ThunderStruck Motors VCU v3.1.23 Feature List – July 2023

Refer to the Vehicle Control Unit (VCU) Manual on our website for detailed instructions:
http://www.thunderstruck-ev.com/images/companies/1/DD_VCUv3.1R3.pdf

The v3.1.7 VCU release includes the following features:

- Controls UQM, UQM Coda and Nissan Leaf motor inverters (2011-2017 Leaf)
- Software feathered throttle with seamless regenerative braking
- Throttle on start protection, dual throttle channel option
- Throttle mapping for torque slope control
- Forward/Neutral/Reverse feature with in-motion protection against direction change
- 5 volt output for throttle sensor (pot or hall)
- Outputs for pre-charge and main contactors
- Brake light relay control during regenerative braking
- Reverse light relay control option
- Software settable canbus termination resistor (120 Ohm)
- Canbus and status tracing for debugging
- Simple command line user interface for Windows and Mac
- Throttle off/max voltage settings (thw1off/thw1max)
- Configurable torque: maximum (maxtorque), throttle regen (idleregen), brake (brakeregen)
- Acceleration Limiter (accellim) - torque change per second, "jerk" control
- Throttle zero torque position (deadspot) in percent of travel
- Torque taper (maxrpmtorque, torquekneerpm) settings limit torque and current at high rpm
- Maximum pack voltage setting (regenvmax) limits regenerative braking for charged packs
- Minimum pre-charge voltage setting (prechgminv) tested prior to closing main contactor

Initial Nissan Leaf Configuration Example:

```
show config
 THROTTLE
  thtype    : hall                ** use hall type for 5 volt hall effect and potentiometer
  thw1off   : 0.10v               ** set to min throttle voltage **
  thw1max   : 4.90v               ** set to max throttle voltage **
 MAP
  range1    :  0..100% throttle =>  0..100% torque
  deadspot  : 30%                 ** this is the throttle range used for variable regeneration **
 BRAKE
  brtype    : switch
  brakeregen: 450.0Nm             ** max shown, reduce to 50 for bench testing **
 MOTOR/INVERTER
  inverter  : leaf                ** set to inverter type **
  maxtorque : 1632.0Nm            ** 80kw max shown, reduce to 100 for bench testing **
  maxrpm    : 10000               ** max shown, set to max motor/drivetrain RPM
  accellim  : 2500Nm/100ms        ** 4000 fast response, 500 slow response **
  idleregen : 300.0Nm             ** reduce to 50 for bench testing **
  maxrpmtorque : 50.0Nm           ** torque at top of taper, set to 0 to revert to max torque **
  torquekneerpm: 5000                     ** starts taper to maxrpmtorque - set to 0 for max torque **
  prechgminv: 310.0V              ** set to minimum operating pack voltage **
  regenvmax : 410.0V              ** set to maximum pack voltage - protects from overcharge **
 OPTIONS
  FNR       : enabled (Forward/Neutral/Reverse switch)
  canterm   : enabled (CAN termination resistor)
vcu>
```