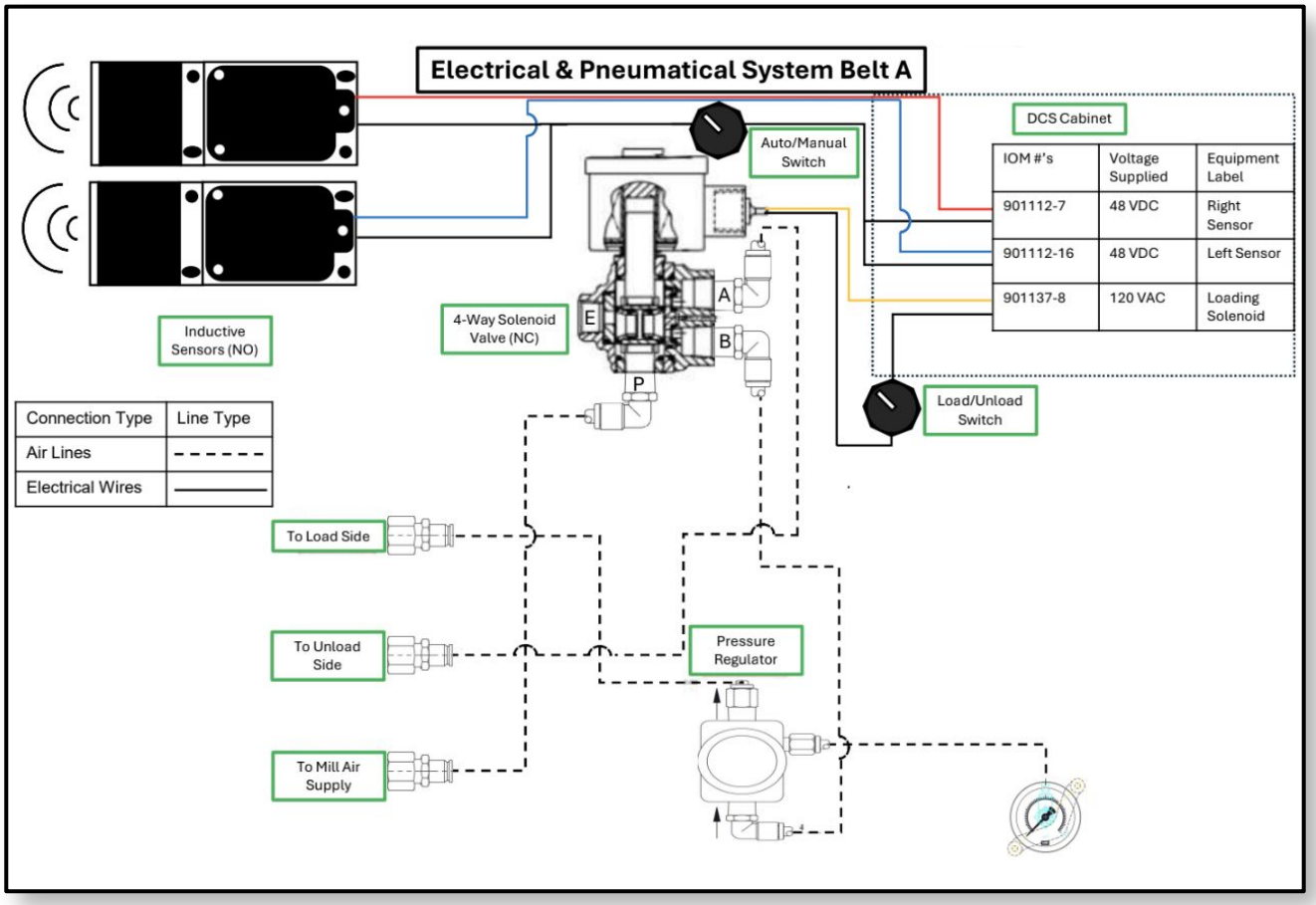
Automated Scraper Blade



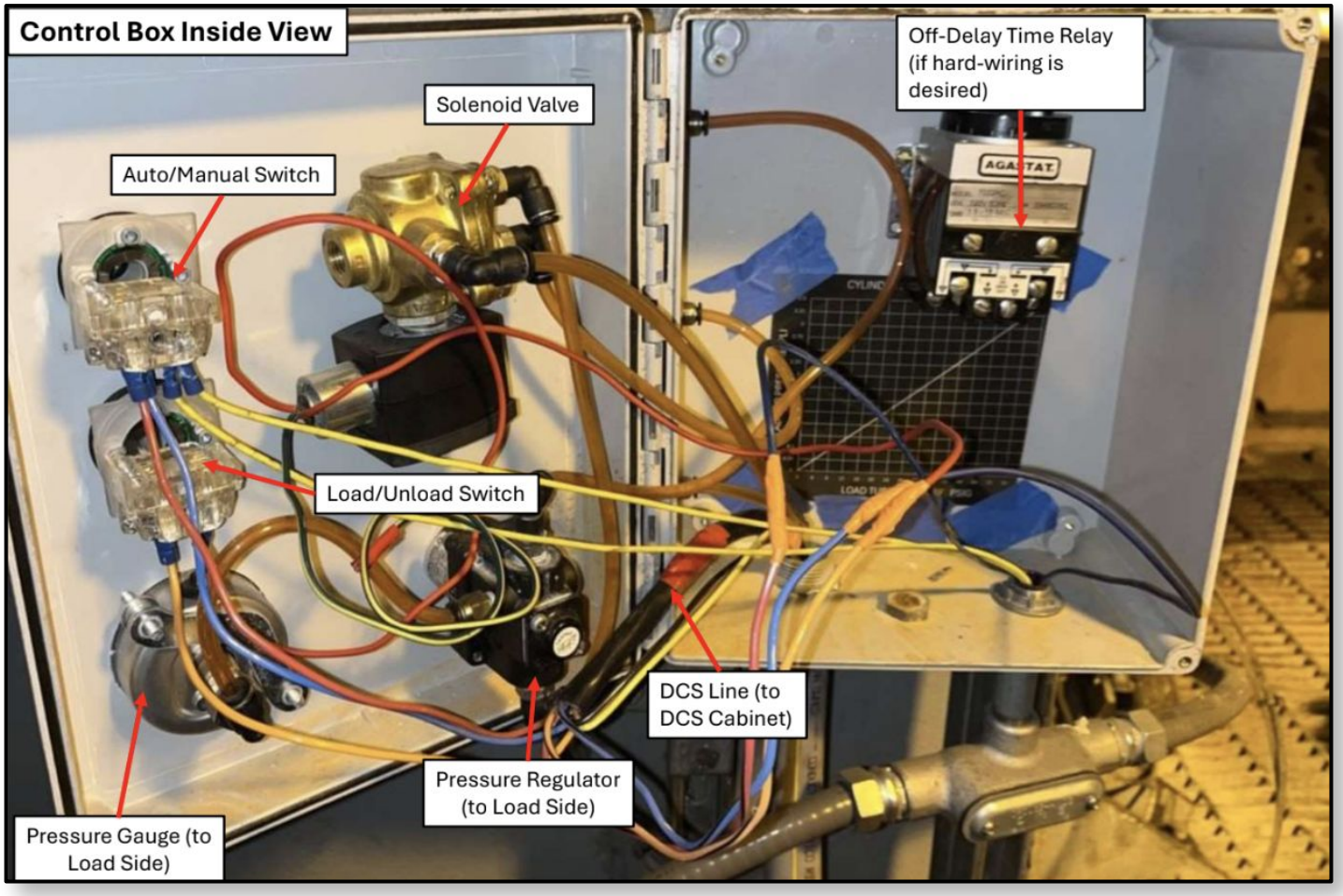
Overview/Objective

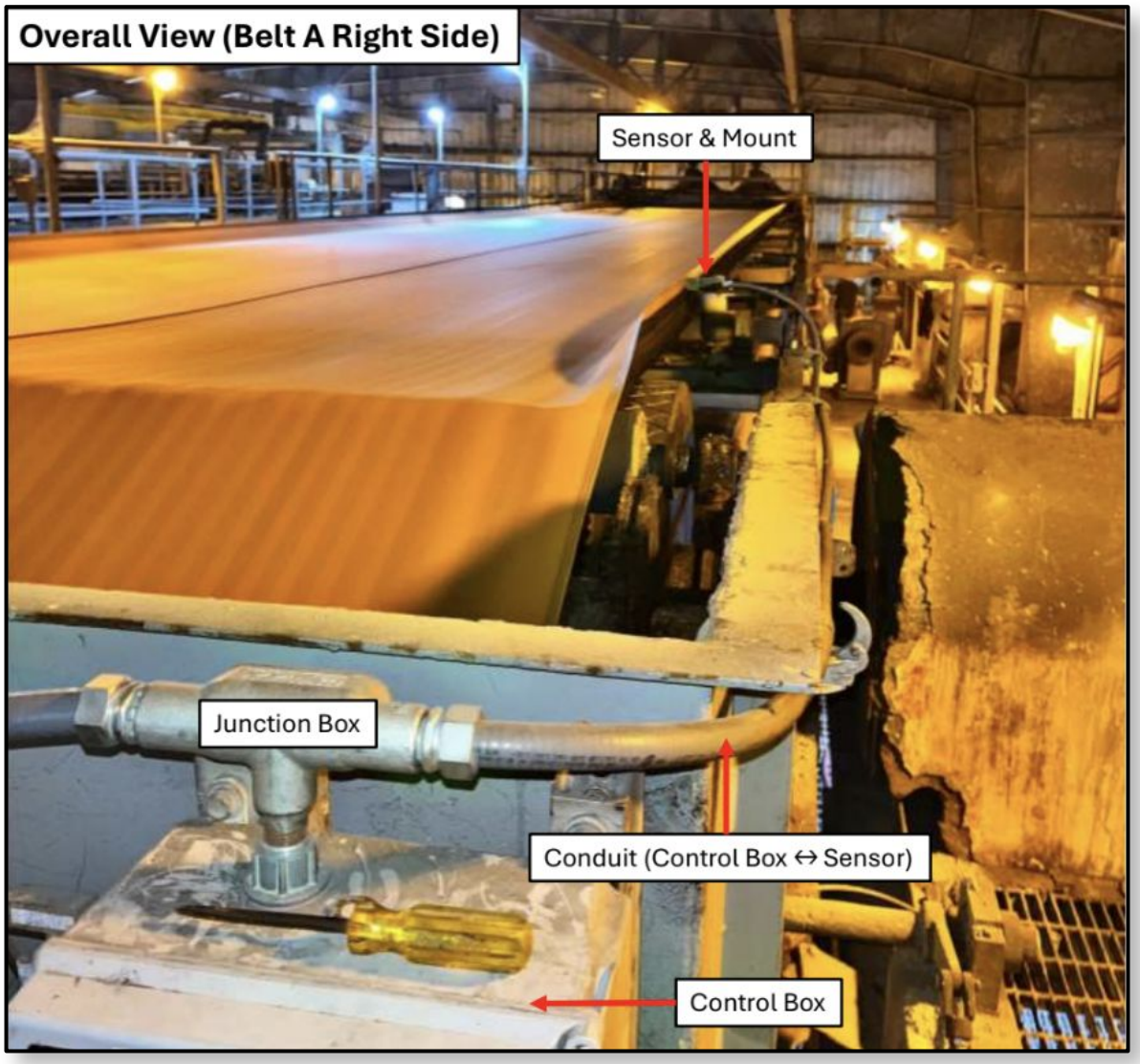
Automate a conveyor belt scraper system to detect belt's seam and avoid blade contact during each belt cycle, preventing conveyor belt damage while enabling the recovery of approximately $16,800 worth of gypsum per day.

