

Power

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This guide explains how the computer uses power.

Contents

1 Power controls and lights

2 Power sources

Connecting the AC adapter 2-2

3 Standby and hibernation

Standby. 3-1

Hibernation. 3-2

Initiating standby, hibernation or shutdown. 3-3

 When you leave your work 3-3

 When a reliable power supply is unavailable 3-4

 When using wireless communication or readable or
 writable media (select models only) 3-5

4 Default power settings

Turning the computer or display on or off. 4-2

Using emergency shutdown procedures. 4-3

Initiating or resuming from standby. 4-4

Initiating or restoring from hibernation 4-5

5 Power options

Accessing Power Options Properties 5-1

Displaying the Power Meter icon. 5-2

Setting or changing a power scheme 5-3

Setting a security prompt 5-4

6 Processor performance controls

7 Battery packs

Inserting or removing a battery pack	7-2
Charging a battery pack	7-4
Monitoring the battery pack charge	7-5
Obtaining accurate charge information	7-5
Displaying charge information on the screen	7-6
Managing low-battery conditions	7-6
Identifying low-battery conditions	7-7
Resolving low-battery conditions	7-8
Calibrating a battery pack	7-9
When to calibrate.	7-9
How to calibrate.	7-10
Conserving battery power	7-13
Conserving power as you work.	7-13
Selecting power conservation settings.	7-14
Storing a battery pack.	7-14
Disposing of a used battery pack	7-14

Index

1

Power controls and lights

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



Component	Description
❶ Display switch	Initiates standby if the display is closed when the computer is on.
❷ Power lights* (2)	On: The computer is on. Blinking: The computer is in standby. Off: The computer is off or in hibernation.

(Continued)

Component	Description
③ Power button	<p>When the computer is</p> <ul style="list-style-type: none">■ Off, press to turn on the computer.■ On, press to enter hibernation.■ In standby, briefly press to exit standby.■ In hibernation, briefly press to exit hibernation. <p>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.</p>
④ fn+f5	Initiates standby.
⑤ Battery light	<p>On: A battery pack is charging or is close to full charge capacity.</p> <p>Off: If the computer is plugged into an external power source, the light is turned 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.</p> <p>Blinking: A battery pack that is the only available power source has reached a low-battery condition. When the battery reaches a critical low-battery condition, the battery light begins blinking quickly.</p>

*There are 2 power lights, which display the same information. The light on the power button is visible only when the computer is open. The other power light is always visible even when the computer is closed.

Power sources

The computer can run on internal or external AC power. The following table indicates the best power source for common tasks.

Task	Recommended Power Source
Work in most software applications	<ul style="list-style-type: none">■ Charged battery pack in the computer■ External power supplied through one of the following devices:<ul style="list-style-type: none"><input type="checkbox"/> AC adapter<input type="checkbox"/> Optional docking device<input type="checkbox"/> Optional power adapter
Charge or calibrate a battery pack in the computer	External power supplied through <ul style="list-style-type: none">■ AC adapter■ Optional docking device■ Optional power adapter
Install or modify system software or write to a CD or DVD	External power supplied through <ul style="list-style-type: none">■ AC adapter■ Optional docking device■ Optional power adapter

Connecting the AC adapter

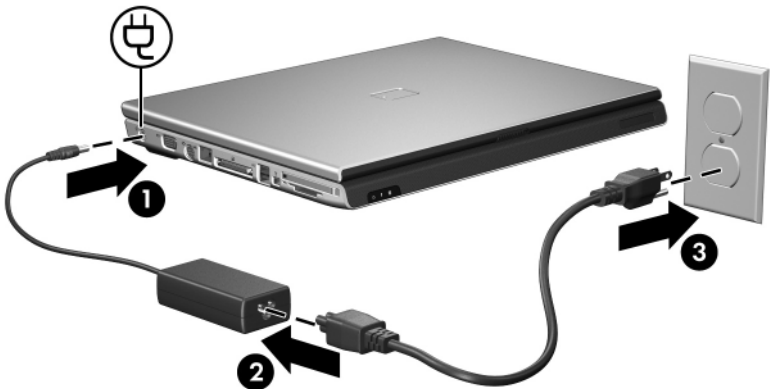


WARNING: To reduce the risk of electric shock or damage to the equipment:

- 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. It is possible to receive an electric shock from a system that is not properly grounded.
-

To connect the computer to external AC power:

1. Plug the AC adapter into the power connector ❶ on rear panel of the computer.
2. Plug the power cord into the AC adapter ❷.
3. Plug the other end of the power cord into an AC outlet ❸.



