DTC P0A10 - Pack Too Hot Fault

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

FAULT DESCRIPTION

IMPORTANT WARNING: This should be considered a critical fault as there may be dangerous conditions present within the battery pack which could lead to thermal runaway.

This error is set when the BMS detects that the highest battery pack temperature measured is above the programmed maximum pack temperature value for at least 30 seconds. A secondary sub-code is set if this condition is met for at least 30 minutes.

Fault Code	Fault Description	Possible Trouble Area
P0A10: Subcode 1	Highest measured pack temperature exceeds maximum allowed temperature for more than 30 seconds.	- Battery Assembly - Thermistor Wiring Assembly - Configuration Settings
P0A10: Subcode 2	Highest measured pack temperature exceeds maximum allowed temperature for more than 30 minutes.	- Battery Assembly - Thermistor Wiring Assembly - Configuration Settings

FAULT BEHAVIOR

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

NOTE: While this fault does not directly impact operation of the BMS, it is assumed that the underlying causes for the fault (excessively high temperatures) will impact the calculated current limits / enable outputs depending on how the BMS is configured. It is very important that the current limit calculation settings be reviewed to ensure expected operation when the pack temperatures are observed to be too hot.

FAULT THRESHOLDS

Fault will trigger when the following conditions are satisfied	(a) **or** (b)
(a) Battery pack highest measured temperature exceeds programmed "Pack Too Hot" maximum allowable temperature threshold for 30 seconds.	One or more battery thermistors are continuously registering higher than the maximum programmed temperature for at least 30 seconds or longer.
(b) Battery pack highest measured temperature exceeds programmed "Pack Too Hot" maximum allowable temperature threshold for 30 minutes.	One or more battery thermistors are continuously registering higher than the maximum programmed temperature for at least 30 minutes or longer.

DIAGNOSTIC STEPS

1.	**Inspect the battery pack assembly and cool pack if necessary.**
	Determine whether the pack is legitimately too hot. If it is, additional cooling action may be needed to bring the pack back to within normal operating temperature range while diagnosing the issue.

2.	**Verify programmed maximum temperature range is properly set.**
	The threshold for this fault code can be configured on the "Fault Settings" tab of the BMS profile utility settings under "Set a Pack Too Hot fault if the temperature goes above X". This value should be set in accordance with the battery cell manufacturers recommendations. If it is set too aggressively (too low) then this fault may be triggering prematurely during normal operation.
3.	**Inspect and validate the battery thermistor wiring harness assembly.**
	A malfunctioning or inappropriately placed battery thermistor probe can cause this fault to be set erroneously. The following situations may be occurring: 1) **One or more thermistor wires may be damaged**, resulting in incorrect or improper temperature readings. Typically this would result in the setting of a P0A9C (Battery Thermistor Fault) but it is possible for a thermistor to be damaged such that it does not also report this fault if the damage is mild or intermittent. If one thermistor in particular is reading significantly higher than the rest, or is rapidly changing, that may be an indication of damage. Damage may include a wire being cut, crushed, snagged or punctured and the wires may be getting shorted to each other, ground or some other voltage source within the application. Visually inspect any suspect thermistor completely, including the wiring leading back to the BMS. 2) **A thermistor may have come free**. If a thermistor has come free from its' original mounting location (ie: the adhesive has broken or become loose) this could cause the thermistor to come in contact with an unintended surface such as a battery charger casing or motor winding which may be significantly warmer than the battery pack itself is. Ensure that all thermistors are properly fastened to monitor the battery cells. 3) **A thermistor may be inappropriately placed**. For example, if a thermistor (which is black) is placed in a location where it might be exposed to direct sunlight, this may cause it to read significantly hotter than it otherwise should be due to thermal gain. Or if a thermistor is placed directly next to something that heats up (charger, motor, radiator, etc) that may also negatively impact readings. Thermistors should be placed such that they are not in direct sunlight and are in direct contact with the battery cell chassis to provide an adequate representation of the temperature of the cell itself.
4.	**Determine if additional cooling is necessary.**
	If the thermistor wiring assembly is in good order and reading properly, the battery pack may require additional cooling capacity to keep up with the amount of generated heat. If the battery pack assembly is unable to dissipate the amount of heat generated during normal operation, the temperature will eventually reach the maximum threshold and trigger this fault.

	Regularly operating the battery pack at elevated temperature will reduce the lifespan of the battery pack and can result in decreased performance.