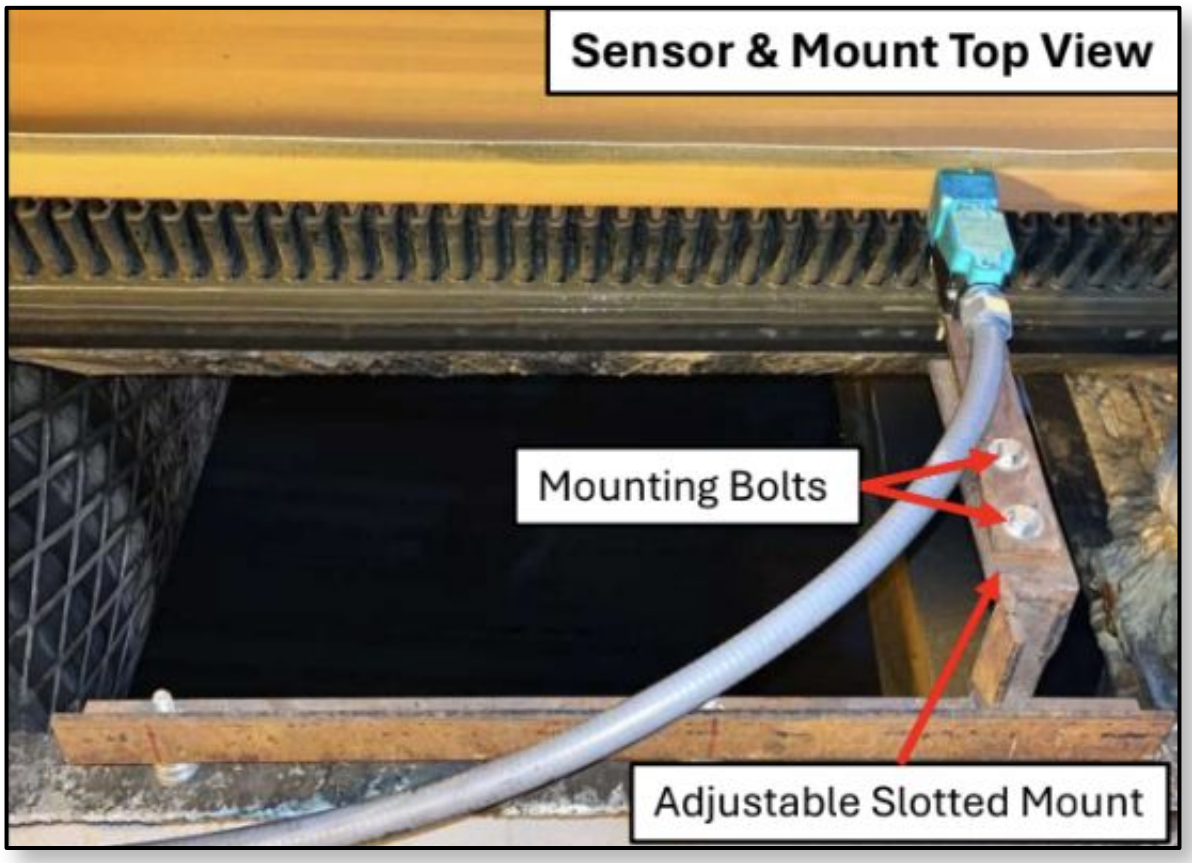
Details

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.

