



Orion BMS Tap Validation Tool

Product Manual



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Product Description

The Orion BMS tap validation tool is used to verify the correct wiring of the cell voltage tap harnesses connected to the main Orion BMS unit. Since the BMS is a centralized design, there are many wires connected to the main unit (one tap wire per cell). This can present a wiring challenge in some instances. The tap validation tool can alert the installer if the harness is wired incorrectly such that the BMS could be damaged or read invalid voltages.

The tap validation tool is available for purchase or for rental. Please contact Ewert Energy Systems for more information on the tool's availability.

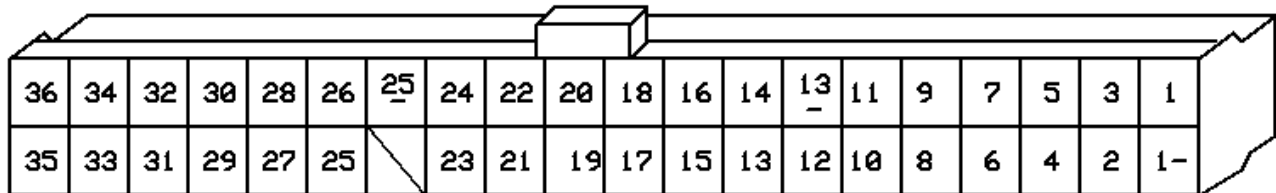
Product Highlights

- Works exclusively with the Orion BMS from Ewert Energy Systems (BMS sold separately).
- LCD screen for superior feedback.
- Can handle 1 full 36 cell tap harness connector at a time.
- Operates off of a standard 9v battery.

Wiring

There is only one connector used on the cell tap validation tool, the cell tap harness connector.

Cell Tap Harness Connector



Away from Board
(Wire Side)

The above diagram provides the pinout for the cell tap voltage harness connector that is plugged in to the cell tap validation tool.

Operation

The operation of the cell tap validation tool is fairly straightforward. There is a switch on the unit for turning on and off the power and a button for selecting through the various screens (see diagram above for details).

- Pressing the main button in the middle will move throughout the various screens described below.

- The cell tap validation tool will only update the stored information (identified problem areas and cell voltages) once the user navigates past the "Please Press Start To Begin" screen. The tap validation tool will loop through all screens (including the "Please Press Button To Continue" screen) indefinitely by pressing the button.

NOTE: The voltage tap connector should not be left connected to the tap validation tool longer than necessary. Even while switched off, the tap validation tool draws small amounts of energy from the cells while it is connected and can drain the battery pack over time. This can also create a balance problem between multiple sections of the battery.

NOTE: The voltage tap connector should be disconnected from the tap validation tool while any changes or modifications are being made to the wiring harness.

Start Screen



This screen is shown when the device is first powered up and follows the "Voltages Screen". Once the user scrolls past this screen the device will perform it's evaluation of the cell tap harness connector. These values are only updated once the user scrolls past this screen.

Connector Overview Screen



This screen gives the overall status of each bank (a bank is comprised of 12 cells and there are 3 banks on a connector). The value will either be "**Good**", "**Warn**" or "**Error**".

- **Good** means the individual bank in question is properly wired and no problems are detected.
- **Warn** indicates there may be problems with the bank though it is possible that the connector is still wired properly (it will warn if there are cells skipped at the end of the connector or if the bank voltages do not continue to grow in voltage--both of which may be desirable depending on configuration).
- **Error** means there is a critical problem detected in the bank (it should flash to catch the users attention). This problem could damage the BMS if it is not corrected before plugging the connector in to the BMS and should be addressed immediately.

Bank Overview Screen



This set of screens (one screen for each of the 3 banks) shows each cell within each bank individually. The cells are labeled with letters that correspond to the status of each cell.

