Small Engine Dynamometer Instruction Manual

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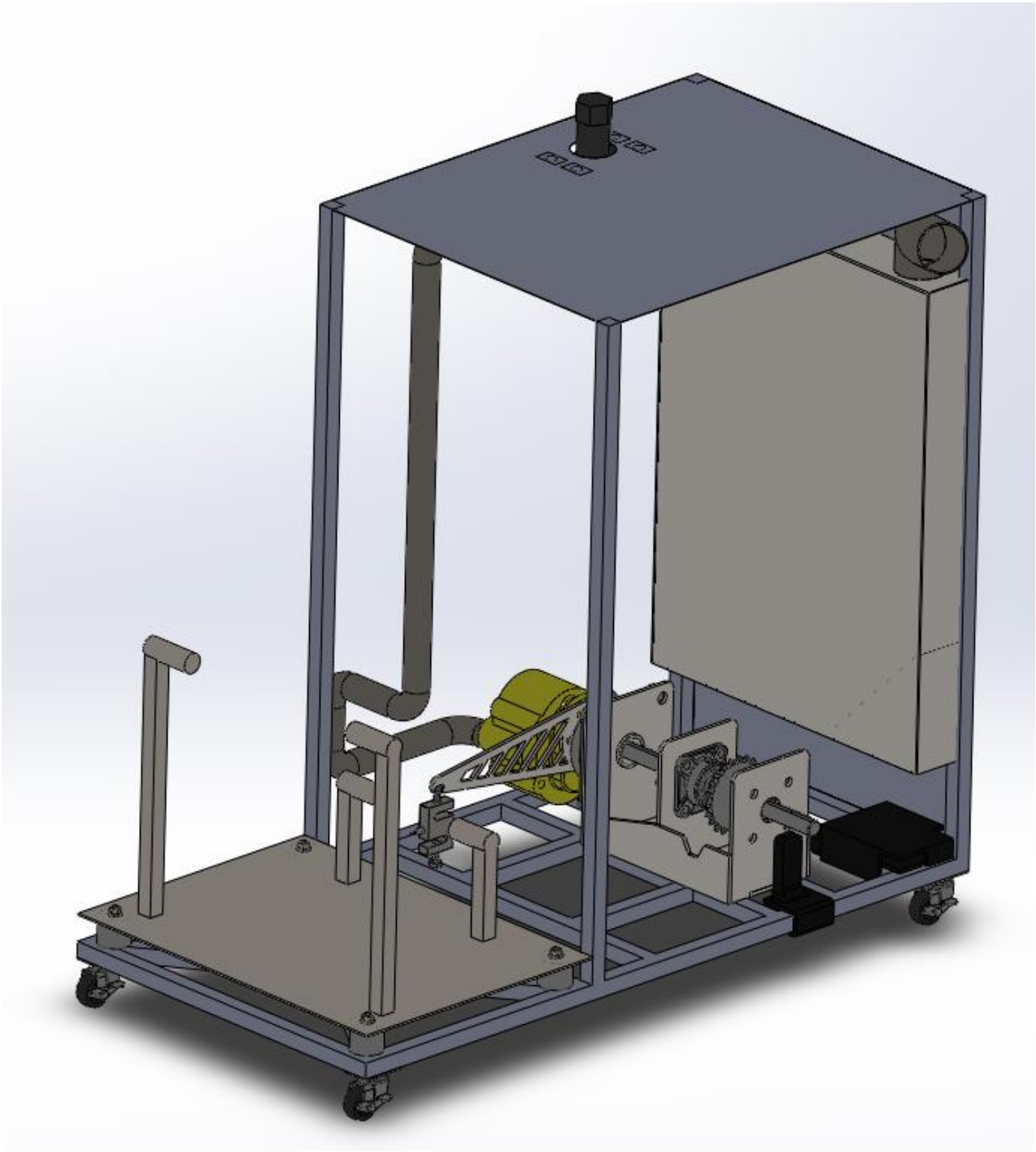

1 Project Description

This is a small engine dynamometer, which is designed to measure the torque and horsepower that is being output from an engine output shaft or sprocket. The yellow pump in the CAD drawing is free-floating and attached to that is a moment arm. From the torque that is being output from the output sprocket to the driveline shaft, the pump will have a torque put on it, which is registered by a load cell at the end of the moment arm. The load cell measures force, and the hall effect sensor measures RPM. See the following figure for a portrayal of each components name.