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. For more information, refer to “[Initiating standby, hibernation or shutdown.](#)”

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 information 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 dock the computer in or undock the computer from a docking device.
 - Do not add or remove memory modules.
 - Do not insert or remove hard drives or optical drives.
 - Do not connect or disconnect external devices.
 - Do not insert or remove an external media card such as a Digital Media Slot card, a PC Card, or an ExpressCard.
-

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 information 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 when 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. Make sure that the **Enable hibernation** check box is selected.

To set the time interval after which the system 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.



You cannot initiate any type of networking communications or perform any computer functions when 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.

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 pack to extend the life of the battery pack. For details on battery pack storage, refer to “[Storing a battery pack.](#)”

When a reliable power supply is unavailable

Make 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 pack 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 (select models only)



CAUTION: To prevent possible audio and video degradation, or loss of audio or video playback functionality, do not initiate standby or hibernation when reading or writing to a CD, DVD, or external media card. To prevent loss of information, do not initiate standby or hibernation when writing to a CD or DVD.

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

- If the computer is in standby or hibernation, you cannot initiate an infrared or Bluetooth transmission.
- If standby or hibernation is accidentally initiated during playback of a medium such as a CD, DVD, or external media card:
 - Your 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 CD or DVD to resume audio and video playback.


4

Default power settings

This section explains the default standby, hibernation, and shutdown procedures.

The controls and lights discussed in this section are illustrated in Chapter 1, “[Power controls and lights](#).”

Turning the computer or display on or off

Task	Procedure	Result
Turn on the computer.	Press the power button.	<ul style="list-style-type: none">■ The power lights are turned on.■ The operating system loads.
Shut down the computer.	<p>Save your work and close all open applications. Then shut down the computer through the operating system by selecting Start > Turn Off Computer > Turn Off.</p> <p> If the system is unresponsive and you are unable to shut down the computer with these procedures, refer to “Using emergency shutdown procedures.”</p>	<ul style="list-style-type: none">■ The power lights are turned off.■ The operating system shuts down.■ The computer is turned off.
Turn off the display when the power is on.	Close the computer.	Closing the computer activates the display switch, which initiates standby.

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 pack.

Initiating or resuming from standby

Task	Procedure	Result
Initiate standby.	<ul style="list-style-type: none">■ With the computer on, press fn+f5.– or –■ Select Start > Turn Off Computer > Stand by. In Windows XP Professional, if Stand by is not displayed.<ol style="list-style-type: none">1. Press the down arrow.2. Select Stand by from the list.3. Click OK.– or –■ Close the computer.	<ul style="list-style-type: none">■ The power lights blink.■ The screen clears.
Resume from user-initiated standby.	<ul style="list-style-type: none">■ Press the power button.■ If the display was closed when the computer was in standby, open the display.	<ul style="list-style-type: none">■ The power lights are turned on.■ Your work returns to the screen.

Initiating or restoring from hibernation


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

To verify 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.	<ul style="list-style-type: none">■ 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:<ol style="list-style-type: none">1. Press the up or down arrow.2. Select Hibernate from the list.3. Click OK.	<ul style="list-style-type: none">■ The power lights are turned off.■ The screen clears.

(Continued)

Task	Procedure	Result
Allow the system to initiate hibernation (with hibernation enabled).	<p>No action required. If the computer is running on battery power, the system initiates hibernation</p> <ul style="list-style-type: none">■ After 30 minutes of computer inactivity.■ When the battery pack(s) reach a critical low-battery condition. <p> Power settings and timeouts can be changed using Power Options in Windows Control Panel.</p>	<ul style="list-style-type: none">■ The power lights are turned off.■ The screen clears.
Restore from user-initiated or system-initiated hibernation.	Press the power button. [†]	<ul style="list-style-type: none">■ The power lights are turned on.■ Your work returns to the screen.

