SOLAR STIK®

# METHODS TO RESTORE AND TO MAINTAIN STATE OF CHARGE EQUALITY AMONG 24VDC LI EXPANDER PAK 2400S IN A HYBRID POWER SYSTEM



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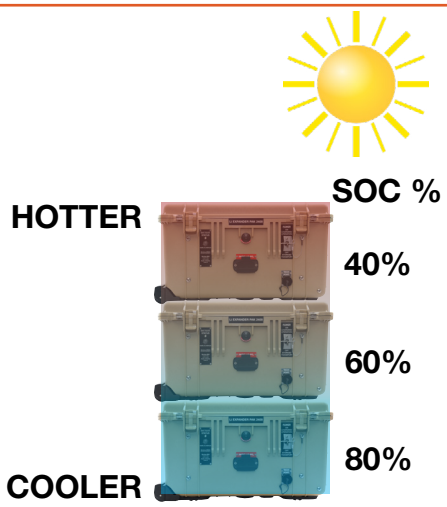
# Method to Restore Equal States of Charge Among 24VDC Li Expander Pak 2400s in a Bank

**Background**
There are two (2) common reasons for state of charge (SOC) disparities:

- **Short-cycling** – this happens when an HPS generator is MANUALLY controlled rather than allowing the HPS to charge the Expander Paks fully on a regular basis in AUTO mode.

- **Solar loading** – Expander Paks exposed to direct sun will be hotter and will discharge more rapidly than Expander Paks that are shaded and cooler. Shade all HPS components (except photovoltaic arrays) to minimize the negative impact of solar loading.



Solar loading and battery self discharge

Expander Pak SOC disparities will cause erratic System behavior including:

- Premature termination of the AGS functions, or generator "short-cycling" (frequent start / stop)
- Expander Pak Circuit breaker tripping

These negative behaviors may be corrected by reestablishing Expander Pak SOC equality using the method below:

# Method to Restore Equal States of Charge

If the System is short-cycling and/or the Expander Pak circuit breakers are tripping, use this protocol to equalize SOC among Expander Paks to 100%. This protocol will not work if all of the Expander Paks have a red-flashing battery status LED.

1. Press SETUP on the PRO-Verter user interface (password may be required).
2. Scroll to 03 Charger Setup, press SELECT,
3. Scroll to 03E MAX Charge, press SELECT,
4. Reduce the charge rate to 40%, press SELECT.
5. Press CTRL and scroll to 03 Gen Control, press SELECT.
6. Scroll to Set Gen Control ON, press SELECT.
7. The "Remote Generator Start and Operation" sequence will begin (total process may take 3 minutes).
8. Charge the Expander Paks until the PRO-Verter user interface Home Screen reports 29.0 V and the charging current has decreased to and stabilized at 5 to 10 A.
9. Set Gen Control to AUTO.

This slow charge protocol will equalize Expander Pak SOCs, eliminate the erratic System behavior and restore normal cycling of the HPS.

# Methods to Maintain Equal States of Charge Among 24VDC Li Expander Pak 2400s in a Bank

## Background

Unequal SOC among individual Expander Paks in a Hybrid Power System (HPS) can result in nuisance tripping of the Expander Pak circuit breakers.

Two programmable features of the PRO-Verter can help to ***maintain*** an equal state of charge (SOC) among individual batteries (Expander Paks) in an HPS battery bank while it is in service. Both are described below.

These methods work best when the PRO-Verter is automatically starting and stopping the System generator.

