Power Management
User Guide

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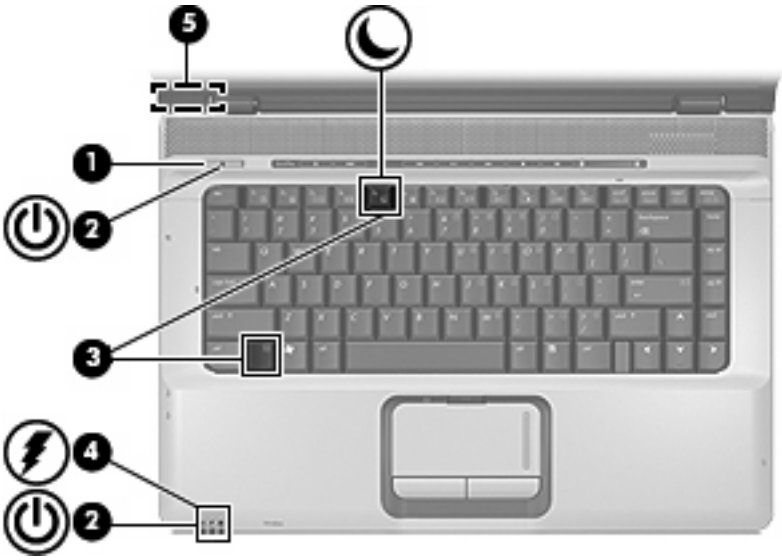
1 Power control and light locations

The following illustration and table identify and describe the power control and light locations.

NOTE: Your computer may look slightly different from the illustration in this chapter.



	Component	Description
(1)	Power button	• When the computer is off, press the button to turn on the computer. • When the computer is on, press the button to initiate hibernation. • When the computer is in standby, press the button briefly to exit standby. • When the computer is in hibernation, press the button briefly to exit hibernation. If the computer has stopped responding and Microsoft® Windows® shutdown procedures cannot be used, press and hold the power button for at least 5 seconds to turn off the computer.
(2)	Power lights* (2)	On: The computer is on. Blinking: The computer is in standby. Off: The computer is off or in hibernation.
(3)	fn+f5	Initiates standby.

	Component	Description
(4)	Battery light	On: A battery is charging. Blinking: A battery that is the only available power source has reached a low-battery condition or a *critical* low-battery condition. Off: If the computer is plugged into an external power source, the light turns off when all batteries in the computer are fully charged. If the computer is not plugged into an external power source, the light stays off until the battery reaches a low-battery condition.
(5)	Internal display switch (select models only)	Turns off the display and initiates standby if the display is closed while the computer is on.

*The 2 power lights display the same information. The light on the power button is visible only when the computer is open. The light on the front of the computer is visible whether the computer is open or closed.

2 Power sources

The computer runs on internal or external AC power. The following table indicates the best power sources for common tasks.

⚠ **WARNING!** To reduce potential safety issues, use only the AC adapter provided with the computer, a replacement AC adapter provided by HP, or a compatible AC adapter purchased from HP.

Task	Recommended power source
Work in most software applications	• Charged battery in the computer • External power supplied through one of the following devices: ◦ AC adapter included with the computer ◦ Optional docking device or expansion product ◦ Optional power adapter
Charge or calibrate a battery in the computer	External power supplied through one of the following devices: • AC adapter included with the computer • Optional docking device or expansion product • Optional power adapter **WARNING!** Do not charge the computer battery while you are onboard aircraft.
Install or modify system software or write to a CD or DVD	External power supplied through one of the following devices: • AC adapter included with the computer • Optional docking device or expansion product • Optional power adapter

Connecting the AC adapter

⚠ **WARNING!** To reduce the risk of electric shock or damage to the equipment:

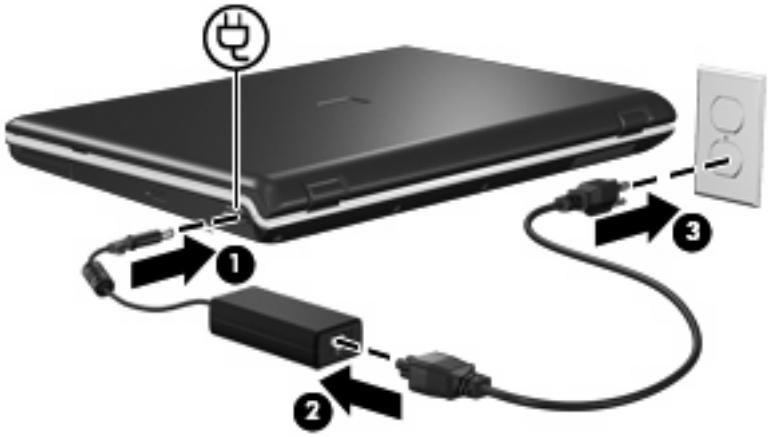
Plug the power cord into an AC outlet that is easily accessible at all times.

