Steam Heat Retrofit

Team: sddec-02
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Client and Advisor : Lee Harker

Problem and Solution

Problem

- Parts of Coover Hall are heated with steam valves; the temperature control is based on valve position and comfort level, not temperature, and the valves are located in inconvenient locations.

Solution

- Retrofitting an embedded controller and motor on the valve that can maintain the temperature set by the user with a web and remote interface.

Requirements

Functional

- Motor-controlled retrofit
- Wireless control
- Physical interface within room
- Virtual interface

Nonfunctional

- Physical interface power supply lasts an entire semester
- Valve position updates with the changing temperature
- Errors reported and handled without user intervention

Operational Conditions

Environment

- Myriad of steam valves within Coover Hall
- Faculty offices
- Graduate student lab spaces
- Several publicly available rooms

Intended Users

- ECpE Students
- ECpE Faculty
- ETG

Technical Details

Motor Control Unit (MCU)

- Raspberry pi controller, motor driver, temperature sensor, and motor. Adjusts temperature according to set and current temperature

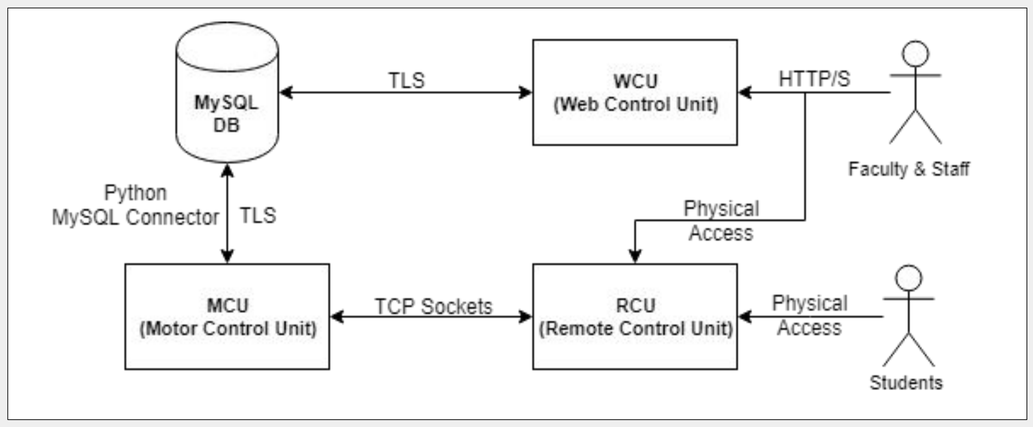
Remote Control Unit (RCU)

- Allows user to view and set room temperature through buttons and LED display

Website Control Unit (WCU)

- Allows user to easily view and set room temperature through a website interface.

Block Diagram



Testing

- RCU and MCU communication
- Database access from MCU and WCU
- Valve mount form and fit
- Battery and power supply sources
- System test WCU to motor

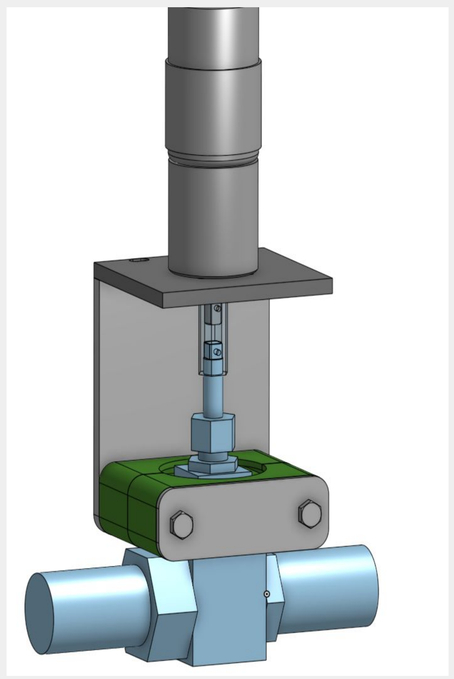
Project Resources

- ETG
- Arduino
- Python
- OnShape
- Spring & Flask Framework
- Open Source Libraries
- Multsim/Ultiboard
- Adafruit Github Files

Standards

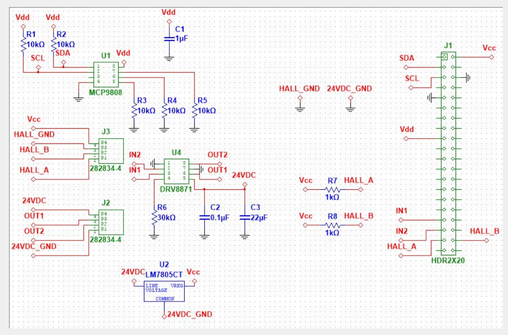
- I2C Data Communication
- NIST - Recommendation for Key Management

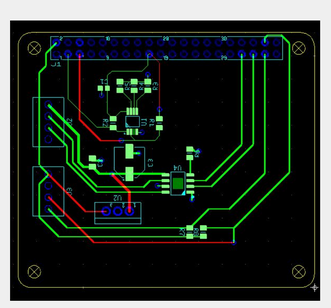
Valve Mount



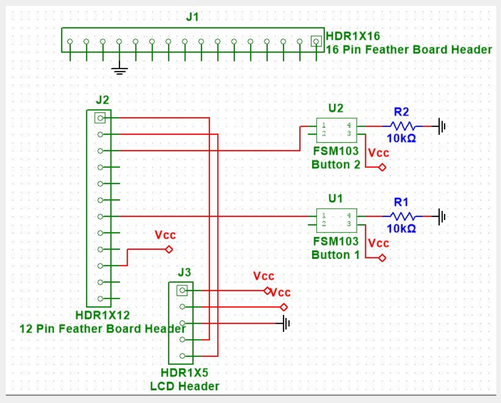
Circuits and PCB

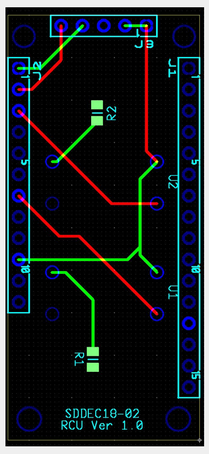
MCU





RCU





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