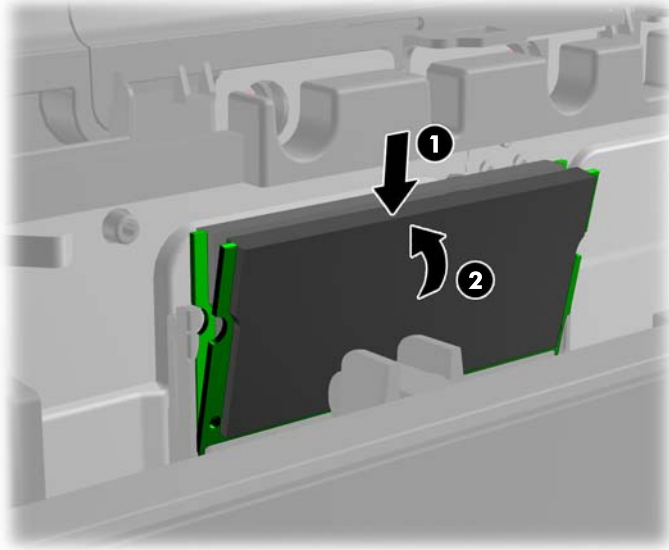
> **NOTE:** A memory module can be installed in only one way. Match the notch on the module with the tab on the memory socket.

The computer should automatically recognize the additional memory the next time you turn on the computer.

Battery

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

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

Do not attempt to recharge the battery.

Do not expose to temperatures higher than 60°C (140ºF).

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

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

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

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

📝 **NOTE:** The lifetime of the lithium battery can be extended by plugging the computer into a live AC wall socket. The lithium battery is only used when the computer is NOT connected to AC power.

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Open the top access door (Opening the top access door on page 24).

3. Note which side of the battery is the positive side so that the new battery has the same orientation and pull the battery out of its holder.
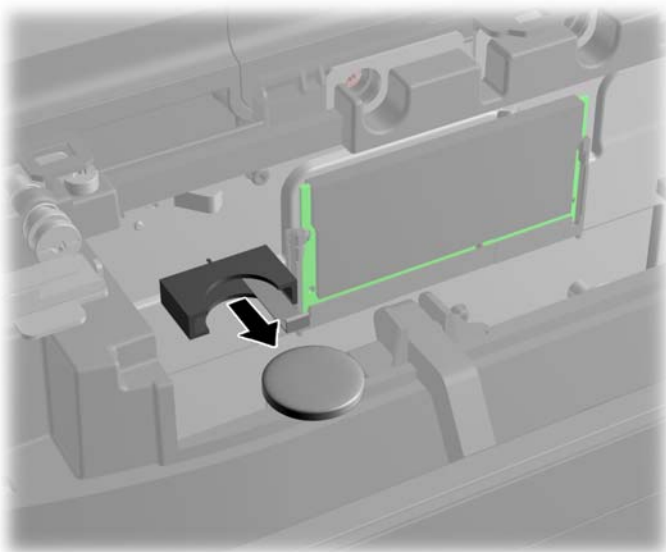
To insert a new battery, reverse the removal procedures.

Optional integrated USB modules

There are three optional integrated USB modules available from HP (sold separately).

1	retail integrated webcam for live video functions	695661-001
2	retail integrated fingerprint reader to add security identification functions	690684-001
3	retail integrated dual-head magnetic stripe reader for card data read	690685-001

The integrated USB modules can be installed on the top or bottom of the display head or on either side of the display head.

NOTE: The webcam must be installed on top of the display head for proper video orientation.

NOTE: These USB ports do not support optical drives or hard drives.
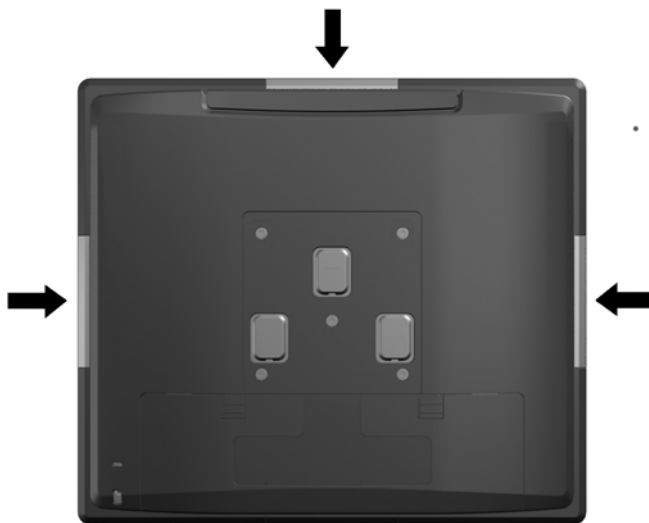
The procedure for installing an integrated USB module is the same for all modules. To install a USB module:

1. Prepare the computer for disassembly ().

2. Remove the rear I/O panel ().

3. Open the top access door ().

4. Rotate the two antenna brackets away from the unit.

5. Loosen the four captive screws that secure the computer panel to the back plate **(1)** and pull the computer panel off the back plate **(2)**.

6. Remove the two screws that attach the USB cover plate to the display head **(1)** then slide the cover plate off the display head **(2)**. Remove only the cover plate that is in the location where you want to install the USB module.

    NOTE: There is a small "fingernail" slot in the center of the interior edge of the USB cover plate that can be used to help slide the cover plate off the unit.
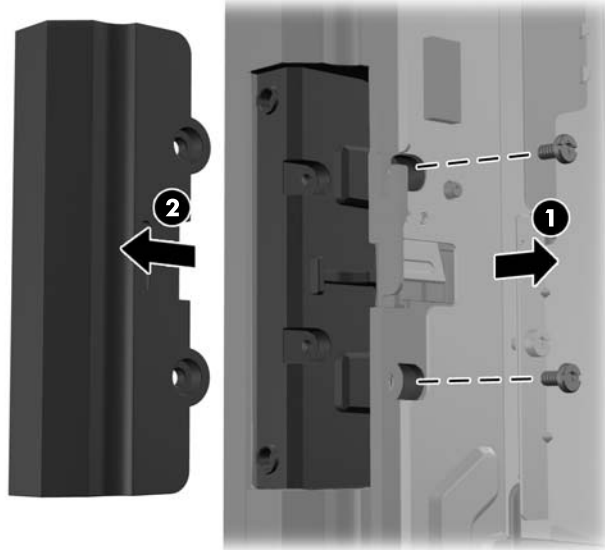
7. Pull the plug that is inserted in the USB port out of the port.

    NOTE: Some models do not have plugs in the USB ports.
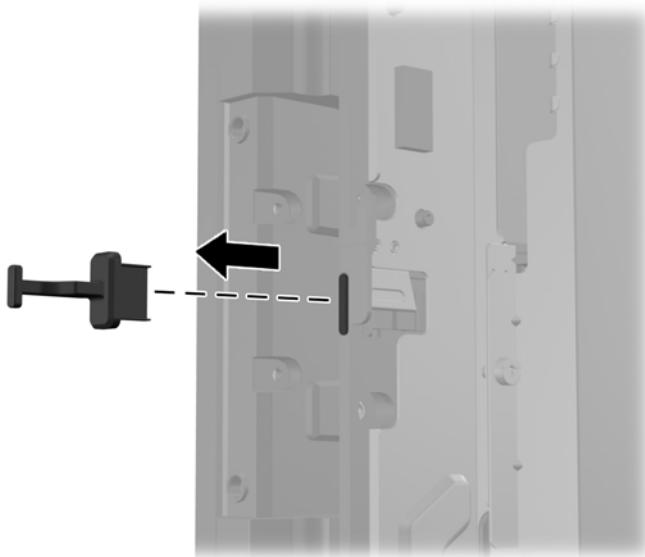
8. Slide the screw hole cover plate on the module back **(1)** and insert the USB connector on the module into the USB port **(2)**.
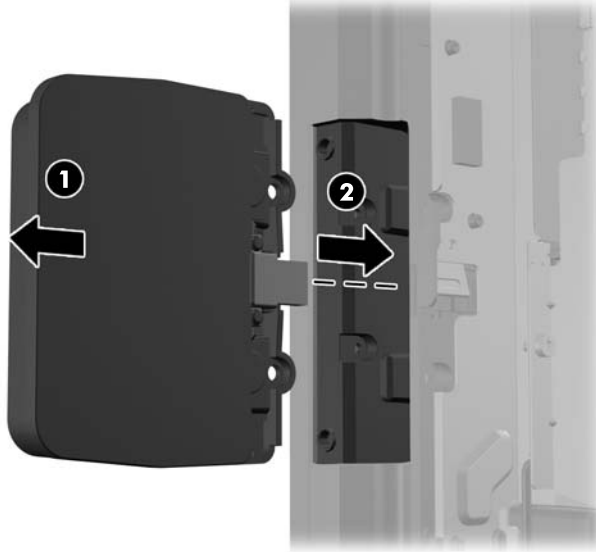
9. Install the two screws that were previously removed **(1)** and slide the cover plate on the module forward to cover the screws **(2)**.
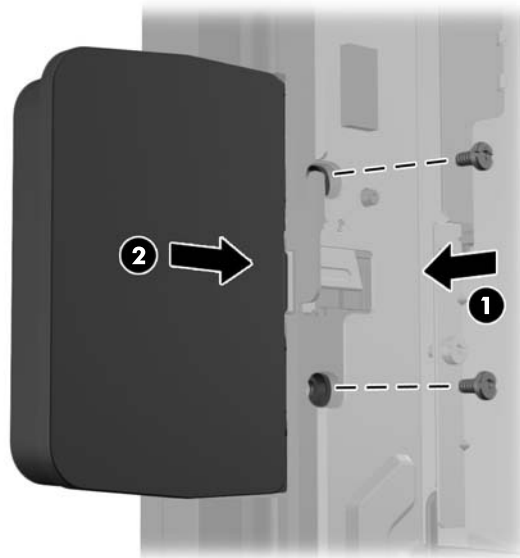
10. Replace the monitor panel onto the computer.

Hard drive

Description	Spare part number
256 GB Solid State Drive (SSD)	661842-001
128 GB Solid State Drive (SSD)	665961-001
32 GB MLC Flash, 2.5-in	686616-001
Grommet, hard drive	594220-001

⚠ **CAUTION:** If you are replacing a hard drive, be sure to back up the data from the old drive so that you can transfer the data to the new drive.

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the rear I/O panel (Rear I/O panel on page 22).

3. Open the top access door (Opening the top access door on page 24).

4. Rotate the two antenna brackets away from the unit.
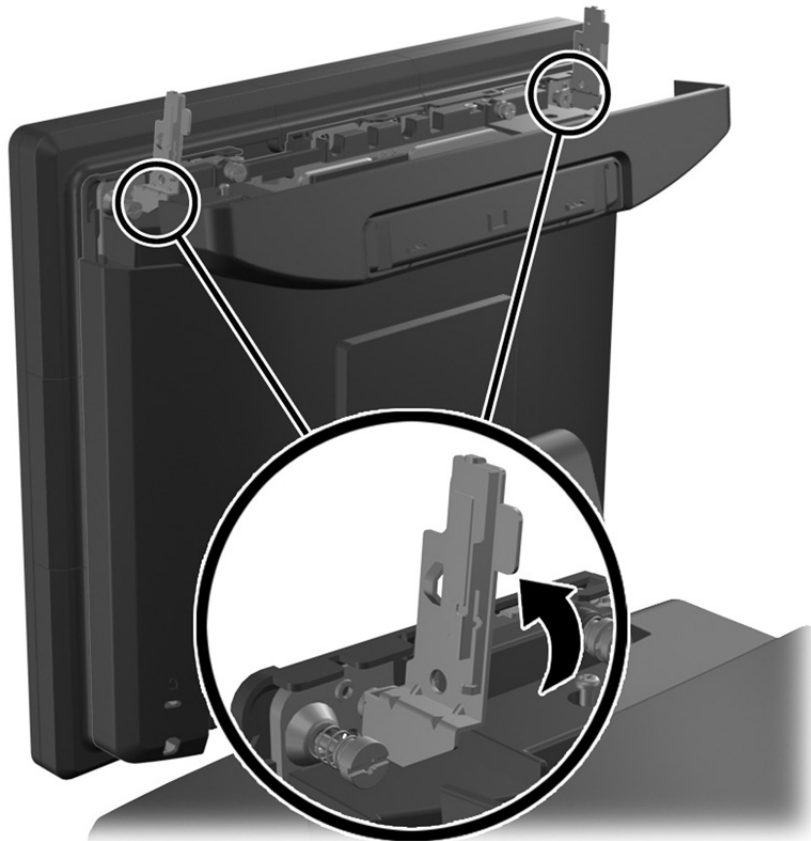
5. Loosen the four captive screws that secure the computer panel to the back plate **(1)** and pull the computer panel off the back plate **(2)**.
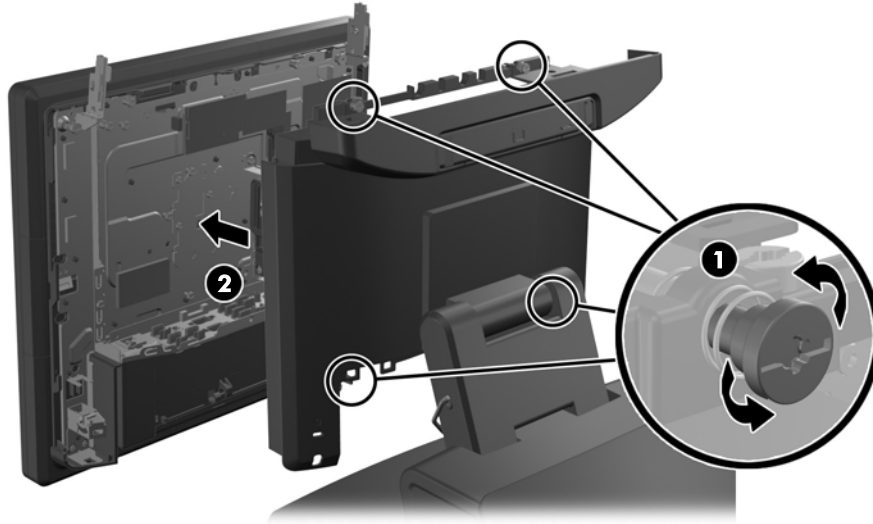
6. Pinch the two tabs together on the hard drive door **(1)** and rotate it open **(2)**, then grasp the pull tab on the side of the hard drive and pull the hard drive out of the drive bay **(3)**.
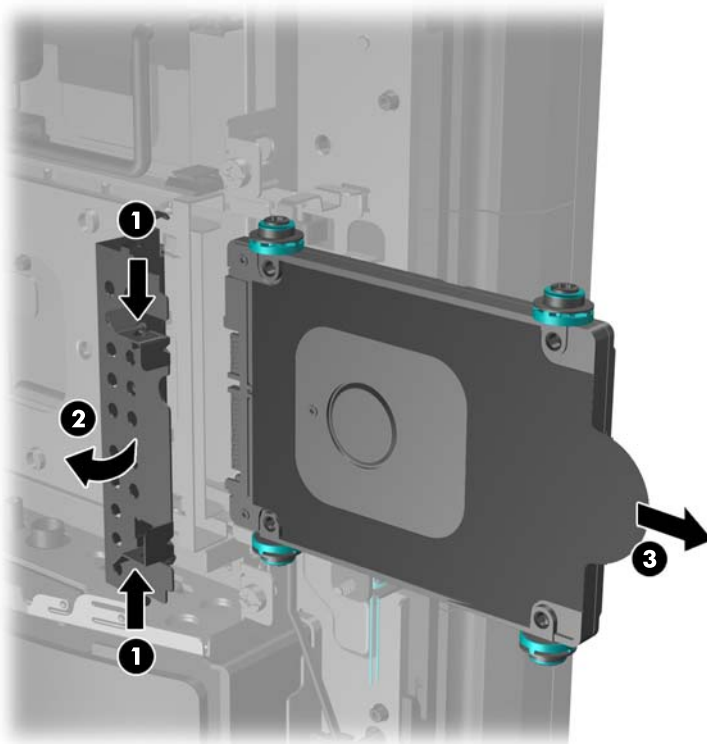
7. Remove the four screws from the sides of the hard drive carrier **(1)** and lift the hard drive out of the carrier **(2)**.
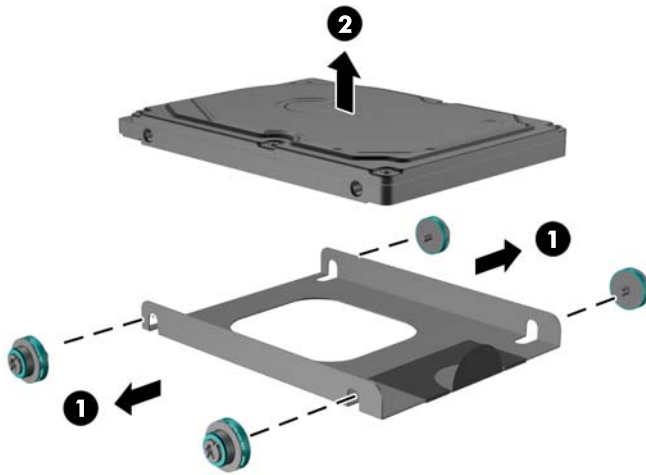
To install a hard drive, reverse the removal steps.