Disconnect power from the computer by unplugging the power cord from the AC outlet (not by unplugging the power cord from the computer).

If provided with a 3-pin attachment plug on the power cord, plug the cord into a grounded (earthed) 3-pin outlet. Do not disable the power cord grounding pin, for example, by attaching a 2-pin adapter. The grounding pin is an important safety feature.

To connect the computer to external AC power, follow these steps:

1. Plug the AC adapter into the power connector **(1)** on the computer.
2. Plug the power cord into the AC adapter **(2)**.
3. Plug the other end of the power cord into an AC outlet **(3)**.



3 Standby and hibernation

Standby and hibernation are energy-saving features that conserve power and reduce startup time. They can be initiated by you or by the system.

Standby

△ **CAUTION:** To avoid a complete battery discharge, do not leave the computer in standby for extended periods. Connect the computer to an external power source.

Standby reduces power to system components that are not in use. When standby is initiated, your work is stored in random access memory (RAM), and then the screen is cleared. When the computer is in standby, the power lights blink. When you resume from standby, your work returns to the screen where you left off.

△ **CAUTION:** To reduce the risk of information loss, save your work before initiating standby.

Hibernation

△ **CAUTION:** If the configuration of the computer is changed during hibernation, resuming from hibernation may not be possible. When the computer is in hibernation:

Do not connect the computer to or disconnect the computer from an optional docking device or expansion product.

Do not add or remove memory modules.

Do not insert or remove any hard drives or optical drives.

Do not connect or disconnect external devices.

Do not insert or remove external media cards.

Hibernation saves your work to a hibernation file on the hard drive, and then shuts down the computer. The power lights are turned off. When you restore from hibernation, your work returns to the screen where you left off. If a power-on password has been set, the password must be entered to restore from hibernation.

△ **CAUTION:** To reduce the risk of information loss, save your work before initiating hibernation.

You can disable hibernation. However, if hibernation is disabled and the system reaches a low-battery condition, the system will not automatically save your work while power is on or when standby has been initiated.

Use Power Options in Microsoft® Windows® Control Panel to reenable hibernation:

- Select **Start > Control Panel > Performance and Maintenance > Power Options > Hibernate** tab.

  Be sure that the **Enable hibernation** check box is selected.

You can set the period of time that the system remains idle before it initiates hibernation:

1. Select **Start > Control Panel > Performance and Maintenance > Power Options**.
2. Click one of the intervals in the **System hibernates** list.

Initiating standby, hibernation or shutdown

The following sections explain when to initiate standby or hibernation and when to shut down the computer.

NOTE: You cannot initiate any type of networking connection or perform any computer functions while the computer is in standby or hibernation.

When you leave your work

When standby is initiated, your work is stored in random access memory (RAM), and then the screen is cleared. When the computer is in standby, it uses less power than when it is on. Your work returns instantly to the screen when you resume from standby.

Initiating hibernation saves your work to a hibernation file on the hard drive, and then shuts down the computer. When the computer is in hibernation, it uses much less power than when it is in standby.

When the computer will be unused and disconnected from external power for an extended period, shut down the computer and remove the battery to extend the life of the battery.

When a reliable power supply is unavailable

Be sure that hibernation remains enabled, especially if you are operating the computer on battery power and do not have access to an external power supply. If the battery fails, hibernation saves your work to a hibernation file and shuts down the computer.

If you pause your work when the power supply is uncertain, you take one of the following actions:

- Save your work, and then initiate standby.
- Initiate hibernation.
- Shut down the computer.

When using wireless communication, or readable or writable media

△ **CAUTION:** To prevent possible audio and video degradation, loss of audio or video playback functionality, or loss of information, do not initiate standby or hibernation while reading from or writing to a disc or an external media card.