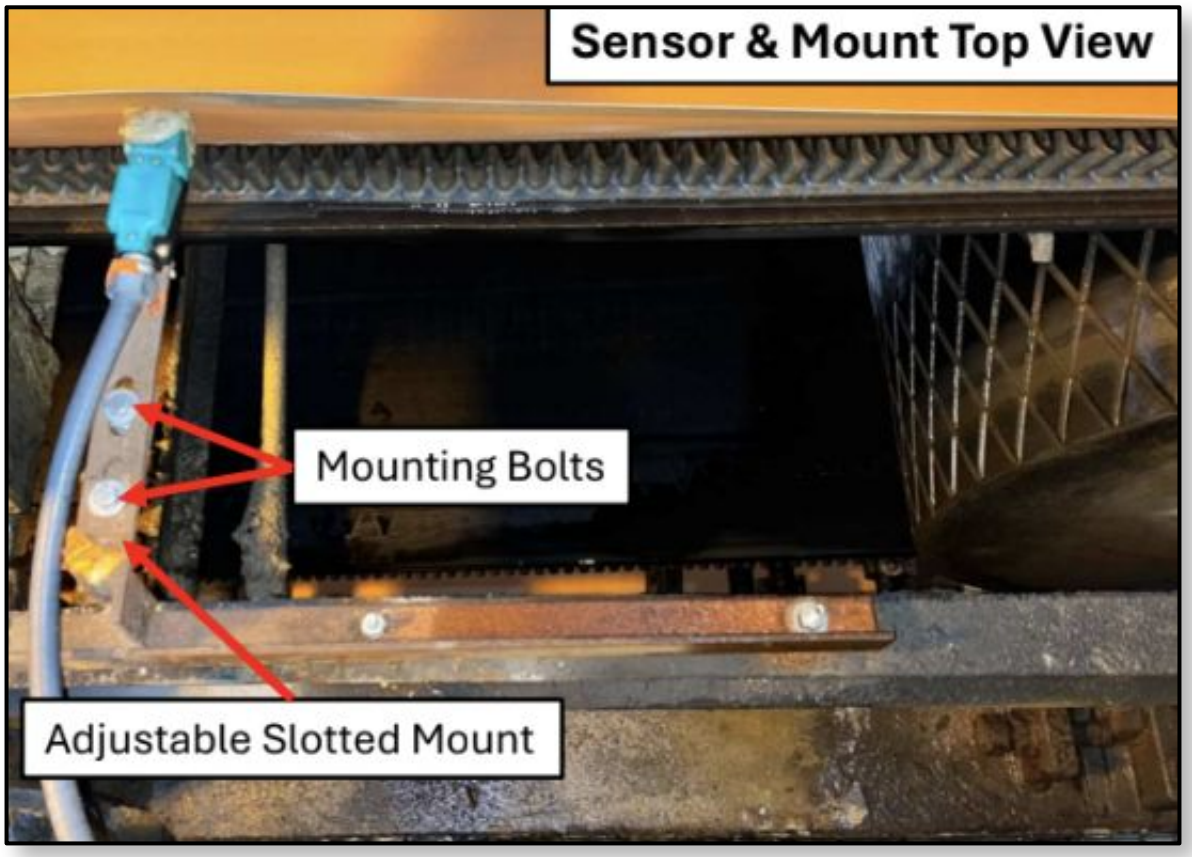

Control Box Outside
⚠LEAVE ON LOAD WHEN IN AUTO!!!
AUTO
MANUAL
LOAD
UNLOAD
PRESSURE
REGULATOR
FAIRCHILD


Control Box Inside View
Off-Delay Time Relay (if hard-wiring is desired)
Solenoid Valve
Auto/Manual Switch
Load/Unload Switch
DCS Line (to DCS Cabinet)
Pressure Regulator (to Load Side)
Pressure Gauge (to Load Side)

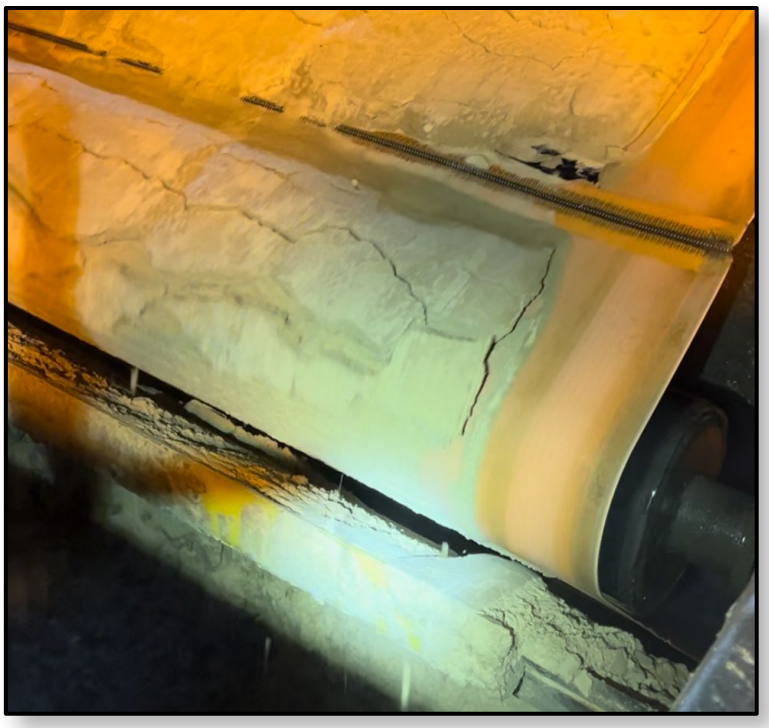

Overall View (Belt A Right Side)
Sensor & Mount
Junction Box
Conduit (Control Box ↔ Sensor)
Control Box


Sensor & Mount Top View
Mounting Bolts
Adjustable Slotted Mount


Overall View (Belt A Left Side)
Sensor & Mount
Conduit (Control Box ↔ Sensor)


