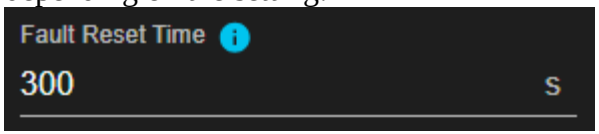
Please note, system warranty is voided if any changes to the system are not done by a licensed electrician or one of our certified technicians. If in need of certification go to https://certification.lionenergy.com/

Notes:

If the green “Normal” light is flashing and there are no alarms, check the remote shutdown switch. Read register 0x1404 to get the status of the switch.

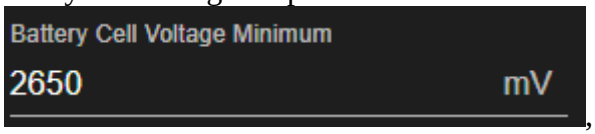
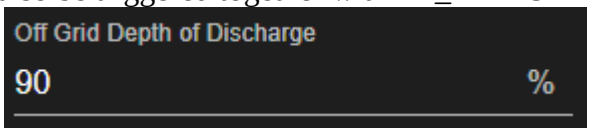
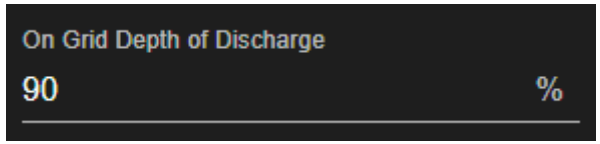
If any alarm persists after troubleshooting, please contact the Lion Energy ESS Support team (see guide for when to use) (435) 244-3352.

Code	Name	Description	Troubleshooting
A1_0	Over-Current Discharge	This alarm occurs when the load is drawing too much power from the battery (usually when the grid is down).	Either wait several minutes for the alarm to clear, or power cycle the inverter. It should clear after that. Limit load usage to 8kW total (4kW per leg max) per inverter.

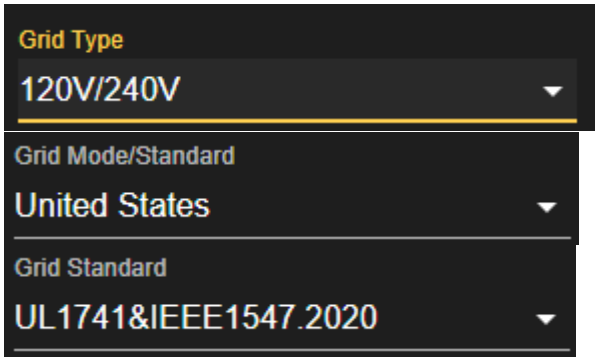
A1_1	Over-Load	This happens when the inverter shuts down due to too much power on the load (over 8 kW). It also can trigger this alarm when the load power is more than the available PV + battery power.	The alarm will clear on its own if you wait up to 17 minutes, depending on the fault restart time setting, which can be up to 1000 seconds depending on the setting:  We recommend turning off high power loads such as appliances with motors until it powers back on. This can be done by turning off backup load breakers. You can power-cycle the system to clear this alarm as well if you don’t want to wait. If this does not clear the fault, contact Lion Energy’s ESS Support team.

