NFPA Fluid Power Vehicle Challenge

NFPA Education and Technology Foundation

Ohio University
Final Presentation
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OHIO UNIVERSITY
Russ College of Engineering and Technology

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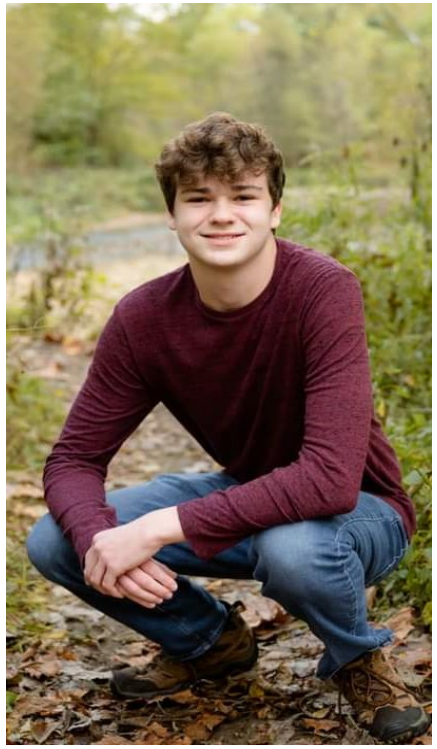

Andrew Eckman
Sophomore

Vehicle Design

Gear system is 7:1

Ability to charge accumulator by hand pump, pedaling, and regen

3 switch electronic system that actuates solenoids in the manifold which defines what circuit is operating

Changes From Last Year

- Added 10:1 gear box to rear gear system
- Total ratio changed from 5.7:1 to 7:1
- Redesigned hydraulic circuit to include a hydraulic manifold
- Frame has more permanent mounting capability
- Added hand pump to manifold to charge the accumulator
- Simplified electrical system
- Added ability to operate without electrical power

New Components Used

Manifold Block

Gear Box (10:1)