Sensor & Mount Top View
Mounting Bolts
Adjustable Slotted Mount

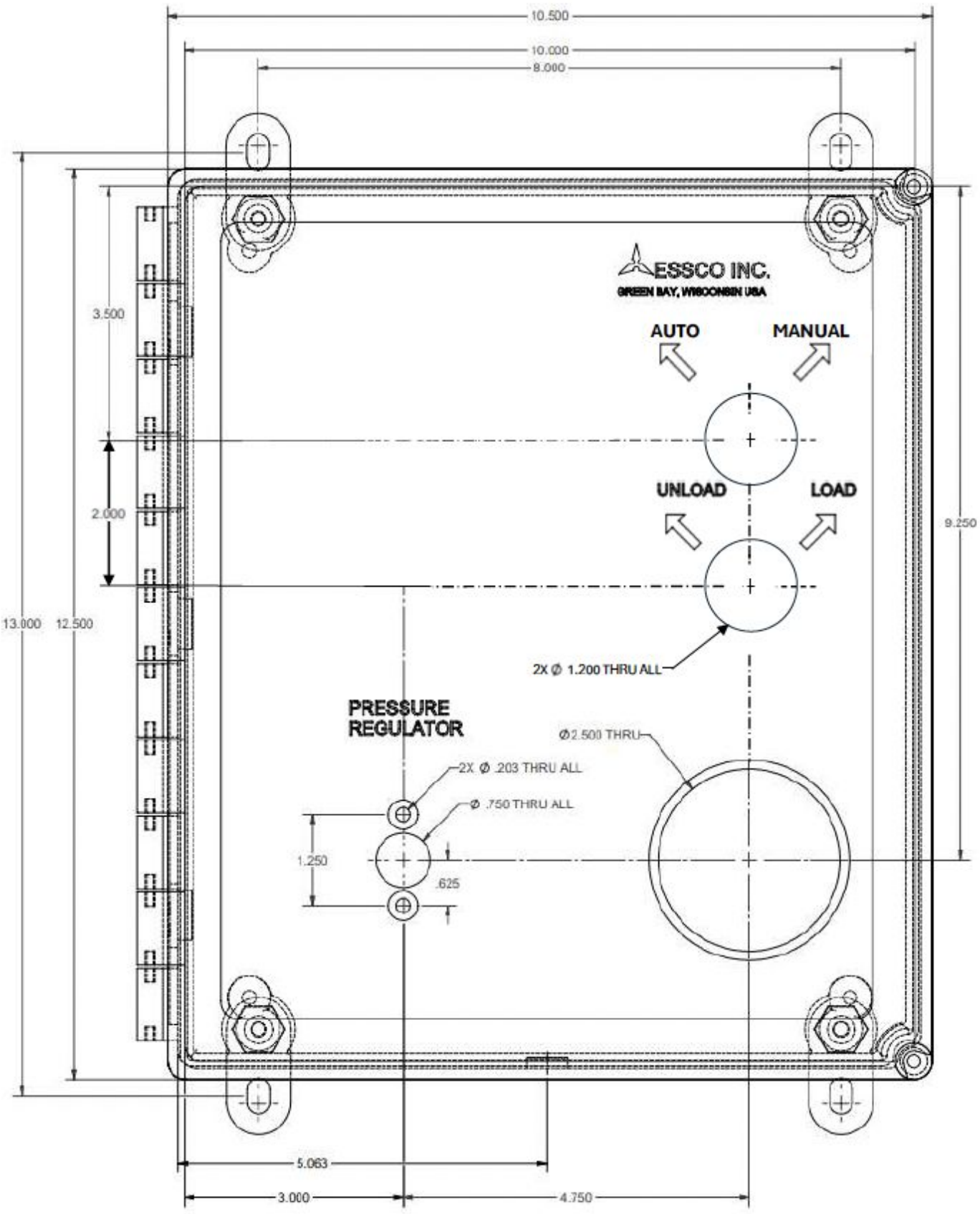
Seam Detected



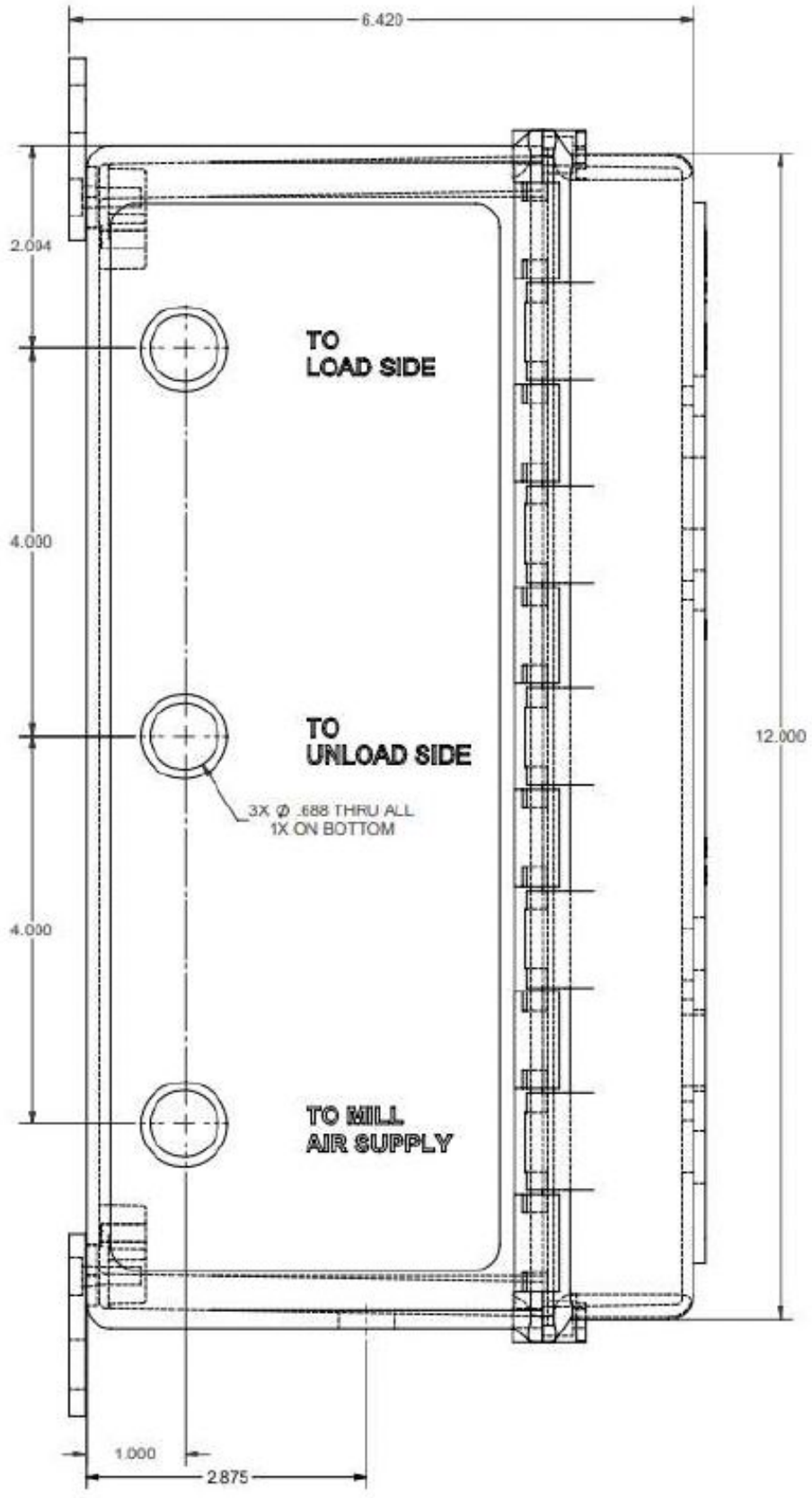
