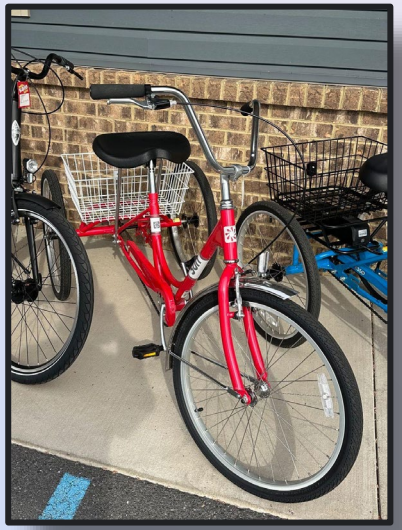
NFPA
Education and
Technology
Foundation

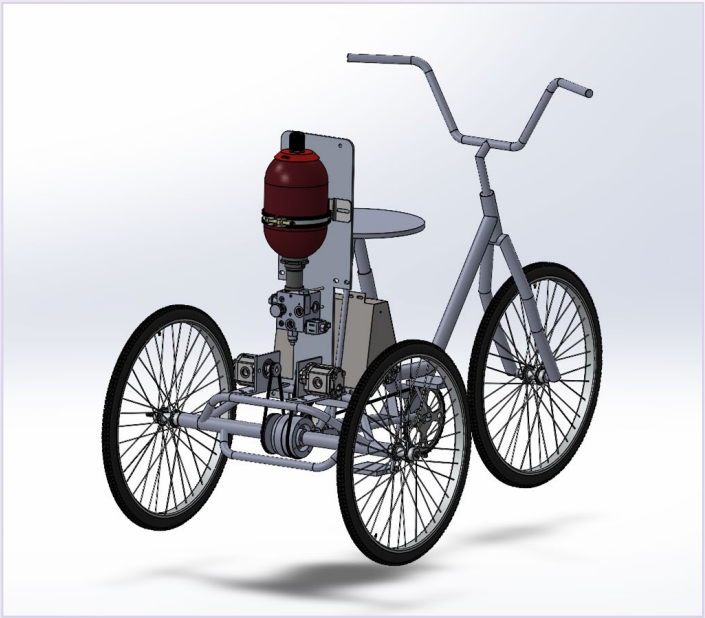
FINAL PRESENTATION &
DESIGN REVIEW
BUCKNELL UNIVERSITY
JONATHAN TORRES AND INDRANIL BRAHMA
4/23/2026

Introductions

Mechanical/Frame (I)



