Battery University

BU-701: How to Prime Batteries

Discover what a battery needs to get going and maintain a long life.

In many ways, a battery behaves like a human being. It senses the kindness given and delivers on the care given. It is as if the battery has feelings and returns on the benevolence bestowed. But there are exceptions, as any parent raising a family will know; and the generosity conferred may not always deliver the anticipated returns.

To become a good custodian, you must understand the basic needs of a battery, a subject that is not taught in school. This section teaches what to do when the battery is new, how to feed it the right "food" and what to do when putting the pack aside for a while. Chapter 7 also looks into restrictions when traveling with batteries by air and how to dispose of them when their useful life has passed.

Just as a person's life expectancy cannot be predicted at birth, neither can we date stamp a battery. Some packs live to a great old age while others die young. Incorrect charging, harsh discharge loads and exposure to heat are the battery's worst enemies. Although there are ways to protect a battery, the ideal situation is not always attainable. This chapter discusses how to get the most from our batteries.

Priming a New Battery

Not all rechargeable batteries deliver the rated capacity when new, and they require formatting. While this applies to most battery systems, manufacturers of lithium-ion batteries disagree. They say that Li-ion is ready at birth and does not need priming. Although this may be true, users have reported some capacity gains by cycling after a long storage.

"What's the difference between formatting and priming?" people ask. Both address capacities that are not optimized and can be improved with cycling. *Formatting* completes the fabrication process that occurs naturally during use when the battery is being cycled. A typical example is lead- and nickel-based batteries that improve with usage until fully formatted. *Priming*, on the other hand, is a conditioning cycle that is applied as a service to improve battery performance during usage or after prolonged storage. Priming relates mainly to nickel-based batteries.

Lead Acid

Formatting a lead acid battery occurs by applying a charge, followed by a discharge and recharge. This is done at the factory and is completed in the field as part of regular use. Experts advise not to strain a new battery by giving it heavy duty discharges at first but gradually working it in with moderate discharges, like an athlete trains for weight lifting or long-distance running. This, however, may not be possible with a starter battery in a vehicle and other uses. Lead acid typically reaches the full capacity potential after 50 to 100 cycles. Figure 1 illustrates the lifespan of lead acid.

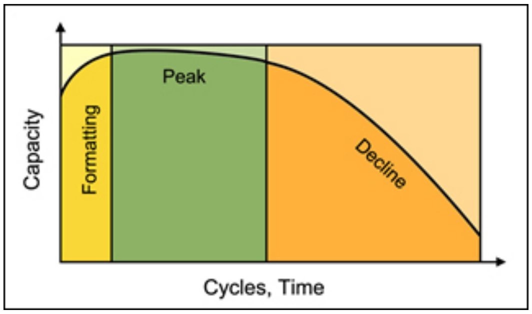

Figure 1: Lifespan of Lead Acid
A new lead acid battery may not by fully formatted and only attains full performance after 50 or more cycles. Formatting occurs during use; deliberate cycling is not recommended as this would wear down the battery unnecessarily.

Deep-cycle batteries are at about 85 percent when new and will increase to 100 percent, or close to full capacity, when fully formatted. There are some outliers that are as low as 65 percent when tested with a battery analyzer. The question is asked, “Will these low-performers recover and stand up to their stronger brothers when formatted?” A seasoned battery expert said that “these batteries will improve somewhat but they are the first to fail.”

The function of a starter battery lies in delivering high load currents to crank the engine, and this attribute is present from the beginning without the need to format and prime. To the surprise of many motorists, the capacity of a starter battery can fade to 30 percent and still crank the engine; however, a further drop may get the driver stranded one morning. See also BU-904: How to Measure Capacity)

Nickel-based

Manufacturers advise to trickle charge a nickel-based battery for 16–24 hours when new and after a long storage. This allows the cells to adjust to each other and to bring them to an equal charge level. A slow charge also helps to redistribute the electrolyte to eliminate dry spots on the separator that might have developed by gravitation.

Nickel-based batteries are not always fully formatted when leaving the factory. Applying several charge/discharge cycles through normal use or with a battery analyzer completes the formatting process. The number of cycles required to attain full capacity differs between cell manufacturers. Quality cells perform to specification after 5–7 cycles, while lower-cost alternatives may need 50 or more cycles to reach acceptable capacity levels.

Lack of formatting causes a problem when the user expects a new battery to work at full capacity out of the box. Organizations using batteries for mission-critical applications should verify the performance through a discharge/charge cycle as part of quality control. The “prime” program of automated battery analyzers (Cadex) applies as many cycles as needed to attain full capacity.