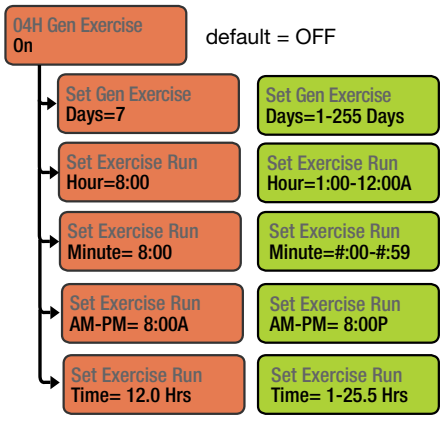
**⚠ CAUTION**

**Use only one (1) of these two (2) protocols.**

## 1. Gen Exercise

The Gen Exercise function will periodically start and run the generator to maintain the generator starter battery and lubricate internal parts of the generator on a regular basis. If run regularly and for long enough, Gen Exercise can also maintain an equivalent SOC among batteries in a bank.

Gen Exercise is in the Setup Menus. The example below shows the programming values for running the exercise once a week starting at 8:00 AM for 12 hours.



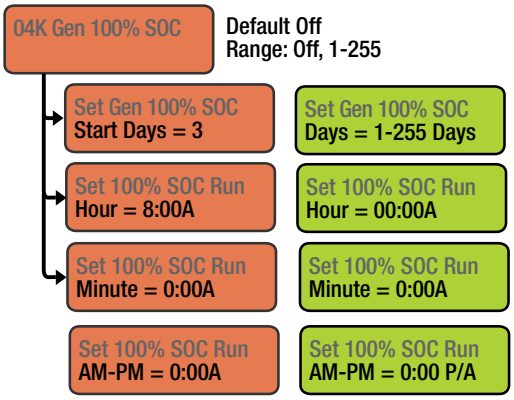

1. Press the SETUP Button on the PRO-Verter user interface (password may be required).
2. Navigate to 04H Gen Exercise. Press SELECT to enter this menu.
3. Enter and save the values best suited for your application into each of the fields. Start with the frequency (e.g., every seven days) and duration (e.g., 12 hours) as shown.
4. Confirm that the SOC of the System battery bank reported in METER 05B is 100%.
5. If the Expander Paks do not reach 100% SOC during the 12 hour period, increase the Gen Exercise the time until they do.

**Note:**

- Ensure that the System clock is set to local time.
- Ensure that the Max Gen Run Time (SETUP 04F) is greater than or equal to the duration of the Gen Exercise.

# 2. Gen 100% SOC

The feature “Gen 100% SOC” is designed specifically for the purpose of equalizing the SOC of all Expander Paks in an HPS to 100%. After the SOC of the bank has been below 100% for a programmable number of days (three in the example below), the PRO-Verter will start and run the generator until the bank is at 100% SOC. The time of day for this protocol to begin must also be set (see below). The length of time require to restore the bank to 100% will depend on the degree to which the bank of Expander Paks are discharged and the magnitude of the SOC difference when Gen 100% SOC starts.




1. Press the SETUP Button on the PRO-Verter user interface (password may be required).
2. Navigate to 04K Gen 100% SOC. Press SELECT to enter this menu.
3. Enter and save the values best suited for your application into each of the fields. Start with the frequency (e.g., every 3 days) as shown and at an appropriate time of day.
4. Confirm that the SOC of the System battery bank reported in METER 05B is 100%. .

**Note:**

- Ensure that the System clock is set to local time.
- Turn OFF Max Gen Run Time (SETUP 04F) to avoid generator shutdown before 100% SOC is achieved.
- The *Gen 100% SOC Start Days* setting uses information from the BMK’s *METER 05J Days Since 100% SOC* to determine how many days have passed since the battery bank has not been charged to 100% SOC.
- A valid SOC number must display in *METER 05B Battery SOC* for the BMK’s *METER 05J Days Since 100% SOC* menu to accumulate and display days (Think’n, No Comm, Internal Fault, Power-up Fault, or Unknown Fault ## are not valid SOC numbers).
- Once the BMK’s *METER: 05B Battery SOC* displays 100%, the AGS stops the generator and the BMK’s *METER: 05J Days Since 100% SOC* display resets to “0 days”.
- If the generator does not start at the scheduled time (i.e., AGS fault, generator runs out of fuel, etc.,), one more day must pass before another attempt is made to charge to 100% SOC.