# RV HOUSE BATTERY NOTES

I have a 2004 Winnebago Itasca Horizon with an older 2000W Dimensions Quasi-sine Inverter/Charger. I like it okay. (It's not so dumb, but not so smart either.) One day I will replace it with a pure-sine wave charger, but not today. I also have 4-100W solar panels to assist with my battery charging.

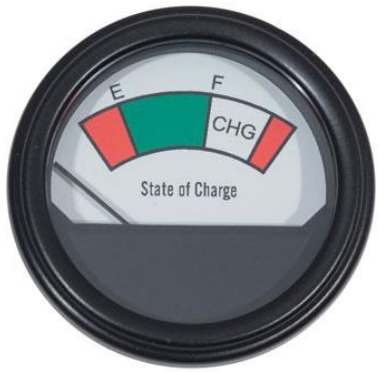
Note: Smarter chargers are "healthier" for your battery system, but every so often a good "dumb" charger does a better job if you want to manually recondition your battery bank.

Since this thread deals with undercharging and over charging your battery bank, I will comment on that first:

**I think it's possible you are expecting too much from you meter.** Here's an article on measuring your battery State Of Charge (SOC) you need to read to understand how inaccurate your meter can be. (Emphasis on "can be.")

http://www.tawaki-battery.com/accurate-measuring-battery-state-charge/

| STATE OF CHARGE | | | | | |
|---|---|---|---|---|---|
| | V open circuit | V open circuit | V open circuit | V open circuit | specific gravity |
| charge | 6-V battery | 12-V battery | 24-V bank | 48-V bank | per cell |
| 100% | 6.37 | 12.73 | 25.46 | 50.92 | 1.277 |
| 90% | 6.31 | 12.62 | 25.24 | 50.48 | 1.258 |
| 80% | 6.25 | 12.50 | 25.00 | 50.00 | 1.238 |
| 70% | 6.19 | 12.37 | 24.74 | 49.48 | 1.217 |
| 60% | 6.12 | 12.24 | 24.48 | 48.96 | 1.195 |
| 50% | 6.05 | 12.10 | 24.20 | 48.40 | 1.172 |
| 40% | 5.98 | 11.96 | 23.92 | 47.84 | 1.148 |
| 30% | 5.91 | 11.81 | 23.62 | 47.24 | 1.124 |
| 20% | 5.83 | 11.66 | 23.32 | 46.64 | 1.098 |
| 10% | 5.75 | 11.51 | 23.02 | 46.04 | 1.073 |




➔ If you are thinking about how fully charged your battery bank is, then you have to consider how accurate your measuring devices are. In addition, there is a problem measuring SOC if you are using your RV. I.e., your house battery bank is never "at rest" long enough to take a good measurement. **That said, I will skip everything you can read about below and just give you my conclusions: Don't worry about what your house battery monitor says above 12.4V or what you solar SOC meter reads above 70%, since neither is accurate most of the time!**

➔ **The best way to really know if your charger is able to fully charge your battery bank, and the only time to trust your voltage meter, is to let the system charge for 1-2 days and then let that battery bank come to rest for 4 hours before your read your voltage meter. …My guess is that if you do this your meter will read 100% or be in the "full green range".**

Note: For days I was going nuts taking measurements off my Power Management Panel in volts and then looking at the voltage chart (see attached) to determine if my battery bank was fully charged. This not how to do it!

And to make matters more confusing, I was trying to compare that voltage information (and voltage chart) to my Solar Panel SOC metering device that shows its SOC in terms of % charge… which never gets over 70% most of the time. Why? Because, as indicated earlier, I was using my RV (with various devices putting a load on the battery bank, and/or I was looking at this solar SOC meter during the day when the solar panels were pumping amps into the battery bank. So nothing about my battery bank was "at rest."

➔ **You know what I think you need to do with your volt meter on your Power Management Panel? Answer: JUST IGNORE IT when it reads over 12.4 volts -- and pay attention to it when it drops under 12.0 volts!**

UNDERCHARGING POSSIBLE CONCERNS

* Some battery chargers have a temperature probe (wire) that connects to one battery only. This is to protect from overcharging, but if you have a bad or weak cell in that battery then I suppose it's possble your inverter/charger may be shutting down prematurely. (Just a guess.)

Solution: Measure your battery cell with a GOOD hydrometer you can buy for less than $15. I prefer not to use a small hydrometer. And if all your battery cells test good, then remove the temperature probe wire and see if your charger now works as normal.

Note: You might look into fixing your temperature probe problem for safety reasons, but this can be expensive since you have to take your inverter charger to a qualified tech. Suggestion: Maybe you can check YouTube.com for a solution I don't know about. Also, your probe wire is just a safety cutoff switch. So your inverter/charger should work fine without it. (Note: It is there to protect your batteries from melting down so you need to monitor your charging system more closely if you remove this wire. So only do so at your own risk.) Plus, I don't know if a bad temperature probe wire may signal other charger problems do take care to make any assumptions when it comes to diagnosing your charging system and making any modifications to it. That inverter/charger is a "black box" that needs to be respected!