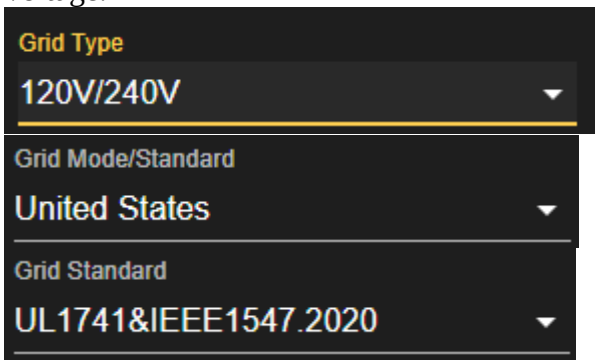
A1_2	Battery Disconnected	This alarm can be triggered when: • The BMS has disabled discharging • The battery is disconnected. • The battery circuit breaker is tripped.	Go to the Lion Energy app and use the compare function to check the battery voltage on the inverter vs. batteries. If the inverter is around 11V, try using the battery wake-up function. Within one minute, the inverter should raise the battery terminal voltage to at least 51V. When the battery senses charging current, it should re-enable itself. If the battery's internal voltage is greater than the inverter's battery terminals, it won't see charging current and won't re-enable. If the green LED on the front panel stops flashing, that worked. If it's still flashing, re-read the alarms to see if the A1_2 alarm is still active. If the wake-up function didn't work, disconnect the positive cable from each battery. Wait at least ten seconds. Reconnect all batteries. If there is only one battery, disconnect the positive cable again within 10 seconds, then wait ten seconds and reconnect the positive cable. The following steps are for qualified technicians only: If disconnecting the battery cables didn't work, disconnect the positive and negative battery cables from the battery and measure voltage at the battery terminals. • If it measures zero volts (open circuit), remove the front panel of the

			battery and check the circuit breaker. If it was tripped, reset it. Measure the cell voltages. If any cell is less than 1400 mV, the battery should be replaced. If the maximum to minimum cell voltage difference is more than 700 mV, the lowest cell needs to be charged until the cell voltage is greater than the next lowest cell. If using a power supply to charge a cell, don't set the open circuit voltage on the power supply to greater than 3.65V. • Use caution while charging low cells. If one cell is charged too much, it may result in the battery cells becoming out of balance. Once the highest cell voltage reaches 3.65V, the BMS will disable charging. Double check battery connections. Measure continuity between the battery cables and the inverter terminals. Try power-cycling the inverter.

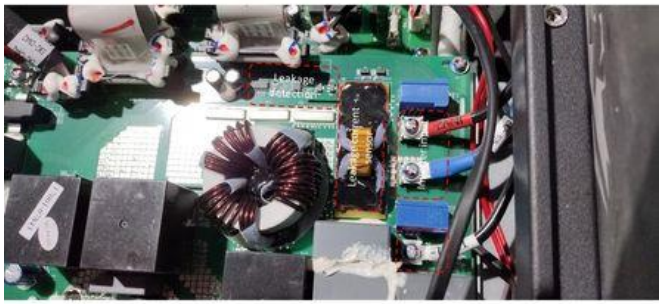
A1_3	*Battery Under-Voltage/ Battery Under Capacity	This happens when a battery state of charge (percent) is below the desired/target state of charge. (ie. target is 20% and you're currently at 15%, or target is 70% and battery is at 65%). Default depth of discharge (DOD) is 90% If any cell voltage drops below the minimum cell voltage setting  , then it will trigger this alarm. It can also be triggered from BMS com failures. This alarm could also be triggered together with A1_4 if BOTH the off-grid DOD  and on-grid DOD  are set to a SOC less than the current SOC. This alarm can usually be ignored. It can happen after a power outage and batteries get discharged to below the target state of charge. If you live in a jurisdiction where charging batteries from the grid is not allowed, you need to wait for solar power to be greater than the load power so it can start charging the battery back above the target SOC.	Most times it happens when an inverter is first powered on and will clear on its own after a minute or so. If it does not, double check battery voltage and depth of discharge settings. If it is past the depth of discharge, change DOD value or allow batteries to charge to SOC target. If all else fails, power cycle the inverter. 1. Wait for solar and/or grid to charge the battery. 2. Change target state of charge (percent) below actual battery state of charge/percent. 3. If grid charging is not allowed, enable Keep Battery Full Mode (Emergency Mode) to use grid power for loads and charge the battery from solar. 4. Check Time of Use Settings and ensure Grid Charge is enabled (if allowed by your jurisdiction). 5. Check advanced settings and ensure Solar Charge Only is disabled

A1_4	*Battery Low Voltage/ Battery Low Capacity	This alarm is triggered when: • The BMS sends status byte 1, bit 5: “cell under voltage”. • Either the off-grid DOD or on-grid DOD is set to a SOC less than the current SOC.	Most times it happens when an inverter is first powered on and will clear on its own after a minute or so. If it does not, double check battery voltage and depth of discharge settings. Allow batteries to charge above DOD target. If all else fails, power cycle the inverter. Also refer to alarm A1_3 troubleshooting.
A1_5	Battery Over-Voltage	This happens when battery is over the voltage limit.	This alarm occasionally happens when the inverter powers on. It should clear on its own after a minute or so. Check the battery voltage. If the battery voltage is less than 58V, power-cycle the inverter.