Cycling also restores lost capacity when a nickel-based battery has been stored for a few months. Storage time, state-of-charge and temperature under which the battery is stored govern the ease of recovery. The longer the storage and the warmer the temperature, the more cycles will be required to regain full capacity. Battery analyzers help in the priming functions and assure that the desired capacity has been achieved.

Lithium-ion

Some battery users insist that a *passivation layer* develops on the cathode of a lithium-ion cell after storage. Also known as *interfacial protective film* (IPF), this layer is said to restrict ion flow, cause an increase in internal resistance and in the worst case, lead to lithium plating. Charging, and more effectively cycling, is known to dissolve the layer and some battery users claim to have gained extra runtime after the second or third cycle on a smartphone, albeit by a small amount.

Scientists do not fully understand the nature of this layer, and the few published resources on this subject only speculate that performance restoration with cycling is connected to the removal of the passivation layer. Some scientists outright deny the existence of the IPF, saying that the idea is highly speculative and inconsistent with existing studies. Whatever the outcome on the passivation of Li-ion may be, there is no parallel to the “memory” effect with NiCd batteries that require periodic cycling to prevent capacity loss. The symptoms may appear similar but the mechanics are different. Nor can the effect be compared to sulfation of lead acid batteries.

A well-known layer that builds up on the anode is the solid electrolyte *solid electrolyte interface (SEI)*. SEI is an electrical insulation but has sufficient ionic conductivity to allow the battery to function normally. While the SEI layer lowers the capacity, it also protects the battery. Without SEI, Li-ion might not get the longevity that it has. (See BU-307: How does Electrolyte Work?)

The SEI layer develops as part of a formation process and manufacturers take great care to do this right, as a batched job can cause permanent capacity loss and a rise in internal resistance. The process includes several cycles, float charges at elevated temperatures and rest periods that can take many weeks to complete. This formation period also provides quality control and assists in cell matching, as well as observing self-discharge by measuring the cell voltage after a rest. High self-discharge hints to impurity as part of a potential manufacturing defect.

Electrolyte oxidation (EO) also occurs on the cathode. This causes a permanent capacity loss and increases the internal resistance. No remedy exists to remove the layer once formed but electrolyte additives lessen the impact. Keeping Li-ion at a voltage above 4.10V/cell while at an elevated temperature promotes electrolyte oxidation. Field observation shows that the combination of heat and high voltage can stress Li-ion more than harsh cycling.

Lithium-ion is a very clean system that does not need additional priming once it leaves the factory, nor does it require the level of maintenance that nickel-based batteries do. Additional formatting makes little difference because the maximum capacity is available right from the beginning, (the exception may be a small capacity gain after a long storage). A full discharge does not improve the capacity once the battery has faded — a low capacity signals the end of life. A discharge/charge may calibrate a “smart” battery but this does little to improve the chemical battery. (See BU-601: Inner Working of a Smart Battery.) Instructions recommending charging a new Li-ion for 8 hours are written off as “old school,” a left-over from the old nickel battery days.

Non-rechargeable Lithium

Primary lithium batteries, such as lithium-thionyl chloride (LTC), benefit from passivation in storage. Passivation is a thin layer that forms as part of a reaction between the electrolyte, the lithium anode and the carbon-based cathode. (Note that the anode of a primary lithium battery is lithium and the cathode is graphite, the reverse of Li-ion.)

Without this layer, most lithium batteries could not function because the lithium would cause a rapid self-discharge and degrade the battery quickly. Battery scientists even say that the battery would explode without the formation of lithium chloride layers and that the passivation layer is responsible for the battery's existence and the ability to store for 10 years.

Temperature and state-of-charge promote the buildup of the passivation layer. A fully charged LTC is harder to depassivate after long storage than one that was kept at a low charge. While LTC should be stored at cool temperatures, depassivation works better when warm as the increased thermal conductivity and mobility of the ions helps in the process.

CAUTION	Do not apply physical tension or excessive heat to the battery. Explosions due to careless handling have caused serious injuries to workers..

The passivation layer causes a voltage delay when first applying a load to the battery, and Figure 2 illustrates the drop and recovery with batteries affected by different passivation levels. Battery A demonstrates a minimal voltage drop while Battery C needs time to recover.

