

QA Test Plan

Introduction

This is a preliminary document, to be discussed with initial ATP. It will be improved and the details of each test defined prior to CDR. It describes a high level plan that will prove that the final fabricated system meets all requirements.

TSV

QAR001a - Charge Algorithm

1. Mathematical analysis of battery charging. Model shall include voltage and temperature, and include coulomb counting.
2. Testing on accumulator test stand.
 - a. charging starts appropriately, normal operation
 - b. charging stops appropriately, normal operation
 - c. charging stops appropriately, all failure modes
3. Charging a discharged TSV accumulator with LiFePO4 cells

QAR001b - Data Acquisition

1. Calibration Accuracy and Analysis (D011)
2. Test I2C messages
3. Test all CAN messages with Lab Terminal, in test stand, in all states
4. Test all CAN messages with VSCADA board, in test stand, in all states
5. Test all CAN messages with Lab Terminal, in Accumulator with LiFePO4 cells, in all states
6. Test all CAN messages with VSCADA board, in Accumulator with LiFePO4 cells, in all states

QAR001c - Displays and Indicators

1. Test all desired displays in test stand, in all states.
2. Test all desired displays in Accumulator with LiFePO4 cells, in all states.

QAR001d - Pack Controls

1. Test navigation to each desired data, or set value, in all states.
2. Set a range of values via controls, in all states.
3. Reset PacMAN in all states.
4. Reset each AMS in all states.

QAR001e - Low Current Output

1. Apply load to draw 29 A.
2. Apply load to draw 31 A.

3. Test Charging functionality.

QAR001f - Delivery of 1 complete accumulator

1. Annotated photographs of wiring harness.
2. Documentation (Maintenance, User's Manual, BOM, etc.)
3. Demonstration of System States, and availability of TSV power

VSCADA

QAR002a QAR002c QAR002d QAR002e - General UI

1. Demonstrate dashboard UI functionality over wide range of time and values
2. Simulate CAN BUS
3. Receive actual CAN BUS from a working system

QAR002b - Safety loop integration

1. Ensure that when safety loop is triggered and only when its triggered the UI displays it as such
2. Have VSCADA trip the safety loop

QAR002f - Throttle Control

1. Demonstrate being able to control the throttle level from any UI

QAR002g - Maintenance mode

1. Control system parameters and these control parameters should correspond properly to the values being read in

QAR002h QAR002i - Drive mode and drive demo mode

1. Drive mode must disable VSCADA throttle control and Drive demo optionally disables it

QAR002j - Plug and Forget Charging

1. Charge accumulator from empty
2. Charge accumulator from partial charge

QAR002k - Shut down mode

1. Allows VSCADA to not be powered on while rest of system is active
2. Logs when it shuts down

QAR002l - Data Logging

1. View and transfer large amounts of data that matches what is read by sensors

QAR002m - Data display

1. Display all promised statistics
2. Have displayed statistics match values obtained from external instruments

QAR002n - Data Scripting

1. Demonstrate values automatically being set

QAR002o - Event logging

1. Show logs of events such as safety loop trigger with expected times of recording

QAR002p, QAR002q - Modularity and documentation

1. Visual inspection of documents to ensure quality and usefulness

GLV/Cabling

QAR003b - GLV Safety

1. Test for safety loop operation under system faults

QAR003c - Vehicle User Interface Panels

1. Test that buttons and interfaces operate as expected

QAR003d - Tractive System Interface

1. Test that the TSI interacts properly with the safety loop and trips it as needed
2. Monitor that TSV remains isolated from the GLV and ground
3. Test that the Motor/Motor Controller can be engaged and disengaged from driver input

QAR003e - Vehicle Computer Interface Hardware

1. Observe various items displayed on the interface
2. Ensure interface hardware connects and acts properly

QAR003f - Throttle

1. Ensure that motor is able to be controlled via a throttle mechanism

QAR004a - Cabling

1. Test continuity and resistance of cables and connections at various points

Motor Characterization/Dynamic Model

QAR005a - Static Characteristics

1. All specified data measured across full range of operation for torque and RPM
2. Data calibration/accuracy falls within specified tolerances

QAR005b - Dynamic Characteristics

1. All desired model parameters estimated
2. Accuracy analysis determines that parameters are calibrated correctly within proper tolerances

QAR005c - Efficiency and Cooling

1. Motor + controller efficiency and cooling requirements have been successfully measured

2. Tests comparing expected cooling system behavior to measured values are successfully completed

QAR006a - Physics Model

1. Physics model output provides reasonable prediction of fully integrated system performance

QAR006b - Simulation

1. Simulation is able to provide outputs expected by the generated physics model
2. Working demonstration to professors successfully completed

QAR006c - Results and Conclusions

1. All data and calculations included in results and conclusions documentation falls within required tolerances, and model provided generates expected outputs for fully integrated system