A1_6	Grid Low Voltage	This happens when the grid input voltage is below the minimum grid voltage.	This alarm occasionally happens after a firmware update and should clear on its own after about five minutes. 1. Check grid input lines (L1 and L2. Target range should be 120V). 2. Ensure all inverters are connected to the grid and breakers are turned on. 3. Ensure grid is turned on. 4. Make sure grid settings are set to 120v/240v. Check actual grid voltage and settings that set the grid voltage.  If that all looks right and it doesn't clear, try a power cycle.

A1_7	Grid Over-Voltage	This happens when grid input voltage is above the maximum grid voltage.	Occasionally happens when inverter powers on, sometimes clears on its own. Check actual grid voltage and settings that set the grid voltage.  If that all looks right and it doesn't clear, try a power cycle.

A1_8	Grid Low Frequency	This happens when grid input frequency is below the minimum grid frequency.	Occasionally happens when inverter powers on, usually clears on its own. 1. Check the setting for the grid standard. 2. Compare measured grid frequency to the inverter's reading of grid frequency. 3. Check grid re-connect frequency settings. 4. Ensure all inverters are connected to the grid and breakers are turned on. 5. If using a generator, check generator frequency settings or reduce battery charge current from the generator. If that all looks right and it doesn't clear, try a power cycle.
A1_9	Grid High Frequency	This happens when grid input frequency is above the maximum grid frequency.	Occasionally happens when the inverter powers on or after a firmware upgrade. It usually clears on its own. See troubleshooting steps in A1_8.

A1_10	Leakage Current (GFCI Fault)	On the top right of the main board, there is a current sensor from the inverter input lines L1, L2, and N. This detects common mode current on all three lines. If there is a common mode component, then that is from ground current. Here is a picture of the sensor and circuit: 	Check PV strings for direct or indirect grounding. Solar to ground leakage can be graphed in the Lion Energy web app. For a sudden jump in current, the inverter will shut off: • 30mA jump: stop in 300ms. • 60mA jump: stop in 150ms. • 150mA jump: stop in 40ms. • Steady current > 300mA, stop in 300ms. Does the alarm happen when the solar panels get wet? Check for connections that are not waterproof. Check the leakage current value. Normal is around 10 mA. If it is higher than 30 mA, rotate the solar (DC) switch to the off position. If that lowers the leakage current to the normal range, then the problem is in the solar array. The following steps are for qualified technicians: 1. Ensure grid ground and neutral is bonded following code requirements for the main panel. 2. Ensure other panels such as load output/combiner panel don’t have

			ground and neutral bonded together, following code. 3. If the leakage current is still high with the DC solar switch off, measure AC and DC current on the ground cables connected to the inverter. If current is found on one ground cable, then the cause is external to the inverter.
A1_11	Parallel CAN Communication Fault	This happens when inverters are configured to be in parallel, but the inverters are not able to communicate with each other across the CAN cable. See installation guide for proper connections.	See parallel wiring diagram. 1. Make sure the CAN communication cables are connected in the right places. 2. Test CAT5 cable to make sure there are no shorts or open connections using an Ethernet cable tester. 3. If that all looks right, take the inverters out of parallel and set them up in parallel again, ensuring you set the correct number of inverters, batteries, and set the inverter addresses correctly. Do a parallel system check. If it passes parallel system check, the system should be configured correctly. Reference the Commissioning Guide for parallel setup.