Removing the display head from the stand

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the VESA plate cover (VESA plate cover on page 23).

3. Remove the RP7 display head from the stand by removing the three screws that attach the stand's mounting bracket to the display head **(1)** then slide the display up and off the mounting bracket **(2)**.

To remove the display head back panel, reverse the installation procedures.

Display head back panel

Description	Spare part number
Display head back panel (includes top access door)	712401-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the VESA plate cover (VESA plate cover on page 23).

3. Remove the display head from the stand (Removing the display head from the stand on page 52).

4. Open the top access door (Opening the top access door on page 24).

5. Loosen the two large, captive Torx screws at the top of the computer.

6. Loosen the two smaller, captive Torx screws in the upper corners of the rear I/O area **(1)**.

7. Lift the back panel up and off the display head **(2)**.

To replace the display head back panel, reverse the installation procedures.

When installing the display head back panel, make sure the antennas are rotated upward.

Drive cables and drive cage

Description	Spare part number
Drive cables and bracket assembly	712407-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the VESA plate cover (VESA plate cover on page 23).

3. Remove the hard drive (Hard drive on page 49).

4. Remove the display head from the stand (Removing the display head from the stand on page 52).

5. Remove the display head back panel (Display head back panel on page 53).

6. Remove the two Torx screws that secure the drive connector to the cage.

7. Remove the drive cable from the computer:

    a. Disconnect the drive cables **(1)** from the system board.

    b. Remove the power cable from the clips on the drive cage **(2)**.

    c. Remove the power cable by pulling it through the opening under the hard drive cage **(3)**.

    d. Rotate the drive cable connector off the drive cage and remove it from the computer **(4)**.
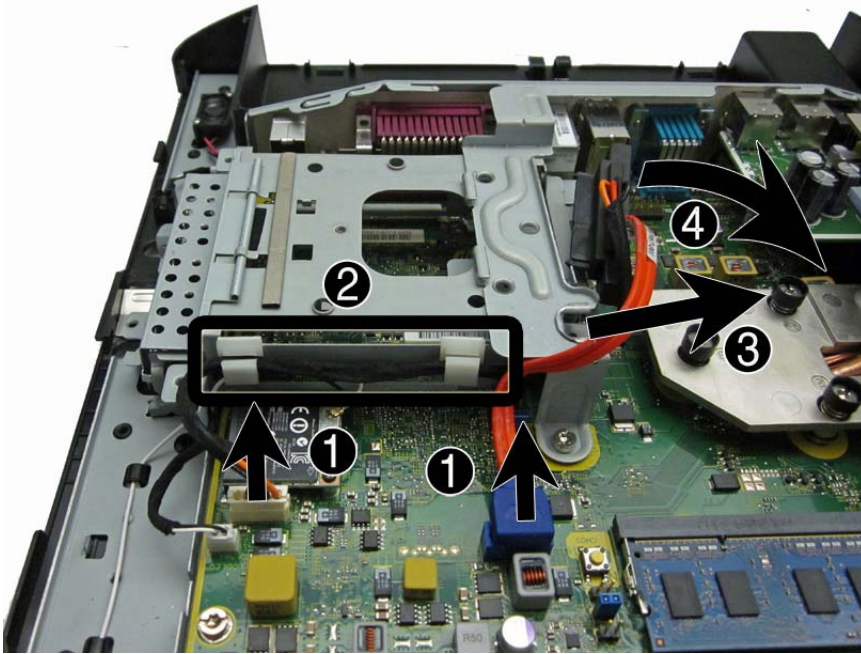
8. Remove the Torx screw **(1)** that secures the drive cage to the computer, and then rotate the drive cage up and lift it from the computer **(2)**.
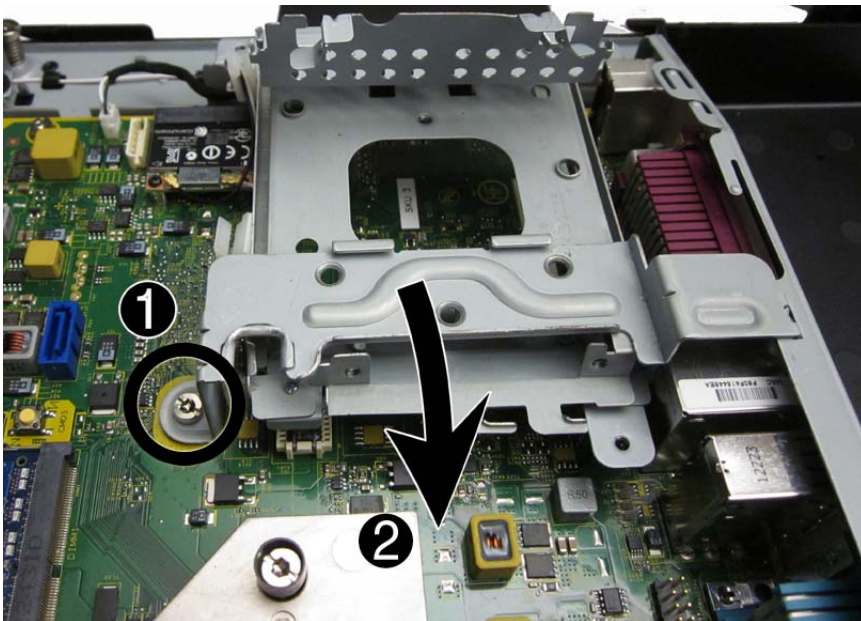
To reinstall the drive cable assembly and drive cage, reverse the removal procedure.

When installing the drive cage, be sure to insert the tabs from the cage into the correct slots in the computer.
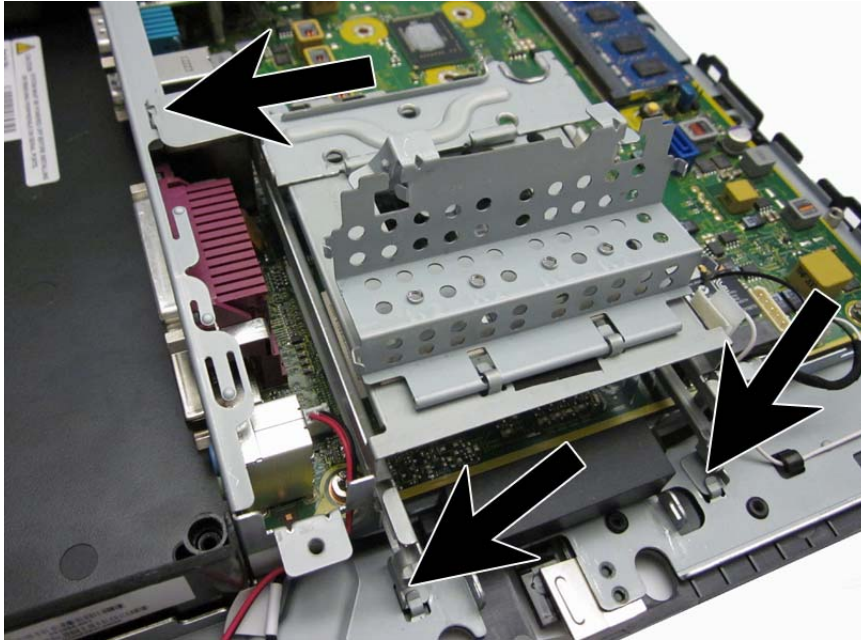
Hard drive LED cable

Description	Spare part number
Hard drive LED cable	702777-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the VESA plate cover (VESA plate cover on page 23).

3. Remove the display head from the stand (Removing the display head from the stand on page 52).

4. Remove the display head back panel (Display head back panel on page 53).

5. Disconnect the cable from the system board connector labeled LED CR14**(1)**.

6. Remove the cable from the routing path **(2)**.

7. Remove the cable from the clips **(3)**.

8. Lift the LED from the holder, and remove the assembly from the computer **(4)**.
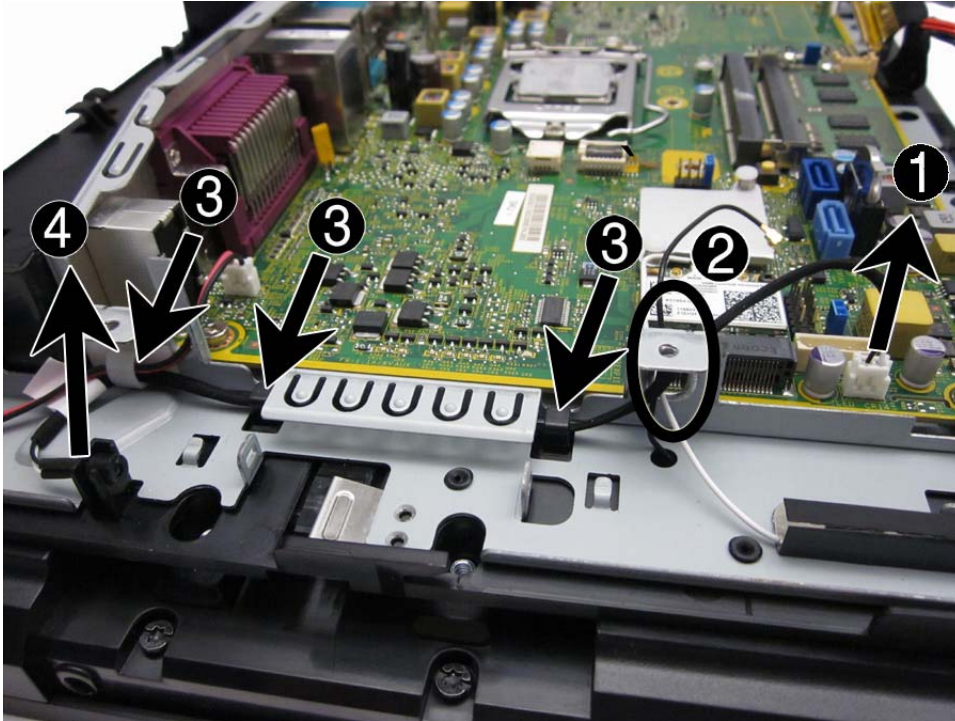
To reinstall the hard drive LED cable, reverse the removal procedure.

Speaker

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the VESA plate cover (VESA plate cover on page 23).

3. Remove the display head from the stand (Removing the display head from the stand on page 52).

4. Remove the display head back panel (Display head back panel on page 53).

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

6. Remove the cable from the clip **(2)**.

7. Disconnect the cable from the system board connector labeled SPKR **(3)**.
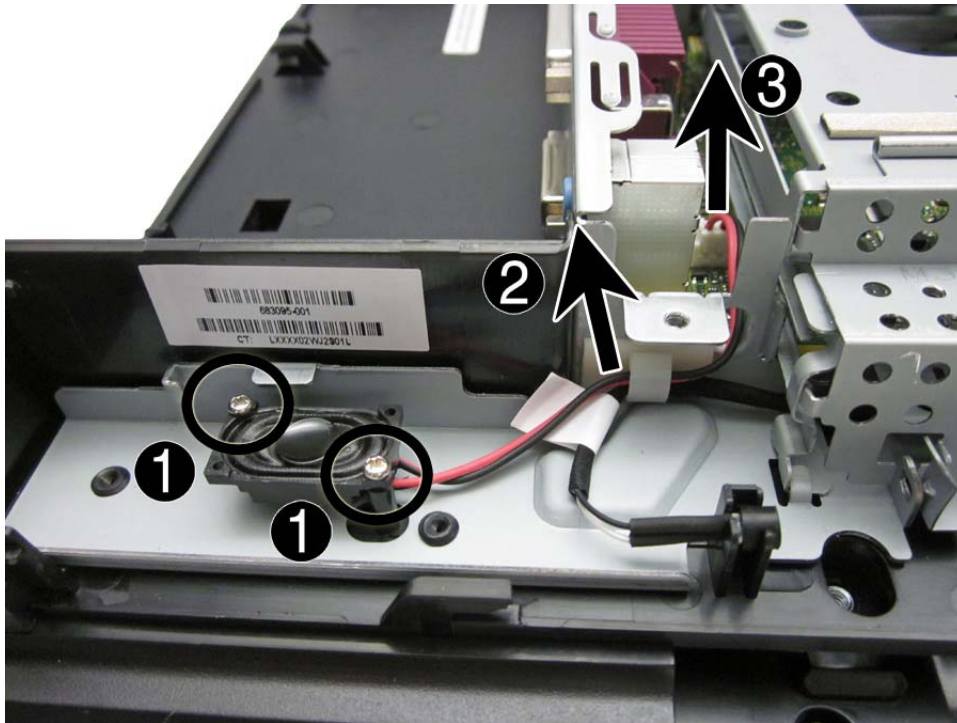
8. Remove the speaker from the computer.

