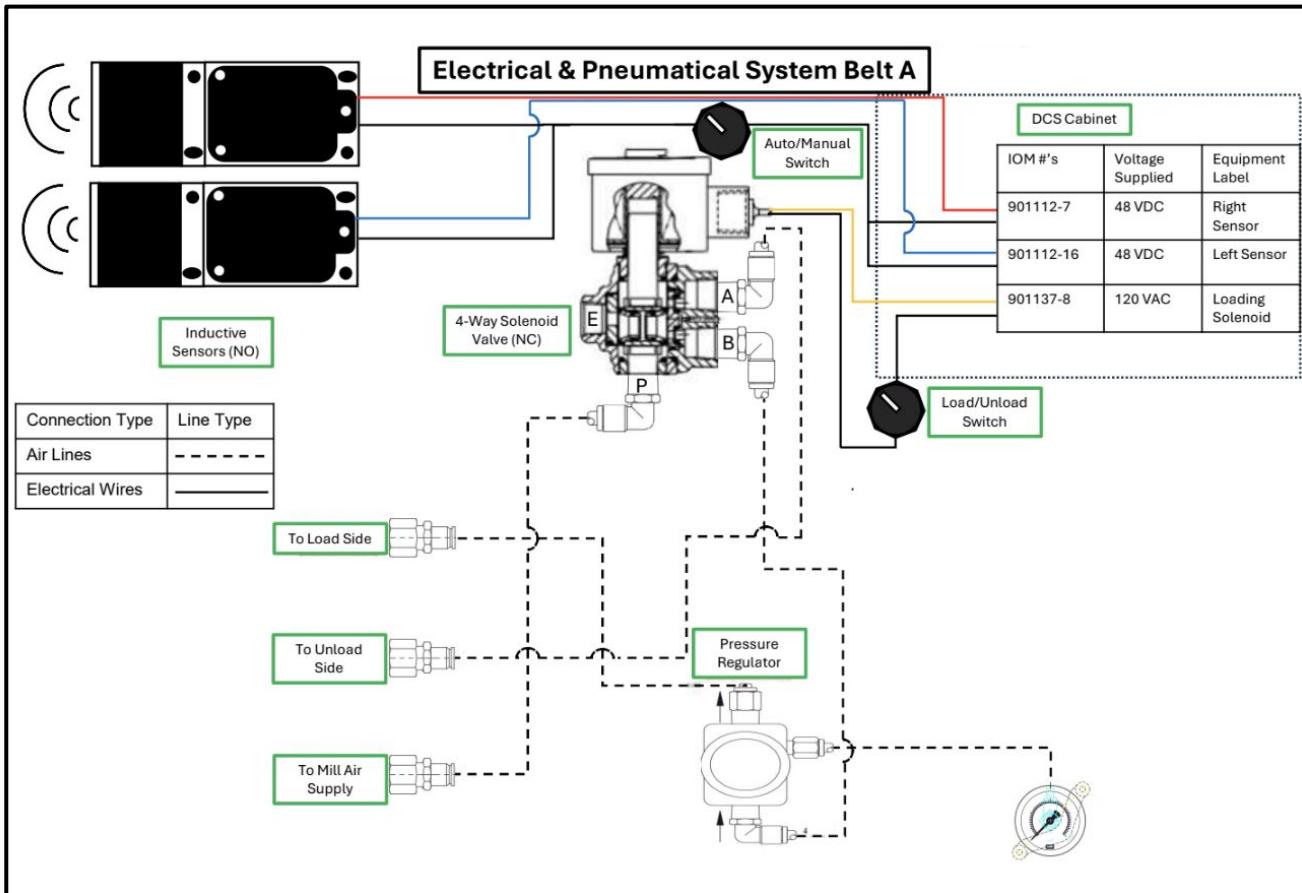


Automated Scraper Blade

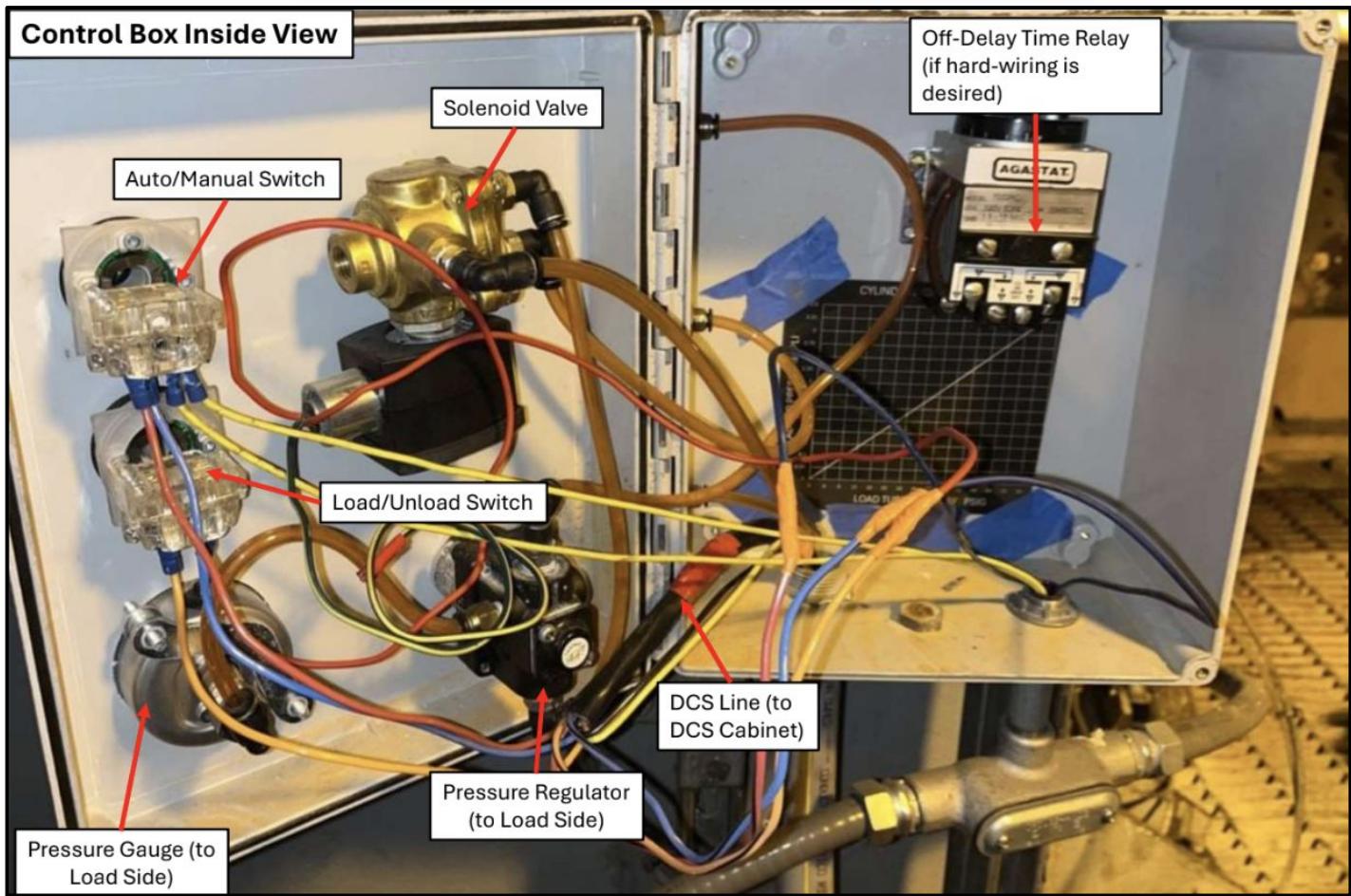


Overview/Objective

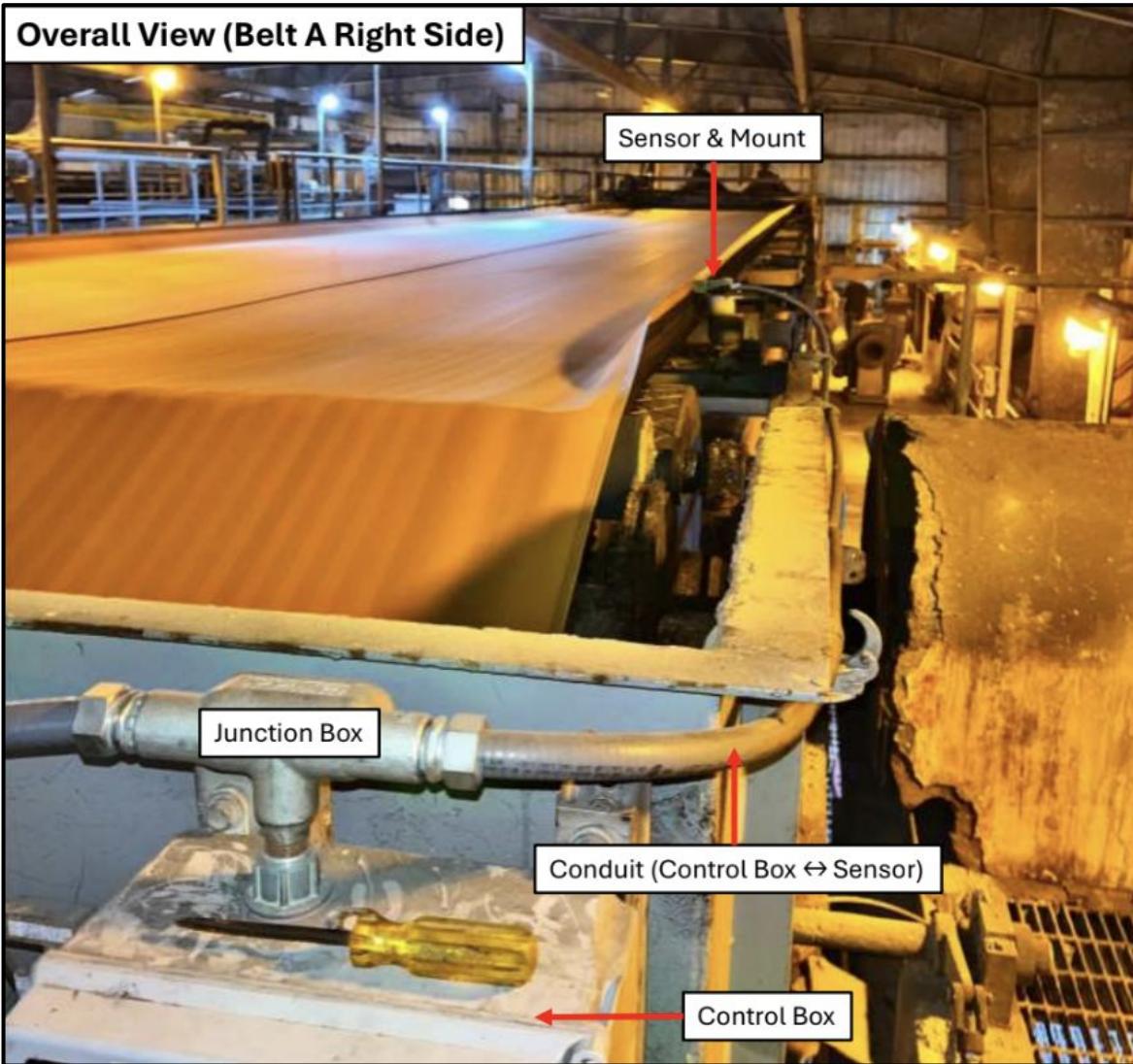
Automate a conveyor belt scraper system to detect belt's seam and avoid blade contact during each belt cycle, preventing conveyor belt damage while enabling the recovery of approximately \$16,800 worth of gypsum per day.