Standby and hibernation interfere with the use of Bluetooth® and WLAN communication, and media. Note the following guidelines:

- If the computer is in standby or hibernation, you cannot initiate a Bluetooth or WLAN transmission.
- Accidental initiation of standby or hibernation during playback of a medium such as a CD, a DVD, or an external media card can affect playback:
  - Playback may be interrupted.
  - You may see the following warning message: "Putting the computer into hibernation or standby may stop the playback. Do you want to continue?" Click **No**.
  - You may need to restart the media to resume audio and video playback.

4 Power settings

This section explains standby, hibernation, and shutdown procedures.

Turning the computer or display on or off

Task	Procedure	Result
Turn on the computer.	Press the power button.	• The power lights turn on. • The operating system loads.
Shut down the computer.*	1. Save your work and close all open applications. 2. Shut down the computer through the operating system by selecting **Start > Turn Off Computer > Turn Off**.*	• The power lights turn off. • The operating system shuts down. • The computer turns off.
Turn off the display while the power is on.	Close the computer.	Closing the computer activates the display switch, which initiates standby.

*If you have been registered to a network domain, the button you click is called **Shut Down** instead of **Turn Off Computer**.

Using emergency shutdown procedures

△ **CAUTION:** Emergency shutdown procedures result in the loss of unsaved information.

If the computer is unresponsive and you are unable to use normal Windows shutdown procedures, try the following emergency procedures in the sequence provided:

- Press ctrl+alt+delete. Then, select **Shut Down > Turn Off**.
- Press and hold the power button for at least 5 seconds.
- Disconnect the computer from external power and remove the battery.

Initiating or resuming from standby

Task	Procedure	Result
Initiate standby.	• With the computer on, press fn+f5. • Select **Start > Turn Off Computer > Stand by**.* In Windows XP Professional, if **Stand by** is not displayed: **a.** Click the down arrow. **b.** Select **Stand by** from the list. **c.** Click **OK**.	• The power lights blink. • The screen clears.
Allow the system to initiate standby.	No action required. • If the computer is running on battery power, the system initiates standby after 10 minutes of computer inactivity (default setting). • If the computer is plugged into external power, the system initiates standby after 25 minutes of computer inactivity (default setting). **NOTE:** Power settings and timeouts can be changed using Power Options in Windows Control Panel.	• The power lights blink. • The screen clears.
Resume from user-initiated or system-initiated standby.	Press the power button.	• The power lights turn on. • Your work returns to the screen.
*If you have been registered to a network domain, the button you click is called **Shut Down** instead of **Turn Off Computer**.		

Initiating or restoring from hibernation

Hibernation cannot be initiated unless it is enabled. Hibernation is enabled by default.

To be sure that hibernation remains enabled, select **Start > Control Panel > Performance and Maintenance > Power Options > Hibernate** tab. If hibernation is enabled, the **Enable hibernation** check box is selected.

Task	Procedure	Result
Initiate hibernation.	• Press the power button. – or – • Select **Start > Turn Off Computer**.* Then, hold down the shift key as you select **Hibernate**. In Windows XP Professional, if hibernate is not displayed: **a.** Click the down arrow. **b.** Select **Hibernate** from the list. **c.** Click **OK**.	• The power lights turn off. • The screen clears.
Allow the system to initiate hibernation (with hibernation enabled).	No action is required. A computer running on battery power initiates hibernation, according to the following conditions: • After 30 minutes of computer inactivity. • When the battery reaches a critical low-battery condition. **NOTE:** Power settings and timeouts can be changed using Power Options in Windows Control Panel.	• The power lights turn off. • The screen clears.
Restore from user-initiated or system-initiated hibernation.	Press the power button.†	• The power lights turn on. • Your work returns to the screen.

*If you have been registered to a network domain, the button you click is called **Shut Down** instead of **Turn Off Computer**.

†If the system has initiated hibernation because of a critical low-battery condition, connect external power or insert a charged battery before you press the power button. (The system does not respond if the discharged battery is the only power source.)

5 Power options

You can change many of the power settings using Windows Control Panel. For example, you can set an audio alert to warn you when the battery reaches a low-power condition, or you can change the factory settings for the power button.

Accessing Power Options Properties

To access Power Options Properties:

- Right-click the **Power Meter** icon in the notification area, at the far right of the taskbar, and then click **Adjust Power Properties**.

  – or –

- Select **Start > Control Panel > Performance and Maintenance > Power Options**.