To install the speaker, reverse the removal procedures.

USB+PWR 24V and Cash drawer port daughter card

Description	Spare part number
USB+PWR 24V and Cash Drawer port daughter card	702775-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the VESA plate cover (VESA plate cover on page 23).

3. Remove the display head from the stand (Removing the display head from the stand on page 52).

4. Remove the display head back panel (Display head back panel on page 53).

5. With the heat sink installed, remove the two Torx screws **(1)** that secure the board to the computer.

6. Lift the card up to disconnect it from the system board connector **(2)**.

7. Slide the card out from under the heat sink and remove the card from the computer **(3)**.
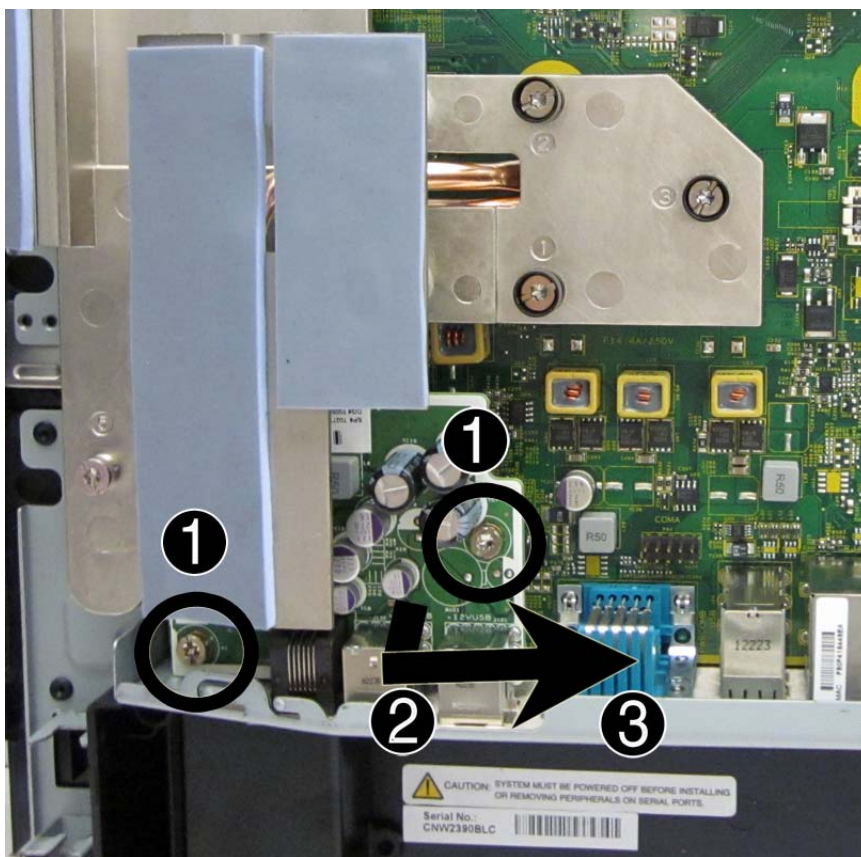
To install the USB+PWR 24V and Cash Drawer port daughter card, reverse the removal procedure.

WLAN module

Description	Spare part number
Ralink RT5390R 802.11bgn 1x1 Wi-Fi Adapter (WLAN module)	701396-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the VESA bracket cover (VESA plate cover on page 23).

3. Remove the display head from the stand (Removing the display head from the stand on page 52).

4. Remove the display head back panel (Display head back panel on page 53).

5. Remove the antenna cables from the connectors on the WLAN module **(1)**.
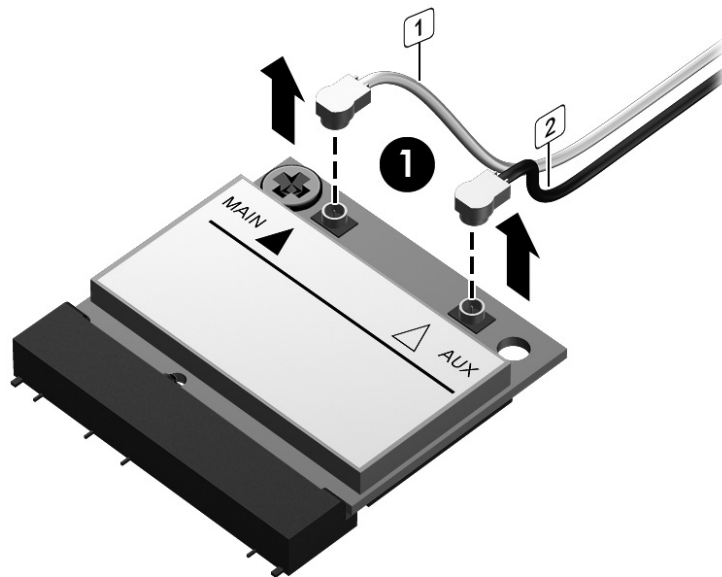
6. Remove the Phillips screw **(2)** that secures the module to the system board.
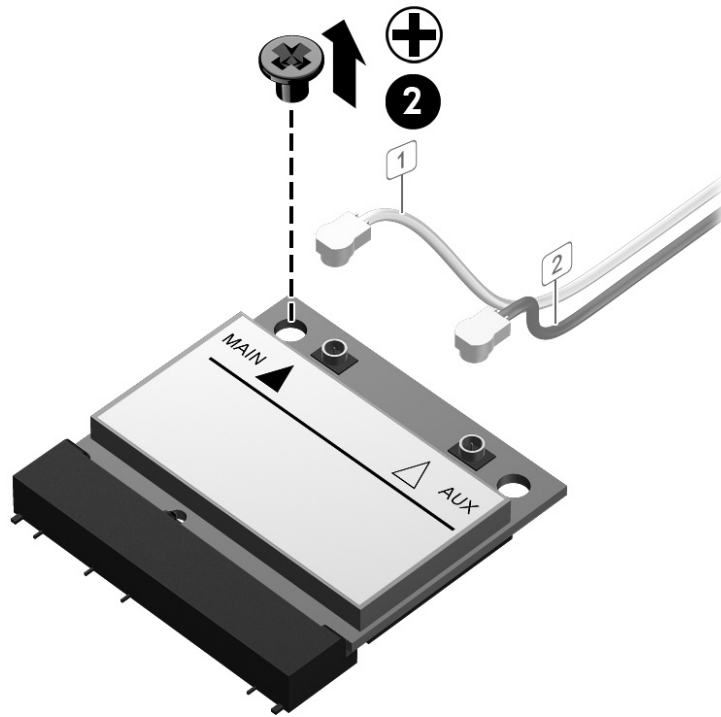
7. Rotate the top of the module upward, and then pull it away from the slot **(3)**.
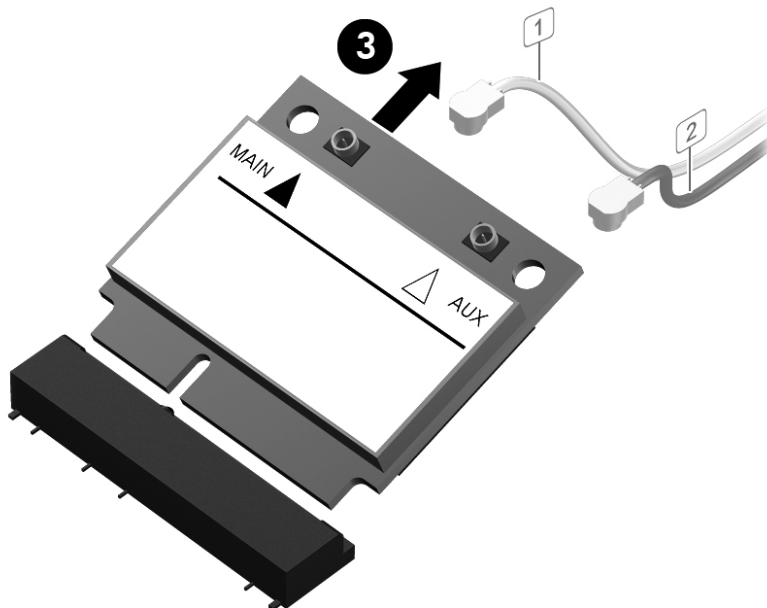
To install the WLAN module, reverse the removal procedure.

Heat sink

Description	Spare part number
Heat sink	712404-001

All heat sink spare part kits contain replacement thermal material.

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the VESA plate cover (VESA plate cover on page 23).

3. Remove the display head from the stand (Removing the display head from the stand on page 52).

4. Remove the display head back panel (Display head back panel on page 53).

5. In the order indicated, loosen the five captive screws that secure the heat sink to the system board.
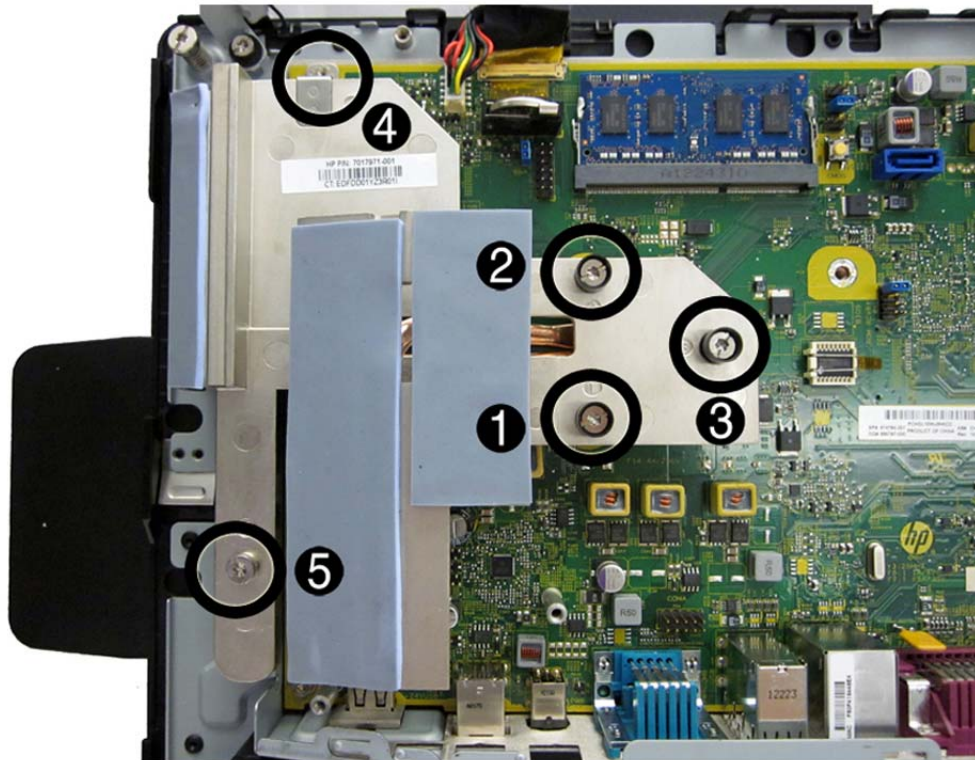
6. Lift the heat sink from the computer.

To replace the heat sink, reverse the removal procedures.

⚠ **CAUTION:** Tighten heat sink retaining screws in the order stamped on the heat sink.

Note the thermal pad locations for the heat sink in the following image. Make sure all thermal pads are intact and correctly installed.
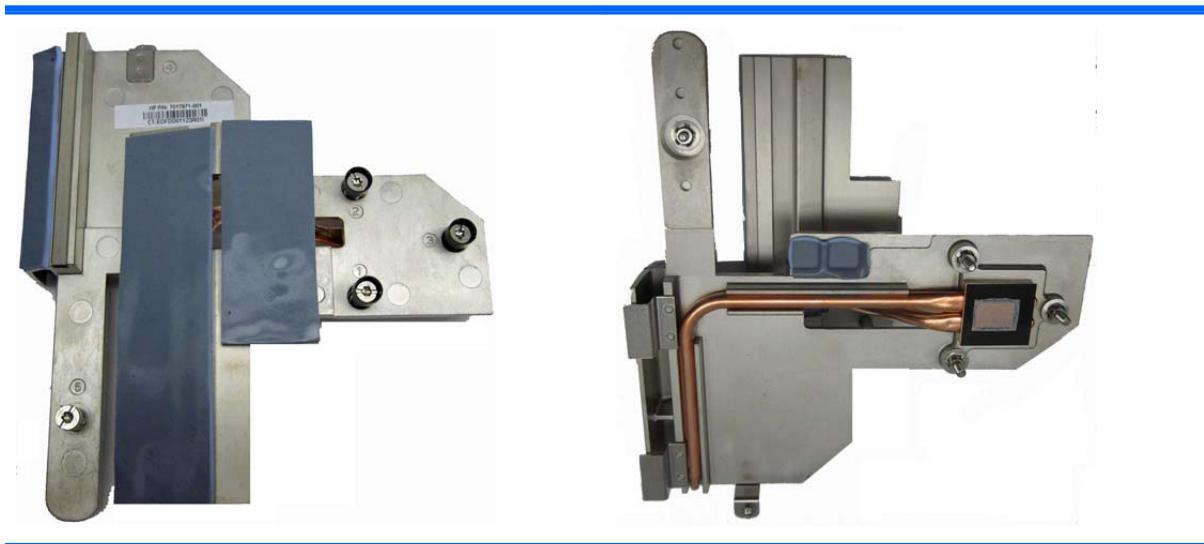
System board

Description	Spare part number
System board (includes thermal material)	674784-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the VESA bracket cover (VESA plate cover on page 23).