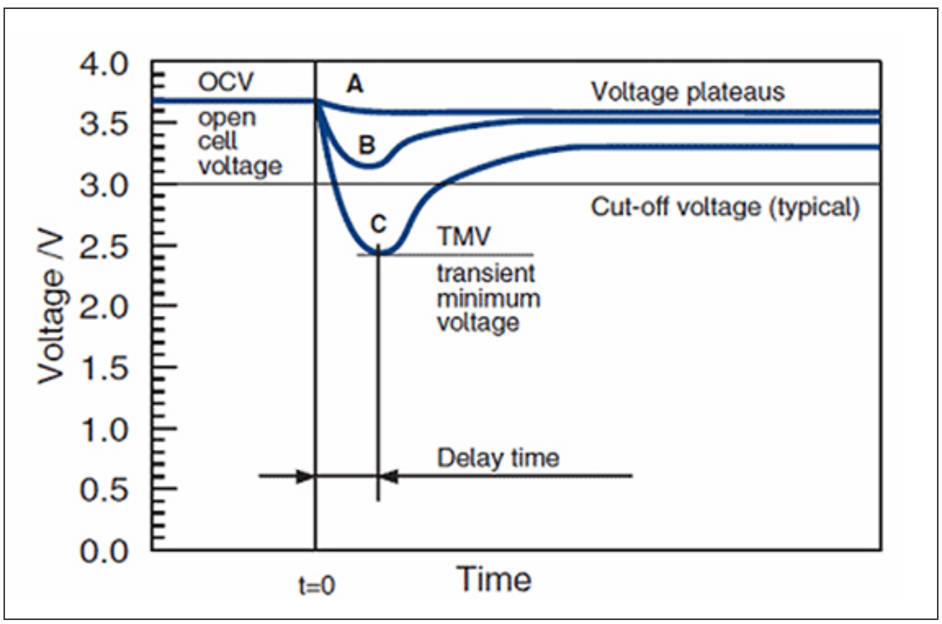

Figure 2: Voltage behavior when applying a load to a passivated battery.
Battery A has mild passivation, B takes longer to restore, and C is affected the most.
Courtesy EE Times

LTC in devices drawing very low current, such as a sensor for a road toll or metering, may develop a passivation layer that can lead to malfunction, and heat promotes such growth. This can often be solved by adding a large capacitor in parallel with the battery. The battery that has developed a high internal resistance is still capable of charging the capacitor to deliver the occasional high pulses; the standby time in between is devoted to recharging the capacitor.

To assist in sulfation prevention during storage, some lithium batteries are shipped with a 36kΩ resistor to serve as a parasitic load. The steady low discharge current prevents the layer from growing too thick, but this will reduce the storage life. After 2-year storage with the 36kΩ resistor, the batteries are said to still have 90 percent capacity. Another remedy is attaching a device that applies periodic discharge pulses during storage.

Not all primary lithium batteries recover when installed in a device and when a load is applied. The current may be too low to reverse the passivation. It is also possible that the equipment rejects a passivated battery as being low state-of-charge or defective. Many of these batteries can be prepared with a battery analyzer (Cadex) by applying a controlled load. The analyzer then verifies proper function before engaging the battery in the field.

The required discharge current for depassivation is a C-rate of 1C to 3C (1 to 3 times of the rated capacity). The cell voltage must recover to 3.2V when applying the load; the service time is typically 20 seconds. The process can be repeated but it should take no longer than 5 minutes. With a load of 1C, the voltage of a correctly functioning cell should stay above 3.0V. A drop to below 2.7V means end-of-life. (See BU-106: Primary Batteries)

These lithium-metal batteries have high lithium content and must follow more stringent shipping requirements than Li-ion of the same Ah. (See BU-704a: Shipping Lithium-based Batteries by air) Because of the high specific energy, special care must be taken in handling these cells.

CAUTION	When charging an SLA with over-voltage, current limiting must be applied to protect the battery. Always set the current limit to the lowest practical setting and observe the battery voltage and temperature during charge. In case of rupture, leaking electrolyte or any other cause of exposure to the electrolyte, flush with water immediately. If eye exposure occurs, flush with water for 15 minutes and consult a physician immediately. Wear approved gloves when touching the electrolyte, lead and cadmium. On exposure to the skin, flush with water immediately.

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If you have a suggestion or would like to report an error, please use the "contact us" form or email us at: BatteryU@cadex.com. We like to hear from you but we cannot answer all inquiries. We recommend posting your question in the comment sections for the Battery University Group (BUG) to share.

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Basics You Should Know

Comments (46)

On July 7, 2011 at 10:21pm

Bob Morein wrote:

A cycle and capacity test was performed on the battery of a Compal CL-50 laptop purchased in 2003. The battery is an 8-cell 18650 unit manufactured by Sony. The llaptop was operated off AC power almost exclusively prior to this test:

1. Rundown from 100% to 6%, at which point the laptop shut off: approximately 90 minutes, implying 1% capacity/minute of run-time.
2. Complete recharge.to 100%
3. Discharge to 58%. Measured 0.7% discharge / minute of run-time.
4. Charge to 100%
5. Discharge to 86%.. Measured 0.5% discharge / minute of run-time.
6. Charge to 100%; laptop unused for 8 days.

