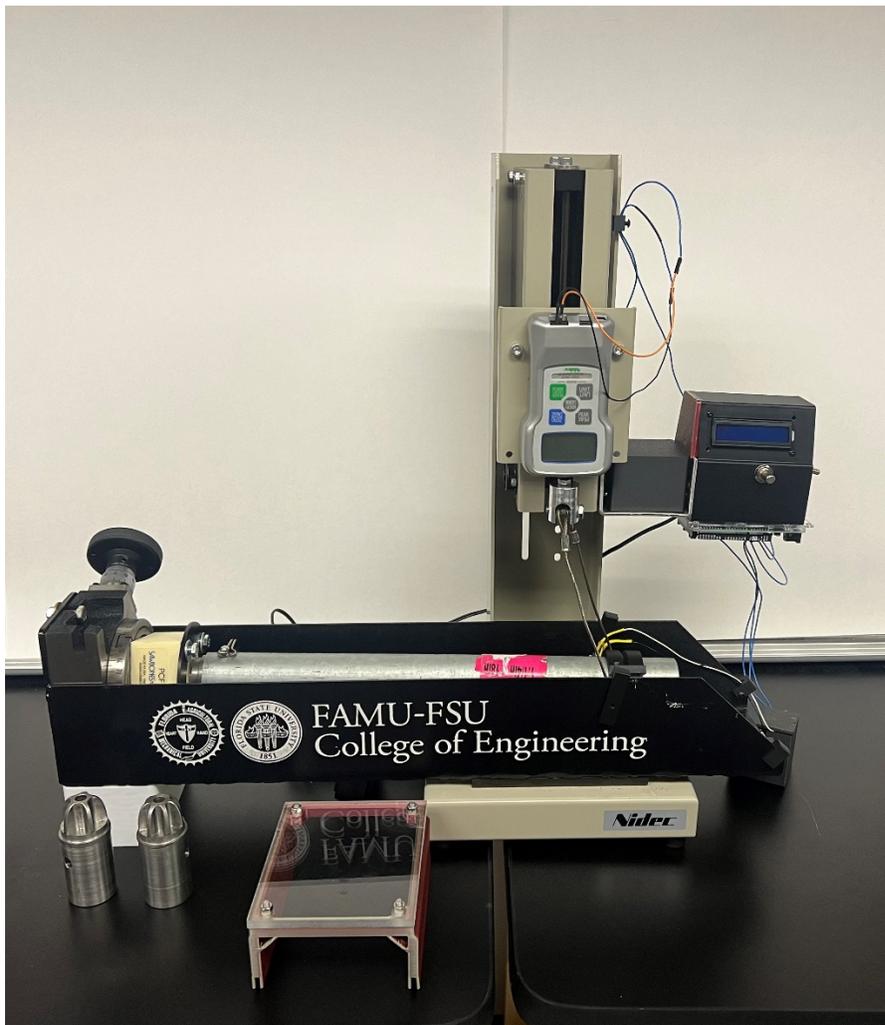
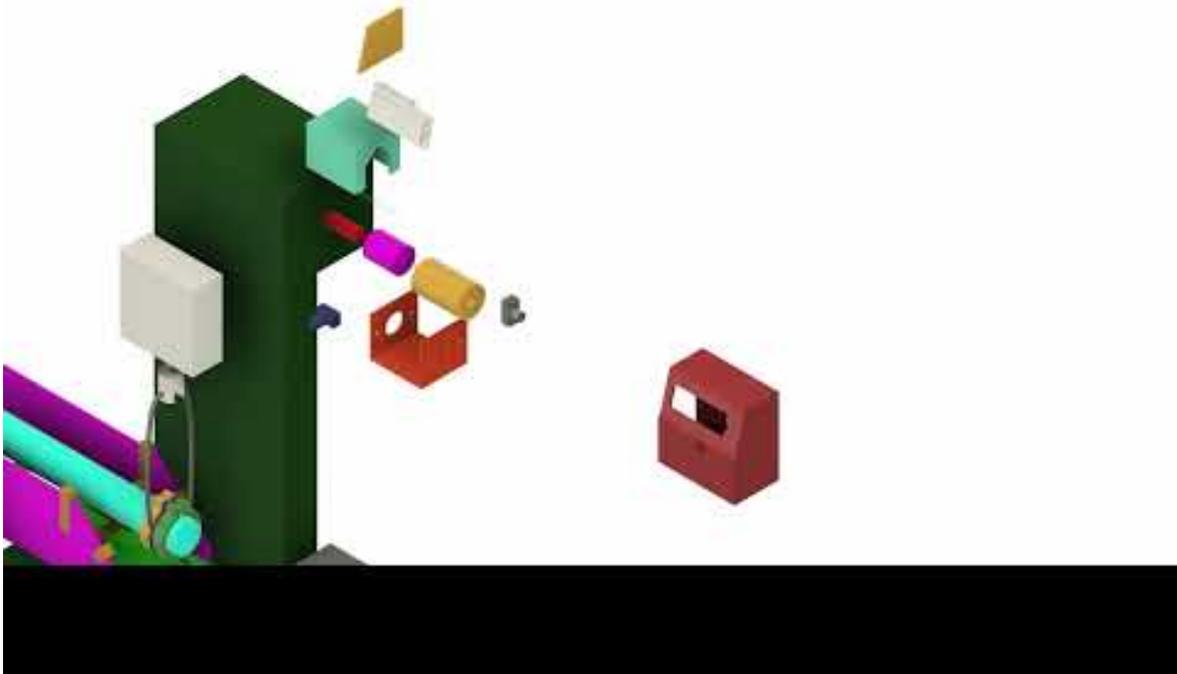