3. Remove the display head from the stand (Removing the display head from the stand on page 52).

4. Remove the display head back panel (Display head back panel on page 53).

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

    ●   Memory modules (Memory on page 41)

    ●   Serial port board (USB+PWR 24V and Cash drawer port daughter card on page 60)

    ●   WLAN (WLAN module on page 61)

    ●   Heat sink (Heat sink on page 63)

6. Disconnect all data, power, and any other cables from the system board.

7. Remove the four Torx screws that secure the system board to the computer.

8. Lift the system board up and out of the chassis.
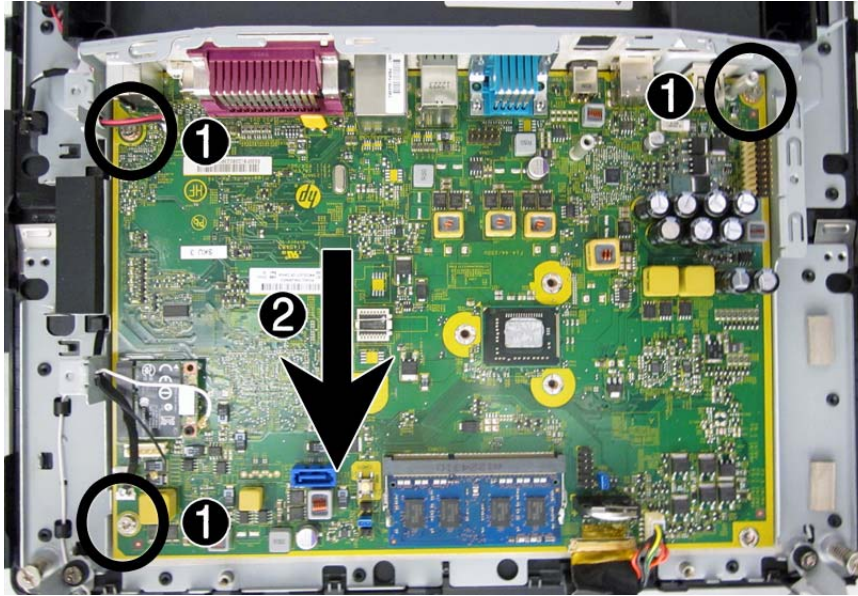
To install the system board, reverse the removal procedure.

Note the thermal pad locations under the system board in the following image. Make sure all thermal pads are intact and correctly installed.
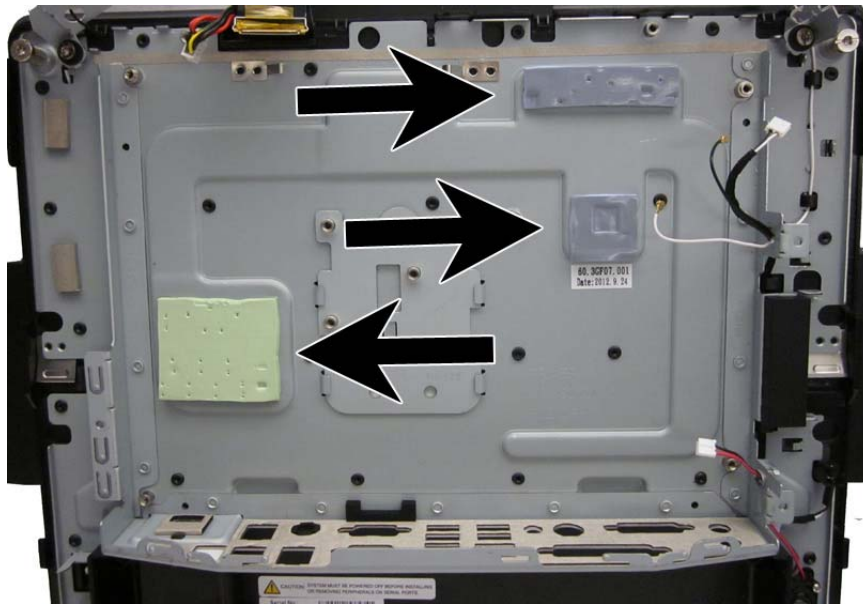
Antennas

Description	Spare part number
Antenna kit, black, auxiliary	720146-001
Antenna kit, white, main	712403-001

There are two separate antennas. The white antenna routes a short distance from the WLAN module to the top of the computer. The black antenna routes from the WLAN module, through to the back of the computer, across the back of the computer, back through the computer and to the top of the computer.

1. Prepare the computer for disassembly (Preparation for disassembly on page 19).

2. Remove the rear I/O panel (Rear I/O panel on page 22).

3. Remove the display head from the stand (Removing the display head from the stand on page 52).

4. Remove the display head back panel (Display head back panel on page 53).

5. Remove the Torx screw **(1)** that secures the white antenna bracket to the computer.

6. Remove the white antenna from the clips **(2)** and the hole in the metal tab **(3)** in the computer .

7. Remove the black antenna from the hole in the metal tab **(3)** in the computer, and then route the black antenna through the hole to the back of the computer **(4)**.
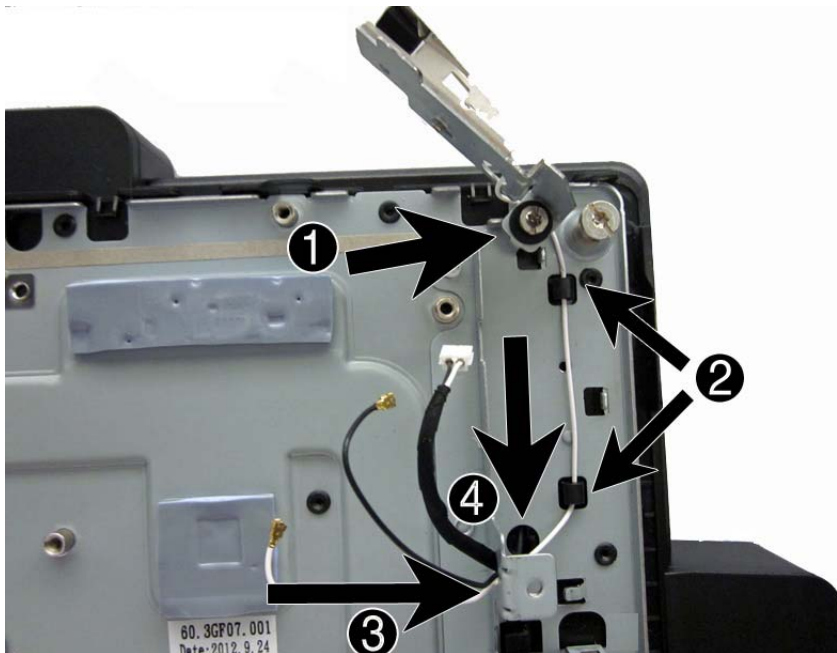
8. Remove the Phillips screw that secures the antenna to the rotating antenna bracket.

9. Turn the computer over, and remove the black antenna from the routing path on the back of the computer.
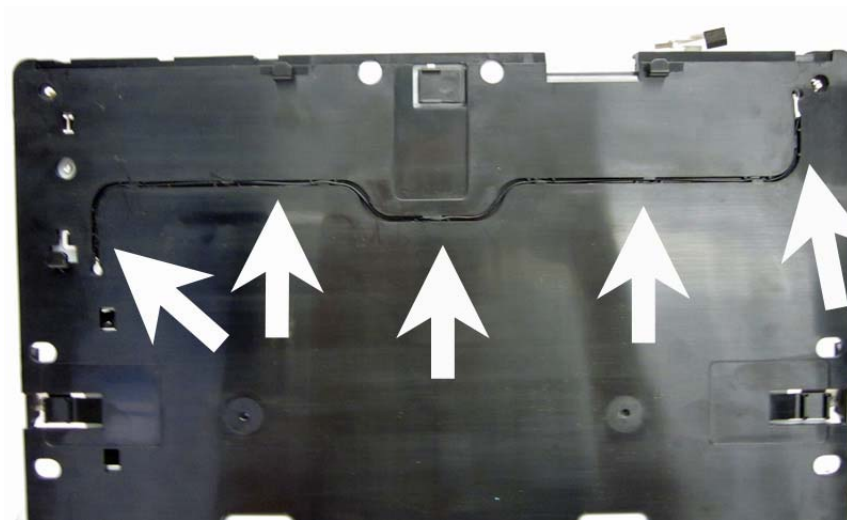
10. Remove the Torx screw **(1)** that secures the white antenna bracket to the computer, and then pull the antenna through the hole **(2)** that routes to the back of the computer.
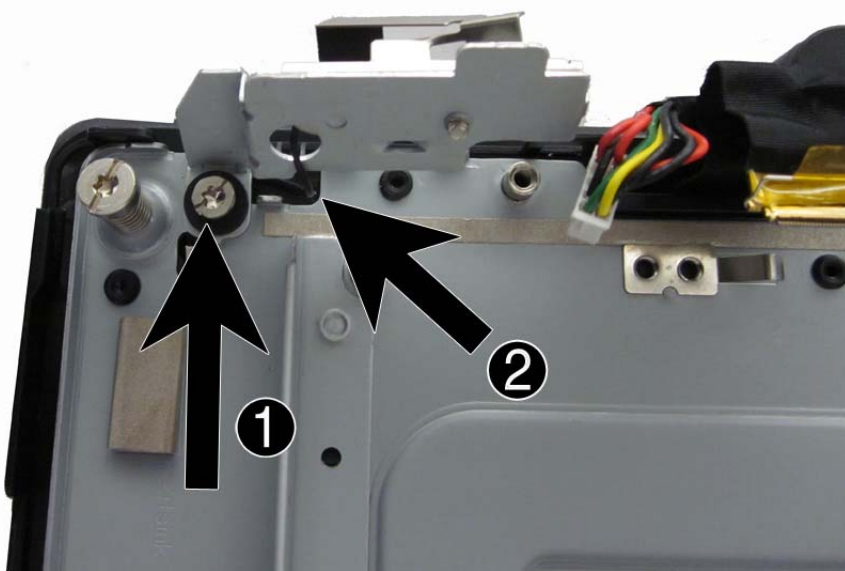
11. Remove the Phillips screw that secures the antenna to the rotating antenna bracket.

To install the display, reverse the removal procedures.

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, diskette 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).

- Establish an Ownership Tag, the text of which is displayed each time the system is turned on or restarted.

- 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.

- Enable or disable legacy diskette write ability (when supported by hardware).

- Solve system configuration errors detected but not automatically fixed during the Power-On Self-Test (POST).

- Replicate the system setup by saving system configuration information on diskette and restoring it on one or more computers.

- 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. If you are in Microsoft Windows, click **Start** > **Shut Down** > **Restart**.

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

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

3. Press F10 to enter Computer Setup.

4. A choice of five headings appears in the Computer Setup Utilities menu: File, Storage, Security, Power, and Advanced.

5. 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.

6. 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.

⚠ **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.

Heading	Table
File	Computer Setup—File on page 71
Storage	Computer Setup—Storage on page 72
Security	Computer Setup—Security on page 73
Power	Computer Setup—Power on page 77
Advanced	Computer Setup—Advanced on page 78

Computer Setup—File

Option	Description
System Information	Lists: ● Product name ● SKU number (some models) ● Processor type/speed/stepping ● Cache size (L1/L2/L3) (dual core processors have this listed twice) ● Installed memory size/speed, number of channels (single or dual) (if applicable) ● Integrated MAC address for embedded, enabled NIC (if applicable) ● System BIOS (includes family name and version) ● Chassis serial number ● Asset tracking number ● ME firmware version ● ME Management mode
About	Displays copyright notice.
Set Time and Date	Allows you to set system time and date.
Flash System ROM	Allows you to update the system ROM with a BIOS image file located on removable media.
Replicated Setup	**Save to Removable Media** Saves system configuration, including CMOS, to a formatted 1.44-MB diskette, a USB flash media device, or a diskette-like device (a storage device set to emulate a diskette drive). **Restore from Removable Media** Restores system configuration from a diskette, a USB flash media device, or a diskette-like device.
Default Setup	**Save Current Settings as Default** Saves the current system configuration settings as the default. **Restore Factory Settings as Default** Restores the factory system configuration settings as the default.
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.

Option	Description
Device Configuration	Lists all installed BIOS-controlled storage devices.
	When a device is selected, detailed information and options are displayed. The following options may be presented:
	Hard Disk: Size, model, firmware version, serial number, connector color, SMART, translation mode.
	● Translation Mode *(ATA disks only)*
	Lets you select the translation mode to be used for the device. This enables the BIOS to access disks partitioned and formatted on other systems and may be necessary for users of older versions of UNIX (e.g., SCO UNIX version 3.2). Options are Automatic, Bit-Shift, LBA Assisted, User, and Off.
	Available only when the drive translation mode is set to User, allows you to specify the parameters (logical cylinders, heads, and sectors per track) used by the BIOS to translate disk I/O requests (from the operating system or an application) into terms the hard drive can accept. Logical cylinders may not exceed 1024. The number of heads may not exceed 256. The number of sectors per track may not exceed 63.
	CAUTION: Ordinarily, the translation mode selected automatically by the BIOS should not be changed. If the selected translation mode is not compatible with the translation mode that was active when the disk was partitioned and formatted, the data on the disk will be inaccessible.
	Default Values
	SATA Defaults
	See Translation Mode above for details.
Storage Options	**SATA Emulation**
	WARNING! SATA emulation changes may prevent access to existing hard drive data and degrade or corrupt established volumes.
	Allows you to choose how the SATA controller and devices are accessed by the operating system. There are three supported options: IDE, RAID, and AHCI (default).
	IDE - This is the most backwards-compatible setting of the three options. Operating systems usually do not require additional driver support in IDE mode.
	RAID - Allows DOS and boot access to RAID volumes. Use this mode with the RAID device driver loaded in the operating system to take advantage of RAID features.
	AHCI (default option) - Allows operating systems with AHCI device drivers loaded to take advantage of more advanced features of the SATA controller.
	NOTE: The RAID/AHCI device driver must be installed prior to attempting to boot from a RAID/AHCI volume. If you attempt to boot from a RAID/AHCI volume without the required device driver installed, the system will crash (blue screen). RAID volumes may become corrupted if they are booted to after disabling RAID.
	Removable Media Boot
	Enables/disables ability to boot the system from removable media. Default is enabled.

DPS Self-Test	Allows you to execute self-tests on ATA hard drives capable of performing the Drive Protection System (DPS) self-tests. **NOTE:** This selection will only appear when at least one drive capable of performing the DPS self-tests is attached to the system.
Boot Order	Allows you to: ● Specify the order in which EFI boot sources (such as a USB flash media device, 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. ● 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. ● Specify the order of attached hard drives. The first hard drive in the order will have priority in the boot sequence and will be recognized as drive C (if any devices are attached). **NOTE:** MS-DOS drive lettering assignments may not apply after a non-MS-DOS operating system has started. **Shortcut to Temporarily Override Boot Order** To boot **one time** from a device other than the default device specified in Boot Order, restart the computer and press F9 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.