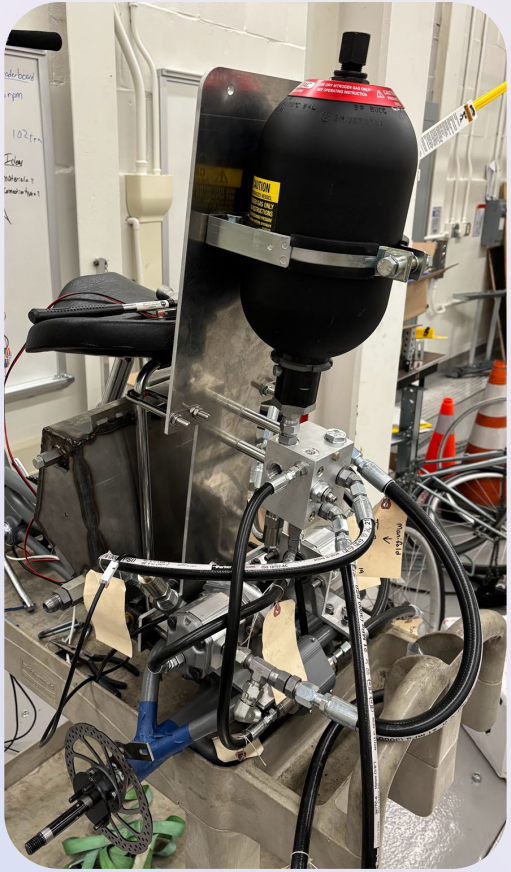
Purchased Used Trike



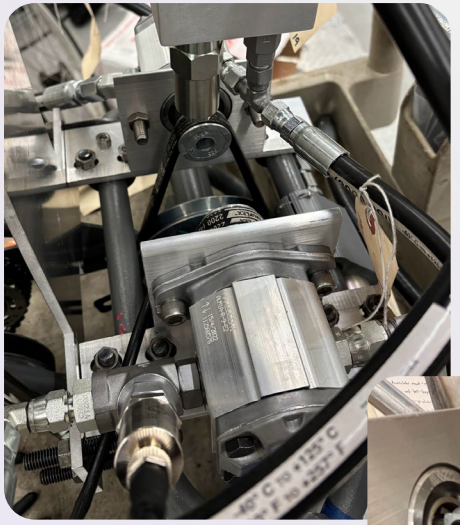
Final CAD Model

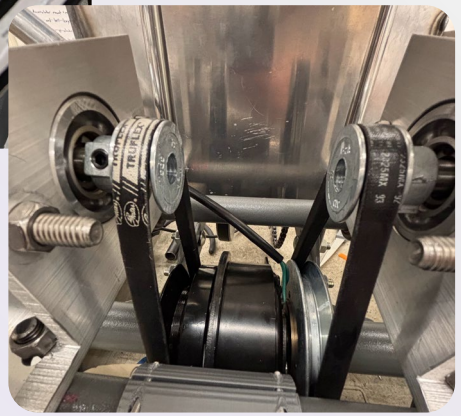
Mechanical/Frame (II)

Rear Disc Brake Mount



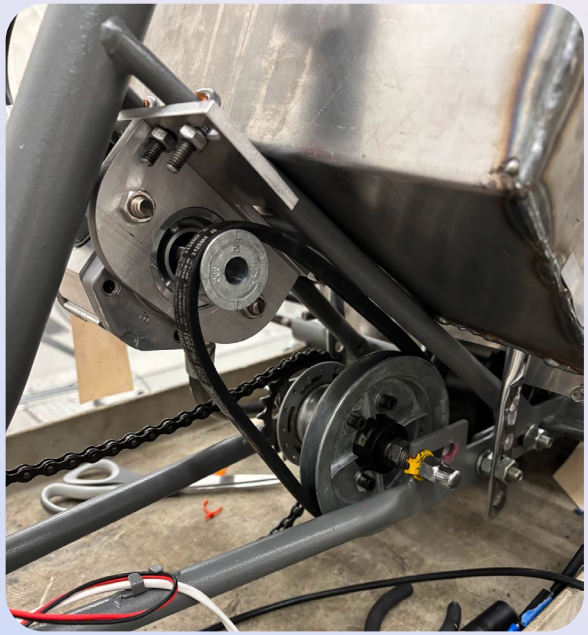
Accumulator + Manifold Mount





Motor Mounts and Rear Axle Alignment

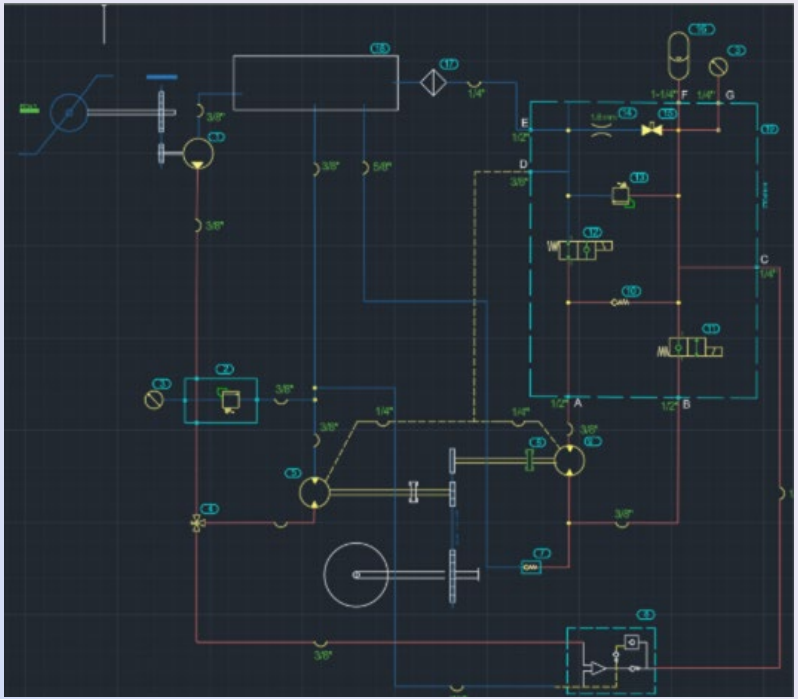
Mechanical/Frame (III)