Details

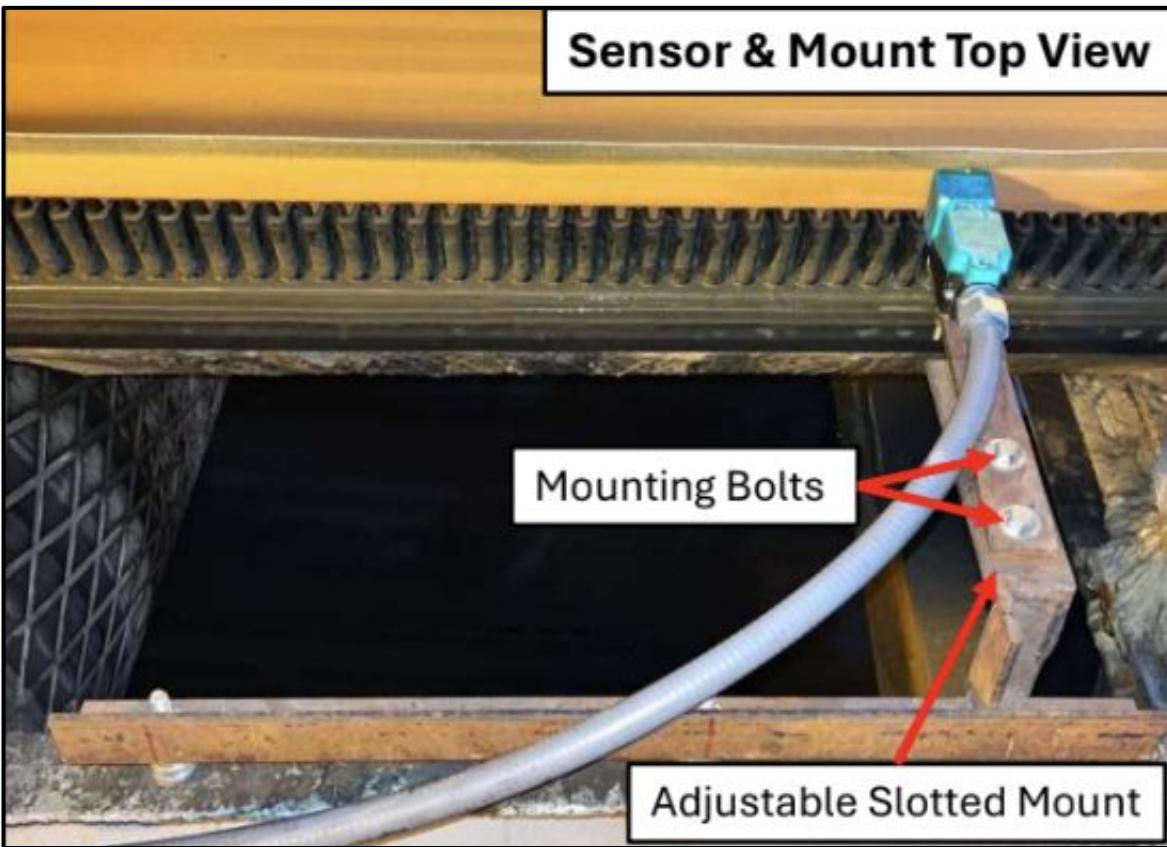
The system was implemented on two conveyor belts, each incorporating redundant inductive seam sensors, dual manual control switches, custom sensor mounts, a control box enclosure, and a solenoid valve driving pneumatic blade actuation. PLC programming integrated through the plant DCS synchronized blade operation with conveyor belt speed, optimizing timing, reliability, and overall scraper performance.



Overall View (Belt A Right Side)



