

Chapter 3

Power

The notebook operates on AC or battery power. This chapter contains the information you need to know to operate the notebook on battery power. The chapter also includes information about the unique power management system.

3.1 Battery Power

The notebook uses a single high-capacity Lithium-Ion smart battery pack that gives you longer use between charges.

3.1.1 Battery Pack Characteristics

The battery pack has the following characteristics:

- *Lithium-Ion Technology* Lithium-Ion technology does not have the memory effect problem of Nickel Cadmium (NiCd) nor the temperature problem of Nickel Metal-Hydride (NiMH) battery types. Li-Ion batteries consistently provide the longest battery life best-suited for road warriors.
- *Battery Gauge* Built into the battery pack is a battery gauge that allows you to check the battery charge level even when the battery is not installed inside the notebook.
- *Battery-low Warning* When the battery charge level becomes low, the battery indicator flashes at regular intervals. This tells the user that the battery power is very low. You can correct this situation by recharging the battery pack.

Whenever possible, use the AC adapter. The battery will come in handy when you travel or during a power failure. It is advisable to have an extra fully-charged battery pack available for backup.

Currently, there is no defined standard for measuring battery life. Several factors have made it almost impossible to compare the battery life of different notebooks based on specifications alone. These factors include different implementations of power saving/management systems, applications in use, the user's "usage pattern", hard disk capacity and access frequency, LCD size and brightness, system form factor and weight.



If the notebook is to be stored for more than two weeks, we suggest that you remove the battery pack. Battery power from a fully charged battery pack depletes in roughly a week with the

notebook in suspend-to-memory mode.

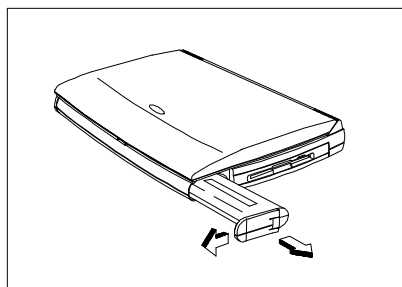


Do not expose battery packs to temperatures below 0°C (32°F) or above 60°C (140°F). This may adversely affect the battery pack.

3.1.2 Removing and Installing the Battery Pack

Removing the Battery Pack

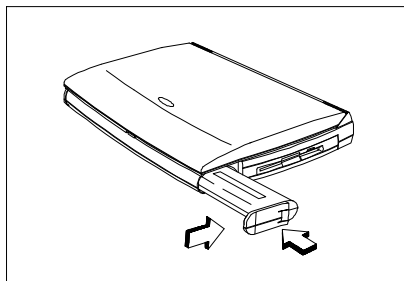
Before removing the battery pack, make sure that you have an AC adapter connected to the notebook; otherwise turn off the notebook. The following figure illustrates how to remove the battery pack.



1. Press the battery compartment cover latch and slide it out.
2. Pull out the battery pack.

Installing the Battery Pack

Follow these steps to install the battery pack.



Insert the battery pack into the battery compartment and slide in the battery compartment cover.

3.1.3 Charging the Battery

To charge the battery, place the battery pack inside the battery compartment and plug the AC adapter into the notebook and an electrical outlet.

Charging Modes

The adapter has three charging modes:

- Rapid charge mode

The notebook uses rapid charging when the notebook is in suspend mode and a powered AC adapter is connected to it. In rapid mode, a fully depleted battery gets fully charged in approximately two hours.

- Charge-in-use mode

When the notebook is in use with the AC adapter plugged in, the notebook also charges the battery pack if installed. This mode will take longer to fully charge a battery than rapid mode. In charge-in-use mode, a fully depleted battery gets fully charged in approximately four hours.

- Trickle charge mode

When the battery is fully charged, the adapter changes to trickle charge mode to maintain the battery charge level. This prevents the battery from draining while the notebook is in use.



We suggest that you charge the battery pack before you go to sleep, letting it charge overnight before traveling. This ensures a fully charged battery for use the next day.

3.1.4 Checking the Battery Level

There are three ways to check the battery charge level:

- Onscreen fuel gauge
- Windows 95 battery indicator
- Battery pack gauge

The fuel gauge shows the minimum guaranteed capacity to provide assurance that the system will be operational for the minimum battery life indicated.

Using the Onscreen Fuel Gauge

To access the onscreen fuel gauge, press **Fn**-q. If a powered AC adapter is connected to the notebook, a plug icon also shows in the onscreen fuel gauge.

Press and hold **Fn** and the cursor keys to move the fuel gauge around the screen. The onscreen fuel gauge indicates the present battery level. Press the hot key again to hide the fuel gauge.