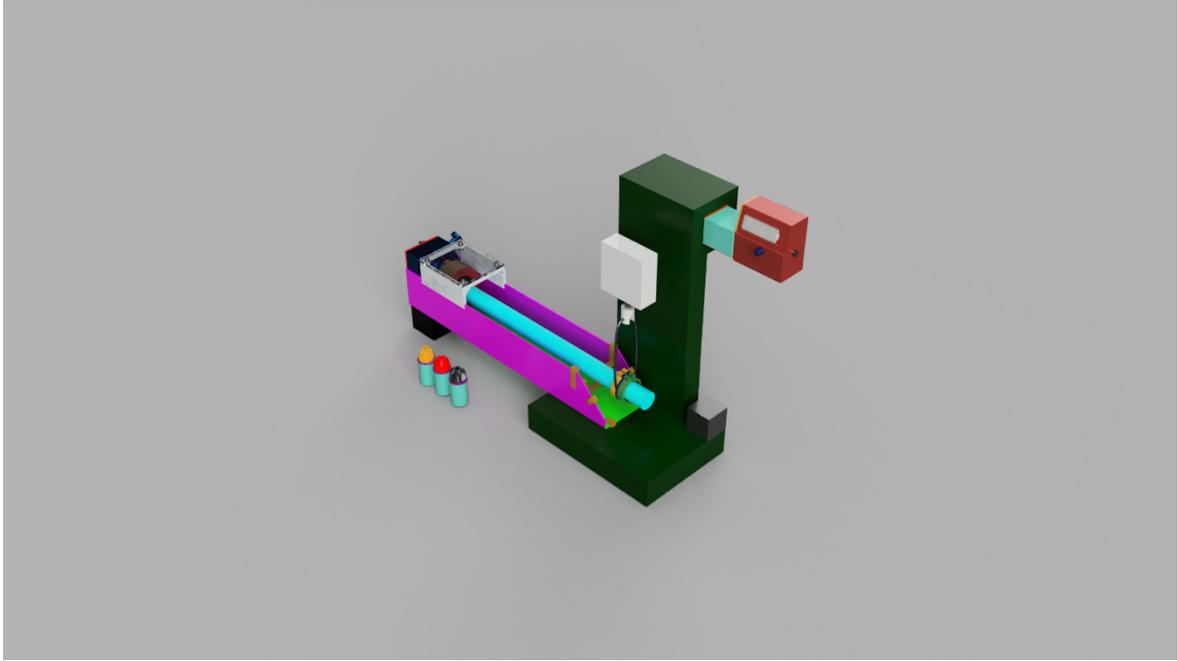


