



DTC P0A0D - Cell Voltage Over 5V Fault

Product Family	Fault Supported
Orion BMS [Original] (24 - 180 Cell)	NO
Orion BMS 2 (24 - 180 Cell)	YES
Orion JR [Original] (16 Cell)	YES
Orion JR 2 (16 Cell)	YES

FAULT DESCRIPTION

IMPORTANT WARNING: The cell tap harness should be immediately disconnected from the BMS if this fault code is set. Leaving the harness connected to the BMS is likely to cause damage to the BMS and may indicate that a cell is severely overcharged. Incorrect wiring may pose a fire and/or personal safety hazard or may lead to cell damage. Never continue to use a damaged BMS unit!

This fault code is triggered if the voltage of an individual cell (as measured by the BMS) exceeds 5.0 volts. This fault code will only trigger after a number of samplings to prevent false positives. If this fault triggers, it will cause the BMS to enter into a voltage failsafe condition disabling all charge and discharge.

This fault can be caused by incorrect cell tap wiring, a loose or disconnected cell tap, a blown fuse inside the BMS, a high resistance or loose busbar, a cell which is actually over 5 volts, or from internal damage to the BMS unit due to previous wiring faults. This fault code should always be immediately investigated as the BMS can be damaged by cell voltage readings above 5.0v and as there may be other dangerous conditions such as over-charged cells.

The Status LED on the BMS will rapidly flash red when this fault code is present to alert the operator to disconnect the BMS immediately.

SAFETY WARNING: Cells which have been over-charged or over-discharged may not be safe to use even after bringing the voltage into a correct range. A cell which has previously been over-charged or over-discharged at any time may develop internal damage, compromising the

safety of the cell. Always consult the cell manufacturer for advice on whether a cell can be safely used after an over-charge or over-discharge event.

Fault Code	Fault Description	Possible Trouble Area
P0A0D	One or more cell voltages are measured above 5.0vDC	<ul style="list-style-type: none"> • High Voltage Battery Assembly • Cell Wiring Assembly • Internal BMS Fault

FAULT BEHAVIOR

This fault will trigger **Voltage Failsafe Mode** which will inhibit the BMS from allowing charging or discharging of the battery pack.

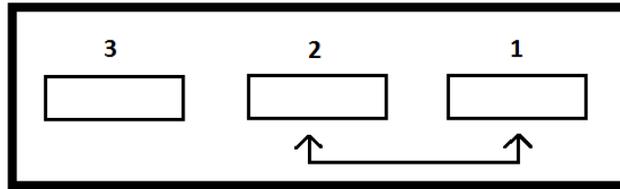
FAULT THRESHOLDS

Fault will trigger when the following condition is satisfied	(a)
(a) Cell voltage registers as over 5vDC.	One or more cells within the pack are measured at or above 5.0vDC

DIAGNOSTIC STEPS

1.	<p>Immediately disconnect the cell tap wiring harness(es) from the BMS.</p> <p><u>Always unplug the cell tap harnesses from the BMS immediately when this fault occurs.</u></p>
2.	<p>Immediately disconnect any battery chargers or loads from the pack.</p> <p>If a charger is malfunctioning or failing to turn off it may be severely over-charging the battery pack. Make sure no charging sources of any kind are connected to the battery pack.</p>

<p>3.</p>	<p>Verify that the cell tap harnesses are properly wired.</p> <p>If the cell taps are not wired properly (eg: a reversed wire or tap, or if more than 1 cell in series is being measured by a single cell tap) could cause the BMS to see more than 5v on a particular input. This can quickly damage the BMS as the inputs on the BMS are only designed to measure up to 5vDC.</p> <p>IMPORTANT NOTE: Some lithium cell modules (such as Nissan Leaf modules, for example) actually have 2 or more cells connected in series inside them. All Orion BMS products require one tap per cell connected in series (eg: one tap per 3.3v or 3.7v cell). See the Orion BMS wiring manual for important details.</p> <p>The tap validation tool is designed to check the voltage of each cell tap and indicate when wiring errors are found. The tap validation tool can locate completely disconnected wires and wires that are very high resistance. It is possible that if wires are intermittently loose or only moderately high impedance, that the tool may not find them. If a tap validation tool is not available this testing can be performed with a hand-held multi-meter (see wiring manual for details).</p> <p>NOTE: Please review the product wiring & installation manual to ensure that all minimum requirements are met for the product being installed. Some products require a certain amount of cells to be loaded to function correctly.</p> <p>Correct any wiring issues found.</p> <p>Once the cell wiring is verified then proceed to the next step.</p>
<p>4.</p>	<p>Clear the fault codes on the BMS.</p> <p>The fault codes on the BMS will need to be cleared through the BMS utility before proceeding. This can be done on the "Diagnostic Trouble Codes" tab in the utility.</p>
<p>5.</p>	<p>Attempt to reconnect the cell tap harnesses.</p> <p>Once the cell wiring is verified to be correct, attempt to reinsert the cell tap harnesses into the BMS. If the fault immediately returns the BMS may be damaged. Verify the accuracy of all reported cell voltages manually to ensure the readings are correct.</p>
<p>6.</p>	<p>If possible, attempt swapping the order of the cell tap connectors.</p> <p>On BMS units that support multiple cell tap harness connectors (standard Orion BMS units over 36 cells), swapping the connector locations on the BMS around is a very useful test that can help identify if the problem is located in the wiring harness or with the unit itself.</p>



Example of swapping connectors #1 and #2 to test the wiring harness.

This procedure is possible since each cell tap connector on the BMS is isolated from the other cell tap connectors with 2.5kV isolation, however since the electronics inside the BMS are not populated for smaller units, it does require a minimum of a 48 - 72 cell size BMS for this to work depending on where the fault is. If it is not possible to swap the order of the connectors, it may be possible to swap out the entire BMS unit with a spare unit if one is available.

If the problem follows the harness (ie: the issue moves from cell 5 to cell 41) then the problem is with the wiring itself. If the problem remains on the same cell despite swapping the affected connector, the problem most likely internal to the BMS and may require servicing.

7. Download the freeze frame for the fault code using the BMS Utility.

The BMS will normally produce a freeze frame on the "Diagnostic Trouble Codes" screen in the BMS Utility when this fault code occurs that contains a comprehensive list of BMS data parameters at the time the fault occurred. **It is strongly recommended that the freeze frame be downloaded from the BMS and saved to disk before the fault is cleared again** as this data may assist in the future if further diagnostics are required. Additionally this freeze frame data may be requested by Technical Support if further assistance is required.

NOTE: Only Fault Codes with a (F) next to them have freeze frame data available for download. If there is no (F) next to the fault, there is no stored freeze frame available and this step can be skipped.

Steps to download the Freeze Frame:

- 1) Connect to the BMS using the Orion BMS utility.
- 2) Click the "Diagnostic Trouble Codes" tab at the top.
- 3) Select the correct fault code by clicking on the ID on the left side of the screen to initiate the Freeze Frame retrieval.
- 4) Once the retrieval process is complete, click the "Export (CSV)" button to save the freeze frame data to the computer disk.

7. If the problem persists, contact technical support.

If all above steps fail to determine the cause of the fault then additional support is needed.

Please contact the company or reseller that the BMS was originally purchased from for additional questions, warranty claims, repair requests and technical support.