

24VDC Li Expander Pak 2400 LED Battery Status Monitor

The status of individual Li Expander Pak 2400 batteries can be monitored using the Battery Status LED on the front of the case.

NOTICE

The 24VDC Li Expander Pak 2400 Battery Status Monitor LED does NOT indicate the battery state of charge (SOC). This LED indicates only the operating mode of the battery.

The 24VDC Li Expander Pak 2400 **BATTERY STATUS LED** is activated by pressing the “DISPLAY” button.



The Status LED provides information about the operational and error modes of the Li Expander Pak 2400. The meanings are in the table below.

Color	Frequency	State
GREEN	Blinking	Normal Operation
RED	Blinking	A RED LED will indicate one of the following issues: <ol style="list-style-type: none"> 1. The Pak is in a discharged fault condition 2. Short circuit (Charge or Discharge) 3. Over current (Charge or Discharge) 4. Over temperature (>160 °F/71 °C) 5. An internal battery fault (such as a broken wire, etc)
Amber	Steady On	Battery is in “FLOAT” mode or SOC may have exceeded 100%. (The battery will function normally when the LED is solid or blinking AMBER . Once the battery is discharged to 99% SOC it will turn GREEN again.)
None	None	Battery is inoperative or LED is not functioning properly.



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NOTICE

If the instructions provided below do not solve your **RED**, **AMBER** or **NO-LIGHT** LED conditions, please contact:

Solar Stik Technical Support Line

800-793-4364 Ext. 102

(24 hours a day, 365 days a year)

Resolving **RED** and **AMBER** LED Conditions

RESOLVING A **RED**-LED CONDITION:

Remove the Li Expander Pak from the AES. Allow the battery to rest with the POWER switch in the ON position for 5 minutes, then check the LED STATUS:

- If the LED is **GREEN**, ensure the ports and connectors for the Li Expander Pak 2400 are clean and that the Inter-Connect cables are in good condition. Then reinstall the Expander Pak into the battery bank and charge normally*.
- If the LED is still **RED**, apply a charging source until the LED turns **GREEN**.
- If the LED remains **RED** after 24 hours of charging, the underlying problem is not the charge level of the battery but rather something internal. If so, the Expander Pak may need to be returned to Solar Stik for assessment, repair, or replacement.

*If only one Li Expander Pak 2400 in the Bank displays a blinking **RED** Battery Status LED, and the situation is resolved fairly quickly after isolating the Li Expander Pak, then the cause of the blinking **RED** LED is most likely an over temperature or over current fault registered by the Li Expander Pak's own internal Battery Management System. When the LED returns to **GREEN** and the Li Expander Pak is reintegrated into the system, the Battery Status should be monitored frequently until it is clear that it will continue to function properly. If the **RED** LED fault reappears quickly after several attempts to clear the **RED** LED fault, then it is likely that the Li Expander Pak should be sent to Solar Stik for assessment, repair, or replacement.



RESOLVING AN **AMBER**-LED CONDITION:

An **AMBER** LED indicates normal behavior. The **AMBER** LED (solid, not flashing) indicates that the Expander Pak battery is fully charged or may have been slightly overcharged. This can occur with individual Expander Paks even when multiple Expander Paks are connected in parallel and cycled together. This is because the fully charged point that exists with this battery chemistry is uniquely balanced by each individual battery's Battery Management System (BMS). If the Li Expander Pak is disconnected from the circuit and either left alone (no load), or a load is placed on the battery, the LED should start to blink **GREEN**.

While the battery BMS has only a solid, non-blinking **AMBER** program in it, a blinking **AMBER** LED indicates that the LED is being turned on and off. This is caused by the Li Expander Pak 2400 battery going into and out of an overcharged condition, and may indicate that the charging voltage of the PRO-Verter or the Power Hub is set too high. The power output of the Expander Pak battery is still functional; however, the battery's BMS is simply protecting itself from any more charge going into it.