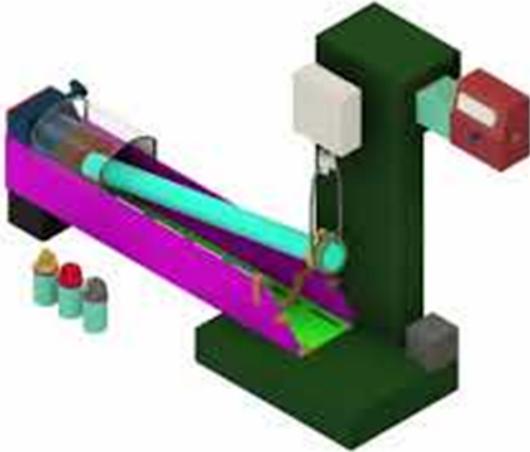
Project Overview

This project overview is focused on the operational pieces of this project. The test stand, implant models, post-processing, and safety instructions. The test stand is made up of three main components the electrical systems, the test stand itself as well as the horizontal support structure. A detailed breakdown of the specific parts is included in the exploded view video attached below. The electrical system involves an Arduino mega, ADS1015, LCD, Force Gauge, IR-sensor, a push-button and a switch. An electrical diagram will be included to help clarify. Operational instructions will be written and included as well. It is important that you either modify the stand to support your needs or follow these instructions, the order of steps matters and should not deviate. The main troubleshooting suggestion would be to connect to the Arduino and watch the serial output. If the ADS does not initialize it is likely due to the main 12-volt power supply not being plugged in. Plug it in and reset the Arduino to fix.

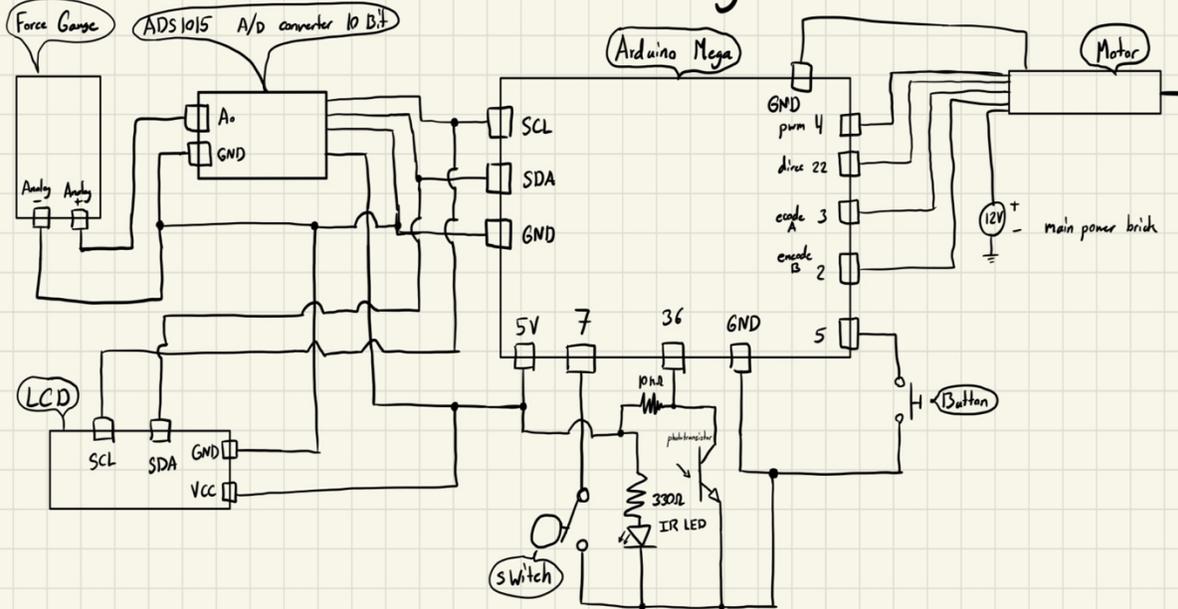
Assembly







Circuit Diagram



Part Number	Part Name
1	Motor-Electronics Housing
2	Flip Switch
3	Button
4	LCD Display
5	Motor
6	Side Pannel
7	Driveshaft Cover
8	Motor Mount
9	Coupler
10	IR-Sensor Electronics Box
11	Alignment Ring
12	Force Guage Adaptor
13	Force Guage Steel Wire Loops
14	7 Fin Model
15	5 Fin Model
16	3 Fin Model
17	Safety Cover
18	Support Block
19	Lever Arm
20	IR-Sensor Alignment Bracket
21	2x Side Walls
22	4x T-Nuts
23	Compressive Ring
24	Bone Block
25	T-Nut Alignment Tool
26	Rotary Vice
27	Bottom Plate
28	Back Plate

Operation

1. Bone block should be drilled prior to testing. Safety goggles must always be worn and hair pulled back before drilling. One hole directly in the center must be drilled approximately 0.55 inches wide and 2.15 inches deep. Four holes must be drilled in each corner of the block all the way through and approximately 0.26 inches wide. Use the provided alignment tool to ensure accurate placement. See figures below.