A1_12	Grid CT is Reversed	Even though this alarm exists, do not rely on this alarm to detect improper CT installation. It usually doesn't detect improper CT installation.	Check to be sure CTs are installed correctly. Arrow should be pointing away from the inverter, L2 should be plugged into the middle slot on the bottom row, L1 should be plugged into the right slot on the bottom row. For new inverters with the CTs in one plug, see the installation manual. For common grid CT connection, the CTs must be installed above the grid connection point of the inverters. A power cycle is the best way to try to clear this alarm.
A1_13	DC BUS Under-Voltage	This can happen at the same time as an inverter overload alarm.	If the fault doesn't clear on its own, try power-cycling the inverter. If that doesn't work, try leaving the inverter off for a longer period of time before powering on again.
A1_14	DC BUS Over-Voltage	This can happen if solar voltage exceeds 500V. Solar panel voltages increase as temperature gets colder. Some customers see this alarm for the first time when the weather turns cold because the installer didn't account for voltage increase due to cold temperatures.	1. Using the Lion Energy web app, check the PV voltage history on each of the PV strings. If any string reached 500V, this is the cause of the problem. Rotate the DC solar switch to the off position and have your installer shorten the PV string by a panel. 2. The PV string open-circuit voltage must not exceed 500V. If the cause of the alarm is unknown, power-cycle the inverter.

A1_15	Inverter Over-Current	This happens when the power demand on the inverter exceeds its rating. This can also happen when multiple inverters are connected, but out of sync due to improper parallel setup.	After the over-current problem is resolved, this alarm should clear on its own after 5-10 minutes or so. It may be best to power-cycle the inverter(s) to clear the alarm. Turn off loads and check what the inverter was doing before the alarm tripped to avoid getting the alarm again. After the alarm is cleared, turn loads back on. This can also be caused by a grid relay that is stuck closed. A relay can get stuck due to over-current. If you turn off the grid breaker to the inverter, both grid L1 and grid L2 at the inverter should turn off. Make sure the inverter is on and the load port has 120V on each line. While the loads are powered on, measure voltage on the grid port. If either grid L1 or grid L2 is still at 120V, a grid relay is stuck closed. If a reset inverter command was issued on a parallel system, contact ESS to get the parallel setup settings corrected.

A2_0	Over-Current Charge	Battery charging over the maximum current.	Compare inverter battery charging current readings from the web app vs. a clamp-on DC ammeter. Compare battery charging currents on each battery from the web app vs. a clamp-on DC ammeter. Check the setting for Battery Max Charge Current for the maximum charge current allowed to a single battery. Check the setting for System Charge Current for the total current from all inverters to charge the batteries. If the charging current per battery is less than 140A on each battery, then power-cycle the inverter to clear the alarm.
A2_1	BUS Voltage Unbalanced		Power-cycle the inverter to clear the alarm. If the alarm persists, contact Lion Energy's ESS Support team.
A2_2	Inverter Under-Voltage		Power-cycle the inverter to clear the alarm. If the alarm persists, contact Lion Energy's ESS Support team.
A2_3	Inverter Over-Voltage		Power-cycle the inverter to clear the alarm. If the alarm persists, contact Lion Energy's ESS Support team.

A2_4	Inverter Frequency Error		Power-cycle the inverter to clear the alarm. If the alarm persists, contact Lion Energy's ESS Support team.
A2_5	IGBT Over-Temperature	The inverter's NTC temperature sensor on the IGBTs is reporting too high temperature.	Turn off the inverter and wait for an hour before powering on again. 1. Make sure there's adequate ventilation. 2. Make sure there are no obstructions to the fans. 3. Make sure all fans are working properly. If the alarm persists, contact Lion Energy's ESS Support team.
A2_6	BMS System Failure	The battery might be sending an alarm code.	See BMS comm failure alarm for ideas on clearing. If that doesn't work, try a power cycle. If the alarm persists, contact Lion Energy's ESS Support team.
A2_7	Battery Over Temperature	This happens when the battery cell temperature exceeds the BMS temperature limit, usually 65C. It will recover at 55C.	This alarm is triggered by the BMS status byte 2, bit 2: "cell over-temperature charging". Ensure battery has proper ventilation.