Displaying the Power Meter icon

By default, the Power Meter icon appears in the notification area, at the far right of the taskbar, displaying different icons to indicate whether the computer is running on battery or external power.

To remove the Power Meter icon from the notification area, follow these steps:

1. Right-click the **Power Meter** icon in the notification area, and then click **Adjust Power Properties**.
2. Click the **Advanced** tab.
3. Clear the **Always show icon on the taskbar** check box.
4. Click **Apply** and then click **OK**.

To show the Power Meter icon in the notification area, follow these steps:

1. Select **Start > Control Panel > Performance and Maintenance > Power Options**.
2. Click the **Advanced** tab.
3. Select the **Always show icon on the taskbar** check box.
4. Click **Apply**, and then click **OK**.

NOTE: If you cannot see an icon you have placed in the notification area, at the far right of the taskbar, click the **Show Hidden Icons** icon (**<** or **<<**) in the notification area.

Setting or changing a power scheme

The Power Schemes tab in the **Power Options Properties** dialog box assigns power levels to system components. You can assign different schemes, depending on whether the computer is running on battery or external power.

You can also set a power scheme that initiates standby or turns off the display or hard drive after a time interval that you specify.

To set a power scheme:

1. Right-click the **Power Meter** icon in the notification area, and then click **Adjust Power Properties**.
2. Click the **Power Schemes** tab.
3. Select the power scheme you want to modify, and adjust options in the lists on the screen.
4. Click **Apply**.

Setting a security prompt

You can add a security feature that prompts you for a password when the computer is turned on, resumes from standby, or restores from hibernation.

To set a password prompt:

1. Right-click the **Power Meter** icon in the notification area, and then click **Adjust Power Properties**.
2. Click the **Advanced** tab.
3. Select the **Prompt for password when computer resumes from standby** check box.
4. Click **Apply**.

6 Processor performance controls

△ **CAUTION:** To reduce the possibility of heat-related injuries or of overheating the computer, do not place the computer directly on your lap or obstruct the computer air vents. Use the computer only on a hard, flat surface. Do not allow another hard surface, such as an adjoining optional printer, or a soft surface, such as pillows or rugs or clothing, to block airflow. Also, do not allow the AC adapter to contact the skin or a soft surface, such as pillows or rugs or clothing, during operation. The computer and the AC adapter comply with the user-accessible surface temperature limits defined by the International Standard for Safety of Information Technology Equipment (IEC 60950).

NOTE: In some cases, a computer may operate at a higher speed on external power than on battery power. If the battery power is extremely low, the computer may attempt to conserve power by reducing processor speed and graphics performance.

Windows XP enables you to manage the processor performance controls by selecting a power scheme. The processing speed can be set for optimal performance or for optimal power conservation.

Processor performance controls are managed in the **Power Options Properties** dialog box.

To access Windows XP processor performance controls:

▲ Select **Start > Control Panel > Performance and Maintenance > Power Options**.

The power scheme you select determines how the processor performs when the computer is plugged into external power or is running on battery power. Each power scheme for external power or battery power sets a specific processor state.

After a power scheme has been set, no other intervention is required to control the performance of the computer processor. The following table describes the processor performance on external and battery power for the available power schemes.

Power scheme	Processor performance while on external power	Processor performance while on battery power
Home/Office Desk	Always runs at the highest performance state.	Performance is determined by CPU demand.
Portable/Laptop (default) *	Performance is determined by CPU demand.	Performance is determined by CPU demand.
Presentation	Performance is determined by CPU demand.	Performance is determined by CPU demand.
Always On	Always runs at the highest performance state.	Always runs at the highest performance state.
Minimal Power Management	Performance is determined by CPU demand.	Performance is determined by CPU demand.
Max Battery	Performance is determined by CPU demand.	Performance declines when the Max Battery setting is selected, but battery life is extended.

*It is recommended that you use the Portable/Laptop power scheme.

7 Batteries

When a charged battery is in the computer and the computer is not plugged into external power, the computer runs on battery power. When the computer is plugged into external AC power, the computer runs on AC power.

If the computer contains a charged battery and is running on external AC power supplied through the AC adapter, the computer switches to battery power if the AC adapter is disconnected from the computer.

NOTE: The display brightness is decreased to save battery life when you disconnect AC power. To increase display brightness, use the fn+f8 hotkey or reconnect the AC adapter.