7/ Discharge to 88%. Measured 1% discharge / minute of run-time

Contrary to itypical ndustry recommendations, the capacity of this battery is strongly influenced by the usage pattern. However Apple Computer does recommend exercise of the battery that seem implied by these results.

On March 25, 2012 at 9:31pm

ReachLocal wrote:

I agree with this statement for the most part “Rechargeable batteries may not deliver their full rated capacity when new and will require formatting. While this applies to most battery systems, manufacturers of lithium-ion batteries disagree.”

On March 31, 2012 at 9:24am

Casper wrote:

Remember, Cycling a battery do add some wear and you lose some capacity. This is why they do not recommand to cycle lithium battery, specially since they are typically only 300 cycles, so cycing does help, but at the same time kill it a bit. Lithium manufacturer say that it’s not needed because it’s usually not a big gain and would kill the batt a bit. The end result would be a lost.

As for bob morein results, the test is probably invalid due to several factors like power usage. Laptop can vary ALOT in power consumption. Also, some laptop report 100% when the battery is really only 85%. The reason why they do that is to be able to advertise a faster charge rate, 0-85% can be done in 1 hour, 85-100% can be 3-5 hours!

On March 31, 2012 at 12:05pm

Bob Morein wrote:

Casper,

I agree with the point on wear, in that I am not recommending a routine procedure. The purpose of the test was to determine what the true life-state of the battery actually is. In the test, laptop was in specific idle mode. On AC, consumption of this mode was determined to be 19W. Also, this is not a fast charge laptop. When new, charge time 0-100% was 4 hours. Time was allowed for laptop to charge according to the percent battery gauge of Windows XP..

The statement of 300 cycle battery life is not a current figure, but it may be true for some laptops.. Liion 18650 cells are typically quoted at 700, but in some laboratory tests in ideal environment, several thousand cycles have been achieved. . The thermal environments of laptops vary widely. 300 cycles may be valid for an HP or Dell that bakes the battery. In a Lenovo, Asus, or other design where the battery extends from the back, the thermal environment is much more hospitable to long battery life. In the case of some HP batteries, it may be possible to approximate the ideal laboratory conditions. These batteries have a separate power connector on the battery casing for charging, so that it may be charged while not installed in the laptop. In this way, high temperature charging of the last few percent of battery capacity, which is now known to be most damaging, can be circumvented.

Since Lion was introduced, a number of reports of user actions that appear to temporarily increase battery performance have been reported. In the late 1990's, I tried these with a Fujutsu laptop that used 18650 cells.

a. Freeze thaw cycle of the battery pack.

b. Sharp rapping of the battery pack on a table. DO NOT DO THIS. This was before the battery explosions in the early 2000's that accompanied higher capacity cells. It worked; it obviously increased battery capacity, but it is now known to be dangerous.

Question:
In all cases I have observed, the first sign of lithium battery aging is that the battery gauge becomes inaccurate on the low end. A calibration cycle does not appear to solve this. The 8 cell 18650 pack of the cycling experiment eventually exhibited this symptom. Capacity would appear to be reasonable until 50% was reached. WIth aging, the number moved up, 60%, then 70%. The battery would then nosedive to 0%.

Perhaps Mr. Buchmann can explain what is going on?

On June 6, 2012 at 1:38pm

Joe wrote:

Thx To all of you for all of these tips!! But all of these scientific words confuse menciuld any ofbyou tell me just what to do to make the battery of my ipod touch 4gen 64 gb hold longer and how not to hurt/ruin the battery of it.

Thx Joe

On August 8, 2012 at 6:54am

Melka wrote:

Regarding on the Lithium battery, I didn't use the battery of my laptop since I bought last six months, What is the right thing to do taking care care and to prolong the battery life?

On September 4, 2012 at 4:59pm

Awesome Pickles wrote:

this is the nerdiest chat room evar!!!!

On September 28, 2012 at 6:33am

longcat wrote:

I like the information at this site, it's helped me a lot, especially since I run a blog about cell phone batteries. However, I have to disagree with the notion that lithium ion batteries don't need any sort of conditioning when new, or that they are at 100% capacity out of the box. This graph of me testing a cell phone battery at 500mA load repeatedly shows that capacity increases each time: https://www.dropbox.com/s/7que8vh5nqw545x/capacity increasing.png. I was under the impression that lithium ion batteries didn't need any sort of conditioning too, and I thought this battery was a counterfeit until I retested and saw the capacity increase… and again… It turns out that's not true about lithium ion. But it seems like the people who believe they require no conditioning are so many and so passionate that I will keep it to myself for fear of being called a heretic and burned at the stake. Also, this is the review that graph I made is for: http://www.agallonofmilk.com/samsung-eb-l1g6llagsta-galaxy-s-iii-standard-battery-2100ma-nfc-b0089vo7om/.

