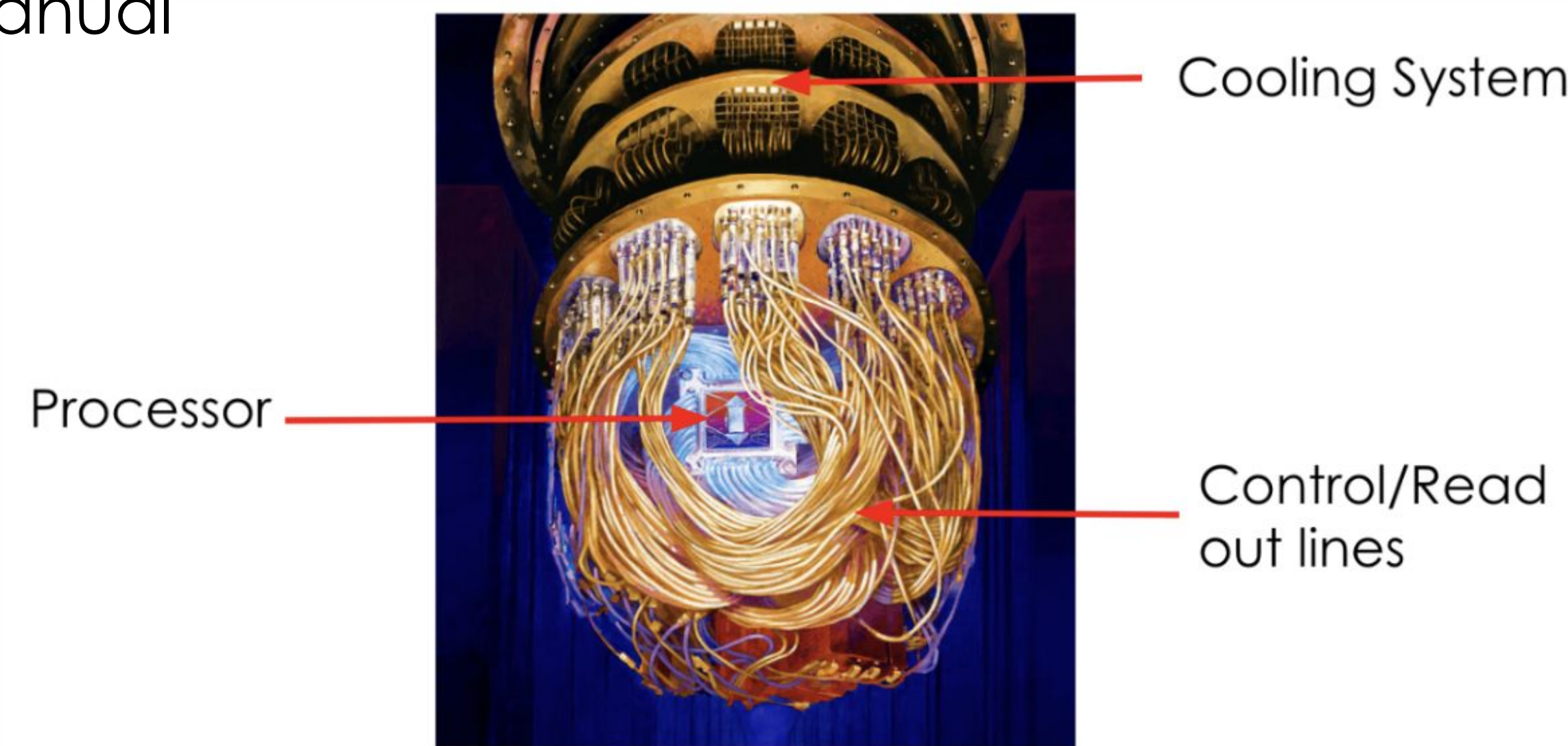




Background

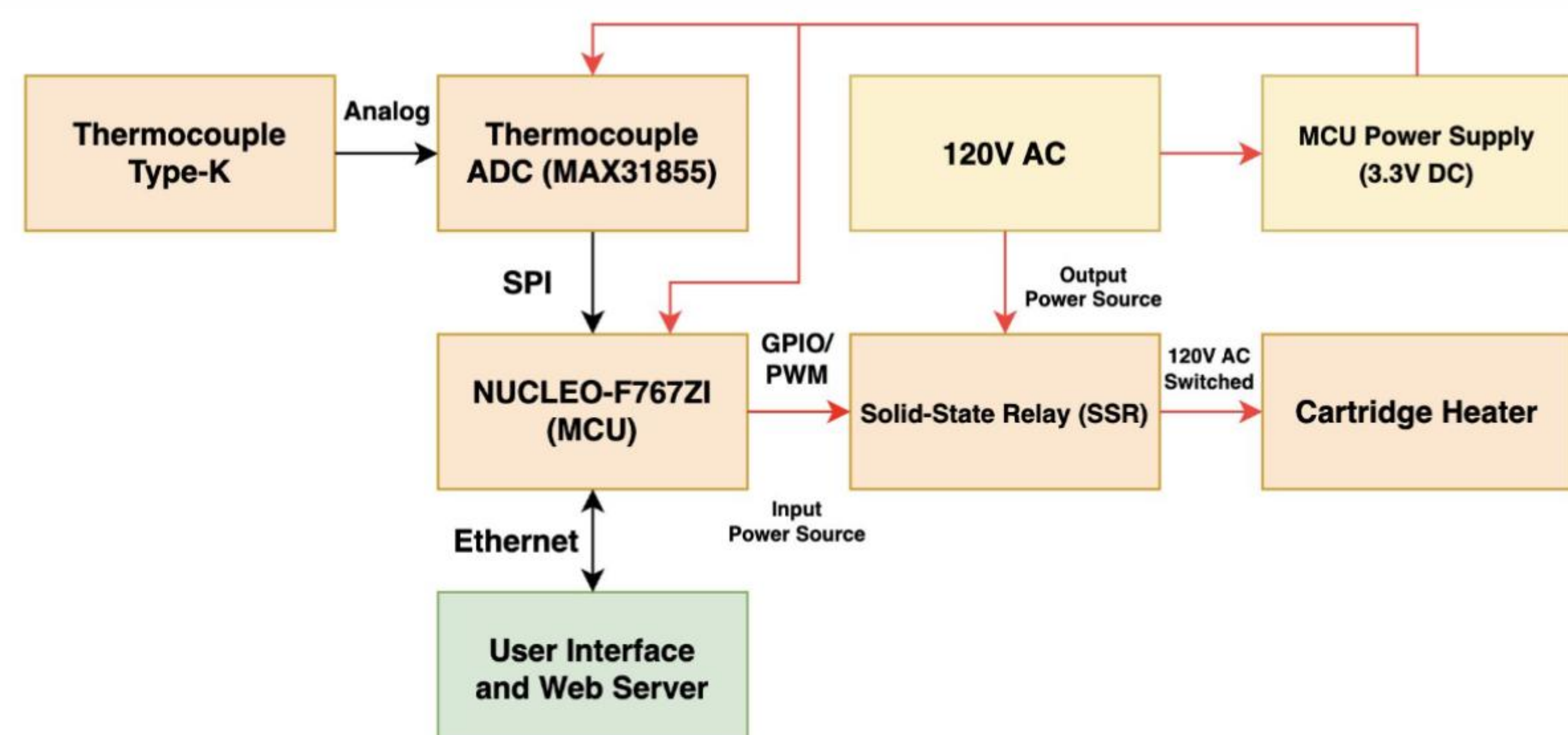
- Use of coaxial cables for control/readout lines has become spatially inefficient
- Solution is to replace coaxial cables with flex PCBs
- W/ flex PCBs the number of lines per fridge port increase from 55 to 192
- Current integration process for flex PCBs is slow and manual