You can keep a battery in the computer or remove and store it, depending on how you work. Keeping the battery in the computer whenever the computer is plugged into external AC power charges the battery and protects your work in case of a power outage. Note that a battery in the computer slowly discharges when the computer is turned off and not plugged into external power.

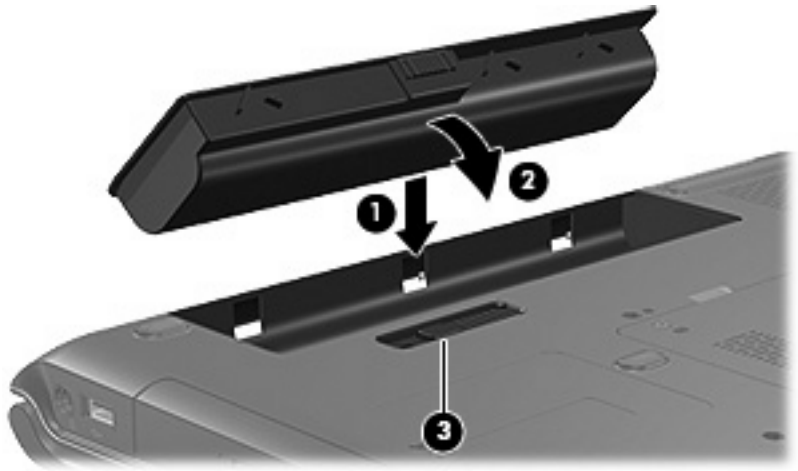
Inserting or removing a battery

NOTE: Batteries vary in appearance by model.

To insert a battery:

1. Turn the computer upside down on a flat surface, with the battery bay away from you.
2. Insert the battery into the battery bay **(1)** and rotate it downward until it is seated **(2)**.

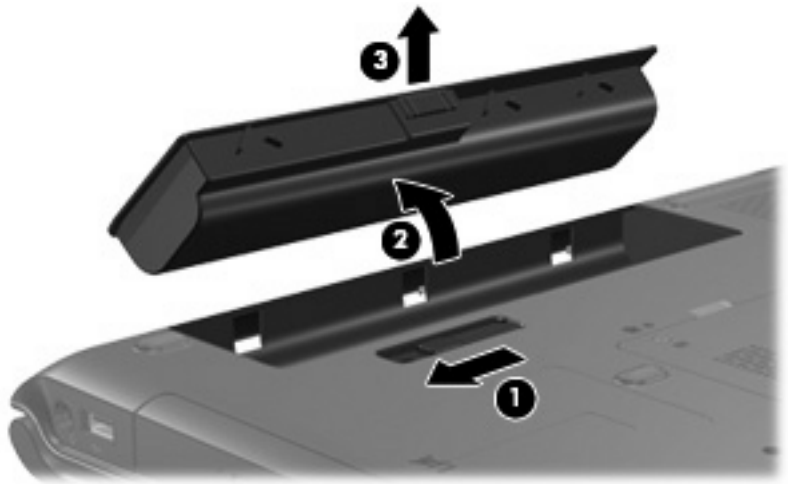
   The battery release latch **(3)** automatically locks the battery into place.



To remove a battery:

CAUTION: Removing a battery that is the sole power source can cause loss of information. To prevent loss of information, initiate hibernation or shut down the computer through Windows before removing the battery.

1. Turn the computer upside down on a flat surface, with the battery bay away from you.
2. Slide the battery release latch **(1)** to release the battery.
3. Pivot the battery **(2)** away from the computer and remove it from the computer **(3)**.



Charging a battery

To prolong battery life and optimize the accuracy of battery charge displays:

⚠ **WARNING!** Do not charge the computer battery while you are onboard aircraft.

- To charge a new battery:
  - Charge the battery while the computer is plugged into external power through the AC adapter.
  - When you charge the battery, charge it fully before turning on the computer.
- To charge a used battery:
  - Allow the battery to discharge to about 10 percent of a full charge through normal use before charging it.
  - When you charge the battery, charge it fully before turning on the computer.

A battery inserted in the computer charges whenever the computer is plugged into external power through an AC adapter, an optional docking device or expansion product, or an optional power adapter.

A battery inserted in the computer charges whether the computer is off or in use, but the battery charges faster while the computer is off. Charging may be delayed if a battery is new, has been unused for 2 weeks or more, or is much warmer or cooler than room temperature.