Computer Setup—Security

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

Option	Description
Setup Password	Allows you to set and enable a setup (administrator) password. **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. **NOTE:** This selection will only appear when at least one drive that supports the DriveLock feature is attached to the system. See the *Desktop Management Guide* for more information.
Power-On Password	Allows you to set and enable a power-on password. The power-on password prompt appears after a power cycle. If the user does not enter the correct power-on password, the unit will not boot. **NOTE:** This selection will only appear when at least one drive that supports the DriveLock feature is attached to the system. See the *Desktop Management Guide* for more information.

Password Options (This selection appears only if a power-on password or setup password is set.)	Allows you to enable/disable: ● Lock Legacy Resources (appears if a setup password is set). Default is enabled. ● Setup Browse Mode (appears if a setup password is set) (allows viewing, but not changing, the F10 Setup Options without entering setup password). Default is enabled. ● Password prompt on F9, F11, & F12 (allows access to menus without entering setup password). Default is enabled. ● Network Server Mode (appears if a power-on password is set). Default is disabled. See the *Desktop Management Guide* for more information.
Smart Cover (some models)	Allows you to: ● Lock/unlock the Cover Lock. ● Set the Cover Removal Sensor to Disable/Notify User/Setup Password. **NOTE:** *Notify User* alerts the user that the sensor has detected that the cover has been removed. Default is disabled.
Device Security	Allows you to set Device Available/Device Hidden (default is Device Available) for: ● Embedded security device (some models) ● System audio ● Serial ports (some models) ● Parallel port (some models) ● Network controllers (some models) ● SATA0 ● SATA1 ● SATA2 (some models) ● SATA4 (some models)

USB Security	Allows you to set Enabled/Disabled (default is Enabled) for:
	
	● Front USB Ports
	
	   ◦ Monitor/USB Hub Ports
	
	● Rear USB Ports
	
	   ◦ RJ45/USB Port 1
	
	   ◦ RJ45/USB Port 2
	
	   ◦ 4 Stack/USB Port 1
	
	   ◦ 4 Stack/USB Port 2

	◦ 4 Stack/USB Port 3
	◦ 4 Stack/USB Port 4
	● Accessory USB Ports
	◦ Red/24V Power USB Port
	◦ Green/12V Power USB Port
Slot Security	Allows you to disable any the PCI Express x1 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	Allows you to set: ● Asset tag (18-byte identifier), a property identification number assigned by the company to the computer. ● Ownership tag (80-byte identifier) displayed during POST. ● 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.) ● Keyboard locale setting for System ID entry.
Master Boot Record Security	Enables/disables Master Boot Record Security. Default is disabled. The Master Boot Record (MBR) contains information needed to successfully boot from a disk and to access the data stored on the disk. Master Boot Record Security may prevent unintentional or malicious changes to the MBR, such as those caused by some viruses or by the incorrect use of certain disk utilities. It also allows you to recover the "last known good" MBR, should changes to the MBR be detected when the system is restarted. When MBR Security is enabled, the BIOS prevents any changes being made to the MBR of the current bootable disk while in MS-DOS or Windows Safe Mode. **NOTE:** Most operating systems control access to the MBR of the current bootable disk; the BIOS cannot prevent changes that may occur while the operating system is running. Each time the workstation is turned on or restarted, the BIOS compares the MBR of the current bootable disk to the previously saved MBR. If changes are detected and if the current bootable disk is the same disk from which the MBR was previously saved, a POST error message is displayed.

System Security (some models: these options are hardware dependent)	Data Execution Prevention (some models) (enable/disable) - Helps prevent operating system security breaches. Default is enabled.
	Virtualization Technology (VTx)(some models) (enable/disable) - Controls the virtualization features of the processor. Changing this setting requires turning the computer off and then back on. Default is disabled.
	Virtualization Technology Directed I/O (VTd) (some models) (enable/disable) - Controls virtualization DMA remapping features of the chipset. Changing this setting requires turning the computer off and then back on. Default is disabled.
	Intel TXT (LT) Support (some models) (enable/disable) - Controls the underlying processor and chipset features needed to support a virtual appliance. Changing this setting requires turning the computer off and then back on. Default is disabled. To enable this feature you must enable the following features:
	● Embedded Security Device Support
	● Virtualization Technology
	● Virtualization Technology Directed I/O
	Embedded Security Device Support (some models) (enable/disable) - Permits activation and deactivation of the Embedded Security Device. Changing this setting requires turning the computer off and then back on.
	NOTE: To configure the Embedded Security Device, a Setup password must be set.
	● Reset to Factory Settings (some models) (Do not reset/Reset) - Resetting to factory defaults will erase all security keys. Changing this setting requires turning the computer off and then back on. Default is Do not reset.
	CAUTION: The embedded security device is a critical component of many security schemes. Erasing the security keys will prevent access to data protected by the Embedded Security Device. Choosing Reset to Factory Settings may result in significant data loss.
	OS management of Embedded Security Device (some models) (enable/disable) - This option allows the user to limit operating system control of the Embedded Security Device. Changing this setting requires turning the computer off and then back on. This option allows the user to limit OS control of the Embedded Security Device. Default is enabled.
	Reset of Embedded Security Device through OS (some models) (enable/disable) - This option allows the user to limit the operating system ability to request a Reset to Factory Settings of the Embedded Security Device. Changing this setting requires turning the computer off and then back on. Default is disabled.
	NOTE: To enable this option, a Setup password must be set.
DriveLock Security	Allows you to assign or modify a master or user password for hard drives. When this feature is enabled, the user is prompted to provide one of the DriveLock passwords during POST. If neither is successfully entered, the hard drive will remain inaccessible until one of the passwords is successfully provided during a subsequent cold-boot sequence.
	NOTE: This selection will only appear when at least one drive that supports the DriveLock feature is attached to the system.

Computer Setup—Power

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

Option	Description
OS Power Management	● Runtime Power Management— Enable/Disable. Allows certain operating systems to reduce processor voltage and frequency when the current software load does not require the full capabilities of the processor. Default is enabled.
	● Idle Power Savings—Extended/Normal. Allows certain operating systems to decrease the processors power consumption when the processor is idle. Default is extended.
	● Unique Sleep State Blink Rates—Enable/Disable. This feature is designed to provide a visual indication of what sleep state the system is in. Each sleep state has a unique blink pattern. Default is disabled. ◦ S0 (On) = Solid green LED. ◦ S3 (Stand By)= 3 blinks at 1Hz (50% duty cycle) followed by a pause of 2 seconds (green LED) — repeated cycles of 3 blinks and a pause. ◦ S4 (Hibernation)= 4 blinks at 1Hz (50% duty cycle) followed by a pause of 2 seconds (green LED) — repeated cycles of 4 blinks and a pause. ◦ S5 (Soft Off) = LED is off. **NOTE:** If this feature is disabled, S4 and S5 both have the LED off. S1 (no longer supported) and S3 use 1 blink per second.
Hardware Power Management	SATA Power Management – Enables or disables SATA bus and/or device power management. Default is enabled. S5 Maximum Power Savings—Turns off power to all nonessential hardware when system is off to meet EUP Lot 6 requirement of less than 1 Watt power usage. Default is disabled.
Thermal	Fan idle mode—This bar graph controls the minimum permitted fan speed. **NOTE:** This setting only changes the minimum fan speed. The fans are still automatically controlled.

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:
	● POST mode (QuickBoot, Clear Memory, FullBoot, or FullBoot Every x Days).
	○ QuickBoot (default) = Do not clear memory or perform a memory test.
	○ FullBoot = Memory test (count) on cold boot. Clears memory on all boots.
	○ Clear Memory = No memory count on cold boot. Clears memory on all boots.
	○ FullBoot Every x Days = Memory count on 1st cold boot on or after the xth day. No more memory counts until 1st cold boot on or after x days. Clears memory on all boots.
	● POST messages (enable/disable). Default is disabled.
	● Press the ESC key for Startup Menu (Enable/Disable). Default is enabled.
	● Option ROM Prompt (enable/disable). Enabling this feature will cause the system to display a message before loading option ROMs. (This feature is supported on some models only.) Default is enabled.
	● After Power Loss (off/on/previous state). Default is Power off. Setting this option to:
	○ Power off—causes the computer to remain powered off when power is restored.
	○ Power on—causes the computer to power on automatically as soon as power is restored.
	○ Previous state—causes the computer to power on automatically as soon as power is restored, if it was on when power was lost.
	NOTE: If 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.
	● 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.
	● Remote Wakeup Boot Source (remote server/local hard drive). Default is Local hard drive.
	● System Recovery Boot Support (Enable/Disable). Setting this feature to enabled will display the text **F11 = Recovery** during POST. Disabling the feature prevents the text from being displayed. However, pressing F11 will still attempt to boot to the HP Backup and Recovery partition. See Factory Recovery Boot Support for more information. Default is disabled.
	● Bypass F1 Prompt on Configuration Changes (Enable/Disable). Allows you to set the computer not to confirm when changes were made. Default is disabled.
BIOS Power-On	Allows you to set the computer to turn on automatically at a time you specify.
Onboard Devices	● Allows you to set resources for or disable Legacy devices.
	● Allows to you change voltage settings for powered serial ports.

Resources you can change include:

◦ Parallel Port

◦ Serial Port A

◦ Serial Port B

◦ Serial Port A Voltage

◦ Serial Port B Voltage

● Available settings for powered ports are:

◦ 0V (default)

◦ +5V

◦ +12V

Bus Options	On some models, 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: ● Turbo Mode (enable/disable). Allows you to enable and disable the Intel Turbo Mode feature, which allows one core of the system to run at a higher than standard frequency and power if other cores are idle. Default is enabled. ● Printer mode (Bi-Directional, EPP + ECP, Output Only). Default is EPP+ECP. ● Num Lock State at Power-On (off/on). Default is off. ● Integrated Video (enable/disable). Use this option to disable the integrated video controller when another video controller is present in the system. Default is enabled. ● Internal Speaker (some models) (does not affect external speakers). Default is enabled. ● NIC Option ROM Download (PXE, iSCSI, disabled). The BIOS contains an embedded NIC option ROM to allow the unit to boot through the network to a PXE server. This is typically used to download a corporate image to a hard drive. The NIC option ROM takes up memory space below 1MB commonly referred to as DOS Compatibility Hole (DCH) space. This space is limited. This F10 option will allow users to disable the downloading of this embedded NIC option ROM thus giving more DCH space for additional PCI cards which may need option ROM space. The default will be to have the NIC option-ROM-enabled. Default is PXE. ● Multi-Processor (enable/disable). Use this option to disable multi-processor support under the OS. Default is enabled. ● System Health Timer Timeout (Disabled, 1 min, 5 min, 15 min). Allows you to set a timer to reset the system in case of a lock up. An expired timer indicates the system hung. Default is disabled. ● Cash Drawer Port. Use this option to enable/disable the cash drawer port that comes on the system board. ● Hard Drive Activity LED. Use this option to enable/disable the hard drive LED. When this feature is disabled, there is no visual indication for hard drive activity. **NOTE:** To hide a device, see Security > Device Security.

VGA Configuration	Displayed only if there are multiple PCI video adapters in the system. Allows you to specify which VGA controller will be the "boot" or primary VGA controller.
AMT Configuration	Allows you to set:
	● AMT (enable/disable). Allows you to enable or disable functions of the embedded Management Engine (ME) such as Active Management Technology (AMT). If set to disable, the Management Engine is set to a temporarily disabled state and will not provide functions beyond necessary system configuration. Default is enabled.
	● Unconfigure AMT/ME (enable/disable). Allows you to unconfigure any provisioned management settings for AMT. The AMT settings are restored to factory defaults. This feature should be used with caution as AMT will not be able to provide any set AMT management functions once unconfigured. Default is disabled.
	● Watchdog Timer (enable/disable). Allows you to set amount of time for a operating system and BIOS watchdog alert to be sent if the timers are not deactivated. BIOS watchdog is deactivated by BIOS and would indicate that a halt occurred during execution if the alert is sent to the management console. An operating system alert is deactivated by the operating system image and would indicate that a hang occurred during its initialization. Default is enabled.

Recovering the configuration settings

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

NOTE: It is recommended that you save any modified computer configuration settings to a diskette, a USB flash media device, or a diskette-like device (a storage device set to emulate a diskette drive) and save the diskette or device for possible future use.

To restore the configuration, insert the diskette, USB flash media device, or other storage media emulating a diskette with the saved configuration and perform the **Restore from Removable Media** command with the Computer Setup (F10) Utility.

B   Using HP PC Hardware Diagnostics

To help in troubleshooting and diagnosing failures, use the UEFI-based hardware diagnostic solution that HP includes on all products. You can use this tool even if the computer will not boot to the operating system.

Why run HP PC Hardware Diagnostics - UEFI

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. A connected USB drive (to download the diagnostics tools to a USB drive, see the instructions in).

2. The hard disk drive.

> **NOTE:**   This option is not available on models with 32 GB solid-state drives.

3. 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.

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 from the three locations in the order listed above.

Downloading HP PC Hardware Diagnostics to a USB device

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

2. Click the **Support & Drivers** link.

3. Select the **Drivers & Software** tab.

4. Enter the product name in the text box and click **Search**.

5. Select your specific computer model.

6. Select your operating system.

7. In the Diagnostic section, click the **HP UEFI Support Environment** link. This link provides additional information.

   - or -

   Click the **Download** button and select **Run**. The download includes instructions (in English) on how to install the tools on the USB device.

NOTE: HP diagnostic solutions are developed to test components typically included on HP products. They may not diagnose all third-party accessories that can be added to the system.

C Restoring and recovering

To protect from loss or damage, back up your personal data files. Refer to the operating system or backup utility documentation for instructions on making backup copies of your data files.

To protect the software from loss or damage, keep a backup copy of all system software, applications, and related files stored on the hard drive.

If you cannot create system recovery CDs or DVDs, you can order a recovery disk set from support. To obtain the support telephone number for your region, see http://www.hp.com/support/contactHP.

System Restore

If you have a problem that might be due to software that you installed on your computer, use System Restore to return the computer to a previous restore point. You can also set restore points manually.

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

NOTE: Some features might not be available on systems that are shipped without a Windows operating system.

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.

To add restore points manually:

1. Close all open programs.

2. Click the **Start** button, right-click **Computer**, click **Properties**, and then click **System protection**.

3. Under **Protection Settings**, select the disk for which you want to create a restore point.

4. Click **Create**, 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.

NOTE: Always use the System Restore procedure before you use the System Recovery program. See .