On September 29, 2012 at 9:25pm

bill wrote:

lots of good info here, if you dont mind a layman chiming in ..I needed a new battery for my hp tablet pc
. using hp battery test and Battery monitor, cpuid hwmonitor, all reported my original hp branded battery at 50% capacity from 5200 designed mwh to 3200mwh 1v. age 2750 days old. bought a $20.00 lion batt on ebay, advertised capacity of 55wh.
hp batt test showed this ebay battery to have a designed 4400 mah and a capacity of 3200 mah. and running at 12.59 volts, very odd. sent it back. replacement battery from ebay, same test data and battery never charges to 100%

cycled replacement ebay battery from 88% (highest charge level it went to before stopping charging.) to 1% charged twice with this method and no change to capacity.
depleted battery to 50% rested, charged, now I get green charge light on laptop and capacity shows increase to 4000mah, repeated cycle twice and now at 42550mah and 92% charge before the laptop shuts off charging.
while the voltage of this battery is showing 12.59 volts and is labeled as a 11volt 6 cell
but hp battery test cant find one of the cells so fails the battery as replace.
obviously a counterfit battery, my research online indicates this is an issue with the internal battery controller programming,
so I created a battery profile that sleeps the laptop at 50% reminding me to charge it,
will try this a few times to see if I can get to that almighty 100%
of note actual runtimes have been around 2hrs with a steady load of 20 watts. same as I get from my half dead 6 year old hp battery.

On September 29, 2012 at 10:09pm

Bob Morein wrote:

Does the labeling on the battery indicate it is made by HP? If not, it is a copy, not a counterfeit. The issue with controller programming is three years old. It may not be the source of your problem, which is common with copies. I think the correct remedy is to do an actual battery calibration, available in some BIOSes, which discharges the battery further than the indicated 0%, and then charges fully.

One thing I have always wondered is why battery calibration is necessary. I thought battery packs contain coulomb gauges, which detect the actual passage of charge from the battery. On the other hand, if the battery capacity is measured by the voltage discharge curve, each set of cells will be different, requiring calibration of an adaptive algorithm.

Since I wrote the original post, I've had some more experience with the effect of discharging:
1. With an old battery, a full discharge/charge cycle usually results in a measurable loss of capacity. It can result in what appears to be an improvement early in the discharge from 100%, but a really old battery seems to fall off a cliff further down the curve.
2.An old Lenovo pack jumped from 29.6 to 36.5 watt-hours after calibration.
3. The makers of battery copies are so varied, and so good at imitation of the outer cases, I have not been able to identify makers of good and bad batteries.
4. Lenovo has a very elaborate battery management utility. None of the copies I've purchased have been identified by the Lenovo software as defective. Perhaps this is because they know they will be found out!

On October 3, 2012 at 5:31am

bill wrote:

Bob, no, the label on the battery is generic but indicates 55wh. after several more partial cycles and another deep cycle, my battery is now at 3850mah. software indicates 44wh. a increase in indicated capacity.
the indicated capacity changes with every cycle, up and down, it may be an indication problem or a cell problem but I have no way to determine which . this battery is going back.
I disassembled one of my original hp battery's and its not rebuild-able for me as it uses ribbon cable spot welded to the cells. it looked like it was just two parallel sets of three in series.
my replacement copy does not communicate properly with the hp software as the battery tests show 12.59v with two cells detected not three., .that's a volt an half to high. so either the battery controller is allowing the cell voltage to go to high or ?.
In my opinion when I buy something it should perform as advertised and just work. that's why I called the battery counterfeit because the battery does not do what the label indicates
the internet is full of blogs and discussions of people discussing how to make things work, from software to hardware. as a society we need to demand better.
this run around with a battery is costing me time. and frankly it causes me to seriously rethink making purchases online.
hopefully I can find a battery that works, the search continues…..
Have a great day.

On October 3, 2012 at 8:15am

Bob Morein wrote:

Bill, all the copies I have tested have lower capacity than marked. The actual capacity depends upon temperature. Also, note that durability is enhanced if the battery is charged only when cool, ie., in an unused laptop.

Almost all these copies are based on the cell conforming to the original Sony 185650. I'm guessing that the generic battery makers have the equipment to make these cells, which have simple "jelly roll" construction. But the capacity of branded 18650 cells increased markedly from 1995-2005, by use of thinner foil, and advancements in electrode construction. I'm guessing that these advances, some of which are proprietary, are not found in generic cells. The generic packs I have examined show exaggerated capacity claims. It would seem the makers are claiming capacities that would be reachable only with the newest branded cells.