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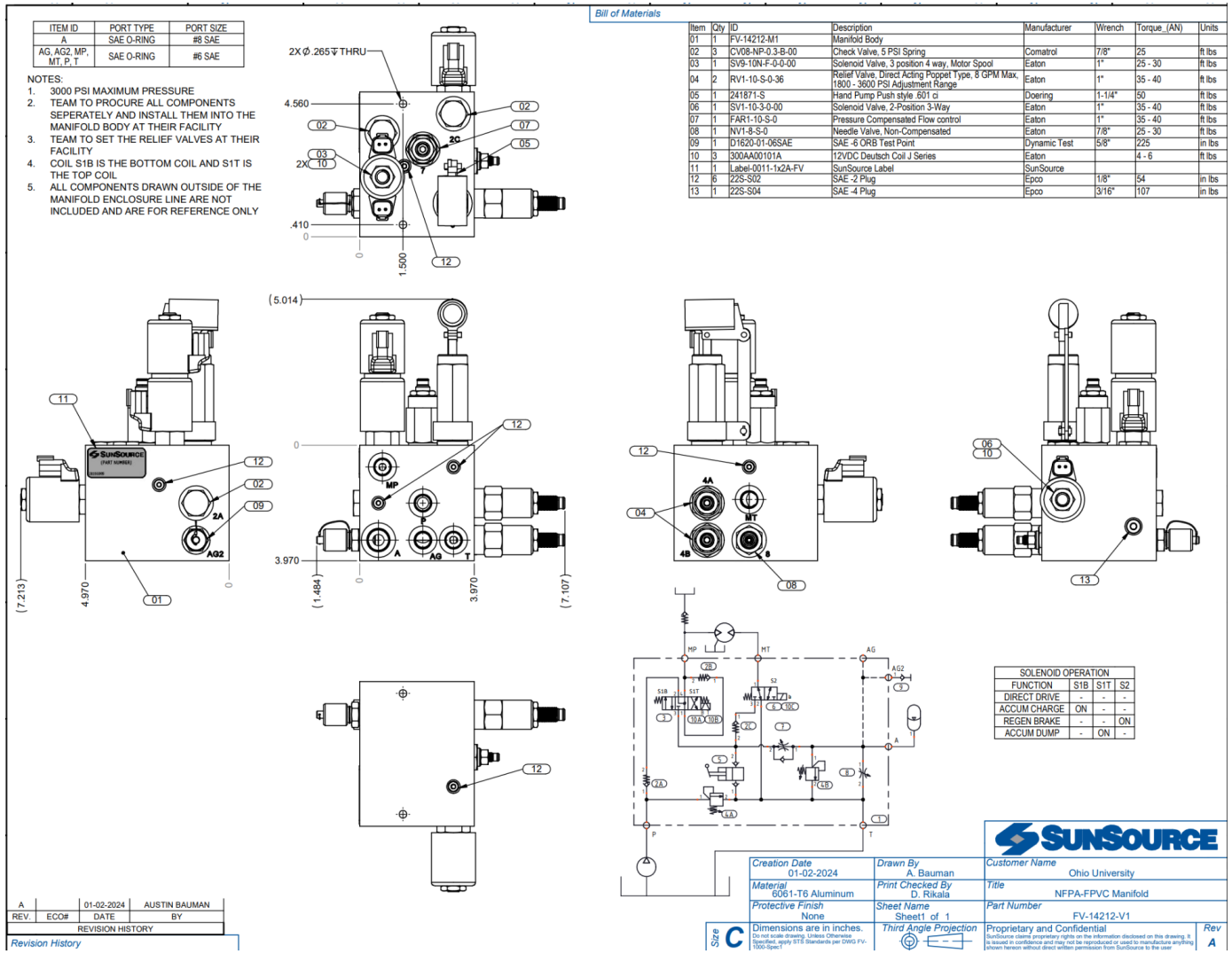
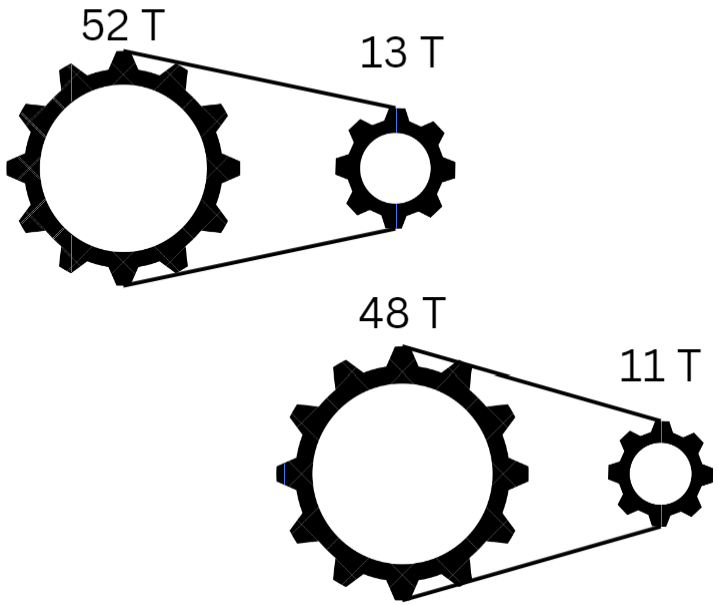
The Manifold