[†]If the system initiated hibernation because of a critical low-battery condition, connect external power or insert a charged battery pack before you press the power button.

Power options

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

By default, when the computer is on:

- Pressing **fn+f5**, called the “sleep button” by the operating system, initiates standby.
- By default, the display switch turns off the display and initiates standby. The display switch is activated by closing the display.

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. The icon changes shape to indicate whether the computer is running on battery or external power.

To add or remove the power meter icon from the notification area:

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



If you cannot see an icon you have placed in the notification area, at the far right of the taskbar, click the arrow in the notification area to view hidden icons.

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 hibernation, 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 choose from the options listed 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**.

Processor performance controls



CAUTION: To prevent overheating, do not obstruct vents. Use the computer only on a hard flat surface. Do not allow another hard surface, such as an adjoining printer, or a soft surface, such as pillows or thick rugs or clothing, to block airflow.



In some cases, the computer may operate at a higher speed on external power than on battery power. If a battery pack is the sole source of power and 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.

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 state is determined based on CPU demand.
Portable/Laptop (default)*	Performance state is determined based on CPU demand.	Performance state is determined based on CPU demand.
Presentation	Performance state is determined based on CPU demand.	Runs at lowest possible performance state.
Always On	Always runs at the highest performance state.	Always runs at the highest performance state.
Minimal Power Management	Performance state is determined based on CPU demand.	Performance state is determined based on CPU demand.
Max Battery	Performance state is determined based on CPU demand.	Runs at lowest possible performance state.

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

Battery packs

When a charged battery pack 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 pack 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.



On select models, the display brightness is automatically decreased to save battery life when you disconnect from AC power. To increase display brightness, use the **fn+f8** hotkey or reconnect your AC adapter.

You can keep a battery pack in the computer or in storage, depending on how you work. Keeping the battery pack in the computer whenever the computer is plugged into external AC power enables the battery pack to charge and also protects your work in case of a power outage.

However, battery packs in the computer slowly discharge when the computer is turned off. For this reason, the battery pack is not shipped inside the computer and must be inserted before the computer can run on battery power.

Inserting or removing a battery pack



CAUTION: To prevent loss of work when removing a battery pack that is the sole power source, initiate hibernation or turn off the computer before removing the battery pack.

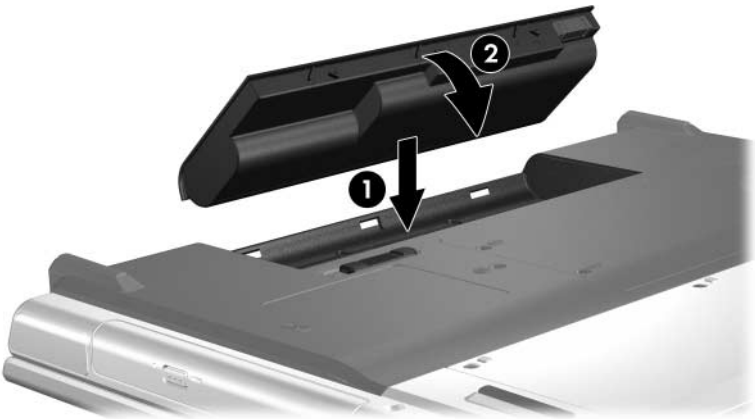


Battery packs may vary in appearance.