But this is not a fatal flaw. In my case, a genuine Lenovo battery costs ~150. A copy costs $25-$30. To me, 10% less capacity is a good tradeoff. I don't know what brand cells are in your genuine HP pack. But because the Lenovo battery manager provides comprehensive information, users have noticed differences between Panasonic, Sony, and Sanyo packs. Their observations go far beyond the standard table indicating a 6% loss per anum for lithium batteries. Sanyo packs have had notably bad cycle life, failing completely in as few as 250 cycles or two years. Some claims that Panasonic cells have the greatest longevity, followed by Sony, with Sanyo trailing. Personally, I have an Asus pack containing Sanyo cells that failed in perhaps 50 cycles.

So there are a number of outcomes that can cause the purchaser to feel cheated. Someone who spent $150 for a Lenovo pack containing Sanyo cells, which failed in two years would feel worse than you

On October 4, 2012 at 1:58pm

Bob Morein wrote:

I just performed a gauge reset on an 8 cell original OEM battery for a Lenovo X61. The battery contains Sanyo cells, has 342 cycles, and was first used in 2008, and an original capacity of 74.88 watt-hours..
Before reset: 42.07 watt-hours.
After reset: 41.15 watt-hours.
The date of the last previous reset is not known. In resets of four Lenovo batteries, only one showed a capacity increase, a considerable 20%. With the other three, gauge reset caused a loss of about 2% capacity.
The extreme capacity loss for 342 cycles is, according to web comments, typical of Sanyo cells.

On October 4, 2012 at 4:01pm

bill wrote:

Right, I dont expect the same performance for a low cost battery, my expectation was for the battery to last for fewer cycles not lower capacity than advertised. well now I know. so I can pay more or I may go for an generic extreme capacity battery. my need is for the laptop to run for 3hrs in the field with out swapping out power supplies.
the last two cycles of the new replacement battery I obtained on ebay showed continued capacity loss I was back down to 41 indicated watt hours. thats about two hours on my pc tablet which sucks lots of juice outdoors when the screen brightness needs to be high.
next I will try a generic 95wh battery (another pound and half) and see if I can manage that way. dont look forward to carrying around 6lbs of laptop….

On December 12, 2012 at 4:43am

Ramesh Iyer wrote:

Have noticed in Lithium-Ion batteries of both mobile handsets as well as notebooks that going through full charge-discharge-recharge cycle doesn't make any noticeable difference in the battery life. Seems this was more applicable to NiMh or NiCd batteries of years ago, which seemed to have a "memory" and hence required to be "conditioned" for the first few charge-discharge cycles.
Incidentally, both mobile as well as notebook retailers continue to "advise" consumers to follow the old routine of few full charge-discharge cycles even with Li-Ion battery-based products, as they perhaps got habituated with this for older products which were NiMh or NiCd based.

On February 7, 2013 at 4:38pm

Psycogeek wrote:

While I would generally agree that li-ion cycling accomplishes nothing, working with raw single cell items, of many types and sizes (not calibrations and unknown metering devices).
Most of the good quality cells never changed much in (within spec) end to end capacity, from doing a few cycles.
The exception to this was some of the junk cells that I have, made in china also of different variety, did change in voltage depression, and capacity retention, within the parameters of my end to end (within spec) cycling.
Never did they improve beyond 2 cycles, and the cells that exhibited the change from cycling were also cells that had a short total life of about 2 years, vrses some of the more premium and brand name cells which lasted longer in general.

On February 8, 2013 at 4:27am

Trevayne10 wrote:

I just deep-discharged/reset my 1.5 year old, 6 cell SANYO PA3817U-1BRS LION laptop battery - it was showing 27% wear level. (53,000+ mWH original). Not good.

After the reset, it is now showing 11% wear level; I verified the increase in use duration before shutdown; I'm getting about 5.5 hours of use out of my 15" laptop (i5-2410M, 8GB RAM, 120GB OCZ SSD), at high performance power profile setting. This is about what I was getting when it was brand new, out of the box, 1.5 years ago. Works for me.

On February 8, 2013 at 8:52am

Bill wrote:

There is test data that you can compile from blogs, comments and manufactures available online that indicates a possible correlation between deep discharge of lion batteries and reduced cycles or watt hours over time. bottom line, my opinion is the designed capacity and actual performance in the field is determined by manufacturing qc and the battery controller algorithms. invariably battery
failure in multi-cell packs like in the Boeing AC will be traced to a single cell failure as a result of a voltage spike from either an internal or external source that wasn't clamped before it arrived at the controller. Resulting in failure of the control circuit. by process of deduction we can lean toward the cell side of the control circuit, as only one cell failed. But as we know strange things happen in IC's when they fail. I have actually recovered electronic circuits by reverse biasing the total impedance of a circuit. I would never return the device to service but it was an interesting observation.