Resolving NO-LIGHT LED Conditions

Background

If the Status LED does not emit light when the button is pressed, it is almost certainly due to abuse of the Expander Pak. The damage that is responsible for the failure of the LED to emit light could be direct or indirect. Proper care, maintenance, and preventive measures (discussed at the end of this section) can provide a high degree of assurance that this problem will not be encountered.

Types of damage:

- Intrusion of water or particulates could cause transient or permanent failure of internal components, including the LED or its electrical connection to the battery.
- Severe mechanical or physical shock (sudden acceleration caused, for example, by impact, drop, earthquake, or explosion) could cause damage that results in the failure of the LED, or other internal components that result in no light being emitted from the LED.

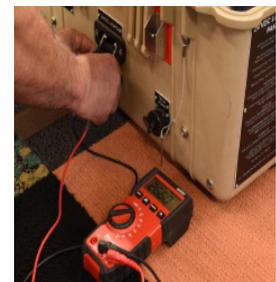
The steps below will isolate and identify the problem.

Disconnect the Expander Pak from the battery bank and system circuit.

1. Turn on the master breaker (“Power”) switch and measure the voltage across the terminals of the Inter-Connect port.

A reading of 20.0 volts (which is the “terminal disconnect voltage”) or less indicates that the battery BMS has disconnected the batteries. The LED will report the status of the battery less frequently as the BMS reduces activity to reduce the draw from the battery. “Phantom voltages” may also be observed. These may be variable and are not an indication that the BMS has reconnected the batteries to the Inter-Connect terminal.

Please see Technical Bulletin 5 for a complete explanation of how the BMS works.





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Turn off the main breaker switch (power switch) for safety before moving on to the next step.

2. Remove the fasteners.

Remove four (4) screws from the top of the Expander Pak 2400 and unlatch the four (4) latches.

3. Open the lid

With the Power Switch in the OFF position, open the lid and immediately, visually inspect the interior of the case for damage or water or particulate intrusion.

If water has pooled in the interior, keep the Expander Pak on a flat surface to prevent water from deep-pooling at the low end of the tilt. This could cause submersion and damage to internal parts. Remove the drain plug and let the water drain until it stops. Then **slowly and carefully** tilt the Li Expander Pak toward the drain hole until the pooled water is gone.

If water has condensed on any surface, carefully dry the water with a nonconductive cloth.

Let any remaining water evaporate until the interior is dry.

Turn on the main power switch ONLY after the interior of the Li Expander Pak is COMPLETELY DRY and proceed with the following steps.

4. Visually confirm that the MKM battery, BMS indicator, LED light is working properly.

It should be flashing **GREEN** if the battery is charged—or at least the voltage is above 20.0 volts. If this LED is flashing, the issue with the Status Indicator LED on the front of the Li Expander Pak 2400 is “downstream” from that point.



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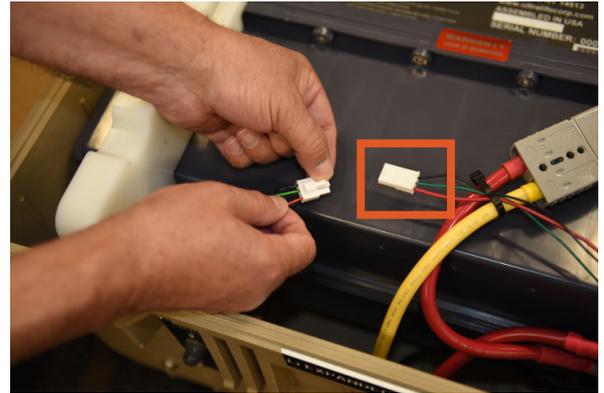


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5. Inspect the white plastic Molex connector for damage.

Tug gently on the three (3) wires inserted into **both ends** of the connector to see if there is a bad crimp or improperly seated pin. The three wires that enter the battery end of the Molex connector are wired into the circuit for the LED on the side of the battery. When it has been determined that the wires are properly seated into this connector, move on to the next step.