Drilled Bone Block



Drilling Guide

2. The chosen design must then be pressed into the bone block using the arbor press. Insert the provided guide into the drilled bone block. Align the center of the guide with the pressing force of the arbor press before operating. Once aligned, the arm of the arbor press must be used to properly press the implant into the bone block. Ensure the base of the implant is flush with bone block. See figures below.



Arbor Press



Proper Press

3. Attach the bone block to the rotary using the bolts. Do not forget to insert the compressive ring as shown in the exploded view video. Use a torque wrench to tighten the bolts until they reach 15 in-lb of torque. Attach lever arm to implant design and place safety pin in hole. Place safety cover above implant and loop the wire under the arm. Refer to video and figures below to ensure proper assembly



Bone Block Fixated



Lever Arm and Wire Attached

4. The force gauge must be turned on and read zero. Plug in the Arduino to computer port 7 and ensure the code has been uploaded. Plug in power supply to a supported wall outlet. Open PuTTY and set up the PuTTY configuration to the settings listed below. Push open on PuTTY and begin testing.

Putty Session

Serial

Speed: 115200 Baude rate

Serial Line: COM7

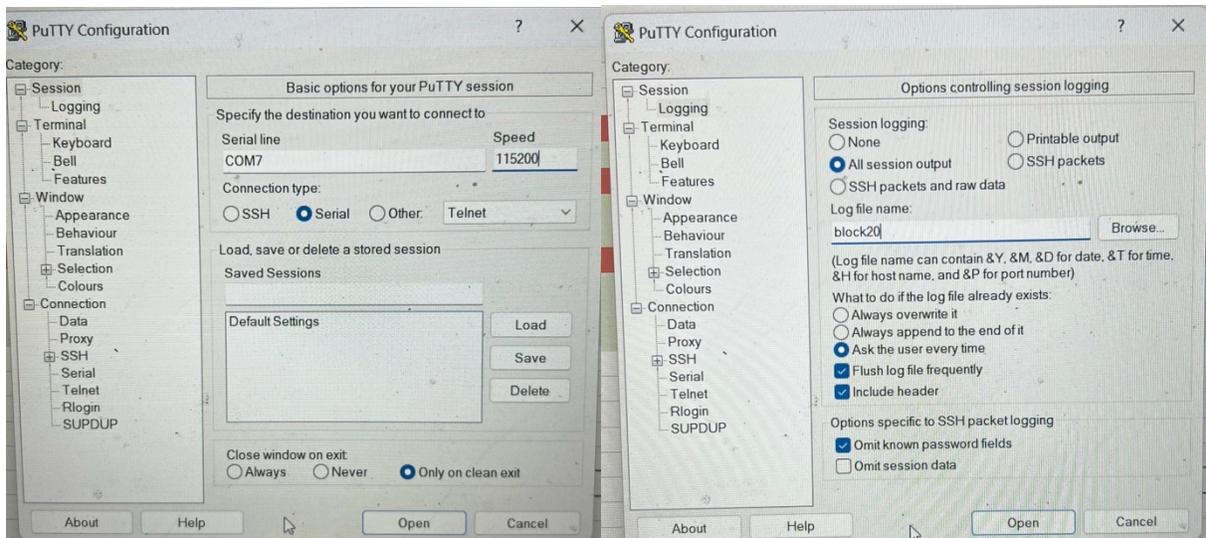
Logging

Log File Name (Name after bone block number used)

Pick Save & File Name

Switch to All Session and Output

Refer to correct PuTTY setting below before running test.



Troubleshooting

If issues arise where the motor sounds like it is running but the force gauge does not move up or down the coupler is the likely problem. Remove the safety cover while in operation. Do not stick your hands near the coupler as the torque output is high. If the coupler is broken or loose, replace or tighten the bolts securing the two shafts together. Electrical issues may occur in which case plug Arduino into computer and check serial output for errors.

Code

The following code is utilized for ultimate strength one time failure testing. It can be edited to achieve a bunch of varying results. Force is calculated using the ADS1015 analog to digital converter and the supplied force gauge. Displacement is calculated by using the 12 Volt DC motor dual channel encoder with extra gearing. This value was determined by comparing encoder counts to inches of upward travel recorded using a dial indicator. Arduino writes these values to serial output with the current clock time in milliseconds.

<https://drive.google.com/file/d/1-BKJgFg9W6bfhI6ZJcAVNGiN0xhu1DVK/view?usp=sharing>

Access Taylor Vanderlinden's OneDrive Senior Design Folder for all other files and documents.

[Senior Design](#)