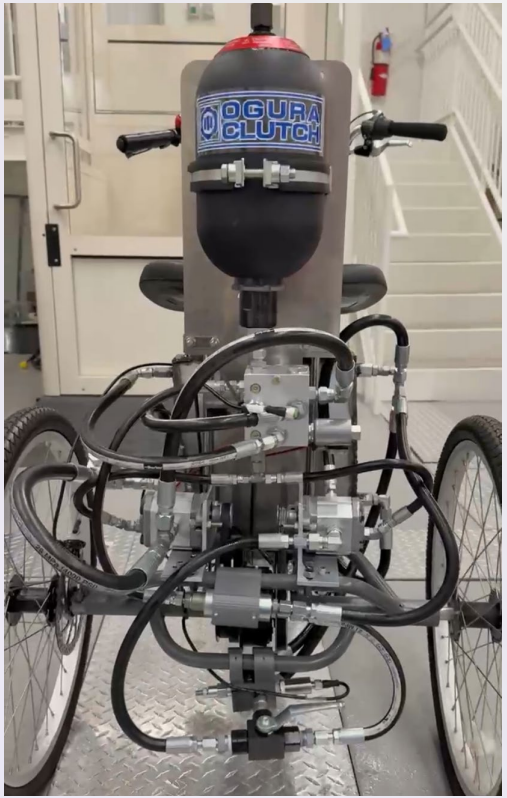
Internal Gear Hub, Pump Mount, and Alignments