On June 12, 2013 at 7:27pm

John H. wrote:

I've never been one to really "care" for batteries, but honestly my laptop battery died out. Doesn't last. I just bought a replacement and this has really opened my eyes. A clear set of instructions on breaking in the battery! It actually takes a bit of effort on my part, but as the suggest, it will help the battery last longer and hold chargers longer. Great stuff here guys! Appreciate it. With new gaming consoles like the Playstation 4, people need to be consider how they are initially handling their PS4 controller battery charging, if just in the first week or so.

On July 17, 2013 at 3:21pm

Kaz wrote:

Lead acid requires 50 to 100 cycles? But you don't really get this in a car, oops! The battery is kept in a charged state by the alternator whenever you run the car, and drains only very slowly due to some low current accessories that are on when the car is parked.

Does this mean that to develop the best capacity in a car battery, we should, 50 to 100 times, leave something on for a while to drain the battery while the car is parked (leaving just enough charge so we can start the vehicle?)

On July 23, 2013 at 7:31am

kwame oduro wrote:

I need sent batters to Africa , how can you help me.

On August 18, 2013 at 1:06pm

Vamp898 wrote:

There is no way to damage your Li-Ion Battery more than unloading it below 20%.

If possible you should plug the battery for load at 40%, minimum is 20%, not below!!!

If you dont use the Battery the perfect state of loading is 60%, at 60% and at room temperature it will live nearly endless.

I follow these rules at my Notebook Battery (2 years old) and it still have 91% of its new capacity.

On November 14, 2013 at 2:00pm

jason wrote:

I recently bought a new battery for my blackberry bold9900 and I just charge the battery untill the green light came on showing its battery full and started using it. Does that mean I damaged my battery or it won't be reaching its full poetential? Pleas help

On April 22, 2014 at 12:12am

naga rajum wrote:

what is the relation between charging time, voltage , capacity, charging current in lithium ion rechargeable battery.
supose how much time it will take 6000mah battery charging with 100mA with 4.2 volts.

On May 17, 2014 at 6:56am

Khaleef wrote:

Hello. Please, i need a help on a particular problem. I opened up few bad Laptop Batteries and found single Battery cells in them. Now, i'm thinking of Making a large mAh Power Bank from these battery cells. I need help on how to join the batteries to get a good performing powerbank! Thanks.

My mail is khaleef.olajide@gmail.com

On May 28, 2014 at 6:33am

noushin wrote:

i used samsung galuxy core mobile 15days ago..it was new phone..but i did not charge it 8hrs ..now what could i do..if u have any solution please inform
..m very worrid coz it does not work..

On May 29, 2014 at 8:10am

Blake Kennedy wrote:

I have a question so I'm using a Samsung galaxy note 2 cell phone and i have 8 batteries that I just keep charged with a wall charger and swap out when they get low or die. Is there any harm in this kind of method? also some of them have different mAh capacities and range from good quality to a few cheap ones i got off ebay. Is that going to affect or confuse my phones battery calibration? Could this damage my phone or the batteries themself? I use my phone A LOT which is why I need so many batteries I usually go through 3 fully charged batteries a day full to empty. Which seems like a lot to me seeing As The Note 2 Is Supposed To Have One Of the Best Battery Lives Of Any phone?

On June 11, 2014 at 5:10am

Ved wrote:

I use Intex Aqua style. My phone uses Lithium Polymer 2500 mAh, 3.7v and 9.25 Wh. Unable to find a battery from manufacturer.

So, can I use a battery from another manufacturer with same configuration?

On June 17, 2014 at 11:10am

D.C. wrote:

I really enjoyed reading these articles. Keep them coming!

On March 4, 2015 at 10:25am

Dick Scheidell wrote:

Question. Have two lithium batteries they have laid about a year and now neither will charge is there any way to rejuvenate them so that they will take a charge? Thanks

On July 3, 2015 at 9:42am

Jon wrote:

Based on the article, coments, and common knowledge, it should be noted that although battery life is determined by construction l-ion batteries typically have two additional controls. In cellular phones for example there is the on board chip noted above, but there is also a software controller as well which will also stop the charge process when it estimates a full charge (a typical redundancy). This would be the reason that while the battery itself should not need recalibration it will suffer reduced usability without calibration.

On September 22, 2015 at 8:21pm

SCOTT RICHARD (DICK) MURRAY wrote:

I nehim.Th know what voltage and amps rating does the charger need to be to charge the battery safely on My Son's Samsung Galaxy Nexus mobile phone the battery is A Samsung Near Field Communication 3.7 V Li-ion 1850 mAh BATTERY?
these are the extra numbers in letters that are on the battery they may help you.
EB-L1D71VZ 1850 mAh VZW : SAM1(or it's an I)515BATS DPP DC120725 PLZ reply back as soon as possible because tomorrow's my son's birthday he's going to be 7 years old and I want to make sure he has a charger for it I picked up the phone at a pawn shop For him.Thank you for your time.