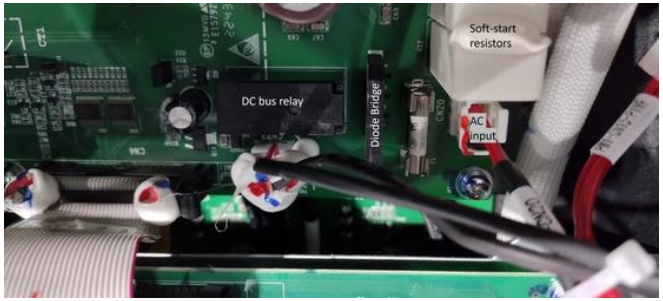
A2_8	Battery Under Temperature	This happens when the battery is too cold or has an open or faulty sensor/connection. The alarm should clear once the battery cells are above 0C.	This alarm is triggered by the BMS status byte 2, bit 5: “cell under-temperature discharging”, or status byte 2 bit 4: “cell under-temperature charging”. Make sure the battery is in a temperature-controlled environment.
A2_9	Battery Cell Unbalanced / Relay open	There is too much of a difference between the two cell temperature measurements. One half of the battery might be at a much different temperature than the other half. There might be a problem with one of the cell temperature sensors. A relay inside the inverter may not be making good contact.	This alarm is triggered by the BMS status byte 2, bit 7: “cell temperature differential discharging”, or status byte 2, bit 6 “cell temperature differential charging”. Check the battery cell temperatures to verify if this is the cause. If one line isn’t getting power, then a bad relay may be the cause of this alarm.
A2_10	Battery is Reverse Polarity	The alarm can also be triggered if the inverter is damaged.	Connect battery positive to the positive terminal. Connect battery negative to the negative terminal.

A2_11	BMS Communication Failure	This happens when the inverter is unable to receive responses from the BMS in any battery.	This is the most common alarm. If this alarm is triggered, focus on it first before any others. It could resolve other alarms. This alarm will trigger as soon as the inverter gets power. It should clear on its own within a minute or two. If it doesn't, try a method below. After trying any method wait a minute or two to see if it is fixed. Sometimes the inverter takes a few minutes to query the BMS using all the different protocols. 1. Make sure all the BMS cables are plugged in and to the correct port (left bottom row). Check contact inside the splitter (if used). Occasionally metal is bent down and isn't actually connected. Make sure connection is secure. 2. If commissioning or installing, the BMS address should be 1 for one battery. If there are more batteries each address should be unique and counting up from 1 with no gaps in the sequence. 3. Make sure the number of batteries you are installing agrees with the number of batteries during commissioning. Other settings to check are: BMS Protocol ID = 1 Battery Communication Type = 2 (RS485)

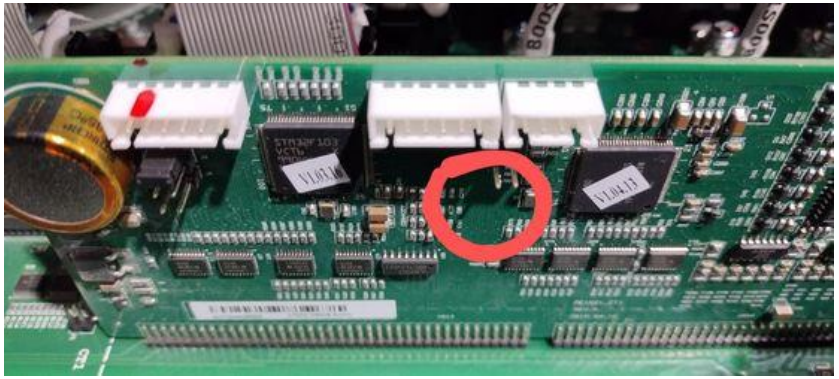
			If a BMS cable connector needs to be replaced, be sure to unplug the cable from the battery before changing the end. On the RJ-45 connector, pin 6 = GND; pin 7 = A; pin 8 = B.
A2_12	Old name = Battery Fault New name = PV miswiring	Since firmware B03D40.out, if the PV wiring is reversed or grounded, this alarm will be triggered.	 This alarm is unrecoverable, meaning a power-cycle is required. The unit must be powered off and wiring connections corrected before being powered back on. Never connect grid power to the Sanctuary inverter if there is a solar to ground short. Never turn on the DC solar switch if there is a solar to ground short.
A2_13	Grid Over-Load	This happens when the load power exceeds the inverter's power rating. The inverter will do grid pass-through and still contribute up to 8kW, but if the grid is interrupted when demand exceeds capability, it will not be able to keep the loads powered and will shut off.	Reduce load power consumption so that each inverter doesn't need to supply more than its 8 kW rating. The alarm should clear once the load is reduced to below its 8 kW rating.

