



# Tech Info Library

## PowerBook Batteries: Memory Effect (6/94)

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TOPIC -----

Is there really a battery "memory effect" and are PowerBook batteries susceptible? The Tech Info Library contains an article from Apple Developer Tech Support that says there isn't.

DISCUSSION -----

Yes, there is disagreement on this topic. This article does contradict the other article you refer to, but it supports the statement in the PowerBook owner's manuals. This information provided by the Battery Technology group.

Apple uses three different types of batteries in its PowerBook computers. Note that these are not interchangeable. Only use the batteries intended for your PowerBook model:

PowerBook 100 - Lead-Acid

Other PowerBook 100 series computers - Nickel Cadmium (NiCad)

PowerBook 500 series computers - Nickel-Metal-Hydride (NiHy)

PowerBook Duo 200 series computers - Nickel-Metal-Hydride (NiHy)

Lead-Acid

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Recharge lead-acid batteries when they become depleted. Never fully discharge the battery. These batteries should always be kept fully charged. If a lead-acid battery becomes fully discharged, it may undergo sulfation, which means the lead electrode inside the battery converts to lead sulfate. Sulfation destroys the battery by making it unable to hold a charge.

Nickel-Cadmium

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Recharge nickel-cadmium (NiCad) batteries when they become depleted. Fully discharge and recharge the battery every 90 days. Ni-Cad rechargeable batteries suffer from an effect commonly called "memory", where if the battery is partially discharged, then recharged, it will reach a

point where the perceived capacity of the battery is that level to which it has been draining to. If the battery is fully drained periodically, this effect can be minimized or eliminated. The earlier Ni-Cads had more of a problem than the ones used now.

Therefore, on PowerBooks, if a customer follows the dialog warning and plugs in the AC Adapter at that first warning, the battery will begin to develop a memory effect. It takes 50 to 100 cycles to develop the effect to the point that it will begin to affect battery life. The recommended procedure is that every 10 to 20 cycles, the battery should be allowed to drain all the way to the 3rd battery warning (the shut-off message). The machine should be left in sleep for several hours to fully drain the battery (down to 5.7 V or so), then be charged for 2 to 3 hours before attempting to use the machine again.

Best case would be to use an external battery charger to drain the battery, so that the PowerBook itself can be used. The Apple external battery charger can be used to discharge by putting the battery in the charger while the charger is disconnected from the power source. 3rd party rechargers that cycle the battery are not recommended on a regular basis, since they typically do a fast discharge, and this will degrade the battery over time. If they have a setting to disable the discharge effect, that effect should only be used every 10 to 20 times the battery is charged.

If a battery is encountered that had significantly less life than can be expected, the above procedure should be tried to make sure this memory effect isn't the problem. It should be used even if the battery is very new.

#### Nickel-Metal-Hydride

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Recharge Ni-Hy batteries when they become depleted. Fully discharge and recharge the battery about every 30 days. Ni-Hy batteries are also subject to the "memory effect" and should be treated like NiCad batteries, as explained above.

#### Article Change History:

29 Jun 1994 - Included information on all three types of batteries used in PowerBook models.

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