

# Fatigue Testing Device

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## Background and Objective

The term “cyclical loading” describes a case in which stresses and strains applied to an object fluctuate in a repeating pattern. In these specific cases with repetitive loads, such as in a car axle, structural components can be fatigued and fail under forces that could typically be considered negligible. Fatigue test devices currently on the market cost in the range of \$20,000. The MENG 302 lab for Mechanics of Materials can greatly benefit by including this type of testing. As such, this design team is building a similar device from scratch for the MENG 302 lab at a fraction of the cost.



Fig 1. Fatigue Testing Device mid Assembly

## Previous Work

Previous teams finished machining and welding the outer frame of the device. All electronic components had been ordered and received before the Fall semester began.



Fig 2. Machined Load Plate

## Progress

The load plate was machined to accommodate different bearing locations as well as the load cell to document load applied to the sample. A power source with the correct current for the motor was assembled. Code to run the motor and motion controller has been compiled. Additional code to detect the lid position and trigger an LED runs as expected. Additional bearings with lesser tolerances were received to allow for translational motion of the collet holders. An oversized collet holder was modified to allow for smooth operation with the bearings.



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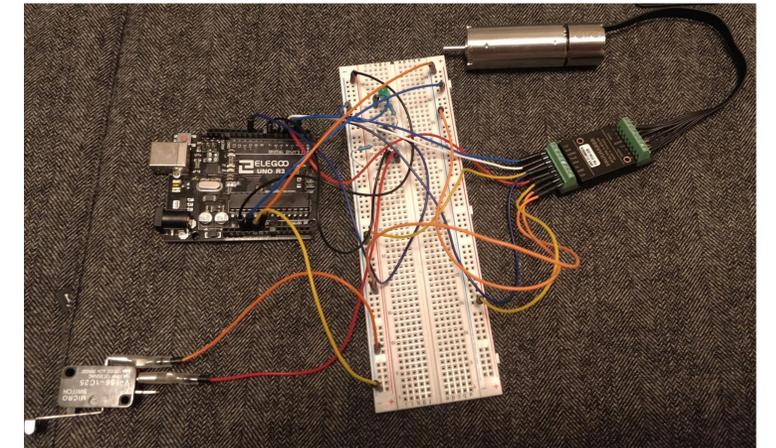


Fig 3: Arduino connected to limit switch, breadboard, and motor.

## Design

The FTD will be set to spin upwards of 4000 rpm while counting the number of rotations. It will also measure the force on the load cell through a force sensor. Lab students will use this data to derive properties of the material tested.

## Future Work

During the next semester (Spring 2021), the team will accomplish the following:

- Mount circuit onto the outer frame (Feb.)
- Test the prototype and troubleshoot any possible malfunctions (Mar./Apr.)
- Define the MENG 302 Lab exercise process and objectives (Apr.)
- Create a lab and safety manual for student use (Apr.)