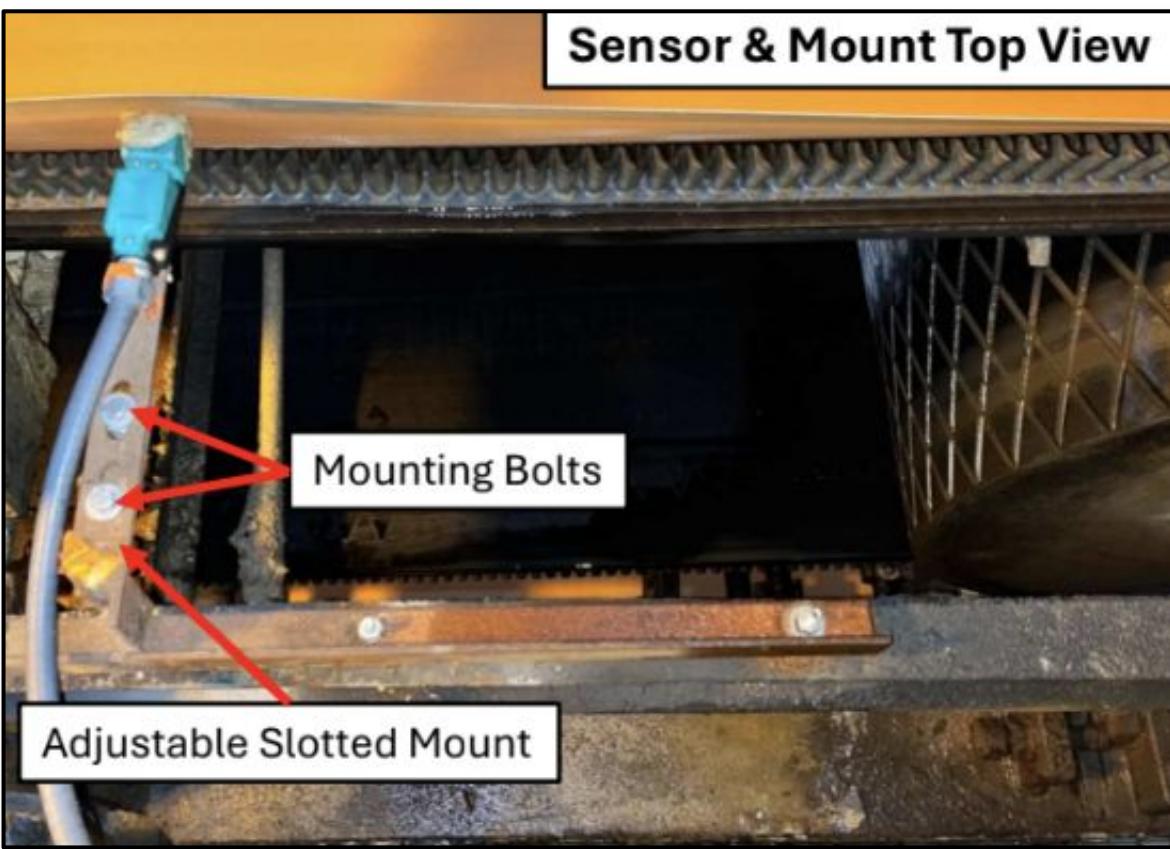
Sensor & Mount Top View

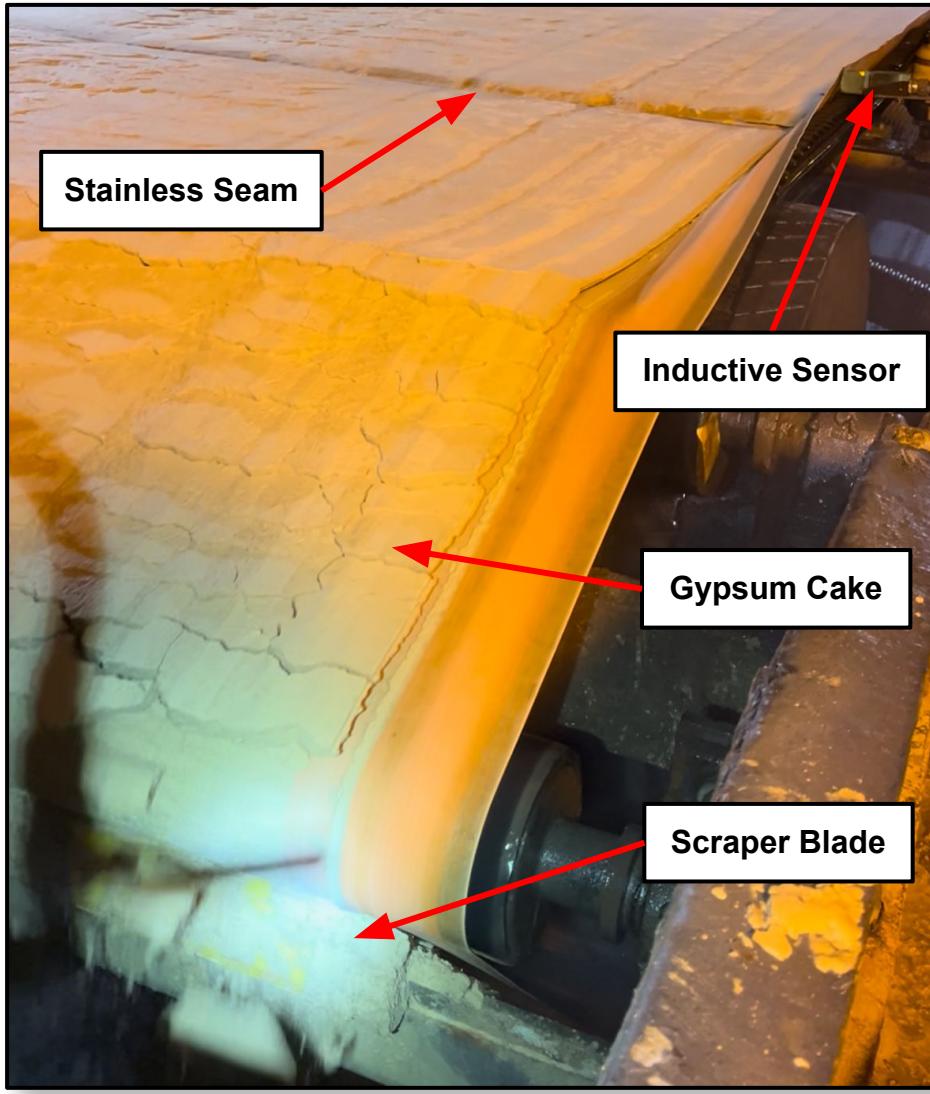


Overall View (Belt A Left Side)



