DTC P0A02 - Weak Pack Fault

Product Family	Fault Supported
Orion BMS [Original] (24 - 180 Cell)	**YES**
Orion BMS 2 (24 - 180 Cell)	**YES**
Orion JR [Original] (16 Cell)	**YES**
Orion JR 2 (16 Cell)	**YES**

FAULT DESCRIPTION

This fault is triggered when the pack state-of-health falls below the value programmed into the BMS profile that indicate when a battery pack is considered "weak". A low state-of-health measurement is calculated 50% based on pack capacity and 50% based on cell resistance. For more information on how state of health is calculated, please see the operational manual.

This error code is designed to alert a user to if the battery pack has degraded and is weak, **this error is triggered based only when pre-programmed conditions are met and does not necessarily indicate a weak is actually weak since the error threshold may be set wrong.** This error may be falsely triggered by incorrect profile settings, a battery pack with an abnormally low state-of-charge or by malfunctioning thermistors which are not accurately reading the pack temperature.

Fault Code	Fault Description	Possible Trouble Area
P0A02	Pack health has dropped below a programmed minimum value	• Battery Pack Assembly • Configuration Settings

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FAULT BEHAVIOR

This fault is **Informational Only** and does not alter the operation of the BMS in any way.

While this error code will not impact the operation of the BMS, this error message likely indicates a problem exists and the actual problem itself (not this error code) may cause the BMS to limit charge or discharge current. A degraded battery pack may result in degraded performance for other reasons such as low capacity or high resistance.

FAULT THRESHOLDS

Fault will trigger when the following condition is satisfied	(a)
(a) The Pack Health drops below the programmed minimum allowed value.	If the BMS determines the pack health to be below a programmed threshold.

DIAGNOSTIC STEPS

1.	**Check if P0A80 (Weak Cell Fault) is present.** If any Weak Cell Faults are present those should be addressed first as they may be significant contributors to the overall reduction in pack health. A single bad cell could result in a profound reduction in capacity.
2.	**Verify that the correct current sensor is selected.** If the wrong current sensor is selected that may cause the BMS to incorrectly identify the pack as weak. It also may result in incorrect capacity / State of Charge calculations. Visually inspect the markings and model number on the current sensor to verify that it matches the current sensor selected in the BMS profile settings.
3.	**Verify thermal compensation settings.** If this fault shows up when cold check the thermal compensation settings to ensure proper resistances are specified for lower temperatures. Cell resistances rise exponentially when battery temperature drops and if settings are incorrect, can easily trigger a false error message. Likewise, ensure thermistors are able

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	to accurately and correctly measure cell temperatures. If cells are split into different physical boxes in different locations, ensure each box has at least one thermistor so that the Orion BMS is aware of the coldest part of the pack.
4.	**Verify that the programmed cell resistance values are accurate.** One aspect that the BMS uses to determine if the pack is within healthy tolerances is to evaluate the expected (nominal) pack resistance versus the observed (measured) pack resistance figures. If the measured resistance is higher than the expected resistance, this reduces the pack state of health calculation. If the programmed nominal (expected) resistance values are too low, the BMS may be incorrectly or prematurely reducing the observed state of health. Please see the BMS Operation Manual for details on how this calculation is performed.
5.	**Verify that the State of Charge drift correction points are correct.** The other aspect that the BMS uses to determine pack health is the observed (measured) pack capacity. If the State of Charge calculation is not accurate, this can result in the BMS observing an abnormally low capacity which would reduce the observed state of health. It is important that the State of Charge correction (drift) points be calculated properly to maximize accuracy so that the BMS can get a true sense of available capacity. Please see the BMS Operation Manual for details on how this calculation is performed, and optimal strategies for determining appropriate State of Charge drift points.
6.	**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.

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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.**

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