2 gal. Reservoir Manufacturing

Hydraulics (I) System Implementation

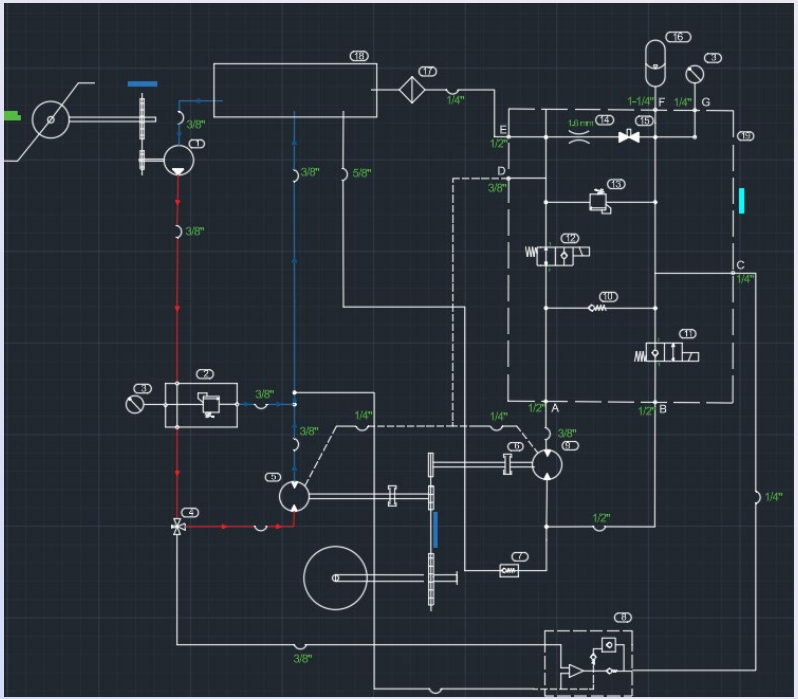


Hydraulic Schematic

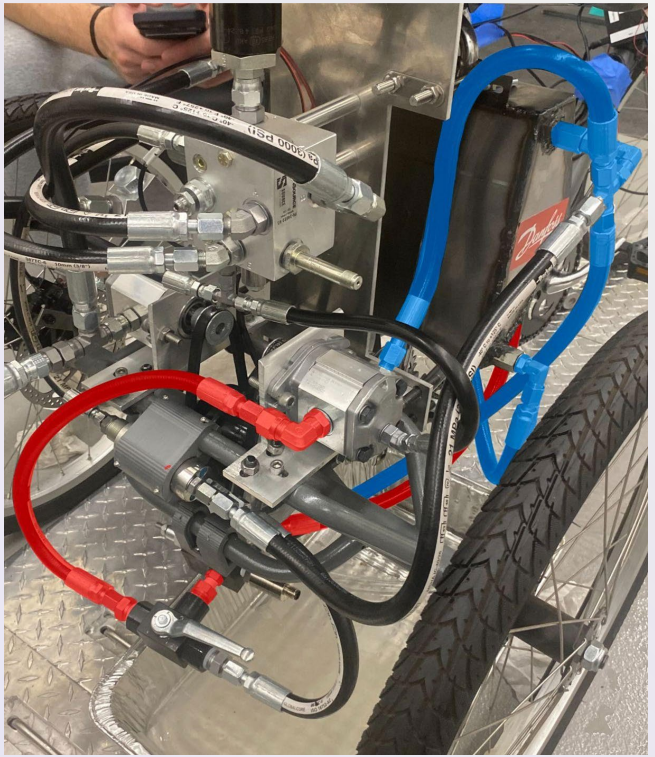


Implemented Hydraulic System

Hydraulics (II) Direct Drive

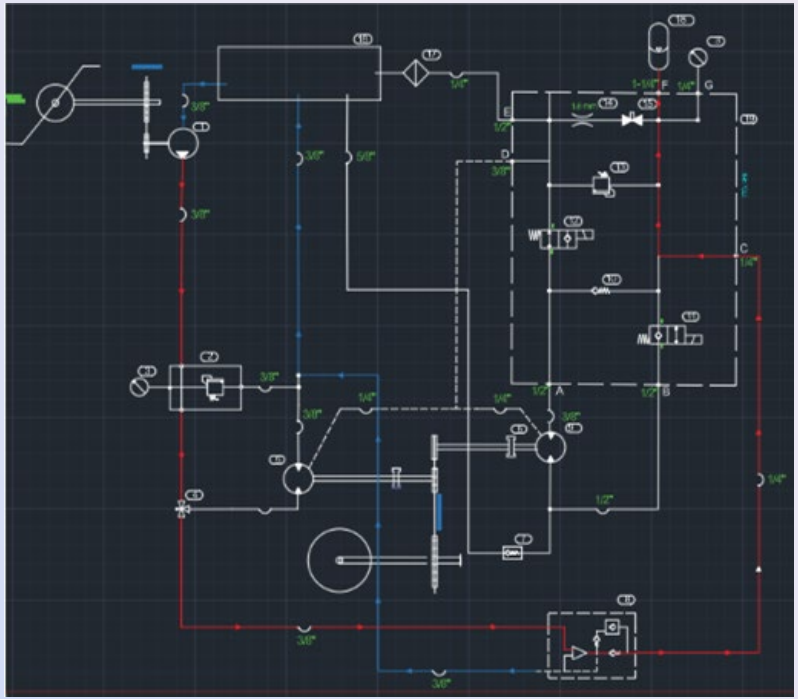