To insert a battery pack:

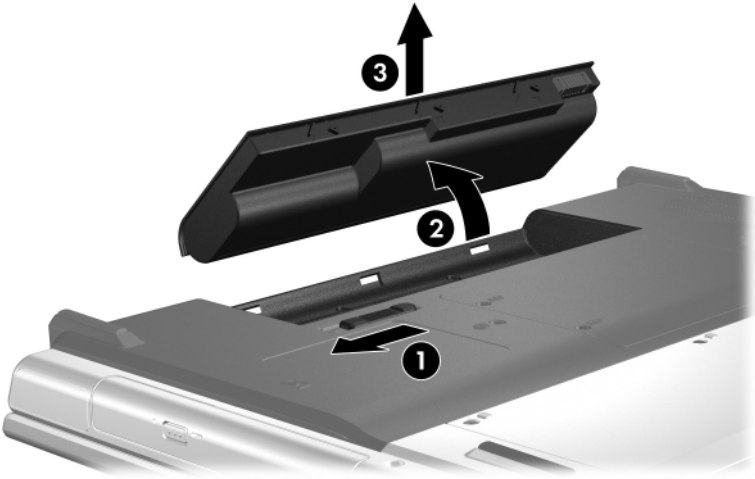
1. Turn the computer upside down on a flat surface.
2. Insert the battery pack **1** into the battery bay and rotate it down **2** until it is seated.

The battery pack release latch automatically locks the battery into place.



To remove a battery pack:

1. Turn the computer upside down with the battery bay facing away from you.
2. Slide the battery pack release latch **1** to release the battery pack.
3. Pivot the battery pack away from the computer **2** and remove it from the battery bay **3**.



Charging a battery pack

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



WARNING: Do not charge the computer battery pack on board aircraft. Charging the battery pack may damage aircraft electronic systems.

- If you are charging a new battery pack:
 - ❑ Charge the battery pack while the computer is plugged into external power through the AC adapter.
 - ❑ When you charge the battery pack, charge it fully before using the computer.
- If you are charging an in-use battery pack:
 - ❑ Allow the battery pack to discharge to about 10 percent of a full charge through normal use before charging it.
 - ❑ When you charge the battery pack, charge it fully.

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

A battery pack inserted in the computer charges whether the computer is off or in use, but the battery pack charges faster while the computer is off. Charging may be delayed if a battery pack 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 pack is charging.
- Blinking: the battery pack has reached a low-battery condition and is not charging.
- Blinking rapidly: the battery pack has reached a critical low-battery condition and is not charging.
- Off: the battery pack is fully charged or not installed.


For information about determining the amount of charge in a battery pack, refer to the “[Monitoring the battery pack charge](#)” section next in this chapter.

Monitoring the battery pack charge

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

Obtaining accurate charge information

To increase the accuracy of all battery charge indicators:

- Allow a battery pack to discharge to about 10 percent of a full charge through normal use before charging it.
- When you charge a battery pack, charge it fully.
 -  The charge even in a new battery pack may be reported inaccurately until the battery pack has been fully charged at least once.
- If a battery pack has been unused for one month or more, calibrate the battery pack instead of simply charging it. For calibration instructions, refer to “[Calibrating a battery pack](#).”

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 pack in the computer:

- 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 pack.
- The time indicates the approximate running time remaining on the battery pack *if the battery pack 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.

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 in 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 pack that is the sole power source for the computer reaches a low-battery condition, the battery light blinks.

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.

In a critical low-battery condition:

- 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 may lose any unsaved information.

To verify that hibernation is enabled:

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



Hibernation is enabled by default.

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 are turned off.

When external power is available

To resolve a low-battery condition when external power is available, connect one of the following:

- AC adapter
- Optional docking device
- Optional power adapter

When a charged battery pack is available

To resolve a low-battery condition when a charged battery pack is available:

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

When no power source is available

To resolve a low-battery condition when no power source is available:

- Initiate hibernation.
- or –
- Save your work and shut down the computer.

When the computer cannot restore from hibernation

To resolve a low-battery condition when the computer lacks the power to restore from hibernation:

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

Calibrating a battery pack

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

When to calibrate

Even if a battery pack 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 pack. Calibrate a battery pack under the following conditions:

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

How to calibrate

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

Step 1: Charging the battery pack

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

To charge the battery pack:

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

The battery light on the computer is turned on.

3. Leave the computer plugged into external power until the battery pack is fully charged.

The battery light on the computer is turned off.

Step 2: Discharging the battery pack

Before you begin a full discharge, disable hibernation, which is enabled by default.