Using the Windows 95 Battery Indicator

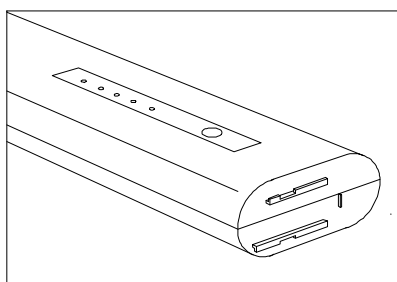
Rest your cursor on the battery icon on the taskbar to display the current power left. Double-clicking on the battery icon on the taskbar displays the Power dialog box. You can also access this dialog box via the Power icon from the Control Panel.



When the notebook is running on AC power, a plug icon replaces the battery icon on the taskbar.

Using the Battery Pack Gauge

The battery pack gauge allows you to check your battery charge level even when it is not installed in the notebook.



Press the fuel gauge button on the battery pack to check the battery charge level.

Table 3-1 is a battery-level chart.

Table 3-1 Battery-level Chart


Battery LEDs	LEDs Lit	Charge Level
●●●●●	five	100%
●●●●○	four	≈80%
●●●○○	three	≈60%
●●○○○	two	≈40%
●○○○○	one	≈20%
*○○○○	one blinking	<20%

3.1.5 Optimizing Battery Life



Optimizing battery life prolongs the charge/recharge cycle and improves recharge efficiency. Follow these suggestions to optimize and maximize battery power:

- Purchase an extra battery pack.
- Set the When Lid is Closed parameter in Setup to [Suspend to Disk]. See section 6.5.1.
- Use the AC adapter whenever possible so that the battery is reserved for on-the-go computing.
- Keep the battery pack in the notebook powered by the AC adapter. The constant trickle charge maintains the battery level to eliminate the battery self-discharge effect. The charge-in-use function also charges the battery pack.
- Set the Internal Modem parameter to [Power-Off] to conserve power when not using the internal modem. See section 6.5.6.
- Set the Display Always On parameter to [Disabled] to save power. See section 6.5.3.
- Eject the PCMCIA card from the card slot when not in use, since the PCMCIA card draws extra power.
- Store the battery pack in a cool, dry place. The recommended storage temperature for battery packs ranges from 10 to 30 degrees C. The higher the storage temperature, the faster the battery pack self-discharges.
- The batteries can be recharged about 500 times when used as directed.
- Take care of your battery pack. See section 1.2.3 for details.

3.1.6 Battery Low Condition

You never have to worry about battery power as long as you are using the AC adapter. However, when you operate the notebook on battery power, pay extra attention to the battery indicator (.

Generally speaking, a battery-low condition occurs when less than twenty percent charge left is in the battery. The following signals a battery-low condition:

- The battery indicator () flashes until battery power is depleted or until AC power is applied
- The fuel gauge (accessed via -q) turns red

When you receive a battery-low warning, you have about fifteen minutes to save your work. If you do not connect the AC adapter or install a backup battery pack within fifteen minutes, the notebook enters suspend-to-disk mode if the following conditions exist:

- There is enough battery power left to save system information onto the hard disk.
- The suspend-to-disk file created by the Sleep Manager is present and valid
- All suspend-to-disk conditions are matched. See section 3.2.2.

Otherwise, the notebook enters suspend-to-memory mode.



Connect the AC adapter or insert a charged battery pack into the notebook as soon as possible to prevent data loss.

Table 3-2 lists the recommended course of action when you encounter a battery-low condition.

Table 3-2 Course of Action for Battery-low Condition

Situation	Recommended Action
AC adapter and power outlet available	<ol style="list-style-type: none">1. Connect the AC adapter to the notebook to begin charging the battery.2. Resume work. <p>If you want the battery to recharge faster, close the display or press Fn - (Z) to enter suspend mode.</p>
An extra fully-charged battery pack available	<ol style="list-style-type: none">1. Press Fn - (Z) or close the display to enter suspend mode.2. Open the battery compartment cover.3. Remove the used up battery pack.4. Install the new battery pack.5. Press any key or open the display to resume work. <p>Remember to recharge the old battery pack.</p>
AC adapter, power outlet and extra battery pack not available	Close the display to enter suspend mode.

3.2 Power Management

At the very heart of this notebook is a new way of power management called Heuristic Power Management (HPM). Part of the notebook's overall design, this power management method allows the notebook to provide maximum power conservation **and** maximum performance.

3.2.1 The Concept of Heuristics

Current power management schemes or methods used by notebooks are timer-based. You have to set various time-out values for the display, the hard disk and other devices. Then based on these fixed time-outs, the system puts itself to sleep when it detects inactivity within this time frame. The problem with this is — no two users are alike. Each individual user has his or her own habits when using the computer. In short, timer-based power management is not an effective way to power-manage a system.

Heuristics suggests an idea of “self-learning”. HPM allows the system to power-manage itself depending on how you use the machine. In effect, the notebook delivers maximum power when you need it and saves power when you don't need as much power, without requiring user intervention. There are no timers to set, nothing to enable or disable, because the system figures out everything for you.