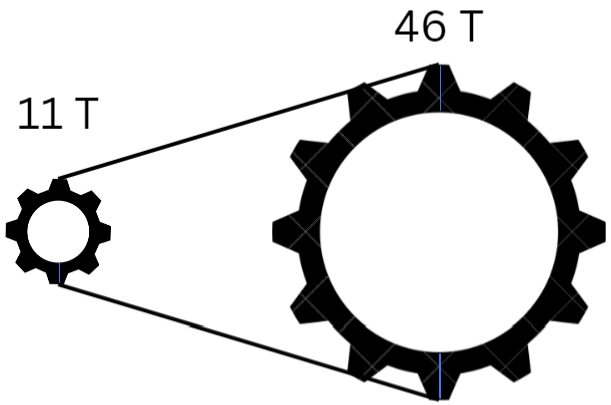


Gears

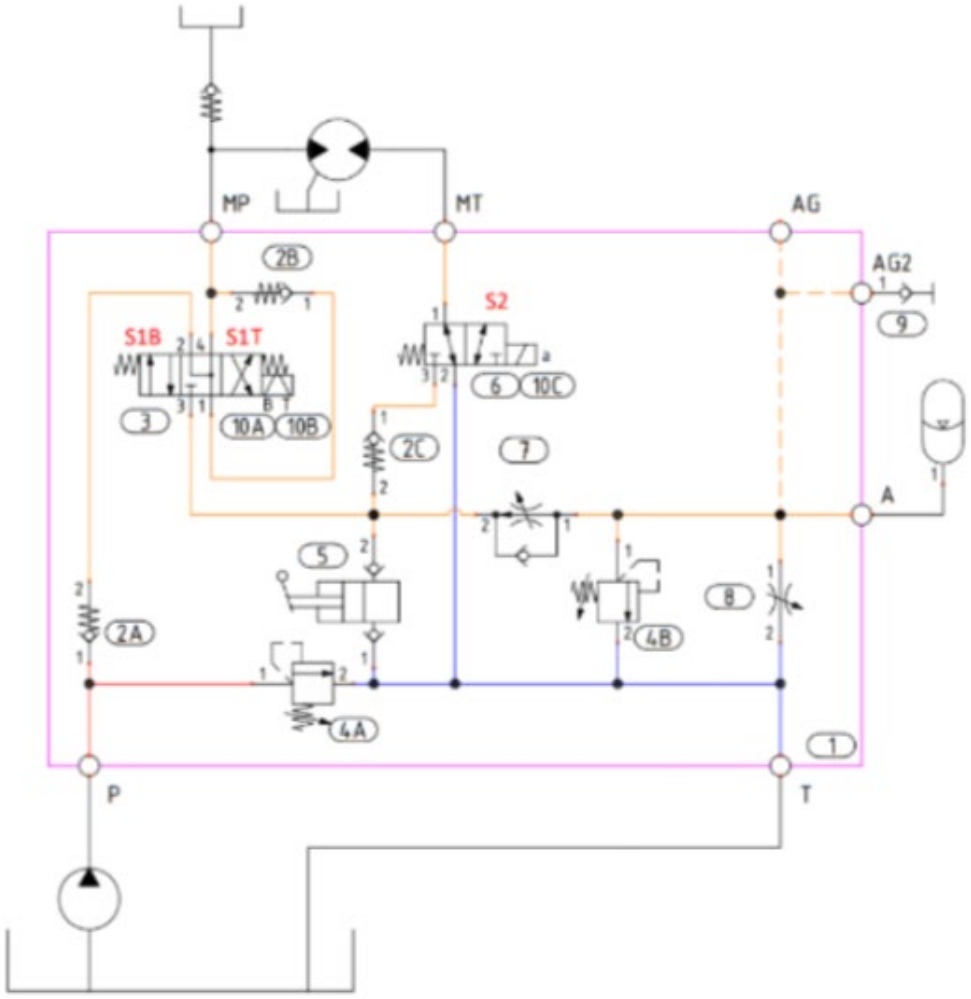
Front Gear System



Rear Gear System



Hydraulic Circuit



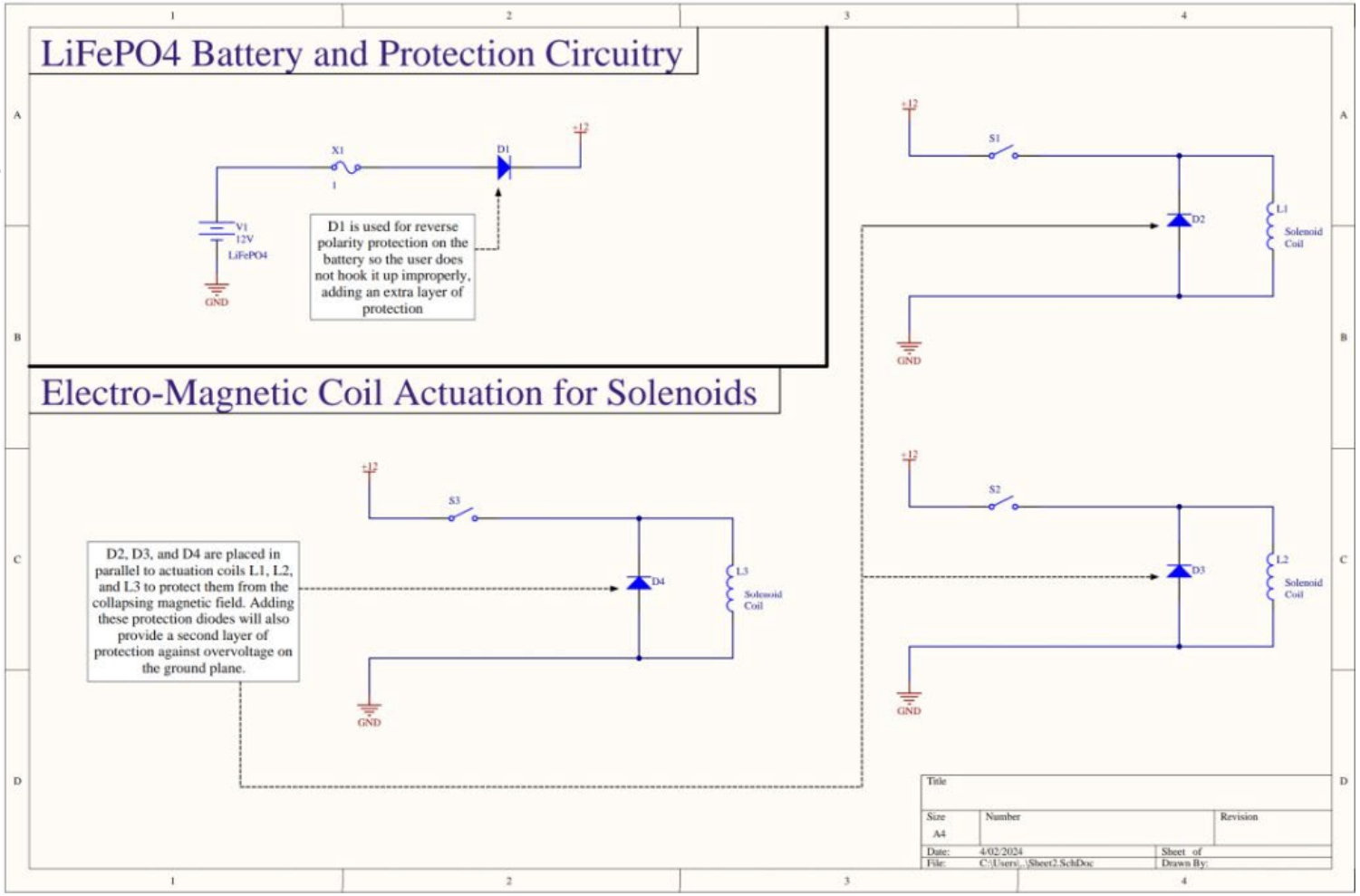
SOLENOID OPERATION			
FUNCTION	S1B	S1T	S2
DIRECT DRIVE	-	-	-
ACCUM CHARGE	ON	-	-
REGEN BRAKE	-	-	ON
ACCUM DUMP	-	ON	-

Item	Qty	Model Code	Description	Manufacturer
1	1	FV-14212-M1	Manifold body	Source FP
2	3	CV08-NP-0.3-B-00	Check 1 to 2	Danfoss ICS
3	1	SV9-10N-F-0-0-00	Solenoid 3 pos. 4 way	Legacy-Eaton
4	2	RV1-10-S-0-36	Relief Direct Acting	Legacy-Eaton
5	1	241871-S	Pump Lever Operated 1 to 2 Push to pump .601 CID	Doering
6	1	SV1-10-3-0-00	Solenoid 2 pos. 3 way	Legacy-Eaton
7	1	FAR1-10-S-0	Flow Control Compensated, Screw Adjust	Legacy-Eaton
8	1	NV1-8-S-0	Needle Valve, Knob Adj	Legacy-Eaton
9	1	D1620-01-04SAE	Test Point Fitting, M16 x 2	Dynamic
10	3	300AA00101A	Coil 12VDC, Deutsch	Legacy-Eaton

Hydraulic Circuit

Electrical Work

- Andrew Clabaugh helped to design a safe electrical circuit and ran the wiring to the solenoids
- System has less power draw than the former design
- Added reverse polarity protection as a safety feature



Manufacturing Process

- Machined clamps and sprockets
- Water jet sprockets
- Machined keyed shafts

Obstacles

- The bike frame was difficult to build on/around
- Length of manufacturing process with a small team
- Designing frame mounts for gear train

Lessons Learned

- Gear box created complication and unnecessary resistance
- Importance of being proficient on CNC machines, water jet, and manual mills

Questions?