The battery light displays charge status:

- On: The battery is charging.
- Blinking: The battery has reached a low-battery condition and is not charging.
- Blinking rapidly: The battery has reached a critical low-battery condition and is not charging.
- Off: The battery is fully charged or not installed.

Monitoring the charge of the battery

This section explains several ways to determine the amount of charge in a battery.

Obtaining accurate charge information

To increase the accuracy of all battery charge indicators:

- Allow a battery to discharge to about 10 percent of a full charge through normal use before charging it.
- When you charge a battery, charge it fully before turning on the computer.
- If a battery has been unused for one month or more, calibrate the battery instead of simply charging it.

Displaying charge information on the screen

This section explains how to access and interpret battery charge indicators.

Viewing charge displays

To view information about the status of any battery in the computer, follow either of these steps:

- Double-click the **Power Meter** icon in the notification area, at the far right of the taskbar.

  – or –

- Select **Start > Control Panel > Performance and Maintenance > Power Options > Power Meter** tab.

Interpreting charge indicators

Most charge indicators report battery status as both a percentage and as the number of minutes of charge remaining:

- The percentage indicates the approximate amount of charge remaining in the battery.
- The time indicates the approximate running time remaining on the battery *if the battery continues to provide power at the current level.* For example, the time remaining will decrease when you start playing a DVD and will increase when you stop playing a DVD.

When a battery is charging, a lightning bolt icon may be superimposed over the battery icon on the Power Meter screen.

Managing low-battery conditions

The information in this section describes the alerts and system responses set at the factory. Some low-battery condition alerts and system responses can be changed using Power Options in Windows Control Panel. Preferences set using Power Options do not affect lights.

Identifying low-battery conditions

This section explains how to identify low-battery and critical low-battery conditions.

Low-battery condition

When a battery that is the sole power source for the computer reaches a low-battery condition, the battery light blinks in an amber color.

Critical low-battery condition

If a low-battery condition is not resolved, the computer enters a critical low-battery condition, and the battery light blinks rapidly.

The computer resolves a critical low-battery condition in the following ways:

- If hibernation is enabled and the computer is on or in standby, the computer initiates hibernation.
- If hibernation is disabled and the computer is on or in standby, the computer remains briefly in standby, and then shuts down and loses any unsaved information.

Perform the following task to be sure that hibernation is enabled:

1. Select **Start > Control Panel > Performance and Maintenance > Power Options > Hibernate** tab.
2. Be sure that the **Enable hibernation support** check box is selected.

Resolving low-battery conditions

△ **CAUTION:** To reduce the risk of losing information when the computer reaches a critical low-battery condition and has initiated hibernation, do not restore power until the power lights turn off.

When external power is available

When external power is available, you can resolve a low-battery condition by connecting on of the following devices:

- AC adapter
- Optional docking device or expansion product
- Optional power adapter

When a charged battery is available

When a charged battery is available, you can resolve a low-battery condition by following these steps:

1. Turn off the computer or initiate hibernation.
2. Insert a charged battery .
3. Turn on the computer.

When no power source is available

When no power source is available, you can resolve a low-battery condition by following either of these steps:

- Initiate hibernation.

  – or –

- Save your work and shut down the computer.

When the computer cannot restore from hibernation

If the computer cannot restore from hibernation, follow these steps:

1. Insert a charged battery or plug the computer into external power.
2. Restore from hibernation by pressing the power button.

Calibrating a battery

When to calibrate

Even if a battery is heavily used, it should not be necessary to calibrate it more than once a month. It is not necessary to calibrate a new battery. Calibrate a battery under the following conditions:

- When battery charge displays seem inaccurate
- When you observe a significant change in battery run time
- When the battery has been unused for one month or more

How to calibrate

Three steps are involved in calibrating a battery: fully charging, fully discharging, and then fully recharging.

Step 1: Charging the battery

A battery can charge whether the computer is off or in use, but it will charge faster when the computer is off.

⚠ **WARNING!** Do not charge the computer battery while you are onboard aircraft.

To charge the battery:

1. Insert the battery into the computer.
2. Connect the computer to an AC adapter, optional power adapter, or optional docking device or expansion product, and then plug the adapter or device into external power.

   The battery light on the computer turns on.
3. Leave the computer plugged into external power until the battery is fully charged.