NOTE: Some features might not be available on systems that are shipped without a Windows operating system.

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 or .

● Recovery media — Run System Recovery from recovery media that you have created from files stored on your hard disk drive or purchased separately. To create recovery media, see .

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. To create this media, follow the instructions in .

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, click **All Programs**, click **Security and Protection**, click **Recovery Manager**, and then click **Recovery Manager**. If prompted, click **Yes** to allow the program to continue.

5. Under **I need help immediately**, click **System Recovery**.

6. Select **Yes**, and then click **Next**. Your computer restarts.

   NOTE: If your system does not detect a recovery partition, it prompts you to insert recovery media that you have created. Insert the first disc or the USB flash drive, select **Yes**, and then click **Next** to restart the computer. If you are using discs, insert the next disc when prompted.

7. 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**.

8. System Recovery begins. After System Recovery is complete, click **Finish** to restart the computer.

9. 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. Under **I need help immediately**, click **System Recovery**.

6. 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**.

7. System Recovery begins. After System Recovery is complete, click **Finish** to restart the computer.

8. When Windows has loaded, shut down the computer, reconnect all peripheral devices, and then turn the computer back on.

System recovery using recovery media

You should create a set of recovery media, either a set of DVDs or a USB flash drive, from the recovery image stored on your hard disk drive. This image contains the operating system and software program files that were originally installed on your computer at the factory. You can create only one set of recovery media for your computer, and the media can be used *only* with this computer. Store the recovery media in a safe place.

📝 **NOTE:** Some features might not be available on systems that are shipped without a Windows operating system.

● To create recovery discs, your computer must have a DVD writer, and you must use only high-quality blank DVD+R or DVD-R discs.

  📝 **NOTE:** You *cannot* use DVD+RW, DVD-RW, DVD+RW DL, DVD-RW DL, DVD+R DL, or DVD-R DL discs to create recovery discs.

● 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.

Creating recovery media

To create recovery discs:

1. Close all open programs.

2. Click the **Start** button, click **All Programs**, click **Security and Protection**, 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 as 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 flash drive with a capacity of at least 8 GB.

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**, 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**.

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

6. Follow the on-screen instructions. When the process is complete, label the USB flash drive and store it in a secure place.

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.

Using recovery media

⚠ **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 create recovery media, see System recovery using recovery media on page 85.

To perform a System Recovery using recovery media:

1. If 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. If the computer is not responding, press and hold the power button for approximately 5 seconds or until the computer turns off.

    or

    Click the **Start** button, and then click **Shut Down**.

3. Disconnect all peripheral devices from the computer except the monitor, keyboard, and mouse.

4. Press the power button to turn on the computer.

5. 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 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.

D Configuring the software

Touch screen calibration

You do not need to install the touch driver software for Microsoft Windows 7 or POSReady 7. Touch drivers are already included in those operating systems for this monitor.

HP recommends that you calibrate the touch screen before using the system to ensure that the touch point registers on the screen where the stylus or finger touches the screen. If at any time you find that the touch point is not registering properly, you may need to repeat the calibration process.

Calibration for Windows 7 and POSReady 7

To calibrate the touch module in Windows 7 and POSReady 7:

1. In the HP factory image, select **Start** > **All Programs** > **Load Windows Calibration Tool**, then proceed to step 2.

    OR

    Open the **Start** menu, tap the **Control Panel** link and type "calibrate" in the Search box. Under **Tablet PC Settings**, tap the **Calibrate the screen for pen or touch input** link. In the **Tablet PC Settings** dialog box, tap the **Calibrate** button, then proceed to step 2.

2. Follow the on-screen instructions to press the target marks on the touch screen. At the end of the calibration process, the touch module should be aligned with the video and the touch points will be accurate.

Calibration for Windows XP

You must load the touch screen driver provided on the software and documentation CD that shipped with the monitor if you are using Windows XP or a Windows XP based operating system. A calibration tool for Windows XP is also included on the CD shipped with the monitor.

To calibrate the touch module in Windows XP:

1. Install the software from the software and documentation CD and refer to the readme file for calibration instructions.

2. After installation, launch the software and follow the on screen instructions. At the end of the calibration process, the touch module should be aligned with the video and the touch points will be accurate.

Configuring the MSR and VFD customer display

To configure the MSR and VFD, refer to the *HP Point of Sale Configuration Guide* (available in English only). The guide is available on the system's hard drive. In Windows XP or Windows Embedded POSReady 2009, select **Start** > **All Programs** > **HP Point of Sale Information** to access the guide. In Windows 7 or Windows Embedded POSReady 7, select **Start** > **HP Point of Sale Information** to access the guide.

Configuring powered serial ports

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

NOTE: The computer ships with all serial ports configured in standard serial mode by default unless the powered serial port AV numbers are ordered.

The serial ports can be configured using the Computer F10 Setup utility. Under the **Onboard Devices** menu, you are given the option to select the following three settings for each individual serial port:

● Standard

● 5v on pins 1 and 9

● 12v on pins 1 and 9

NOTE: To access the Computer F10 Setup utility, restart the computer and press the F10 key as soon as the HP logo screen is displayed (before the computer boots to the operating system).

E   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 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 the *Computer Setup (F10) Utility Guide* on the *Documentation and Diagnostics CD*.

Power-On Self-Test (POST)

POST is a series of diagnostic tests that runs automatically when the system is turned on. POST checks the following items to ensure that the computer system is functioning properly:

- Keyboard

- Memory modules

- All mass storage devices

- Processors

- Controllers

NOTE: If the Power-On Password is set, a key icon appears on the screen while POST is running. You will need to enter the password before continuing.

If POST finds an error in the system, an audible and/or visual message occurs.

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 E-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.	1. Verify the correct ROM. 2. Flash the ROM if needed. 3. If an expansion board was recently added, remove it to see if the problem remains. 4. Clear CMOS. 5. If the message disappears, there may be a problem with the expansion card. 6. Replace the system board.
103-System Board Failure	DMA or timers.	1. Clear CMOS. 2. Remove expansion boards. 3. Replace the system board.
110-Out of Memory Space for Option ROMs	Recently added PCI expansion card contains an option ROM too large to download during POST.	1. If a PCI expansion card was recently added, remove it to see if the problem remains. 2. In Computer Setup, set **Advanced** > **Device Options** > **NIC PXE Option ROM Download** to **DISABLE** to prevent PXE option ROM for the internal NIC from being downloaded during POST to free more memory for an expansion card's option ROM. Internal PXE option ROM is used for booting from the NIC to a PXE server. 3. Ensure the ACPI/USB Buffers @ Top of Memory setting in Computer Setup is enabled.
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 *Hardware Reference Guide* on the *Documentation and Diagnostics CD* for instructions on installing a new battery, or contact an authorized dealer or reseller for RTC battery replacement.

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

Control panel message	Description	Recommended action
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 *Hardware Reference Guide* on the *Documentation and Diagnostics CD* 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.	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.	1. Run Computer Setup or Windows utilities. 2. Ensure memory modules are correctly installed. 3. Verify proper memory module type. 4. Remove and replace the identified faulty memory module(s). 5. 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.	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.
219-ECC Memory Module Detected ECC Modules not supported on this Platform	Recently added memory module(s) support ECC memory error correction.	1. If additional memory was recently added, remove it to see if the problem remains. 2. Check product documentation for memory support information.

Control panel message	Description	Recommended action
301-Keyboard Error	Keyboard failure.	1. Reconnect keyboard with computer turned off. 2. Check connector for bent or missing pins. 3. Ensure that none of the keys are depressed. 4. Replace keyboard.
303-Keyboard Controller Error	I/O board keyboard controller.	1. Reconnect keyboard with computer turned off. 2. Replace the system board.
304-Keyboard or System Unit Error	Keyboard failure.	1. Reconnect the keyboard with computer turned off. 2. Ensure that none of the keys are depressed. 3. Replace the keyboard. 4. Replace the system board.
404-Parallel Port Address Conflict Detected	Both external and internal ports are assigned to parallel port X.	1. Remove any parallel port expansion cards. 2. Clear CMOS. 3. Reconfigure card resources and/or run Computer Setup.
410-Audio Interrupt Conflict	IRQ address conflicts with another device.	Enter Computer Setup and reset the IRQ in **Advanced** > **Onboard Devices**.
411-Network Interface Card Interrupt Conflict	IRQ address conflicts with another device.	Enter Computer Setup and reset the IRQ in **Advanced** > **Onboard Devices**.
501-Display Adapter Failure	Graphics display controller.	1. Reseat the graphics card (if applicable). 2. Clear CMOS. 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.	1. Reseat CPU fan. 2. Reseat fan cable. 3. Replace CPU fan.

Control panel message	Description	Recommended action
512-Chassis, Rear Chassis, or Front Chassis Fan not Detected	Chassis, rear chassis, or front chassis fan is not connected or may have malfunctioned.	1. Reseat chassis, rear chassis, or front chassis fan. 2. Reseat fan cable. 3. Replace chassis, rear chassis, or front chassis fan.
514-CPU or Chassis Fan not Detected	CPU or chassis fan is not connected or may have malfunctioned.	1. Reseat CPU or chassis fan. 2. Reseat fan cable. 3. Replace CPU or chassis fan.
610-External Storage Device Failure	External tape drive not connected.	Reinstall tape drive or press F1 and allow system to reconfigure without the drive.
611-Primary Floppy Port Address Assignment Conflict	Configuration error.	Run Computer Setup and check the configuration in **Advanced** > **Onboard Devices**.
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
1151-Serial Port A Address Conflict Detected	Both external and internal serial ports are assigned to COM1.	1. Remove any serial port expansion cards. 2. Clear CMOS. 3. Reconfigure card resources and/or run Computer Setup or Windows utilities.
1152-Serial Port B Address Conflict Detected	Both external and internal serial ports are assigned to COM2.	1. Remove any serial port expansion cards. 2. Clear CMOS. 3. Reconfigure card resources and/or run Computer Setup or Windows utilities.
1155-Serial Port Address Conflict Detected	Both external and internal serial ports are assigned to same IRQ.	1. Remove any serial port expansion cards. 2. Clear CMOS. 3. Reconfigure card resources and/or run Computer Setup or Windows utilities.
1201-System Audio Address Conflict Detected	Device IRQ address conflicts with another device.	Enter Computer Setup and reset the IRQ in **Advanced** > **Onboard Devices**.

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

Control panel message	Description	Recommended action
1202-MIDI Port Address Conflict Detected	Device IRQ address conflicts with another device.	Enter Computer Setup and reset the IRQ in **Advanced** > **Onboard Devices**.
1203-Game Port Address Conflict Detected	Device IRQ address conflicts with another device.	Enter Computer Setup and reset the IRQ in **Advanced** > **Onboard Devices**.
1720-SMART Hard Drive Detects Imminent Failure	Hard drive is about to fail. (Some hard drives have a hard drive firmware patch that will fix an erroneous error message.)	1. Determine if hard drive is giving correct error message. Enter Computer Setup and run the Drive Protection System test under **Storage** > **DPS Self-test**. 2. Apply hard drive firmware patch if applicable. (Available at http://www.hp.com/support.) 3. Back up contents and replace hard drive.
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, SATA1, 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**. 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.	1. Upgrade BIOS to proper version. 2. Change the processor.
Invalid Electronic Serial Number	Electronic serial number has become corrupted.	1. Run Computer Setup. If Setup already has data in the field or will not allow the serial number to be entered, download from http://www.hp.com. 2. Run Computer Setup and try to enter serial number under Security, System ID, then save changes.
Memory Parity Error	Parity RAM failure. Third-party graphics card may be causing a problem.	Run Computer Setup and Diagnostic utilities. Remove third-party graphics card to see if the problem goes away.

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

Control panel message	Description	Recommended action
Network Server Mode Active and No Keyboard Attached	Keyboard failure while Network Server Mode enabled.	1. Reconnect keyboard with computer turned off. 2. Check connector for bent or missing pins. 3. Ensure that none of the keys are depressed. 4. Replace keyboard.
Parity Check 2	Parity RAM failure. Third-party graphics card may be causing a problem.	Run Computer Setup and Diagnostic utilities. Remove third-party graphics card to see if the problem goes away.
The system is violating the thermal environment requirement.	Improper processor installed or add-in card installed in 50C mode.	1. Replace the processor with a 65-W processor. 2. Remove any add-in cards.

Interpreting POST diagnostic front panel LEDs and audible codes

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

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

📝 **NOTE:** If you see flashing LEDs on a PS/2 keyboard, look for flashing LEDs on the front panel of the computer and refer to the following table to determine the front panel LED codes.

Recommended actions in the following table are listed in the order in which they should be performed.

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

Activity	Beeps	Possible Cause	Recommended Action
Green Power LED On.	None	Computer on.	None
Green Power LED flashes.	None	Computer in Suspend to RAM mode (some models only) or normal Suspend mode.	None required. Press any key if a keyboard is attached or move the mouse if a mouse is attached to wake the computer. You can also wake the computer by pressing the power button or tapping the touch screen.

Activity	Beeps	Possible Cause	Recommended Action
Red Power LED flashes two times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	2	Processor thermal protection activated: Fan may be blocked or not turning. OR The heatsink/fan assembly is not properly attached to the processor.	1. Ensure that the computer air vents are not blocked and the fan is running. 2. Open the cover, press the power button, and see if the fan spins. If the fan is not spinning, make sure the fan's cable is plugged onto the system board header. 3. If the fan is plugged in, but is not spinning, then replace heatsink/fan assembly. 4. Contact an authorized reseller or service provider.
Red Power LED flashes three times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	3	Processor not installed (not an indicator of bad processor).	1. Check to see that the processor is present. 2. Reseat the processor.
Red Power LED flashes four times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	4	Power failure (power supply is overloaded).	1. Ensure the DC power cable is plugged into the I/O panel. 2. Check if a device is causing the problem by removing ALL attached devices (such as a hard drive). Power on the system. If the system enters the POST, then power off and replace the device to see if the problem is resolved. 3. Replace the power supply. 4. Replace the system board.
Red Power LED flashes five times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	5	Pre-video memory error.	CAUTION: To avoid damage to the SODIMMs or the system board, you must unplug the computer power cord before attempting to reseat, install, or remove a SODIMM module. 1. Reseat SODIMMs. 2. Replace SODIMMs one at a time to isolate the faulty module. 3. Replace third-party memory with HP memory. 4. Replace the system board.
Red Power LED flashes six times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	6	Pre-video graphics error.	1. Unplug the power cord. Press the CMOS reset button. Install the FDO jumper to disable ME (or remove the FDO jumper to disable ME if it was installed). 2. Replace the system board.
Red Power LED flashes seven times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	7	System board failure (ROM detected failure prior to video).	Replace the system board.