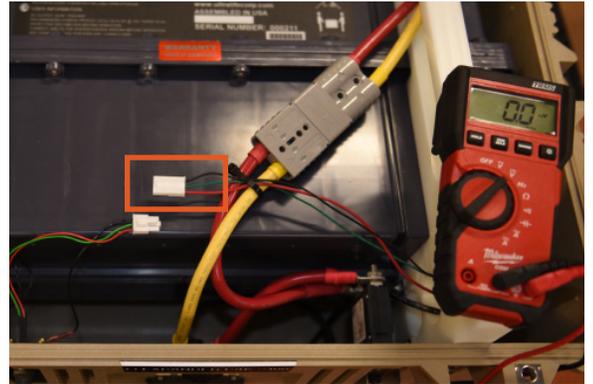


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6. Measure the voltage across each of the wires.

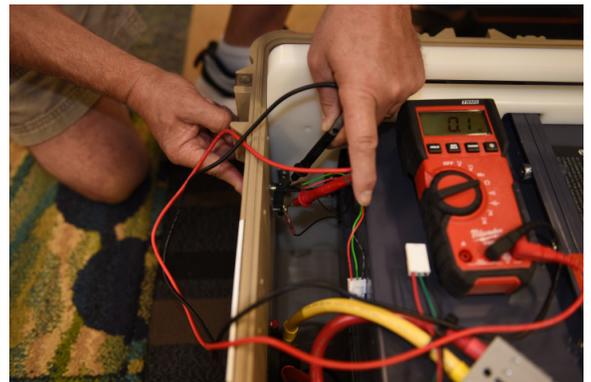
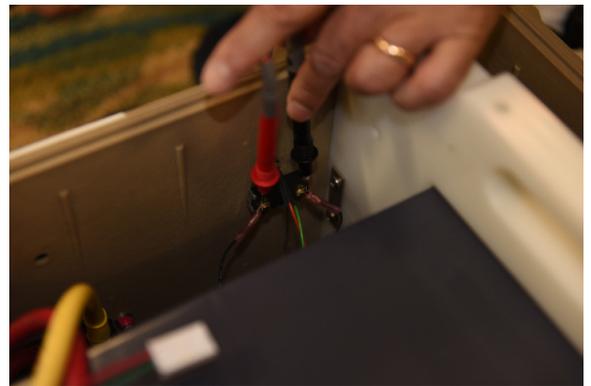
Insert the probes into the holes of the battery side (male-end) Molex connector. Measure: Red to black and green to black. These should produce intermittent voltages of ≤ 2.0 mV. If these voltages are present at these points, move to the next step.

NOTE: The thicker gauge of some lead probes can make it difficult to make electrical contact inside of the connector. If a zero (0) reading is observed, ensure that it is not due to failure to make electrical contact.



7. Check the momentary switch for loose connections and perform a continuity test.

Set the meter to DC Ohms for continuity. The reading should be infinite when the Battery Status Button of the switch is depressed and 0.00 when the button is released.





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Summary

One of the tests or observations described above should provide the answer to the specific reason for the no-light LED situation. If a battery is properly maintained and has not experienced abuse, it is unlikely that this situation will be encountered.

Temporary LED failure due to moisture intrusion has been observed. Ensure that the interior and all components are dry if the cause of the no-light condition is not resolved by any of the steps above.

The service environment of the Expander Pak will vary. In any environment, it is critical that the interior of the Expander Pak (and all other System Components) remains dry. Water may enter the Expander Paks by submersion or condensation.

Preventative measures:

If the Expander Paks are exposed to standing or blowing water, several representative Expander Paks should be selected for inspection as soon as possible. Disconnect the Expander Paks from the circuit and turn off the Expander Pak main breaker to prevent the potential for electrical shock. Open the lid, as described above for inspection. If water is found in the interior of any of the Expander Paks, inspect all Expander Paks and dry them as necessary.

If dew is present on a regular basis in the service environment, check for moisture in the interior of several representative Expander Paks at least once each month. If water is condensing in the interior, open all Expander Paks and dry the interior of each. Increase the frequency of inspection to the point necessary to prevent the accumulation of water in the interior.

If dew is infrequent in the service environment, check the interior of several representative Expander Paks every third month and dry the interior as necessary. If water has condensed on interior parts, dry them completely before returning them to service.



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