A2_14	Grid Phase Error	Grid phase sequence is incorrect. This alarm is specific to three-phase installations.	Check grid phase sequence (if three phase). The line1 phase should be leading the line2 phase. See the instructions for wiring up and commissioning three-phase systems in the installation manual. Power-off the inverter, correct the wiring, and then turn the inverter back on.
A2_15	ARC Fault Detected	The arc fault detector is located just above the PV connections in the inverter. If any PV wiring sparks (loose connection), it should trigger this alarm. If there is any arcing inside a solar panel, it should trigger this alarm. Solar production will be shut down to prevent fire. This fault does not clear automatically per NEC 690.11.	Check PV panels and PV wiring. Repair or replace any damaged wiring/connectors/panels/MLPE. Restart the inverter to clear the alarm.
A2_16	Charge Derating due to BMS MOSFET Temperature	This alarm is triggered when the MOSFETs in the BMS get hotter than the BMS Temperature Derate setting. If it is charging, the battery charging will be derated. If it is discharging the battery on-grid, the power drawn from the battery will decrease and shift more to the grid. If it is discharging the battery off-grid, there will be no change, but limiting loads is recommended.	Decrease loads or put batteries in a temperature-controlled environment.
A2_17	Charge Stop due to BMS MOSFET Temperature	This alarm is triggered when the MOSFETs in the BMS get hotter than the BMS Temperature Cutoff setting. If it is charging, the battery charging will be stop. If it is discharging, loads will turn off. Once the MOSFETs reach 80C, the BMS on the battery will disable the battery current until it cools off.	Decrease loads or put batteries in a temperature-controlled environment.
F1_0	DC BUS Soft Start Failure	The inverter failed a power-on test.	Power Cycle the inverter. Contact Lion Energy.

F1_1	Inverter Soft Start Failure	The inverter failed a power-on test.	Power Cycle the inverter. Contact Lion Energy.
F1_2	DC BUS Short Circuit	The inverter has detected an internal problem.	Power Cycle the inverter. Contact Lion Energy.
F1_3	Inverter Short Circuit	This can be caused by wiring or configuration errors resulting in over-current.	Double check the installation manual instructions regarding line1 and line2 wiring and verify it is correct before powering the inverter back on. Make sure parallel inverters are configured properly (wiring and settings) before combining the load outputs. Power Cycle the inverter. Contact Lion Energy.
F1_4	Fan Lock Error	One or more fans has stopped turning while commanded on.	Check for worn out or damaged fans. Power Cycle the inverter. Contact Lion Energy.
F1_5	Low PV Insulation Impedance	During the PV insulation check, the inverter measured too low impedance.	Check solar panel wiring for any leakage to ground. Power Cycle the inverter. Contact Lion Energy.

F1_6	DC BUS Relay Fault	If there is AC present (generator or grid), it will run a self-check and measure the DC bus voltage. If it's less than about 1.2 * AC Vrms then it will assume a problem with the DC relay. Info: On the control board (see photo), the diode bridge will create a DC voltage from AC that peaks at about 1.4 * AC Vrms. 	An inverter overcurrent (A1_15) may draw down the DC bus voltage and trigger this fault. If both occur together, correct the cause of the overcurrent and power-cycle the inverter(s). In parallel systems, if you disconnect the load port from one or more inverters while off grid, it may overcurrent upon reconnecting.
F1_7	Grid Relay Fault	One of the grid relays is either stuck closed or not making good contact.	Power Cycle the inverter. Contact Lion Energy.
F1_8	EPS/Back-up Relay Fault	One of the EPS relays is either stuck closed or not making good contact.	Power Cycle the inverter. Contact Lion Energy.
F1_9	GFCI Fault	Ground current is detected.	Have a qualified electrician check for ground current faults. Power Cycle the inverter. Contact Lion Energy.