Blade Unloads

Blade Loads

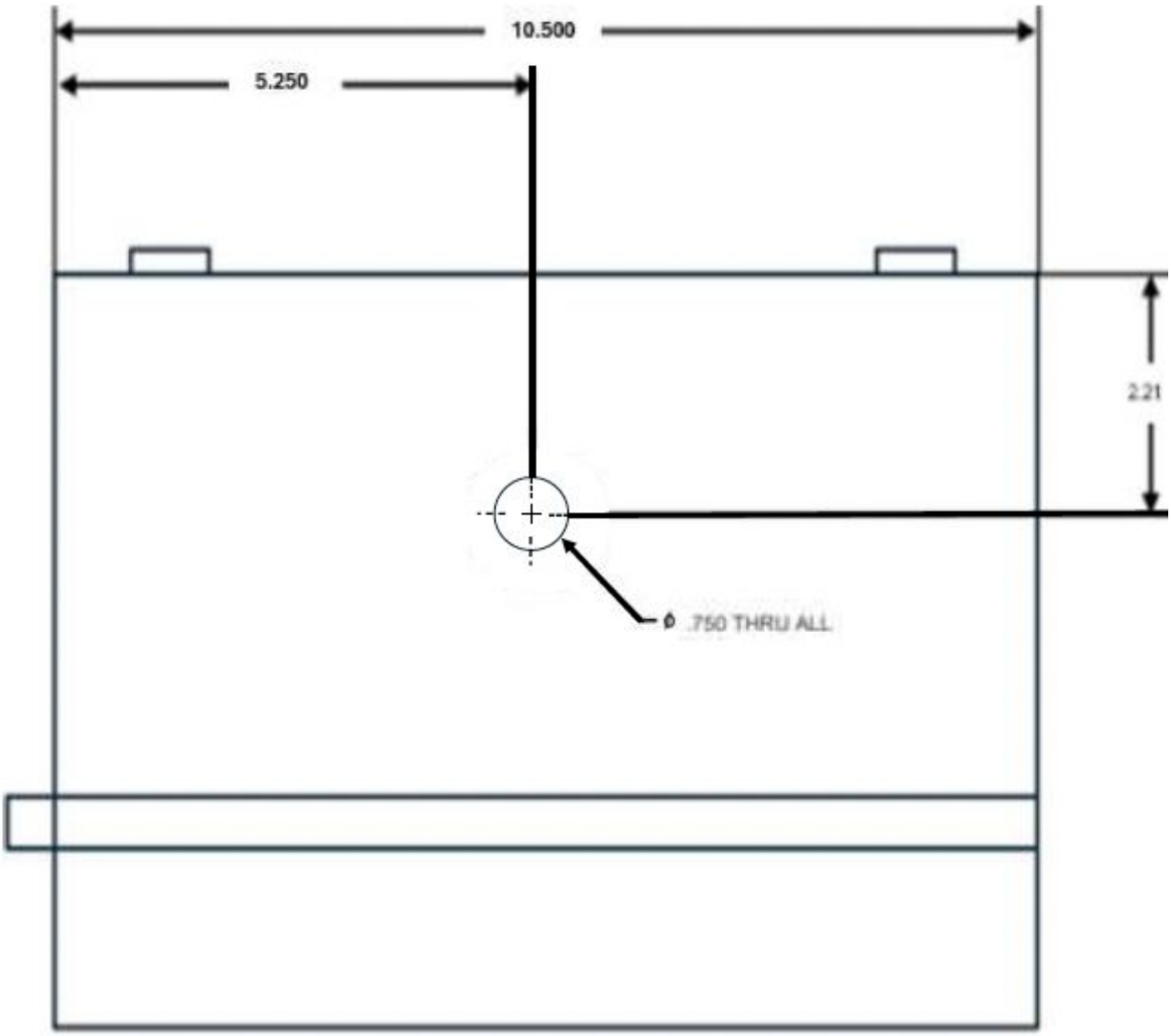
Control Box Housing



Front View