Sensor & Mount Top View



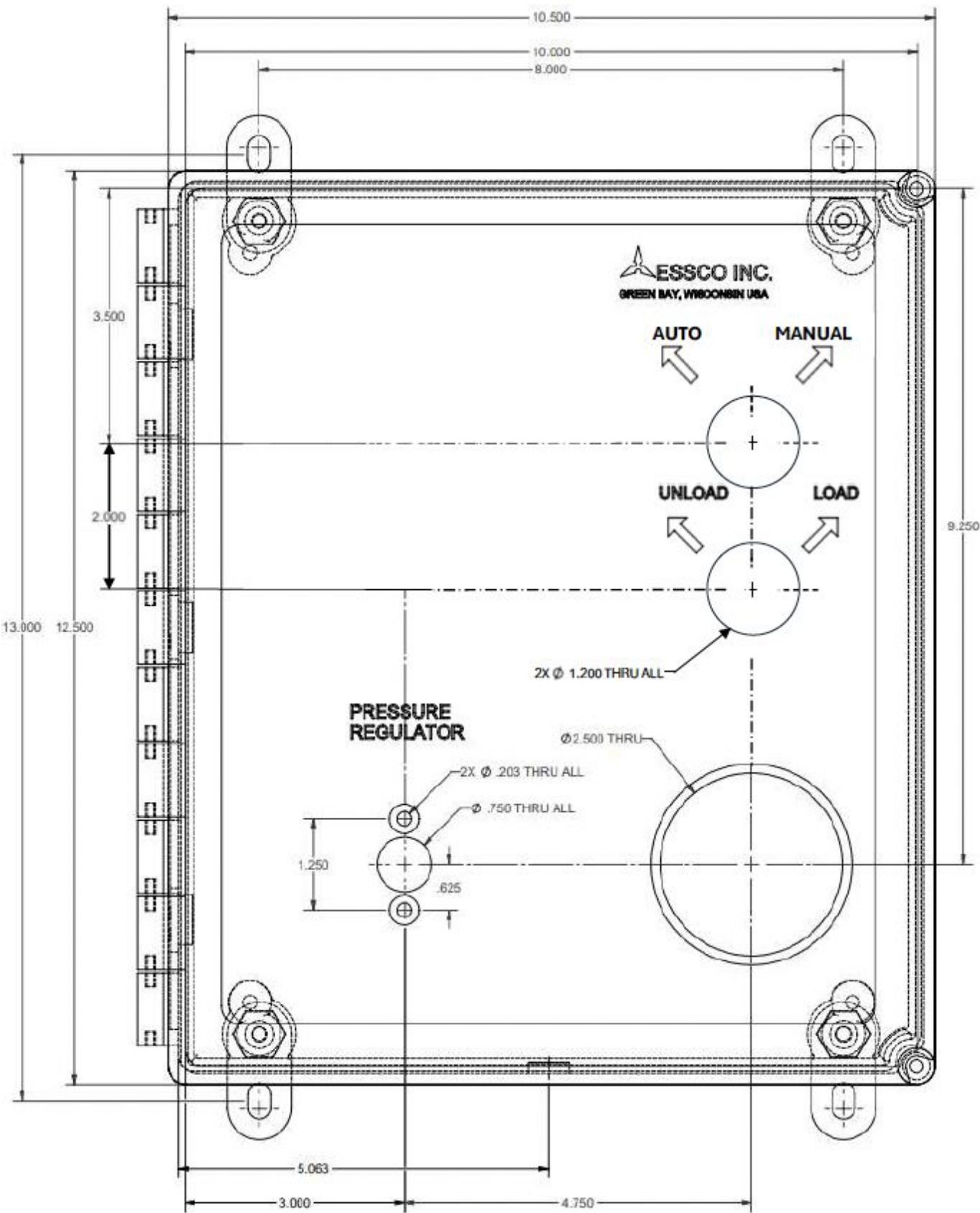


Seam Detected

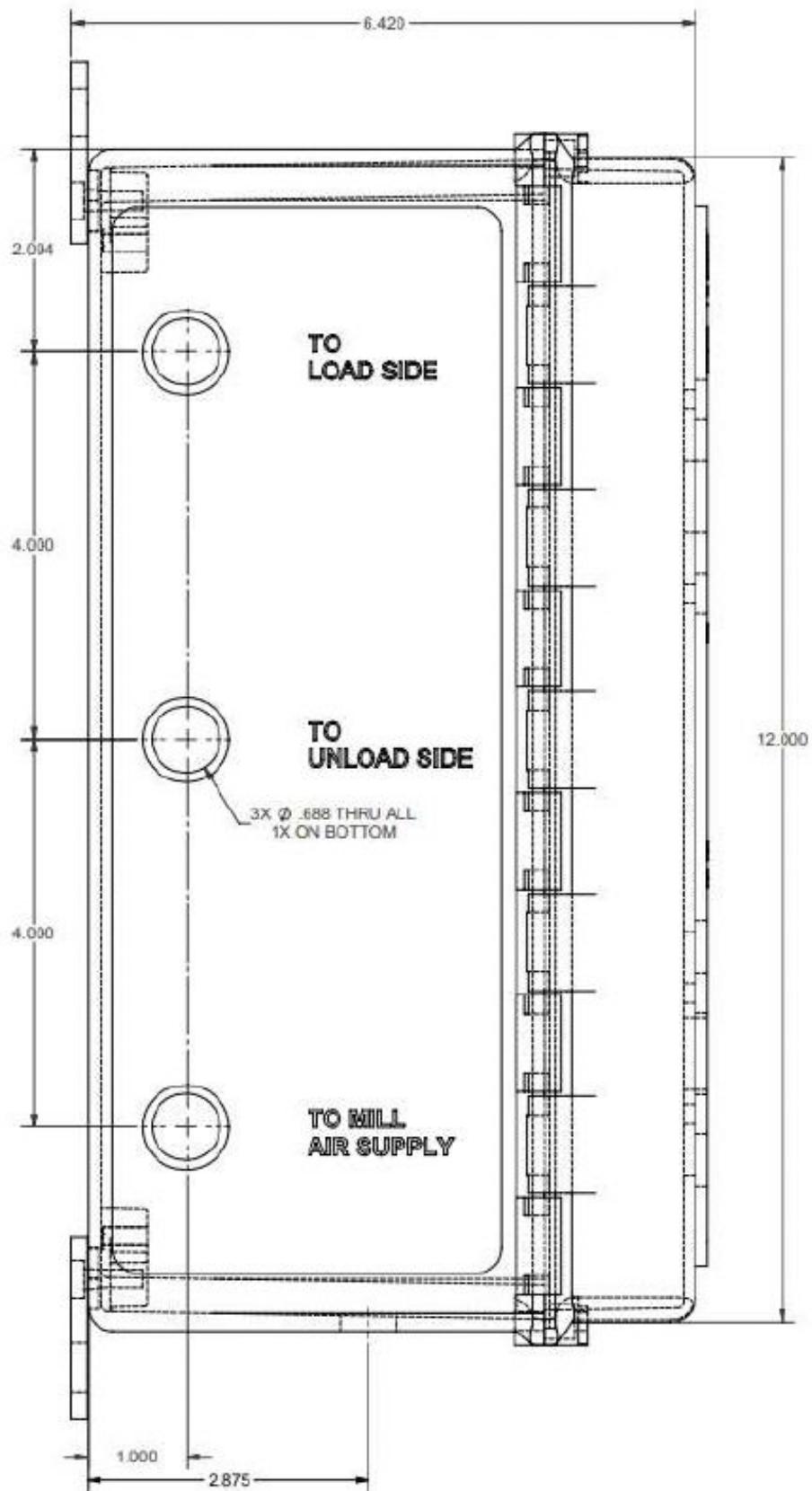


Blade Unloads → Seam Passes → Blade Reloads