Flow path in Hydraulic Schematic



Flow path in Hydraulic System

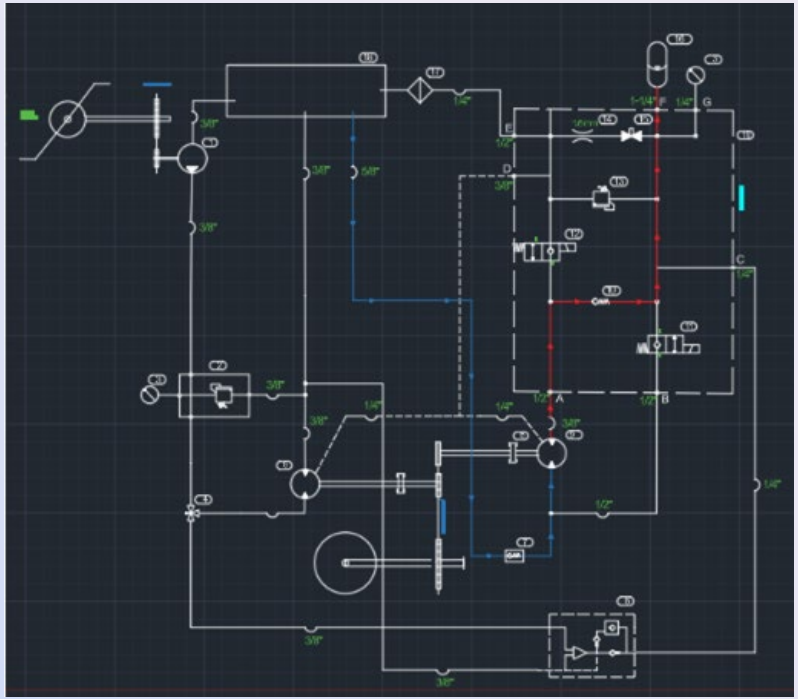
Hydraulics (III) Accumulator Charging



Flow path in Hydraulic Schematic

Flow path in Hydraulic System

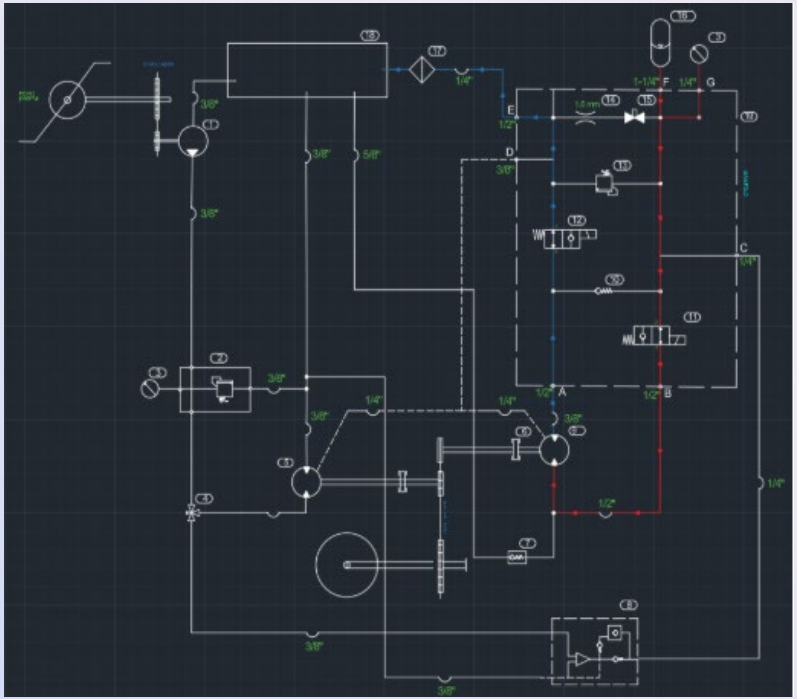