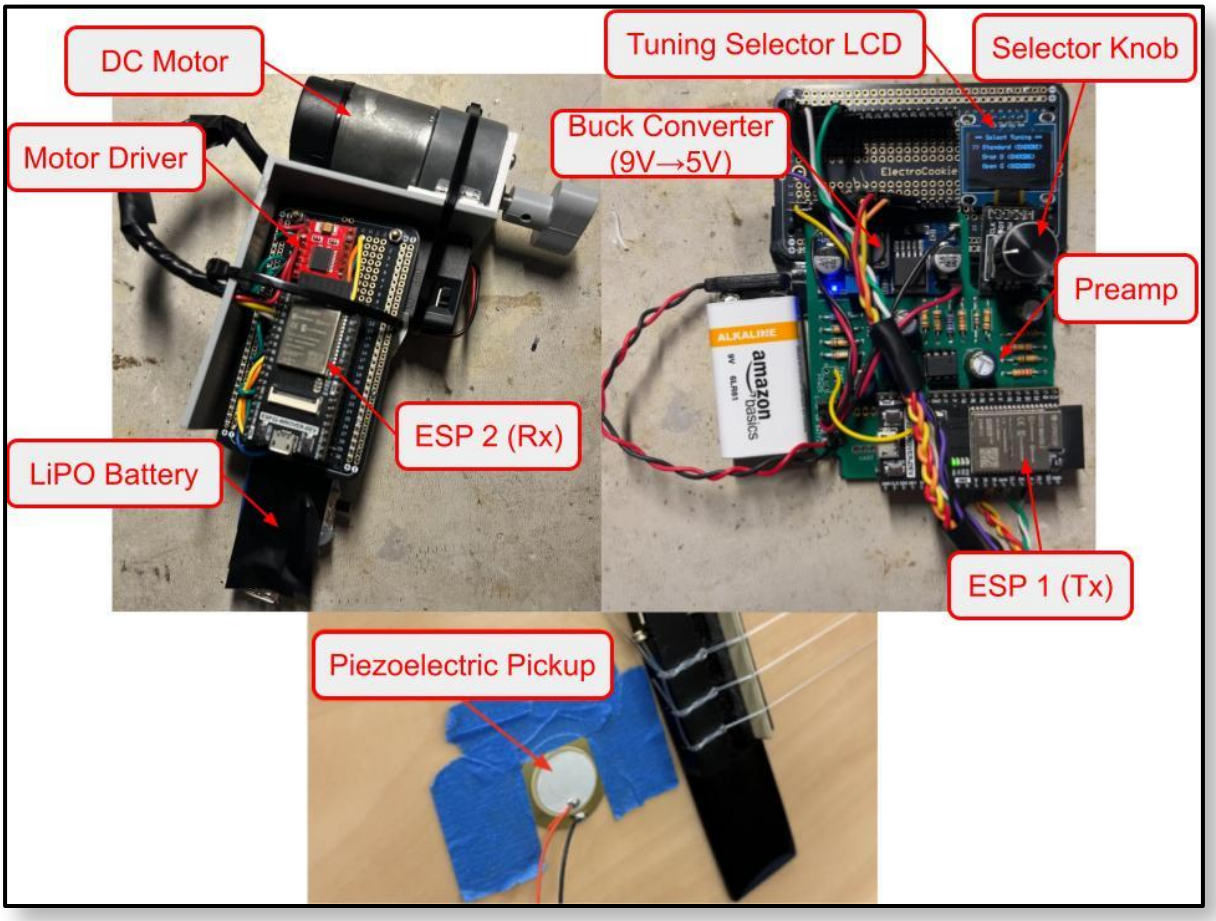

6.420
2.094
TO
LOAD SIDE
4.000
TO
UNLOAD SIDE
3X Ø .688 THRU ALL
1X ON BOTTOM
4.000
TO MILL
AIR SUPPLY
12.000
1.000
2.875