   The battery light on the computer turns off.

Step 2: Discharging the battery

Before you begin a full discharge, disable hibernation.

To disable hibernation:

1. Select **Start > Control Panel > Performance and Maintenance > Power Options > Hibernate** tab.
2. Clear the **Enable hibernation** check box.
3. Click **Apply**.

The computer must remain on while the battery is being discharged. The battery can discharge whether or not you are using the computer but will discharge faster while the computer is in use.

- If you plan to leave the computer unattended during the discharge, save your information before beginning the discharge procedure.
- If you use the computer occasionally during the discharge procedure and have set energy-saving timeouts, expect the following performance from the system during the discharge process:
  - The monitor will not turn off automatically.
  - Hard drive speed will not decrease automatically when the computer is idle.
  - System-initiated hibernation will not occur.

To fully discharge a battery:

1. Right-click the **Power Meter** icon in the notification area, at the far right of the taskbar, and then click **Adjust Power Properties**.

   – or –

   Select **Start > Control Panel > Performance and Maintenance > Power Options**.
2. Record the 4 settings listed in the **Running on batteries** and **Plugged in** columns so that you can reset them after the calibration.
3. Set the 4 options to **Never**.
4. Click **OK**.
5. Unplug the computer from its external power source, but do *not* turn off the computer.
6. Run the computer on battery power until the battery is fully discharged. The battery light begins to blink in an amber color when the battery has discharged to a low-battery condition. When the battery is fully discharged, the battery light turns off and the computer shuts down.

Step 3: Recharging the battery

To recharge the battery:

1. Plug the computer into external power and maintain external power until the battery is fully recharged. When the battery is recharged, the battery light on the computer turns off.

   You can use the computer while the battery is recharging, but the battery will charge faster if the computer is off.

2. If the computer is off, turn it on when the battery is fully charged and the battery light turns off.

3. Select **Start > Control Panel > Performance and Maintenance > Power Options**.

4. Reenter the settings that you recorded for the items in the **Plugged in** column and the **Running on batteries** column.

5. Click **OK**.

△ **CAUTION:** After calibrating the battery, reenable hibernation. Failure to reenable hibernation may result in a complete battery discharge and potential information loss.

To reenable hibernation, select **Start > Control Panel > Performance and Maintenance > Power Options > Hibernate** tab. Select the **Enable hibernation** check box, and then click **Apply**.

Conserving battery power

Using the battery conservation procedures and settings described in this section extends the time that a battery can run the computer from a single charge.

Conserving power as you work

- Turn off wireless and local area network (LAN) connections and exit modem applications when you are not using them.
- Disconnect external devices that you are not using that are not plugged into an external power source.
- Stop, disable, or remove any external media cards that you are not using.
- Disable or remove an inserted digital card.
- Use the fn+f8 and fn+f7 hotkeys to adjust screen brightness as you need it.
- Use optional powered speakers instead of the internal speakers, or adjust system volume as you need it.
- Press fn+f4 to switch the screen image from the computer display to an external display device.
- If you leave your work, initiate standby or hibernation, or shut down the computer.

Selecting power conservation settings

- Select a short wait for the screen saver, and select a screen saver with minimal graphics and motion.

  To access screen saver settings:

  Select **Start > Control Panel > Appearance and Themes > Choose a screen saver**.

- Select a Power Scheme with low power-use settings.

  To select a Power Scheme:

  Select **Start > Control Panel > Appearance and Themes > Choose a screen saver > Power** button.

Storing a battery

⚠ **WARNING!** To reduce potential safety issues, use only the battery provided with the computer, a replacement battery provided by HP, or a compatible battery purchased from HP.

△ **CAUTION:** To prevent damage to a battery , do not expose it to high temperatures for extended periods of time.

If a computer will be unused and unplugged from external power for more than 2 weeks, remove the battery and store it separately.

To prolong the charge of a stored battery, place it in a cool, dry place.

Calibrate a battery before using it if it has been stored for one month or more.

Disposing of a used battery

⚠ **WARNING!** To reduce the risk of fire or burns, do not disassemble, crush, or puncture a battery; short the external contacts on a battery; or dispose of a battery in fire or water. Do not expose a battery to temperatures above 60˚C (140˚F). Replace the battery only with a battery approved for this computer.

Refer to the *Regulatory, Safety, and Environmental Notices* for battery disposal information.

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