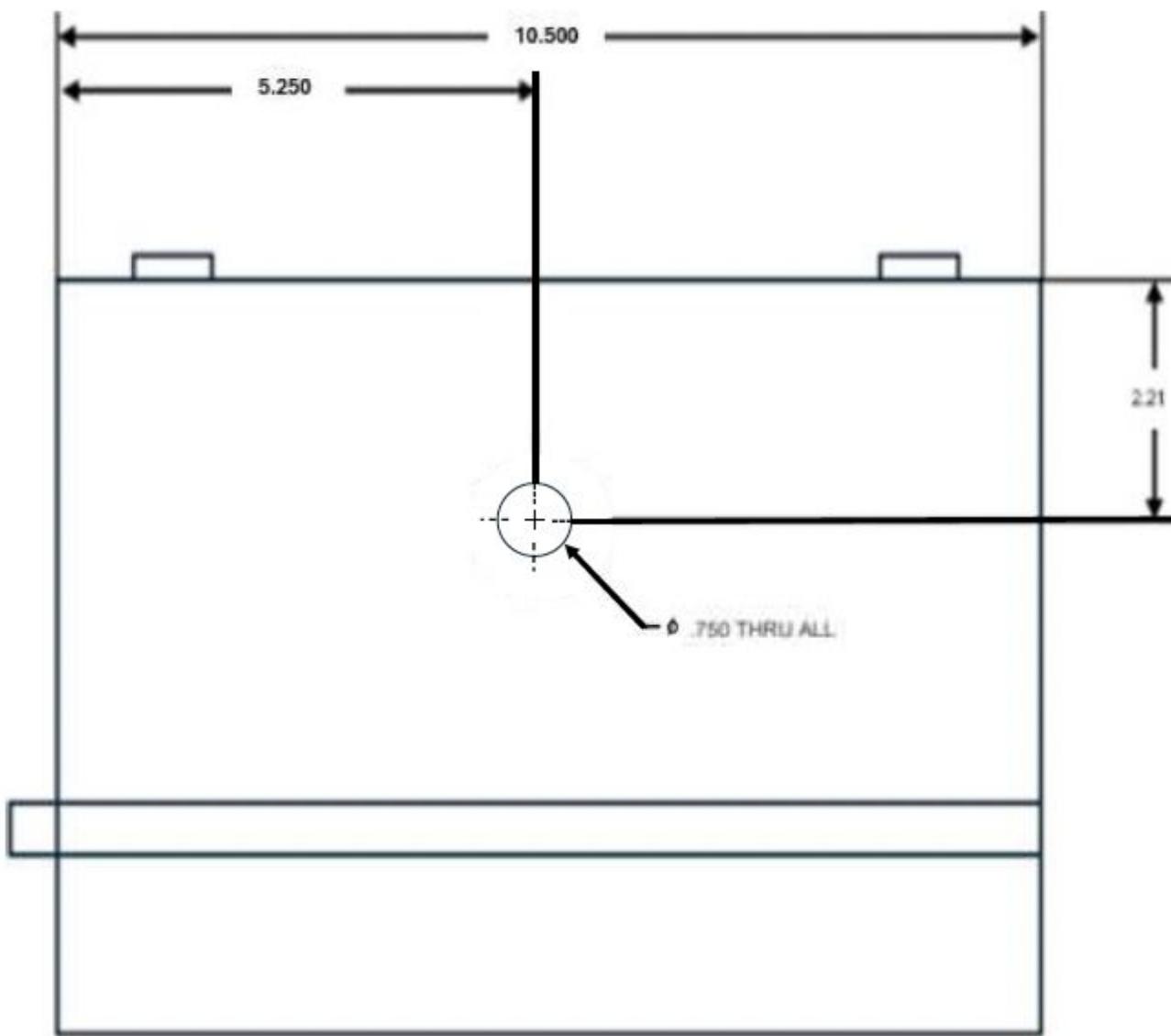
Control Box Housing



Front View

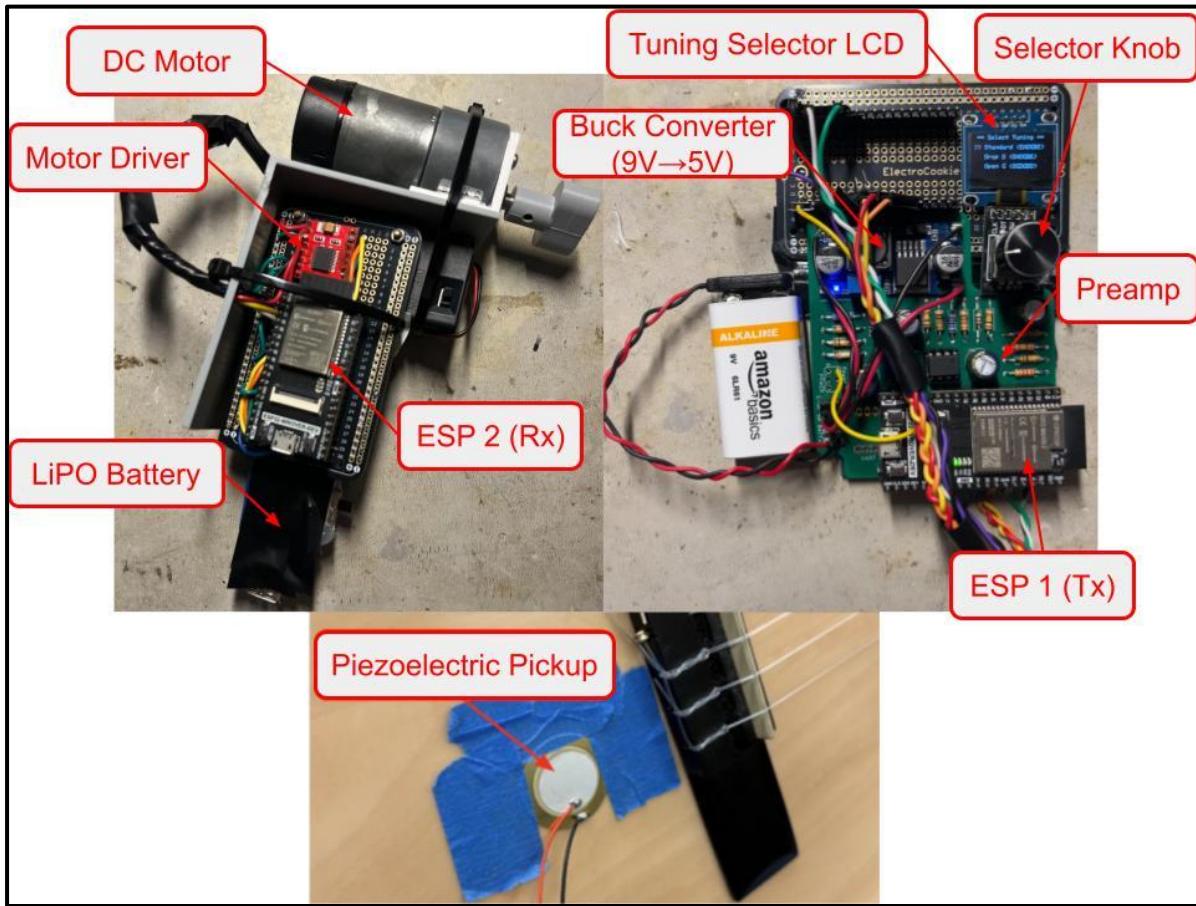


Side View



