Critical Design Review

Engine Controller, Data Acquisition,
Spark Plug Ignition

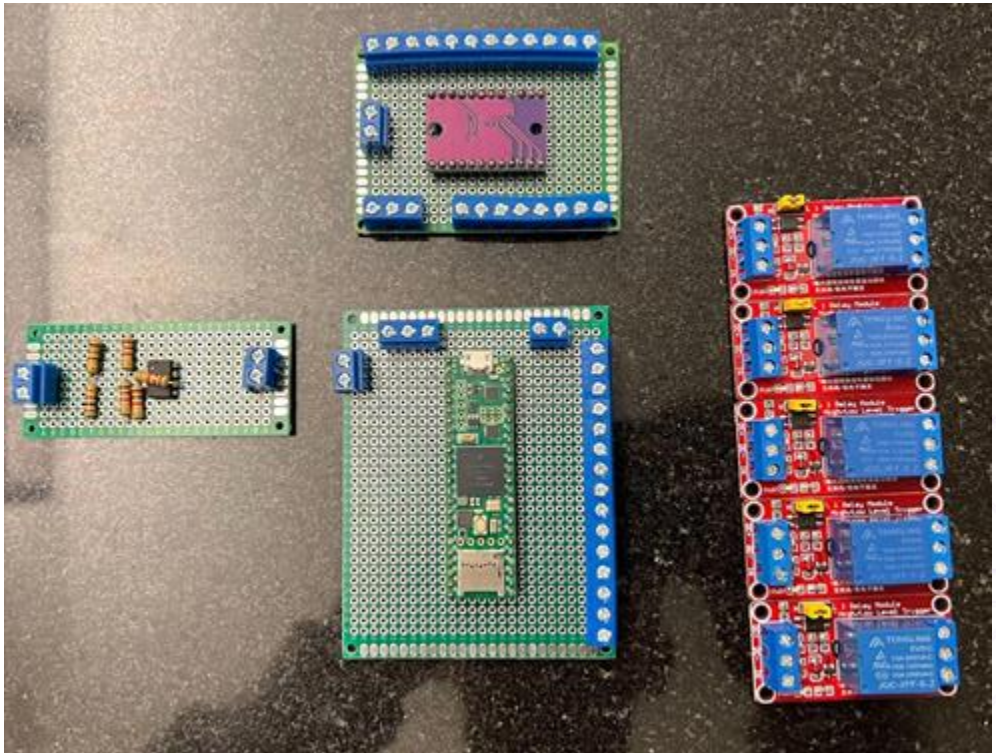
Recap: Targets & Constraints

- Qualities
  - Sufficient amperage to handle pull from all sensors and valves (~11-12 Amps)
  - Enough power for all components with some tolerance - 24VDC 50A BMS Battery
  - Reliable; fast clock speeds - Implemented Teensy 4.1
  - Modular - add or take away components - Protoboard prototype
  - Antialiasing - clear signals - noise reduction - biasing - Not needed right now
  - NEW: Had to be cheap, had to be built quickly
- Quantities
  - ~~14 Valves~~ ~~6 Valves~~ 5 Valves
  - ~~8 Pressure Transducers~~ ~~4 Pressure Transducers~~ 5 Pressure Transducers
  - 3 Thermocouples
  - ~~1 Load Cell~~
  - 5”x5” PCB

Brief Design Overview

- 5 Normally Open Relays for 5 valves controlled by Teensy 4.1
- 5 I2C Sensata Pressure Transducers read by using an I2C Multiplexer
- 3 differential thermocouples read by a 4-20mA receiver and differential op-amp into the Microcontroller
- 9.5” x 7” x 1.5” 3D printed fluid-proof container with easy-access top (any ideas how to make wire connections to the box waterproof? I.e. plastic compression tube fittings, water-tight conduit kit) (location TBD)
- Screw terminals
- 2 E-Stops: One for whole-system, one for valve-only
- Verify valve functionality with red LED-indicator lights
- *Remember to implement power distribution board*

Build Documentation

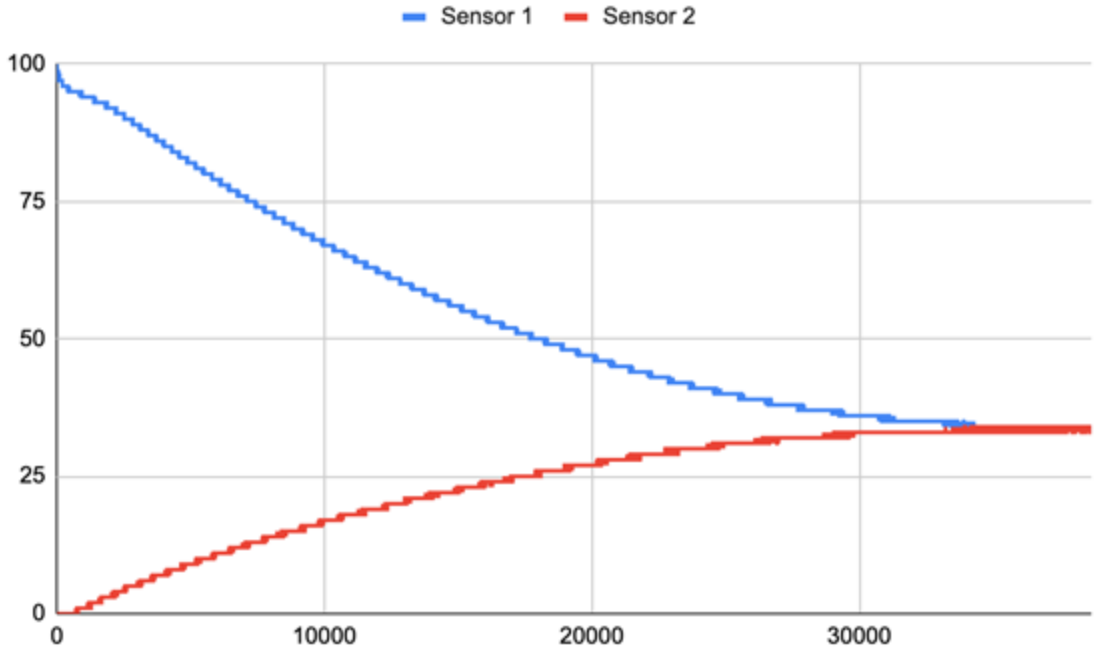


Quick Overview of Tests

Tests:

- Sensata + I2C Multiplexer test w/ needle valve characterization
- Valve with relay test
- Thermocouple test
- Teensy-Sensor reading test
- Teensy-Engine control test
- Teensy-Ethernet control test
- Indicator light test
- Spark ignition test
- Full-system E-Stop test
- Valve-only E-Stop test
- Full-sequence test

Sensata + I2C Multiplexer test w/ needle valve characterization



Valve with relay test (spoiler alert… works)

Spark Ignition Test

Periodic Testing and Maintenance

Examples of possible types of periodic testing/maintenance:

- Checking valves and connectors for oxidation
- Re-calibrating sensors and tools
- Leak testing
- Verifying torque on fasteners and connectors before every operation

Who will be responsible for this maintenance? How will you keep track of this maintenance (spreadsheet, google calendar events, etc?)

Challenges

- What are the most difficult parts of this plan to execute?
- What are the blockers that might cause delays in our plan?
- What can we do now to avoid these roadblocks?

Wins

You’ve already spend a lot of time making this presentation. Tell us something that has gone really well since the BRR!

Questions

- Help everyone better understand your project progress and future plan
- Discuss design considerations to help flesh out plans for integration