F1_10	CT Fault		On certain firmware versions, this has occurred when updating the firmware. Power cycle to clear. This fault seems to be unrelated to external grid CTs, since they can be disconnected or installed incorrectly and the inverter will still run, although not correctly.
F1_11	PV Short Circuit		Power Cycle the inverter. Contact Lion Energy
F1_12	Bypass Relay Fault	One of the bypass relays is either stuck closed or not making good contact.	Power Cycle the inverter. Contact Lion Energy

F1_13	System Fault	If any of the following occur 15 times, it will trigger system fault (F1_13): • bus relay soft fail (F1_0) • grid relay fail (F1_7) • current sensor fail (F1_10). If off-grid inverter short (F1_3) accumulates three times, it will trigger system fault (F1_13) which needs a power-cycle to clear it. There is also a possibility to trigger this fault in a test mode when a jumper is connecting these test-mode terminals (but do not connect this jumper):  When these terminals are connected, the inverter makes measurements on the grid and load terminals to make sure there is no voltage before proceeding with the test mode. If there is voltage, it triggers this fault so that the inverter is not damaged by external power during the test.	Power-cycle the inverter. Determine the cause of the repeated faults that trigger this unrecoverable fault. (Unrecoverable without a power-cycle)

F1_14	DC Over-Current		Observe what battery and solar were doing before it cut. If everything looks fine, then power cycle.
F1_15	DC Over-Voltage		Observe what battery and solar were doing before it cut. If everything looks fine, then power cycle.
B1_1	BMS - Cell Over Voltage	The BMS has reported a cell above the maximum cell voltage limit.	If any battery alarm shows up only on a child inverter, it's not real. That sometimes happens after a firmware update, but depends on what firmware version it was updated to. Try power-cycling the inverter(s) to clear the alarm. Use the web app to read the maximum cell voltage. Battery charge voltage might need to be adjusted down.
B1_2	BMS - Cell Under Voltage	The BMS has reported a cell below the minimum cell voltage limit.	Use the web app to read the minimum cell voltage and the battery state. If the BMS has disabled charging due to max to min cell voltage difference greater than 700 mV, the low cell needs to be charged manually by qualified personnel. If any cell voltage is below 1400 mV, the battery needs to be replaced. If everything looks ok, then try a power cycle.

B1_3	BMS - Cell Over Temperature	The battery temperature is above the maximum limit.	Use the web app to read the BMS cell temperatures. Compare with actual battery temperature. If everything looks ok, then try a power cycle.
B1_4	BMS - Cell Under Temperature	The battery temperature is below the minimum limit.	Use the web app to read the BMS cell temperatures. Compare with actual battery temperature. The battery needs to be above freezing to be charged. If everything looks ok, then try a power cycle.
B1_7	BMS - Over Current Discharge	The BMS is reporting too high discharge current.	The BMS will automatically disable discharging if the discharge current is too high. Make sure the batteries are with 0.5 V of each other before connecting in parallel. Use the web app to check the state of the other batteries to see if any other batteries have disabled discharge.
B1_8	BMS - Over Current Charge	The BMS is reporting too high charge current.	The BMS will automatically disable charging if the charge current is too high. Make sure the batteries are with 0.5 V of each other before connecting in parallel. Use the web app to check the state of the other batteries to see if any other batteries have disabled charge. Make sure the battery charge parameters are set correctly: Charging voltage, derating charging voltage, battery max charge current, battery cell voltage maximum, battery cell de-rating voltage.

B1_11	BMS - Internal Communication Fault	The BMS has reported an internal problem.	Contact Lion Energy.