Hydraulics (IV) Regenerative Braking



Flow path in Hydraulic Schematic

Flow path in Hydraulic System

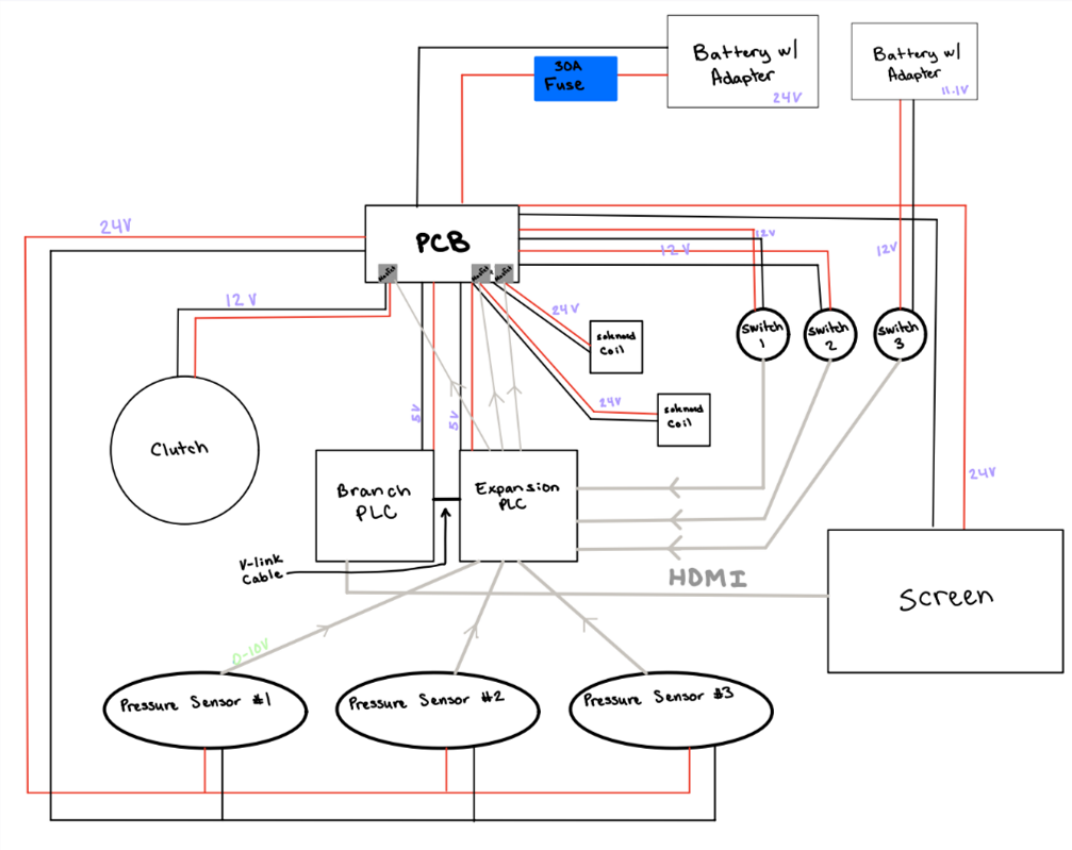
Hydraulics (V) Accumulator Discharging



Flow path in Hydraulic Schematic

Flow path in Hydraulic System

Electronics (I)