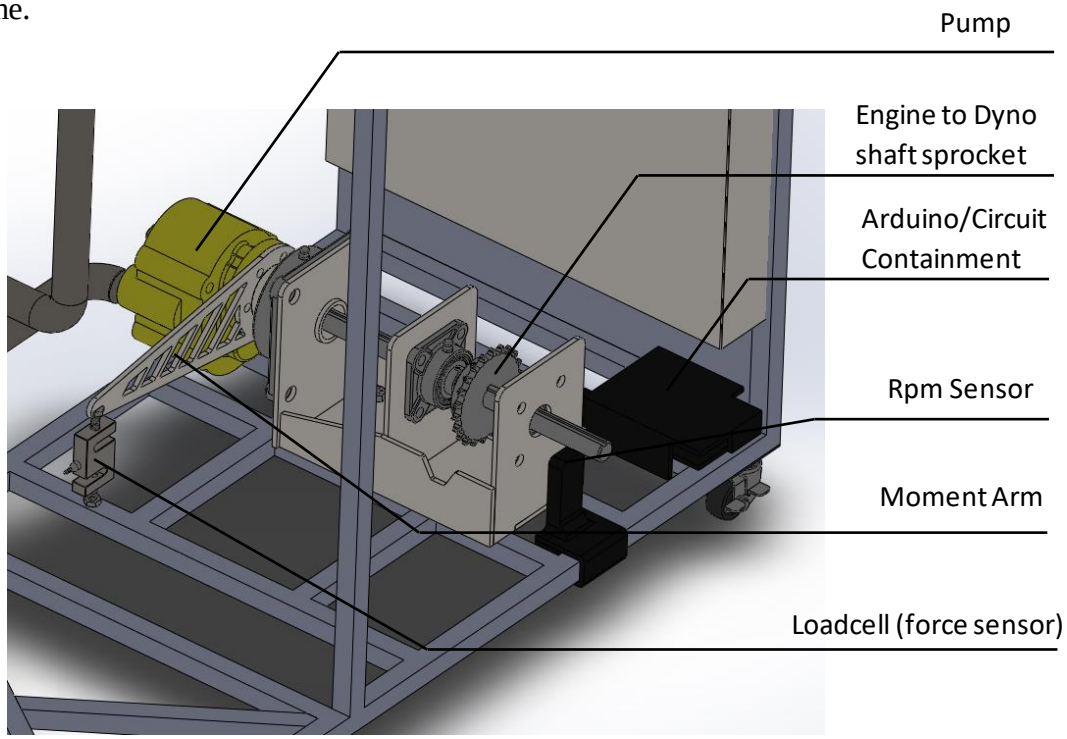

Figure 1: Driveline and Pump Assembly

The hydraulic pump creates a load on the shaft, which simulate a breaking force on the engine. There is a valve located on top of the dyno (not shown in figure above), which restricts the flow in the hydraulic pump, which creates a back pressure/force on the pump. The max rpm of driveline shaft has been designed for 3000 rpm. The team should create a driveline sprocket that is suitable for correct testing while keeping the hydraulic pump running under 3000rpm (larger sprocket means lower rpm, and vise versa). The max power of this hydraulic dynamometer is 121HP. It is also advisable that the team create a chain protection in case anything catastrophic happens (sheet metal cover over engine to driveline chained connection). To see the overall circuit diagram of the Arduino, see the following figure.