Side View



Top View

Automatic Guitar Tuner

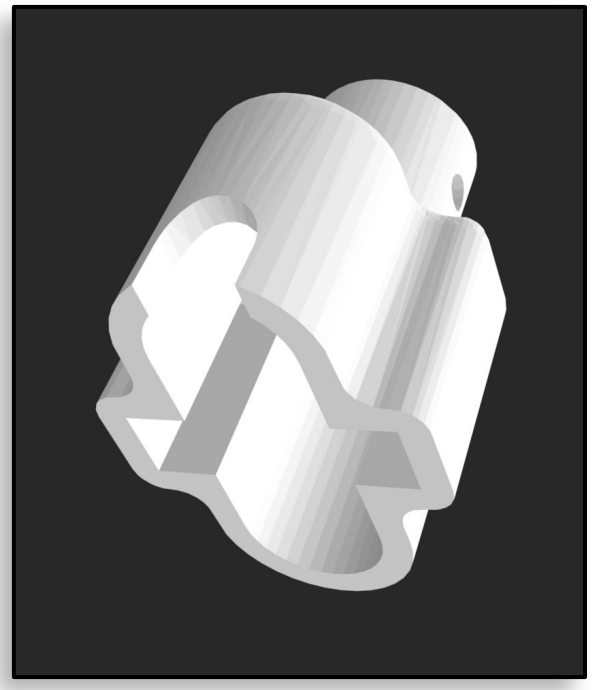


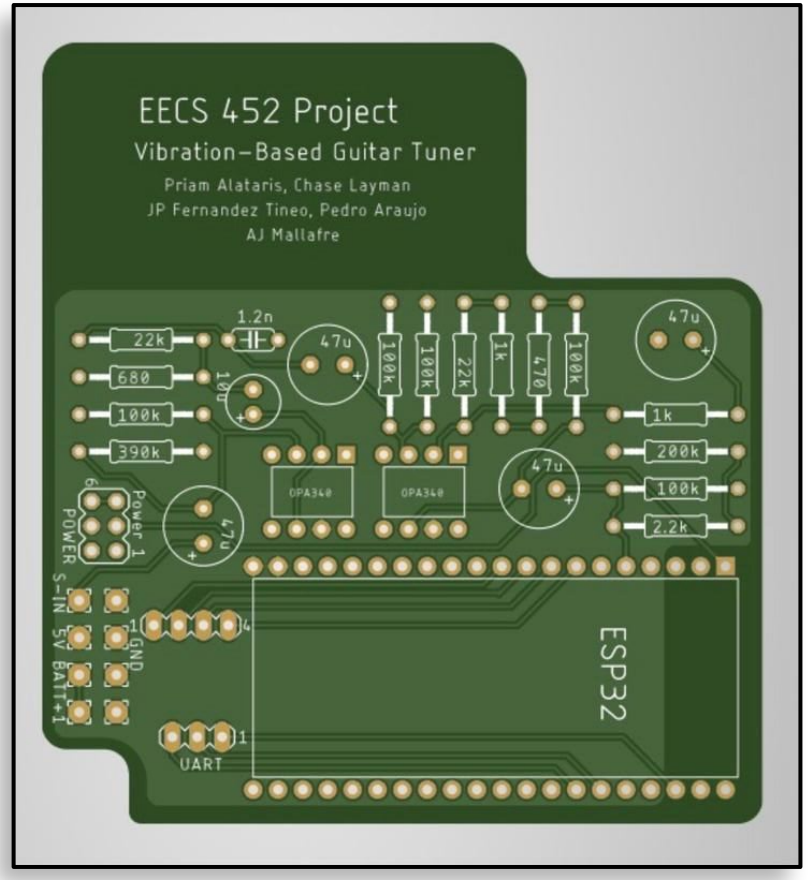
Overview/Objective

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)

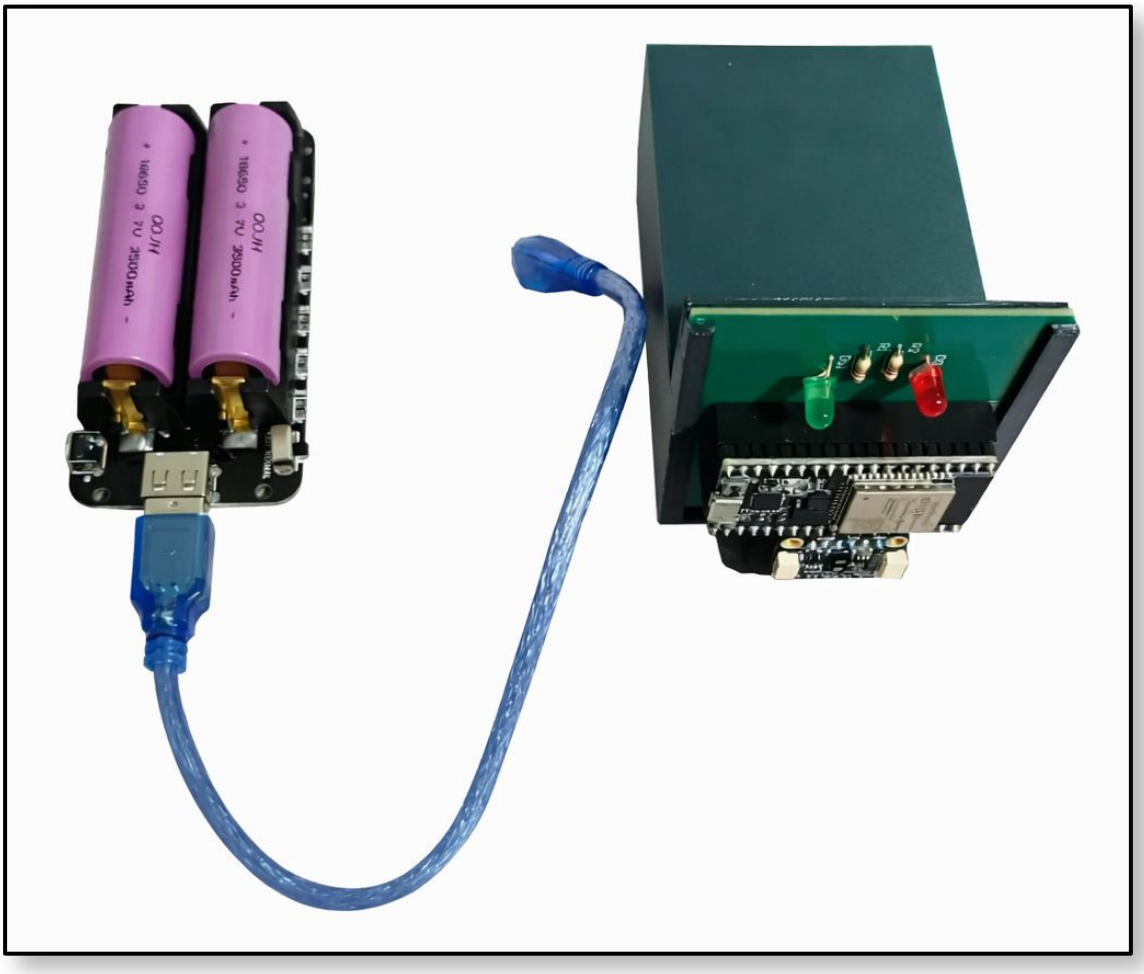
Details

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.




EECS 452 Project
Vibration-Based Guitar Tuner
Priam Alataris, Chase Layman
JP Fernandez Tineo, Pedro Araujo
AJ Mallafre
22k
680
100k
390k
1.2n
10u
47u
100k
100k
22k
1k
470
100k
47u
1k
200k
100k
2.2k
47u
OPA340
OPA340
Power 1
POWER
S-IN
5V
BAT+
GND
UART
ESP32

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.