Top View

Automatic Guitar Tuner

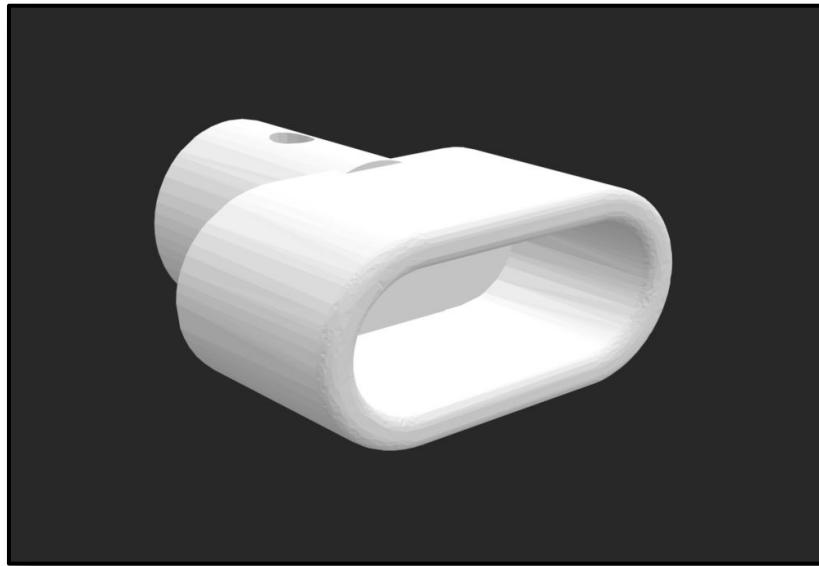
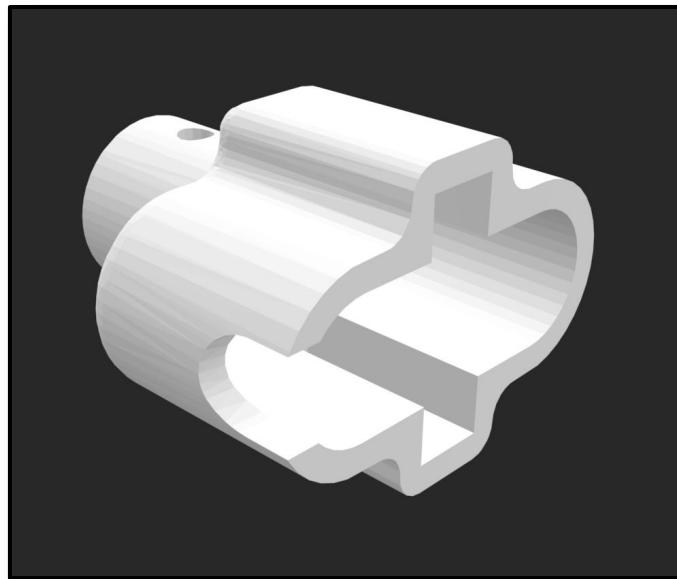
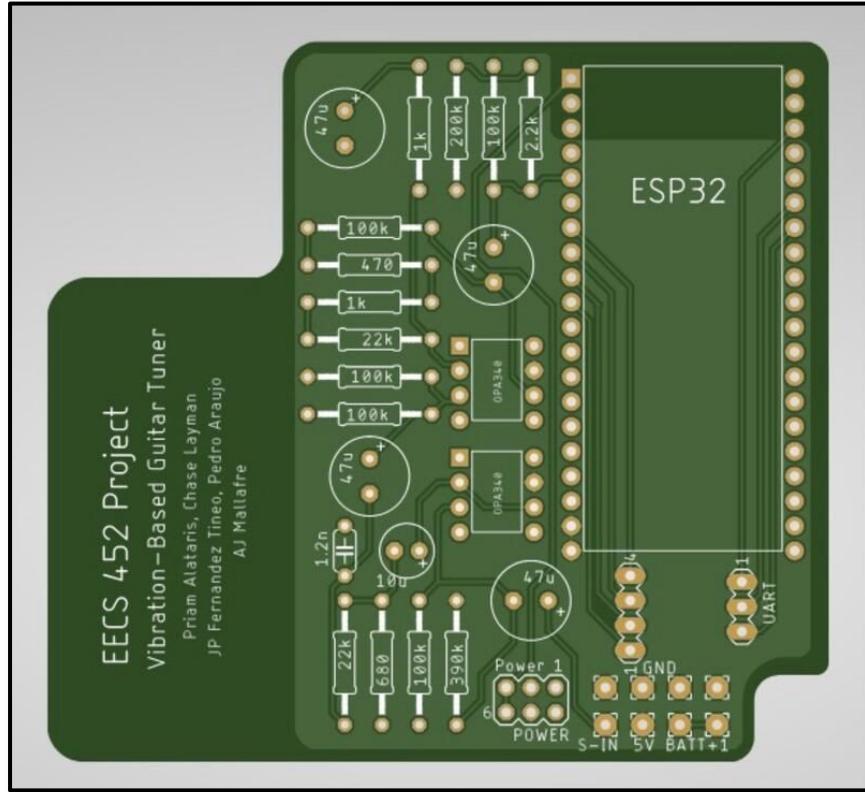


