

# Thunderstruck VCU Troubleshooting – December 2022

Please perform tests in the following sequence if there is intermittent or no motor response when using the Thunderstruck Dilithium VCU. Please refer to the online manual at this location:

[thunderstruck-ev.com/Home/Controllers/VCU for Nissan Leaf, UQM or Coda Motors](http://thunderstruck-ev.com/Home/Controllers/VCU%20for%20Nissan%20Leaf,%20UQM%20or%20Coda%20Motors)

1. Verify all high voltage and low voltage connections per the VCU manual. If being run on a test bench, secure the motor to a sturdy surface.
2. If UQM, configure inverter per VCU manual before tests.
3. If Leaf, the motor and inverter are paired at the factory, and must be from the same vehicle.
4. Attach the motor securely when bench testing – high torques can cause motor rotation.
5. Use power wires and terminal ends of adequate current capacity and voltage insulation.
6. Connect power and phase wires correctly per manual and manufacturer information.
7. Connect motor resolver wires/cables between inverter and motor. Correct any damaged pins or connectors before operating. Use the original manufacturer harness for proper connection/shields.
8. If the drivetrain has a parking pawl, ensure it is set in the drive position. For the Nissan Leaf, this can be operated manually - unbolt the park motor and rotate the splined shaft CCW until you feel a firm “click.”
9. Review the startup procedure below. Verify each startup step in sequence. **DO NOT** force the main contactor to close without the VCU precharge process. Inverter and contactor damage can result.
  - a. 12v power always on connections – see online manual
  - b. Keyswitch activation provides 12v to the inverter and VCU
  - c. If using two main contactors (one on B+ and one on B-) then typically the B- contactor closes on keyswitch power. The B+ contactor includes the precharge circuit.
  - d. VCU Tests throttle voltage – fails if above **thw1off**.
    - i. If fail, enter **me thw1**, then set thw1off and thw1max to the min and max voltages shown in the report with full range throttle travel.
  - e. VCU starts the precharge cycle by activating the 12v precharge output. Verify precharge relay clicks closed. This relay coil should draw less than 400 ma current.
  - f. VCU communicates with inverter and waits for reported voltage to reach **prechgminv**.
    - i. If never reached, check battery voltage and set **prechgminv** to the expected minimum pack voltage.
  - g. VCU powers the main contactor coil (B+ if two used).
    - i. If not then verify 12v reaches contactor coil. Verify contactor coil ground (-12v) connection.
    - ii. Canbus communication required at this step. If no main contactor click, check canbus wiring.
  - h. System operational when all tests have passed
    - i. Place the FNR switch in the desired position and test the throttle response
10. If the motor still does not run, check configuration as follows:
  - a. Enter **show config**
    - i. **set inverter** [inverter type] – this is either leaf, leafgen1, uqm, coda
  - b. Enter **show**

- i. Check for errors, look for voltage listed in the list. If zero then either canbus has failed, there are bad high voltage connections, or the precharge process failed.
- c. Check canbus HI LO connections. **Note Leaf HI is blue and VCU HI is green.** This is reverse from the VCU canbus colors. VCU green connects to Inverter blue for the Leaf.
- d. Enter ***tr canbus*** – record the results for Thunderstruck. Enter ***tr off*** (this stops the trace)
- e. Enter ***tr uc***. If the motor is not spinning, run the throttle through its full range, if spinning, use small throttle movements. Record the results.
  - i. note the rpm entry near the left of each trace, and the throttle voltage information.
    - 1. If zero percent throttle, then check throttle connections. Stop the trace and run ***me thw1*** and record voltage range.
  - ii. if you see the letters “FB” (this means Forward/Brake) or “RB” in the left column then the brake circuit is activated. Disconnect brake wires from the VCU and test functionality.
  - iii. If you see “N” listed in the left column, and you have positioned the switch in F or R, then stop the trace and run the ***me fnr*** report and select each of 3 positions and send results.
  - iv. enter ***tr off*** to stop the trace
- 11. Include as many of the above reports as possible in support emails to TSM - start with ***show config*** and ***show***. Send pictures of the inverter, VCU and precharge wiring if possible.
- 12. The best way to send results is to copy the text from the user interface window and paste into a text document. Enter notes to describe the tests shown.
- 13. **Safety Notes:** When troubleshooting, if the motor operates in any unexpected manner, disconnect the 12v supply to the inverter, and determine the cause before operating again. We recommend against running the following user interface operations while driving vehicles: ***trace*** commands, and the list commands ***show config***, ***help*** and ***set***.

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