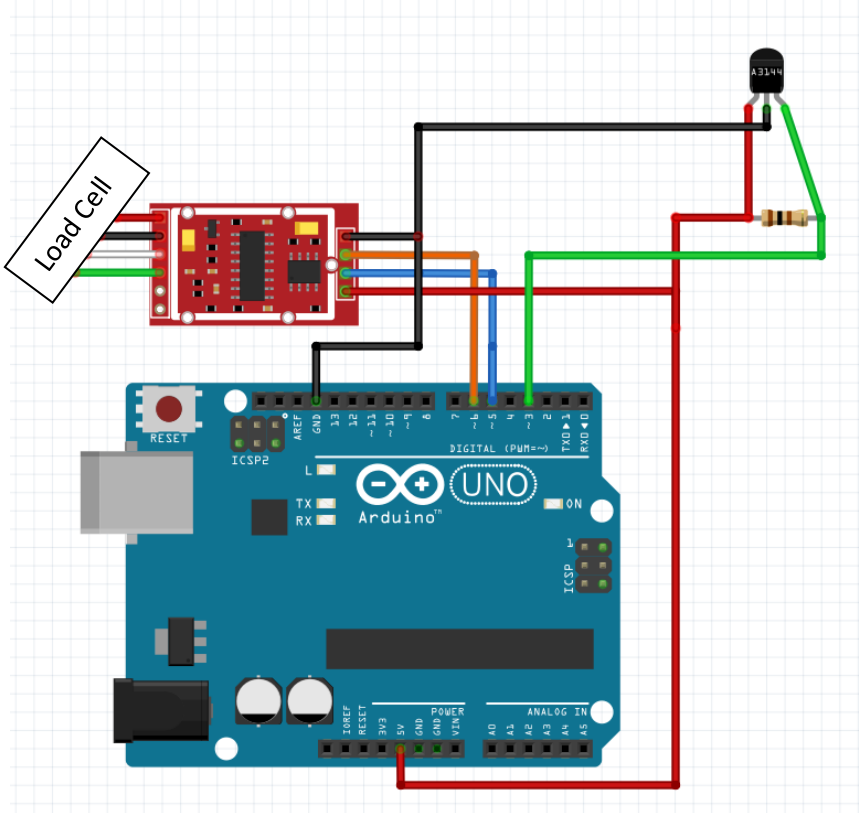

Figure 2: Overall Circuit Diagram

2 Operating Procedure

1. To obtain customized results, download the following Nodejs and React app from the following GitHub link: https://github.com/olinanderson/Small-Engine-Dynamometer.
2. If you require access to the CAD model for dimensioning or future modifications, see the grab cad link:
3. Once all the files are downloaded, you will need to make npm and Nodejs downloaded. Once the files are downloaded, make sure the dependencies are downloaded by typing “npm install” .
4. The next step is to change the COM port to the correct one and ensure the baud rate is set correctly. The current code on the Arduino is set to a baud rate of 115200, so you can most likely leave that. The only thing you need to make sure is correct is the COM port, which will be different on different laptops (Hint: Open Arduino and play around until you reach the com port and use that one in the code). To change the COM port, it is located inside the server.js file at the top (see figure below).

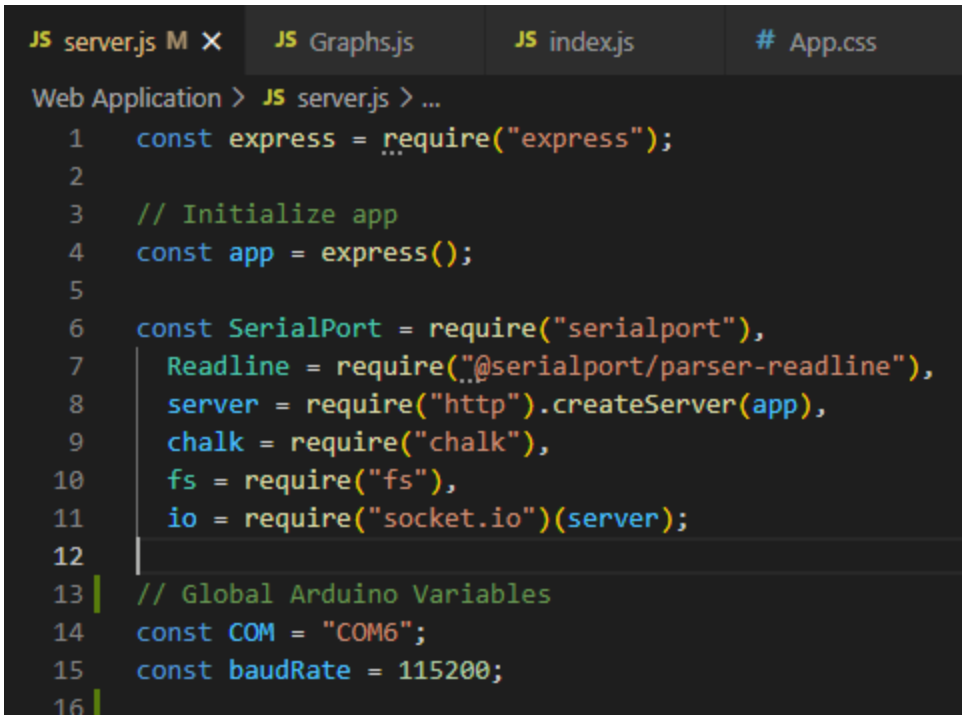

Figure 3: server.js

5. If you do not want to use the custom code provided in the GitHub link above, you can create your own which listens to the COM port, or just use Arduino. If you use Arduino only however, it will not save any data.
6. To run each server, run the following script: "npm run dev". This will run both Nodejs and React servers at once and automatically open it on your computer's browser.
7. If it does not open it, open the browser, and navigate to: "localhost:3000".
8. Now with the graph livestreaming, the values will show up on this web page. Note: The Torque and RPM values that are livestreaming from the Arduino will not show any changes unless the shaft is rotating.
9. The engine can now be tested on the Dyno!

3 Safety Precautions

- The dynamometer is a hydraulic system so there is potential for the hydraulics to fail, therefore extreme caution must be maintained while testing.
- The shaft of the driveline is openly rotating, so all jewelry must be taken off and long hair must be propped up.
- The dynamometer is provided with a long USB cord so whoever is operating it can use the computer far away, to mitigate any accidents that might happen. Make sure that the cord is out of reach of the rotating driveline shaft.

4 Support Links

The Arduino code and libraries, as well as the custom code to graph the data is located here: https://github.com/olinanderson/Small-Engine-Dynamometer. The most up-to-date CAD model is hosted here: https://grabcad.com/library/small-engine-dynamometer-1.

Note: If you require any further detail or schematics, please see the capstone report, which is also located at the GitHub link above.