Overview/Objective

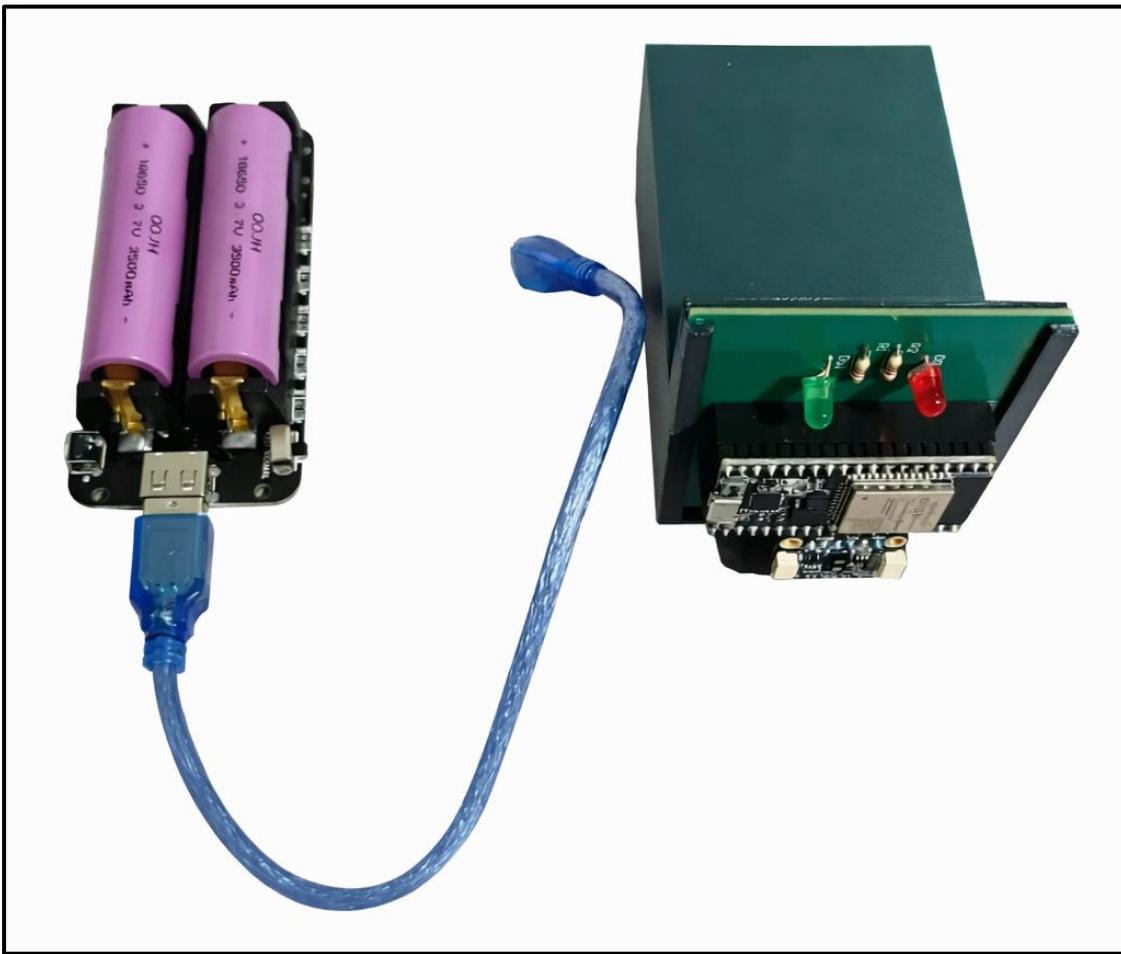
Detect string frequency using a piezoelectric vibration sensor and digital signal processing, then automatically adjust peg windings via DC motor control system in real-time. It was also a requirement to make the system cost less than existing competitors (<\$130)

Details

Two subsystems: pitch detector and tuning gun (see image above). Pitch detector included vibration sensor, tuning-selection user interface, preamplifier, and ESP 1 to process the signal and transmit commands to the tuning gun receiver (ESP 2). Tuning gun consisted of ESP 2, motor driver, peg adapter, and DC motor that physically adjusts the guitar pegs.



Time-of-Flight People Counter



Overview/Objective

Develop a robust ESP32-based embedded system capable of tracking room occupancy in real time by counting people entering and exiting, including handling edge cases such as simultaneous crossings and partial entries, with occupancy data transmitted wirelessly via Wi-Fi to a secondary ESP32.

Details

The system consists of a 3D-printed housing that holds two Li-Po batteries, a battery shield, a time-of-flight sensor, a custom PCB, an ESP32, and status LEDs (green for entries, red for exits). The housing includes a top opening for battery access and is mounted above a door frame using velcro tape.