Analogy on Heuristics

You normally walk to a grocery store. If you cross the street, you might have to walk a bit faster, or even run. Whether you walk or run depends upon situations that are not fixed.

The same should be true for computers. A computer should know when to operate at full power and when to operate at anything less than full power. Timer-based power management operates by a fixed set of rules which cannot adapt to dynamic situations. Heuristic power management allows the computer to adapt to dynamic situations.

3.2.2 Suspend Modes

The heuristic power management system performs automatic suspend, hot-key suspend and all suspend actions resulting from various events and conditions. You only need to set the suspend mode type the notebook enters when a suspend condition occurs.

The two suspend modes are:

- Suspend-to-memory mode
- Suspend-to-disk mode

The suspend mode that the notebook enters into is specified in the When Lid is Closed parameter in Setup. See section 6.5.1.



The When Lid is Closed parameter can also be set to Sleep Mode. Sleep Mode maintains active modem and network connections when the display lid is closed. This power saving mode saves the least power.



If an external monitor is connected to the notebook, the notebook will not enter the desired suspend mode if you close the display. To enter suspend mode, disconnect the monitor plug, open the display and close the display again.

Suspend-to-Memory Mode

The notebook consumes very low power in suspend-to-memory mode. Data remains intact in memory. The notebook restores this information from the memory and resumes from where you left off upon leaving suspend mode.



When battery runs out of power and the AC adapter is not connected, the notebook automatically does a suspend-to-disk operation and ignores the When Lid is Closed parameter setting in Setup. The suspend-to-disk file should be present and valid.


Suspend-to-Memory Mode Conditions


For the notebook to enter suspend-to-memory mode, any of the following conditions should exist:

- When Lid is Closed parameter is set to [Suspend To Memory]
- The suspend-to-disk file is either absent or invalid

Entering Suspend-to-Memory Mode

With the suspend-to-memory conditions satisfied, there are many ways to enter suspend mode:

- Closing the display
- Pressing the suspend hot key  -| (Z²)
- Sustained inactivity
- Battery fail condition occurs without a powered AC adapter connected
- Any suspend condition where suspend-to-disk fails

When the system enters suspend-to-memory mode, the power indicator () flashes.

Leaving Suspend-to-Memory Mode

There are four ways to leave suspend-to-memory mode and return to normal mode:

- If the display is closed, open the display
- If the display is open, press any key.
- The Resume on Modem Ring: parameter is set to [Enabled] and the internal modem rings.
- The Resume on Schedule parameter is set to [Enabled] and the Resume Date and Time parameters have been met.

Suspend-to-Disk Mode

In suspend-to-disk mode, power shuts off. The notebook saves all system status information onto the hard disk (in a file created by Sleep Manager) before entering suspend-to-disk mode. The next time you open the notebook, it restores this information from the hard disk and resumes from where you last left off.

Suspend-to-Disk Mode Conditions

For the notebook to enter suspend-to-disk mode, all of the following conditions should exist:

- When Lid is Closed parameter is set to [Suspend To Disk]
- The suspend-to-disk file created by Sleep Manager is present and valid
- The Resume on Modem Ring and Resume on Schedule parameters are disabled. See sections 6.5.5 and 6.5.6.

Entering and Leaving Suspend-to-Disk Mode

With the suspend-to-disk conditions satisfied, there are four ways to enter suspend-to-disk mode:

- Closing the display
- Battery fail condition occurs without a powered AC adapter connected and Suspend to Disk on Critical Battery is set to [Enabled].
- When battery is low while the notebook is in suspend-to-memory mode, the notebook wakes up and performs a suspend-to-disk operation to prevent data loss.

To leave suspend-to-disk mode, open the display. Make sure a charged battery pack is installed and/or a powered AC adapter is connected before you open the display.

Validating the Suspend-to-Disk File

To check if the suspend-to-disk file is present and valid, rest your cursor on the Sleep Manager icon on the taskbar to show the status. See section 5.2

3.2.3 Advanced Power Management (APM)

This notebook supports the APM standard designed to further reduce power consumption. APM is a power-management approach defined jointly by Microsoft® and Intel®. The notebook's heuristic power management scheme works hand-in-hand with APM to take advantage of power saving features and allows greater system availability without degrading performance.



*Advanced Power Management greatly prolongs battery life.
Use APM whenever possible.*

Setting the Optimum Power Management Level

Follow these steps:

1. Select the Start button, click on Settings... and select Control Panel.
2. Double-click on the Power icon in the Control Panel window.
3. Set the power management mode to Advanced for optimum power management.

Enabling APM

If APM under Windows 95 is not enabled, follow these steps to enable it:

1. Select the Start button, click on Settings... and select Control Panel.
2. Double-click on the System icon in the Control Panel window.
3. Select the Device Manager tab and double-click on System devices.
4. Double-click on Advanced Power Management support to display its properties. Select the Settings tab and make sure the check box for enabling power management support is selected.

Refer to the Windows 95 user's guide for details.