On September 25, 2015 at 10:28am

Don wrote:

Is there any information on Lithium Polymer batteries on this site? I fly RC models and use LiPos exclusively. I am wondering what the reasoning process is for putting LiPos at a storage value of about 3.85 volts per cell. And does leaving them fully charged at 4.2volts per cell over a period of 2 or 3 months damage them?

On May 2, 2016 at 8:31am

Ron wrote:

I am interested in the performance of the lead-acid batteries supplied by Halfords (UK) and described as CA "calcium"

On May 24, 2016 at 7:56am

Anusha wrote:

I have 5v 5Ah battery but I want 1A for 10 hours.Can anyone please tell how can i acheive that?

On July 7, 2016 at 3:13am

Komal wrote:

I have an iPhone 5S which i bought a month ago. The battery discharges at a rate of almost 2%/minute. Any idea how i can improve the battery life?

On July 8, 2016 at 6:20pm

Anita wrote:

To Komal
I strongly recommend that you consult your phone vendor
the battery may discharge at that rate because there is too many stuff (applications) running simultaneously

On July 8, 2016 at 6:25pm

Anita wrote:

To Ansuha
the Ah rating is for 20 hours. 5Ah means 0.25A for 20h (when new)
so if you need 1A for 10h, then you need at least 20Ah battery
based on my experience, the Ah can easily vary ±double/half!

depending what is the system, how long it has to last, how often it is used…you may need 40Ah

On August 16, 2016 at 11:39am

Robert Stevens wrote:

I find it "utterly disturbing" that smartphone manufactures are now sealing batteries with the device itself. For many reasons, this is a terrible trend.

On September 20, 2016 at 9:10am

Barb wrote:

how do i store regulare AA or C or AAA batteries in Phx

On March 16, 2017 at 1:53am

THUMPER wrote:

I've just bought a new lead acid cranking battery for my landcruiser, (Neuton Power 95D31LS)
Should I run my charger before fitting to my vehicle to maximise longevity? Only have 7 stage automatic charger. Also my work requires me to do many short drives. Running on the caherger every 2- 3 months should be part of its maintenance cycle, yes?

ps excellent site

On August 20, 2017 at 7:00am

Yan wrote:

This is very informative.
I do have a question though regarding Lithium Iron Phosphate cells.
5 cells are being tested and all of them reach 85% capacity. 1 of the cell's OCV jumps from what would translate as 100% in a minute or two while the rest barely reach 86% which is typical under the current they were all given.
how could i determine that 1 cell is faulty? The impedance was slightly higher (3mOhm) than the rest. The capacity measured after charging was 100%. Another capacity test was taken after a 7 days delay, which revealed an 8% loss in capacity. Could rusting or loss of the chemical properties of the cell, explain that?

On March 4, 2018 at 8:03am

Yusuf Rupam wrote:

Can anyone help me to provide the test procedure of self-discharge/charge retention test of lead acid battery?

On March 8, 2018 at 9:32am

Brian Brostek wrote:

I only know what's in front of me. Just got a new iPhone battery. At first the level just kept dropping even with screen dim and low power mode on. Then I did a full charge during evening than a full consumption of battery. Then after another charge it's back like a new iPhone. I'm telling ya the drop the first time was a drop in power level every 1 minute or so. So I believe it needs to be primed. Again I'm not all scientific just know what I see.

On May 23, 2019 at 6:08pm

charles r dahlberg wrote:

recently bought three sla/agm batteries for scooter. these are sealed batteries. i took the cover off to expose the caps. when i unscrewed caps discovered no acid (liquid). if they are sealed,aren't they supposed to come with liquid in them?

On March 14, 2020 at 10:44pm

Dev Guy wrote:

All these comments regarding personal experience with laptops and phones do not take into account the power draw from a laptop or phone is highly variable even if you just let it sit there of think you are using it in similar ways. Most phones, for example, adjust their screen brightness to the ambient light. WiFi and LTE mobile radio power requirements vary greatly depending on the signal strength. Phones and laptops often have significant background activities that greatly increase power consumption (such as software updates or operating system tasks). And the battery percent remaining indicators in phones and laptops are famously inaccurate, highly variable, influenced by temperature, recent load, recent charging, etc. All of this means all these people who claim "my phone or laptop only used XX% of the battery when I did whatever" are almost meaningless as there are too many things out of their control greatly influencing the battery level. The only data we can trust is from experiments done under highly controlled lab-like conditions not day-to-day random use of a phone or laptop. So everyone is best served to ignore all the people claiming "when I do this my battery lasts longer" as they're often drawing the wrong conclusion and unaware of all the hidden factors.