Activity	Beeps	Possible Cause	Recommended Action
Red Power LED flashes eight times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	8	Invalid ROM based on bad checksum.	**1.** Reflash the system ROM with the latest BIOS image. **2.** Replace the system board.
Red Power LED flashes nine times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	9	System powers on but is unable to boot.	**1.** Replace the processor. **2.** Replace the system board.
Power LED flashes 12 times, once every second, followed by a two second pause. Beeps stop after third iteration and the computer reboots.	12	Health timer expired.	None.
System does not power on and LEDs are not flashing.	None	System unable to power on.	Press and hold the power button for less than 4 seconds. If the hard drive LED turns green, the power button is working correctly. Replace the system board. OR Press and hold the power button for less than 4 seconds. If the hard drive LED does not turn on green then: **1.** Check that the unit is plugged into a working AC outlet. **2.** Ensure that the DC power cable is plugged into the I/O panel. **3.** Replace the power supply.

F   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. Backup is performed through Computer Setup. See Computer Setup (F10) Utility on page 69 for information on backing up the CMOS settings.

Resetting the password jumper

To reset 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 E49 on the system board.

   📝 **NOTE:**   The password jumper is green so that it can be easily identified. For assistance locating the password jumper and other system board components, see the Illustrated Parts & Service Map (IPSM). The IPSM can be downloaded from http://www.hp.com/support.

5. Remove the jumper from the header.

6. Replace the jumper.

7. Replace the access panel.

8. Reconnect the external equipment.

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

10. Establish the new passwords in Computer Setup. Refer to Computer Setup (F10) Utility on page 69 for Computer Setup instructions.

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

2. Disconnect any external equipment connected to the computer.

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

> **CAUTION:** When the computer is plugged in, the power supply always has voltage applied to the system board even when the unit is turned off. Failure to disconnect the power cord can result in damage to the system.
>
> Static electricity can damage the electronic components of the computer or optional equipment. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object. See the *Safety & Regulatory Information* guide for more information.

3. Slide the rear cover off the computer.

> **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 69 for information on backing up the CMOS settings.

4. Open the memory door.

5. Reach in, press, and hold the CMOS button in for five seconds. You can access the CMOS button after removing the memory door.

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

NOTE: For assistance locating the CMOS button and other system board components, see the Illustrated Parts & Service Map (IPSM) for that particular system.

6. Close the memory door and replace the rear cover.

7. Reconnect the external devices.

8. Plug in the computer and turn on power.

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

For instructions on Computer Setup, see Computer Setup (F10) Utility on page 69.

G   Troubleshooting without diagnostics

This chapter provides information on how to identify and correct minor problems, such as diskette drive, 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, .

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 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, 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 104 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 HP Backup and Recovery Manager.

⚠ **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:** Restoring the computer requires an external USB optical drive.

📝 **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 is plugged into a working electrical outlet.

- Check that the computer is turned on and the green power light is on.

- Check the Power LED on the front of the display 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 90 for more information.

- Turn up the brightness and contrast controls of the display if dim.

- If a keyboard is connected, 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, pressing the power button, or tapping the screen. 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 121 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 (if an external USB optical or diskette drive is attached) from the system before turning it on.

- If you have installed an operating system other than the factory-installed operating system, check to be sure that it is supported on the system.

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

Solving retail system-specific problems

The issues listed in this section are specific to features available in this Retail System.

Powered serial ports don't have power.

Cause	Solution
Ports are not correctly configured in Computer Setup.	1. Run the Computer Setup utility.
	2. Under **Onboard Devices**, make sure the correct setting is selected for each individual serial port (A, B, if available, C, and D).
	Available settings are:
	◦ Standard
	◦ 5v on pins 1 and 9
	◦ 12v on pins 1 and 9
A powered serial device was connected while system power was on.	The computer must be powered off when you plug in powered serial devices.
	Disconnect the device, power off the system, plug in the device, and power on the system.

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.	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 USB keyboard or mouse.

Cause	Solution
Computer is in **standby** mode.	To resume from **standby** mode, press the power button or press any key. **CAUTION:** When attempting to resume from **standby** mode, 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.	First, 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.

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

Cause	Solution
The Num Lock key may be on.	Press the Num Lock key. The Num Lock light should not be on if you want to use the arrow keys. The Num Lock key can be disabled (or enabled) in Computer Setup.

There is no sound or sound volume is too low.

Cause	Solution
System volume may be set low or muted.	1. Check the F10 BIOS 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.
	4. Make sure that speakers are not muted in the On-Screen Display (OSD).

Poor performance is experienced.

Cause	Solution
Processor is hot.	1. Make sure airflow to the computer is not blocked. Leave a 10.2-cm (4-inch) clearance on all vented sides of the computer 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.
Hard drive fragmented.	Defragment hard drive.
Program previously accessed did not release reserved memory back to the system.	Restart the computer.
Virus resident on the hard drive.	Run virus protection program.
Too many applications running.	1. Close unnecessary applications to free up memory.
	2. Add more memory. 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, go to **Start** > **All Programs** > **Accessories** > **Run** and type `msconfig`. On the **Startup** tab of the System Configuration Utility, clear applications that you do not want to launch automatically.
Some software applications, especially games, are stressful on the graphics subsystem	1. Lower the display resolution for the current application or consult the documentation that came with the application for suggestions on how to improve performance by adjusting parameters in the application.
	2. Add more memory.
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.	1. Ensure that the computer air vents are not blocked and the processor cooling fan is running. 2. Open hood, press power button, and see if the processor fan spins. If the processor fan is not spinning, make sure the fan's cable is plugged onto the system board header. 3. If fan is plugged in, but is not spinning, then replace the heat sink/fan assembly.

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

Cause	Solution
System unable to power on.	Press and hold the power button for less than 4 seconds. If the hard drive LED turns green, then: 1. Check that the voltage selector, located on the rear of the power supply on some models, is set to the appropriate voltage. Proper voltage setting depends on your region. 2. Replace the system board. OR Press and hold the power button for less than 4 seconds. If the hard drive LED does not turn on green then: 1. Check that the unit is plugged into a working AC outlet. 2. Open computer and check that the power button board cable is properly connected to the system board. 3. Check that 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 board. 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.

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.	1. Ensure that the computer air vents are not blocked and the processor cooling fan is running. 2. Ensure the blower is running.

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).	1. Check if a device is causing the problem by removing ALL attached devices (such as hard, diskette, or optical drives, and expansion cards). Power on the system. If the system enters the POST, then power off and replace one device at a time and repeat this procedure until failure occurs. Replace the device that is causing the failure. Continue adding devices one at a time to ensure all devices are functioning properly. 2. Replace the power supply. 3. Replace the system board.

Solving hard drive problems

Hard drive error occurs.

Cause	Solution
Hard disk has bad sectors or has failed.	1. Right-click **Start**, click **Explore**, and right-click on a drive. Select **Properties** then select the **Tools** tab. Under **Error-checking** click **Check Now**. 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.	Right-click **Start**, click **Explore**, and right-click on a drive. Select **Properties** then select the **Tools** tab. Under **Error-checking** click **Check Now**.

Drive not found (identified).

Cause	Solution
Cable could be loose.	Check cable connections.
The system may not have automatically recognized a newly installed device.	See reconfiguration directions in the Solving hardware installation problems on page 121 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. If this is a newly installed drive, run the Computer Setup utility and try adding a POST delay under **Advanced** > **Power-On**.
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.

NOTE: Only if external USB diskette drive is installed.

Cause	Solution
The system is trying to start from a diskette that is not bootable.	Remove the diskette from the diskette drive.
The system is trying to start from the hard drive but the hard drive may have been damaged.	1. Insert a bootable diskette into the diskette drive and restart the computer. 2. Check the hard drive format using fdisk: If NTFS formatting, use a third party reader to evaluate the drive. If FAT32 formatting, the hard drive cannot be accessed.
System files missing or not properly installed.	1. Insert a bootable diskette into the diskette drive and restart the computer. 2. Check the hard drive format using Fdisk: If NFTFS formatting, use a third party reader to evaluate the drive. If FAT32 formatting, the hard drive cannot be accessed. 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.
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's controller is not listed first in the Boot Order.	Run the Computer Setup utility and select **Storage** > **Boot Order** and ensure the bootable hard drive's controller 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.	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 is damaged.	Observe if the Power LED is blinking RED and if any beeps are heard. See Appendix A, POST error messages on page 90 to determine possible causes for the blinking red and beep codes. See the Worldwide Limited Warranty for terms and conditions.

Computer seems to be locked up.

Cause	Solution
Program in use has stopped responding to commands.	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.

The removable hard drive enclosure is beeping and the green LED is flashing.

Cause	Solution
Fan failure alarm on the removable hard drive enclosure has been activated.	Shut down the computer and contact HP for a replacement enclosure.

Solving media card reader problems

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.	Open **Computer**, right-click on the corresponding drive icon, and select **Eject**. Then pull the card out of the slot. **NOTE:** Never remove the card when the green LED is flashing

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
You may have a screen blanking utility installed or energy saver features are enabled.	Use the touch keyboard, or If a keyboard or mouse is installed, press any key or click the mouse button and, if set, type your password.
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.
Computer is in **standby** mode.	Press the power button or touch the screen to resume from **standby** mode. **CAUTION:** When attempting to resume from **standby** mode, 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.

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.	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: 1. 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.

Blurry video or requested resolution cannot be set.

Cause	Solution
The correct graphics drivers may not be loaded.	Update graphics drivers.
Graphics card is bad.	Replace the graphics card.

Image is not centered.

Cause	Solution
Position may need adjustment.	Press the display'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.

"Out of Range" displays on screen.

Cause	Solution
Video resolution and refresh rate are set higher than what the monitor supports.	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.

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
The correct graphics drivers may not be loaded.	1. Update the graphics driver.

Certain typed symbols do not appear correct.

Cause	Solution
The font you are using does not support that particular symbol.	Use the Character Map to locate and select the appropriate symbol. Click **Start** > **All Programs** > **Accessories** > **System Tools** > **Character Map**. You can copy the symbol from the Character Map into a document.

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.
Audio is hidden in Computer Setup.	Enable the audio in Computer Setup: **Security** > **Device Security** > **System Audio**.
Speakers muted in On-Screen Display (OSD) settings.	Make sure the speakers are not muted in the OSD.
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 speakers should be plugged into the rear line-out jack and the headphones should be plugged into the front 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.
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 **standby** mode.	Press the power button or touch the screen to resume from **standby** mode. **CAUTION:** When attempting to resume from **standby** mode, 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**.
The application is set to use a different audio device than speakers.	Make sure the correct device is being used.
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.
Speakers muted in On-Screen Display (OSD) settings.	Make sure the speakers are not muted in the OSD.

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.	Make sure the correct device is being used.
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.
Speakers muted in On-Screen Display (OSD) settings.	Make sure the speakers are not muted in the OSD.

Solving printer problems

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

Printer will not print.

Cause	Solution
Printer is not turned on and online.	Turn the printer on and make sure it is online.
The correct printer drivers for the application are not installed.	1. Install the correct printer driver for the application. 2. Try printing using the MS-DOS command: `DIR C:\ > [printer port]` where `[printer port]` is the address of the printer being used. If the printer works, reload the printer driver.
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 is offline.

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

Solving keyboard and mouse problems (if installed)

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

Keyboard commands and typing are not recognized by the computer.

Cause	Solution
Keyboard connector is not properly connected.	1. Click **Start**, click the arrow on the lower right corner of the Start menu, then select **Shut Down**. 2. After the shutdown is complete, reconnect the keyboard to the back of the computer and restart the computer.
Program in use has stopped responding to commands.	Shut down your computer using the mouse and then restart the computer.
Keyboard needs repairs.	See the Worldwide Limited Warranty for terms and conditions.
Computer is in **standby** mode.	Press the power button to resume from **standby** mode. **CAUTION:** When attempting to resume from **standby** mode, 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 may be on.	Press the Num Lock key. The Num Lock light should not be on if you want to use the arrow keys. The Num Lock key can be disabled (or enabled) in Computer Setup.

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. 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 the Enter key. 3. 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 may need cleaning.	Remove the roller ball cover on the mouse and clean the internal components.

Mouse does not respond to movement or is too slow.

Cause	Solution
Mouse may need repair.	See the Worldwide Limited Warranty for terms and conditions.
Computer is in **standby** mode.	Press the power button to resume from **standby** mode. **CAUTION:** When attempting to resume from **standby** mode, 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.

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

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

Cause	Solution
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.
When the system advised you of changes to the configuration, you did not accept them.	Reboot the computer and follow the instructions for accepting the changes.
A plug and play board may not automatically configure when added if the default configuration conflicts with other devices.	Use Windows Device Manager to deselect the automatic settings for the board and choose a basic configuration that does not cause a resource conflict. You can also use Computer Setup to reconfigure or disable devices to resolve the resource conflict.
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.	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 must always be installed. DIMM1 must be installed before DIMM3. 2. Observe the beeps and LED lights on the front of the computer. Beeps and flashing LEDs are codes for specific problems. 3. If you still cannot resolve the issue, contact Customer Support.

Power LED flashes red 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.	**CAUTION:** To avoid damage to the DIMMs or the system board, you must unplug the computer power cord before attempting to reseat, install, or remove a DIMM module.
	1. Reseat DIMMs. Power on the system.
	2. Replace DIMMs one at a time to isolate the faulty module.
	NOTE: DIMM1 must always be installed. DIMM1 must be installed before DIMM3.
	3. Replace third-party memory with HP memory.
	4. Replace the system board.

Solving network problems

Some common causes and solutions for network problems are listed in the following table. These guidelines do not discuss the process of debugging the network cabling.

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 Saving**.
S5 Wake on LAN is disabled.	: Enable the S5 Wake on LAN option in Computer Setup. Select **Advanced** > **Device Options** > **S5 Wake on LAN**.
Wake-on-LAN is not enabled.	1. Select **Start** > **Control Panel**. 2. Under **Network and Internet**, select **View network status and tasks**. 3. Click **Local Area Connection**. 4. Click the **Properties** button. 5. Click the **Configure** button. 6. Click the **Power Management** tab, then select the check box to **Allow this device to wake the computer**.

Network driver does not detect network controller.

Cause	Solution
Network controller is disabled.	1. Run Computer Setup and enable network controller. 2. Enable the network controller in the operating system via 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.	Check for the device status within Windows, such as Device Manager for driver load and the Network Connections applet within Windows for link status.
Network controller is disabled.	1. Run Computer Setup and enable network controller. 2. Enable the network controller in the operating system via Device Manager.