System Highlights

CENTRAL PCB

- Manages multiple supply voltages
- Consolidates and organizes wiring

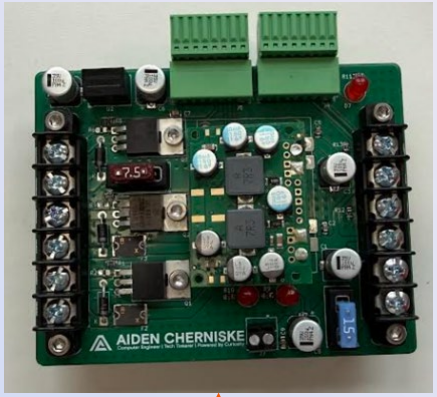
SENSORS

- Pressure sensors for real-time display
- HDMI interface for main screen

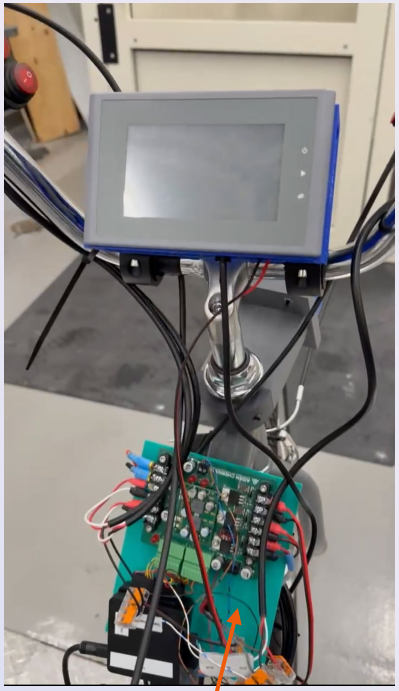
CONTROL

- Switches for drive modes
- Integration with PLC expansion

Electronics (II)

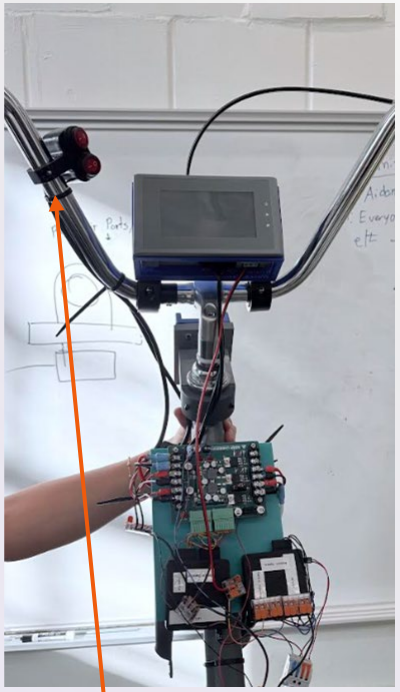


PCB



Final layout for PLC/PCB Mount

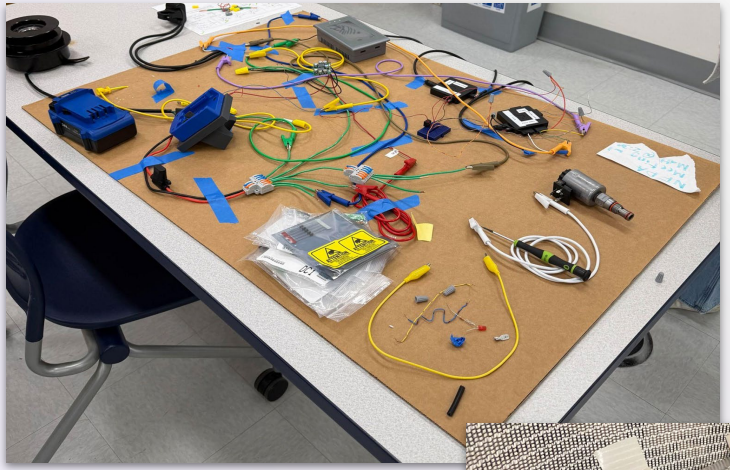
Battery and Screen Mounts



Handle Bar Switches

Vehicle Testing

- Tested for leaks in manufactured components by sealing up ports and using compressed air with soapy water
- Independently tested each electrical component and ensured all connections are functioning properly with integrated circuit testing
- Tested mechanical power transmission through pedals and belts to ensure motors are sufficiently actuated
- Ensured two independently actuated brakes function properly



Lessons Learned

- Order all crucial components before winter break to ensure everything arrives with time to spare
- Budget more time than anticipated for final testing
- Try to finalize hydraulic circuits and component layout early and stick to them
- When planning the project, organize tasks so that they don’t require each step beforehand so that they can be worked on
- Order any additional components ahead of time so replacements are available in case of failure or short circuits

Thank you *to our advisors, Jim Diehl, and the NFPA sponsors!*