The numbers along the top and bottom indicate the number that corresponds to the adjacent cell (immediately above or below the numbers). The number is

- **'C'** indicates the cell is correctly wired as far as the tap validation tool is able to verify.
- **'N'** indicates that the measured voltage at the negative wire does not match the previous cell voltage (ie: the measured voltage 13- does not match the measured voltage of 12). This can indicate that the installer accidentally skipped a cell in the pack. This warning can show up in a correctly wired pack if the installer is intending to monitor the same bank of cells multiple times within the same connector (for parallel monitoring or pack redundancy).
- **'X'** indicates a critical error with the cell. This could indicate that a negative voltage is detected between the cell in question and the previous cell (ie: the previous cell voltage is higher than the current cell indicating they are backwards). This error could also indicate that the measured voltage between the current cell and the previous cell is greater than ~5V (indicating a cell was skipped which would cause damage to the BMS since the BMS can only measure cells from 0.5v to 5v).

NOTE: If cells are skipped at the end of a bank, all the remaining cell tap wires must be tied to the positive most cell in that bank (A common cause for this fault). Failure to do so can significantly reduce voltage sensing accuracy.

- **'S'** indicates that a cell may have been skipped accidentally. This usually means that the previous two cell voltages are equal to each other and the current cell voltage is greater than 0. The Orion BMS does not allow for cells to be skipped (unpopulated) in the middle of a bank (ie: one cannot populate cells 1-3, skip 4 and continue with 5-12).
- **'Z'** indicates that the cell is reading 0v. This does not necessarily indicate an error as some cells are intentionally skipped

Bank Voltages Screen



This screen is used to display the measured voltages on the cell tap harness connector pins with respect to 1- (that is, the negative most cell on the connector). The voltages displayed are in increments of 100 mV.

NOTE: This screen does not report the actual cell voltages but rather the voltages measured between each cell and the negative of the negative (-) most cell on the connector (cell #1-). This means that the positive most cell (cell #36) should read the full voltage of the whole connector (often around 118 volts if fully loaded)

Troubleshooting

Problem Symptoms	Likely Cause & Solution
The LCD screen does not turn on.	<ul style="list-style-type: none"> • Verify that the power switch is flipped ON (try both directions). • Verify that the 9v battery is good with a multimeter or replace it with a known good battery.
The cell tap validation tool tells me there is an error with my wiring but I know it is correct.	<ul style="list-style-type: none"> • Not all warnings are actual problems. The cell tap validation tool is primarily looking for errors that will cause damage to the BMS. It's secondary goal is to look for common wiring mistakes made with normal configurations. Special configurations (such as monitoring the same bank multiple times on the same connector) may set warnings but these can be safely ignored in these instances.
The voltages table is showing cell voltages way above what they should be (my cells are 3.2v but it's showing 17v and 20v and so on).	<ul style="list-style-type: none"> • This is normal. The "Voltages" screens do not show the actual cell voltages, but rather the voltage measured between the given cell and the negative (-) most cell (cell #1). This provides a more useful readout for diagnosing and correcting problems. • The actual cell voltages can be determined by subtracting the previous cell voltage from the cell voltage you are trying to determine.
I have fixed the problem that the tool detected, but the tool is still telling me the problem exists.	<ul style="list-style-type: none"> • The tool will only update it's internal error calculations and voltage readings once you scroll past the <u>"Please Press Start To Begin"</u> page. Make sure you have scrolled past this screen at least once after you have modified the wiring harness. • Verify that the wiring changes are correct with a multimeter.

Electrical & Product Specifications

Tap Validation Tool Dimensions:

10.8 cm (W) x 22 cm (L) x 9.2 cm (H)

Item	Min	Typ	Max	Units
Supply Voltage (9v internal battery)	6	9	16	Vdc
Operating Temperature Range	-20		80	C
Module Weight		14.1		oz



An Ewert Energy Systems, Inc Product

The Orion BMS and this validation tool are designed and manufactured by Ewert Energy Systems, Inc which is a research & development company focusing on developing solutions for plug-in hybrid and electric vehicles. Ewert Energy provides custom solutions as well as off the shelf components.