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 when the battery pack is being discharged. The battery pack can discharge whether or not you are using the computer but will discharge faster when 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 your 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 pack:

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 –

Access the Power Schemes tab by selecting **Start > Control Panel > Performance and Maintenance > Power Options > Power Schemes** tab.

2. Record the 4 settings 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. Disconnect the computer from its external power source, but do *not* turn off the computer.
6. Run the computer on battery power until the battery pack is fully discharged. The battery light begins to blink when the battery pack has discharged to a low-battery condition. When the battery pack is fully discharged, the battery light is turned off and the computer shuts down.

Step 3: Recharging the battery pack

To recharge the battery pack:

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

You can use the computer when the battery pack is recharging, but the battery pack will charge more quickly if the computer is off.

2. If the computer is off, turn it on when the battery pack is fully charged and the battery light is turned off.
3. Access the Power Schemes tab by selecting **Start > Control Panel > Performance and Maintenance > Power Options > Power Schemes** tab.
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 pack, 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 life of a battery pack.

Conserving power as you work

To conserve power as you use the computer:

- 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 if they are not plugged into an external power source.
- Stop or remove any optional external media cards that you are not using.
- Remove a CD or DVD that you are not using.
- Disable or remove an inserted digital card.
- Use the **fn+f7** hotkeys to reduce screen brightness.
- Use optional powered speakers instead of the internal speakers.
- Turn off a device connected to the S-Video-out jack.
- If you leave your work, initiate standby or hibernation, or shut down the computer.

Selecting power conservation settings

To set the computer to conserve power:

- 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. For more information, refer to “[Setting or changing a power scheme.](#)”

Storing a battery pack



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

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

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

Disposing of a used battery pack



WARNING: To reduce the risk of fire or burns, do not disassemble, crush, or puncture a battery pack; short the external contacts on a battery pack; or dispose of a battery pack in fire or water. Do not expose a battery pack to temperatures above 60°C (140°F).

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

Index

B

- battery charge information 7–5
- battery light
 - displaying charge status 7–7
 - identifying 1–2
- battery pack
 - battery power vs. AC power 7–1
 - calibrating 7–9
 - charging 7–4, 7–10
 - conserving power 7–13
 - disposing of 7–14
 - inserting 7–2
 - low-battery conditions 7–6
 - monitoring charge 7–5
 - recharging 7–12
 - removing 7–2
 - storing 7–14
 - using 7–1
- battery pack release latch 7–3
- button, power 1–2

C

- calibration, battery 7–9
- charging battery packs 7–4
- computer display, turning on or off 4–2

- conservation, power 7–13
- critical low-battery condition 7–7

D

- display switch, identifying 1–1
- drive media 3–5

E

- emergency shutdown procedures 4–3

F

- fn+f5** hotkey 1–2, 4–4

H

- hibernation
 - defined 3–2
 - enabling/disabling 3–2
 - initiated during critical low-battery condition 7–7
 - initiating 4–5
 - restoring from 4–5
 - when to use 3–1
- hibernation file 3–2
- hotkeys, **fn+f5** 1–2, 4–4

L

- lights, power 1–1
- low-battery condition 7–6

O

operating system 4-2
optional power adapter 2-1,
7-10

P

passwords, security 5-4
power
 conserving 7-13
 control and light locations
 1-1
 schemes 5-3
 setting preferences 5-1
 sources 2-1
power button 1-2
power light 1-1
Power Meter icon 5-2
power settings 4-1
power supply 3-4
processor performance
 controls 6-1

R

readable media 3-5
release latch, battery pack 7-3
reset (emergency shutdown
procedures) 4-3

S

screen saver 7-14
security passwords 5-4
shutdown procedures 4-3
shutting down 4-2
software, Power Meter 5-1
standby
 defined 3-1
 initiating 4-4

 resuming from 4-4
switch, display 1-1

T

temperature, storage, battery
pack 7-14
traveling with the computer,
battery pack temperature
considerations 7-14
turning off the computer 4-2,
4-3

U

unresponsive system,
emergency shutdown
procedures 4-3

W

writable media 3-5

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