* Maybe your inverter/charger is not set for the right type of battery you are using? Normally, these switch options have more to do with the maximum current the charger will pump in to the battery bank, but I suppose a "smarter"

charging system may not charge your battery bank fully if this switch is not set for the type of lead acid battery you are using: (AGM, GEL, STD)

* Maybe your battery solenoid is leaking current to ground. This happens more often than most people think. Why? There are point-like-contacts inside one of two solenoids that wear out; and I think it's a good idea to replace these every 5-10 years. (And in my opinion, this can also prevent you from not being able to start your coach if your solenoid fails in the field, which is a "hard failure" vs. a "soft failure" that I suppose can affect your charging system, albeit not very much.)

*** My guess is that you THINK your battery bank is not fully charging, because your gauges say so. But hopefully now you know your gauges are not very accurate and are not going to worry about them so much.**

**I like to look at my voltage gauge and my SOC % Solar Meter at two times:**

**1) When I turn the system on -- so I can set the charging limit (in Amps) on my Power Management Panel.**

**2) In the morning when I wake up to see if my battery bank dropped below 11.9V. This tells me if I need to run my generator at so point before I go to bed… so the system can last over-night and end up above the 50% battery charge limit I like to operate in.**

Note: I don't have automatic generator start module and I don't think I will ever go to the expense of installing one. This is just another toy that can cause trouble when it brakes. For example: I like Cadillac cars, but I don't want to own one.

Note: When you select 25 AMPS "MAX" you need to know the charge rate per battery is only 1/4 this amount if you have 4 batteries in your battery bank, which means ~6.25A is being used to charge each battery; which is the fastest your GC2 lead acid battery "likes" to be charged. Therefore, I like to like set my charger limit to 20A-MAX so it charges more slowly and puts less demand on my charger too! I also do this because I believe I get a longer lasting battery life by charging it longer and slower, and I believe a slower charge rate will extend my battery life.

Note: I once had 3-12V deep cycle house batteries, and found that I warped the outside of the battery side walls, probably because a 25A-MAX charger output that pushed ~8.3V into each battery, which was too much for the battery to withstand over time. And these were high quality US-Batteries too!

* Each lead acid battery cell is 2v in series with the next battery cell. This is the case no matter if you have a 12V battery or 6V battery. (Just count the number of "water holes" on top your battery and times it by 2V and you will see what I mean.) So when you charge a bunch of cells in series by hooking up a positive lead on one end, and a negative lead on the other, there are going to be lot of varying chemical interactions in each of those middle-battery-cells. And overtime sulfate deposits are going to form on the plates differently. These deposits need to be "boiled" off and that's why batteries smell when you "condition" them. AGMs are sealed batteries and do not smell, which is very desirable if

your battery bank is under your bedroom like mine is; or if your battery storage compartment is not sealed off very well from your bedroom like mine is as well. (See more comments on this subject below.)

BATTERY KNOWLEDGE

* Batteries in series increase voltage, but not current (amps). And if it helps, think of stacking batteries in series like you do a flashlight.

* Batteries in parallel increase amperage, but not voltage.

* Most charging systems are based on 12V, but newer coaches may have 24V systems.

* AGM Deep Cycle batteries can be charged faster and are sealed. So you will not smell the sulfur when your batteries are being "conditioned." But AGM cost twice as much!

* Deep cycle battery capacity is measured in AMP/HRS (typically at 20A draw) which means we need to convert 110V-AC appliances to 12V-DC in terms of amps used. Example: A residential 110V refrigerator operates at 1A. But in terms of DC amps used by your inverter to power this appliance you need to think of your refrigerator as using 10x that amp draw, which is 10 x 1 = 10A-DC equivalent time then number of hours used. I.e., if you refrigerator runs 10 hours per day… then to calculate your DC amps needed by your inverter to create the 110V output it would look like this: 1 x 10 x 10 = 100DC-amps per day.

So if your 4-6V (GC2) batteries have 430 Amp-Hours of "bank" then 50% of that is only 215A-hrs, which is almost all the DC amps you have in your battery bank per day, if do not want to run your battery bank down below the 50% level (which is a rule of thumb if you don't want to replace your house batteries in 1-3 years).

* The best way to measure Battery SOC (State Of Charge) is using a hydrometer, but because that's impractical on a daily basis, we use SOC meters of various types. Some are more accurate than others.

* If your coach doesn't charge your house batteries when driving, then I definitely recommend you add a $100 VSR (Voltage Sensitive Relay) I bought on Amazon.

https://www.amazon.com/KeyLine-Chargers-Battery-Smart-Isolator/dp/B00WTAFR52/ref=sr_1_1_sspa/137-3387717-3540951?ie=UTF8&qid=1538349668&sr=8-1-spons&keywords=vsr&th=1

REFERENCES

1) SOC measurement accuracy article:

http://www.tawaki-battery.com/accurate-measuring-battery-state-charge/

2) Why do I smell a foul odor when my batteries are being “conditioned?”

http://www.rvdoctor.com/2012/03/foul-odor-from-rv-batteries.html