Network status link light never flashes.

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

Cause	Solution
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** icon in the **Control Panel** and configure the network controller.

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 created from the hard drive's Recovery Partition.
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 DIMM 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.

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 socket.	Ensure that a memory module is installed in the DIMM1 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. ECC and non-ECC memory modules cannot be mixed.

Out of memory error.

Cause	Solution
Memory configuration may not be set up correctly.	Use the Device Manager to check memory configuration.
You have run out of memory to run the application.	Check the application documentation to determine the memory requirements.

Memory count during POST is wrong.

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

Insufficient memory error during operation.

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

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

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

Solving 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.	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.	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.	1. Install a TXT capable processor.
	2. Disable TXT in the Computer Setup (F10) utility.
	3. Reinstall the original processor.

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 ensure that "Device available" is selected for "Front USB Ports" and "Rear USB Ports" under **Security** > **Device 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.

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.
Modem is not set up properly.	Reconnect the modem. Verify the connections are correct using the quick setup documentation.
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.)
The CAT5 UTP cable is disconnected.	Connect the CAT5 UTP cable between the cable modem and the computers's RJ-45 connector. (If the connection is good, the "PC" LED light on the front of the cable/DSL modem will be on.)
IP address is not configured properly.	Contact your ISP for the correct IP address.
Cookies are corrupted. (A "cookie" is a small piece of information that a Web server can store temporarily with the Web browser. This is useful for having the browser remember some specific information that the Web server can later retrieve.)	1. Select **Start** > **Control Panel**. 2. Click **Network and Internet**. 3. Click **Internet Options**. 4. In the **Browsing history** section on the **General** tab, click the **Delete** button. 5. 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.

Internet takes too long to download Web sites.

Cause	Solution
Modem is not set up properly.	Verify that the modem is connected and communicating properly.
	1. Select **Start** > **Control Panel**.
	2. Click on **Hardware and Sound**.
	3. Click on **Device Manager**.
	4. Double-click **Modems**.
	5. Select the modem.
	6. On the **General** tab, click **Diagnostics**.
	7. Click **Query Modem**. A "Success" response indicates the modem is connected and working properly.

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 no HP logo screen has appeared.

Cause	Solution
POST error has occurred.	Observe the beeps and LED lights on the front of the computer. See Appendix A, POST error messages on page 90 to determine possible causes.
	See the Restore Kit or the Worldwide Limited Warranty for terms and conditions.

Computer will not continue after HP logo screen has appeared.

Cause	Solution
System files may be damaged.	Use recovery diskette to scan hard drive for errors.

"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.

H   Serial and parallel ATA drive guidelines and features

NOTE: Serial ATA = SATA

Parallel ATA = PATA

HP only supports the use of SATA hard drives on these models of computer. No PATA drives are supported on any of these models.

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	3.0 Gb/s

SATA connectors on the system board are color coded to make identification easier.

SATA Identification	Color	Port	Attachment Sequence
Primary channel, device 0	Dark blue	SATA 0	1
Primary channel, device 1	Light Blue	SATA 2	4

NOTE: If there is an error on the application of the attach rules, a POST error message may be displayed.

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. As shown in the table, each cable has 3 grounds, and 4 transmit/receive pins.

Pin Number	Usage	Device Plug	Host Plug
P1	Ground	Ground	Ground
P2*	A+	Transmit data	Receive data
P3*	A-	Transmit data	Receive data
P4	Ground	Ground	Ground
P5**	B-	Receive data	Transmit data
P6**	B+	Receive data	Transmit data
P7	Ground	Ground	Ground

*P2 and P3 differential signal pair

**P5 and P6 differential signal pair

SATA power cable

Pin	Usage	Notes	Pin	Usage	Notes
P1	V3.3	3.3 V power	P9	V5	5 V power
P2	V3.3	3.3 V power	P10	Ground	
P3	V3.3	3.3 V power	P11	Ground	
P4	Ground		P12	Ground	
P5	Ground		P13	V12	12 V power
P6	Ground		P14	V12	12 V power
P7	V5	5 V power	P15	V12	12 V power
P8	V5	5 V power			

ATA SMART 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.

Hard drive capacities

The combination of the file system and the operating system used in the computer determines the maximum usable size of a drive partition. A drive partition is the largest segment of a drive that may be properly accessed by the operating system. A single hard drive may therefore be subdivided into a number of unique drive partitions in order to make use of all of its space.

Because of the differences in the way that drive sizes are calculated, the size reported by the operating system may differ from that marked on the hard drive or listed in the computer specification. Drive size calculations by drive manufacturers are bytes to the base 10 while calculations by Microsoft are bytes to the base 2.

Drive/Partition Capacity Limits				
			Maximum Size	
File System	Controller Type	Operating System	Partition	Drive
FAT 32	ATA	Windows 7	32 GB	2 TB
NTFS	ATA	Windows 7	2 TB	2 TB

I   Routine care, and disassembly preparation

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

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

Electrostatic discharge information

A sudden discharge of static electricity from your finger or other conductor can destroy static-sensitive devices or microcircuitry. Often the spark is neither felt nor heard, but damage occurs. An electronic device exposed to electrostatic discharge (ESD) may not appear to be affected at all and can work perfectly throughout a normal cycle. The device may function normally for a while, but it has been degraded in the internal layers, reducing its life expectancy.

Networks built into many integrated circuits provide some protection, but in many cases, the discharge contains enough power to alter device parameters or melt silicon junctions.

Generating static

The following table shows that:

● Different activities generate different amounts of static electricity.

● Static electricity increases as humidity decreases.

	Relative Humidity		
Event	**55%**	**40%**	**10%**
Walking across carpet	7,500 V	15,000 V	35,000 V
Walking across vinyl floor	3,000 V	5,000 V	12,000 V
Motions of bench worker	400 V	800 V	6,000 V
Removing DIPs* from plastic tube	400 V	700 V	2,000 V

Removing DIPs* from vinyl tray	2,000 V	4,000 V	11,500 V
Removing DIPs* from Styrofoam	3,500 V	5,000 V	14,500 V
Removing bubble pack from PCB	7,000 V	20,000 V	26,500 V
Packing PCBs in foam-lined box	5,000 V	11,000 V	21,000 V

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

NOTE: 700 volts can degrade a product.

Preventing electrostatic damage to equipment

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

- To avoid hand contact, transport products in static-safe containers such as tubes, bags, or boxes.

- Protect all electrostatic parts and assemblies with conductive or approved containers or packaging.

- Keep electrostatic sensitive parts in their containers until they arrive at static-free stations.

- Place items on a grounded surface before removing them from their container.

- Always be properly grounded when touching a sensitive component or assembly.

- Avoid contact with pins, leads, or circuitry.

- Place reusable electrostatic-sensitive parts from assemblies in protective packaging or conductive foam.

Personal grounding methods and equipment

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

- **Wrist straps** are flexible straps with a maximum of one-megohm ± 10% resistance in the ground cords. To provide proper ground, a strap must be worn snug against bare skin. The ground cord must be connected and fit snugly into the banana plug connector on the grounding mat or workstation.

- **Heel straps/Toe straps/Boot straps** can be used at standing workstations and are compatible with most types of shoes or boots. On conductive floors or dissipative floor mats, use them on both feet with a maximum of one-megohm ± 10% resistance between the operator and ground.

Static Shielding Protection Levels	
Method	**Voltage**
Antistatic plastic	1,500
Carbon-loaded plastic	7,500
Metallized laminate	15,000

Grounding the work area

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

- Cover the work surface with approved static-dissipative material. Provide a wrist strap connected to the work surface and properly grounded tools and equipment.

- Use static-dissipative mats, foot straps, or air ionizers to give added protection.

- Handle electrostatic sensitive components, parts, and assemblies by the case or PCB laminate. Handle them only at static-free work areas.

- Turn off power and input signals before inserting and removing connectors or test equipment.

- Use fixtures made of static-safe materials when fixtures must directly contact dissipative surfaces.

- Keep work area free of nonconductive materials such as ordinary plastic assembly aids and Styrofoam.

- Use field service tools, such as cutters, screwdrivers, and vacuums, that are conductive.

Recommended materials and equipment

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

- Antistatic tape

- Antistatic smocks, aprons, or sleeve protectors

- Conductive bins and other assembly or soldering aids

- Conductive foam

- Conductive tabletop workstations with ground cord of one-megohm +/- 10% resistance

- Static-dissipative table or floor mats with hard tie to ground

- Field service kits

- Static awareness labels

- Wrist straps and footwear straps providing one-megohm +/- 10% resistance

- Material handling packages

- Conductive plastic bags

- Conductive plastic tubes

- Conductive tote boxes

- Opaque shielding bags

- Transparent metallized shielding bags

- Transparent shielding tubes

Tools needed

A Phillips, Torx, or flat blade screwdriver is needed for most of the procedures described in this guide.

Computer operating guidelines and routine care

Follow these guidelines to properly set up and care for the computer and monitor:

- Although the display is water resistant, it is best to keep it away from excessive moisture, direct sunlight, and extremes of heat and cold.

- Never restrict the airflow into the computer by blocking any vents or air intakes.

- Never operate the computer with the cover or side panel removed.

- 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 vents.

- 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.

- Turn off the computer before you do either of the following:

    ◦ Wipe the exterior of the computer with a soft, damp cloth as needed. Using cleaning products may discolor or damage the finish.

    ◦ 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.

Touch screen maintenance

Keep your display and touch sensor clean. The touch sensor requires very little maintenance. HP recommends that you periodically clean the glass touch sensor surface. Be sure to turn off your display before cleaning. Typically, an isopropyl alcohol and water solution ratio of 50:50 is the best cleaning agent for your touch sensor. It is important to avoid using any caustic chemicals on the touch sensor. Do not use any vinegar-based solutions.

Apply the cleaner with a soft, lint-free cloth or a microfiber cloth. Avoid using gritty cloths. Always dampen the cloth and then clean the sensor. Be sure to spray the cleaning liquid onto the cloth, not the sensor, so that drips do not seep inside the display or stain the bezel.

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 (HP screwdriver with bits, PN 161946-001)

- 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

- HP tamper-resistant T-15 wrench (Smart Cover FailSafe Key, PN 166527-001) or HP tamper-resistant bits (Smart Cover FailSafe Key, PN 166527-002)

Screws

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

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

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

Cables and connectors

Most cables used throughout the unit are flat, flexible cables. These cables must be handled with care to avoid damage. Apply only the tension required to seat or unseat the cables during insertion or removal from the connector. Handle cables by the connector whenever possible. In all cases, avoid bending or twisting the cables, and ensure that the cables are routed in such a way that they cannot be caught or snagged by parts being removed or replaced.

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

Hard Drives

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

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

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

- Avoid dropping drives from any height onto any surface.

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

- Before handling a drive, ensure that you are discharged of static electricity. While handling a drive, avoid touching the connector. For more information about preventing electrostatic damage, refer to Electrostatic discharge information on page 134

- 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.

Lithium Coin Cell Battery

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

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

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

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

J   Power cord set requirements

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

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

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

General requirements

The requirements listed below are applicable to all countries:

1. The power cord must be approved by an acceptable accredited agency responsible for evaluation in the country where the power cord set will be installed.

2. The power cord set must have a minimum current capacity of 10A (7A Japan only) and a nominal voltage rating of 125 or 250 volts AC, as required by each country's power system.

3. The diameter of the wire must be a minimum of 0.75 mm$_2$ or 18AWG, and the length of the cord must be between 1.8 m (6 feet) and 3.6 m (12 feet).

4. A C15 power cord MUST be used.

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

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

Japanese power cord requirements

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

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

Country-specific requirements

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

Country	Accrediting Agency	Country	Accrediting Agency
Australia (1)	EANSW	Italy (1)	IMQ
Austria (1)	OVE	Japan (3)	METI
Belgium (1)	CEBC	Norway (1)	NEMKO
Canada (2)	CSA	Sweden (1)	SEMKO
Denmark (1)	DEMKO	Switzerland (1)	SEV
Finland (1)	SETI	United Kingdom (1)	BSI
France (1)	UTE	United States (2)	UL
Germany (1)	VDE		

1. The flexible cord must be Type HO5VV-F, 3-conductor, $0.75mm_2$ conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the certification mark of the agency responsible for evaluation in the country where it will be used.

2. The flexible cord must be Type SVT or equivalent, No. 18 AWG, 3-conductor. The wall plug must be a two-pole grounding type with a NEMA 5-15P (15A, 125V) or NEMA 6-15P (15A, 250V) configuration.

3. Appliance coupler, flexible cord, and wall plug must bear a "T" mark and registration number in accordance with the Japanese Dentori Law. Flexible cord must be Type VCT or VCTF, 3-conductor, $0.75 \ mm_2$ conductor size. Wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7A, 125V) configuration.

K Specifications

Dimensions (With stand – 15 inch Display Option		
	13.2 in	33.6 cm
Height		
	14.4 in	36.6 cm
Width		
	16.7 in	42.4 cm
Depth		
Dimensions (Without stand – 15 inch Display Option		
	12.3 in	31.3 cm
Height		
	14.4 in	36.6 cm
Width		
	3.5 in	8.9 cm
Depth		
Dimensions (With stand – 17 inch Display Option		
	13.7 in	34.8 cm
Height		
	15.2 in	38.6 cm
Width		
	17.0 in	43.1 cm
Depth		
Dimensions (Without stand – 17 inch Display Option		
	13.3 in	33.9 cm
Height		
	15.2 in	38.6 cm
Width		
	3.6 in	9.1 cm
Depth		
Approximate Weight		
With stand	26.8 lb to 31.3 lb	12.1 kg to 14.2 kg
Without stand	15.0 lb to 19.6 lb	6.8 kg to 8.9 kg
Temperature Range		
Operating	50° to 95°F	10° to 35°C
Nonoperating	50° to 95°F	10° to 35°C
Relative Humidity		
Operating	20-85%	20-85%

Altitude (unpressurized)		
Operating	0 – 10,000 ft	0 – 3048 m
Nonoperating	0 – 30,000 ft	0 – 9.144m
Power Supply		
Watts	180-watt, external	180-watt, external
Rated Voltage Range	100-240 V	100-240 V
Operating Voltage Range	90-264 V	90-264 V
Average efficiency	87%	87%
Rated Line Frequency	50-60 Hz	50-60 Hz
Operating Line Frequency Range	47 – 63 Hz	47 – 63 Hz
Rated Input Current	≤2.9A	≤2.9A
Power Cord Length	6.0ft (1.8 3m)	6.0ft (1.8 3m)

Index