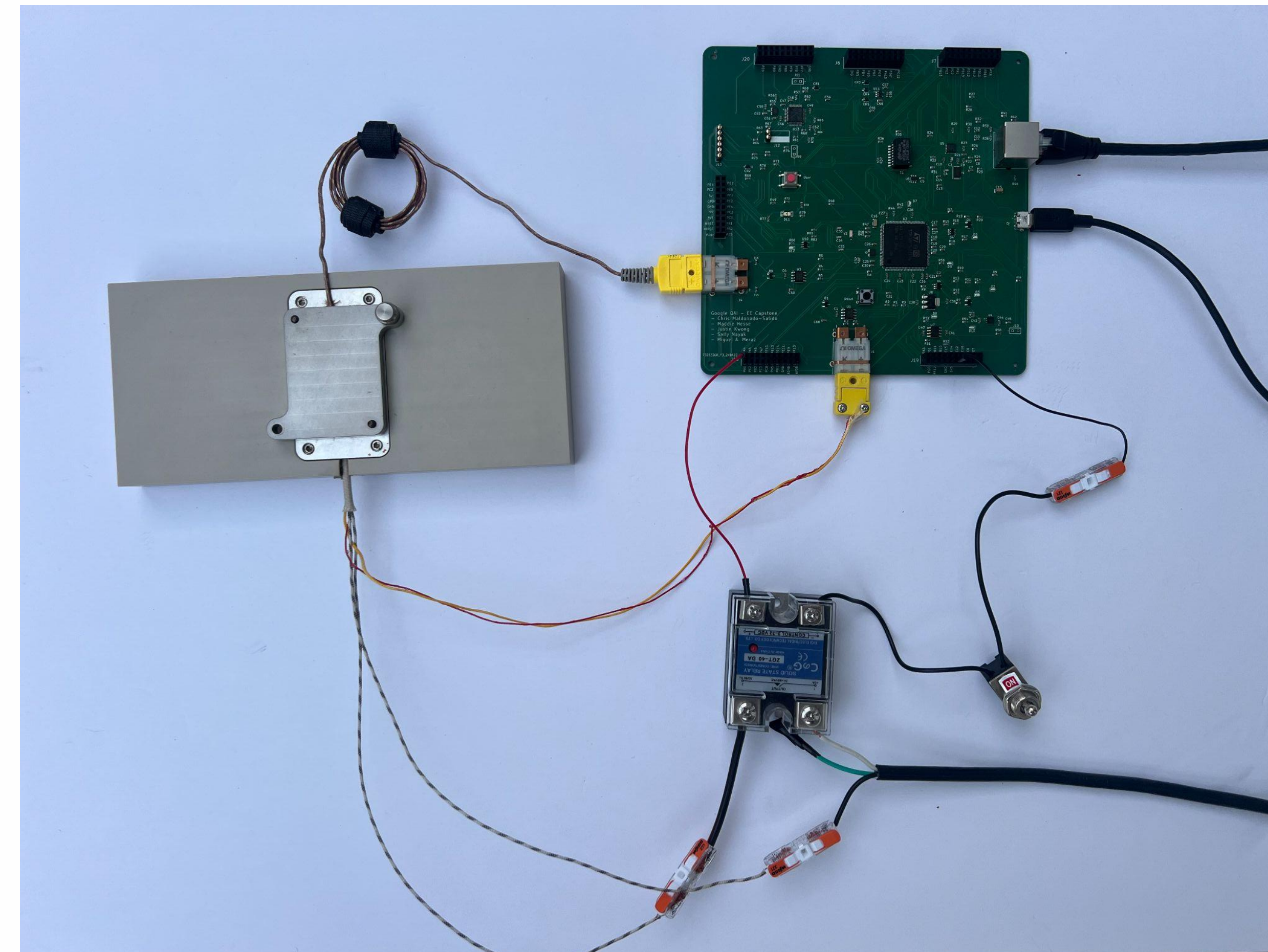
System Overview

- Automated temperature regulation of jig during reflow
 - Heating across jig at $190^{\circ}\text{C} \pm 3^{\circ}\text{C}$ of variation
 - PID control firmware to regulate power delivery
- Web-server hosted user interface
 - Solder job runtime input and start/stop buttons
 - PID parameters and temperature data monitoring abilities
- Custom PCB design
- Our new system will increase daily solder jobs by 5-10 times

System Block Diagram

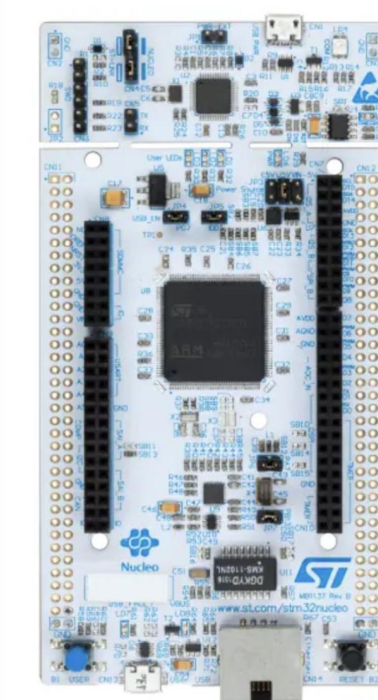


Design



Final system setup

Hardware / Key Components



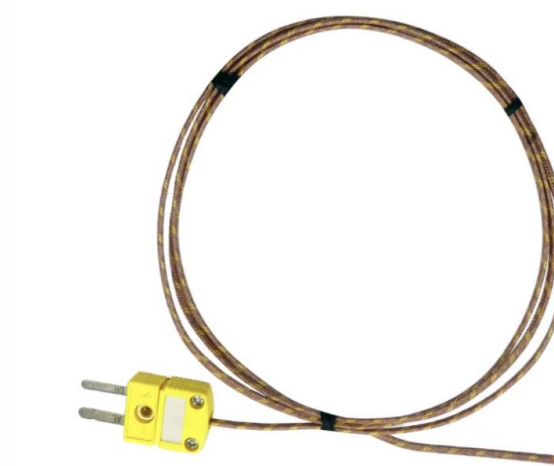
Microcontroller:
NUCLEO-F767ZI



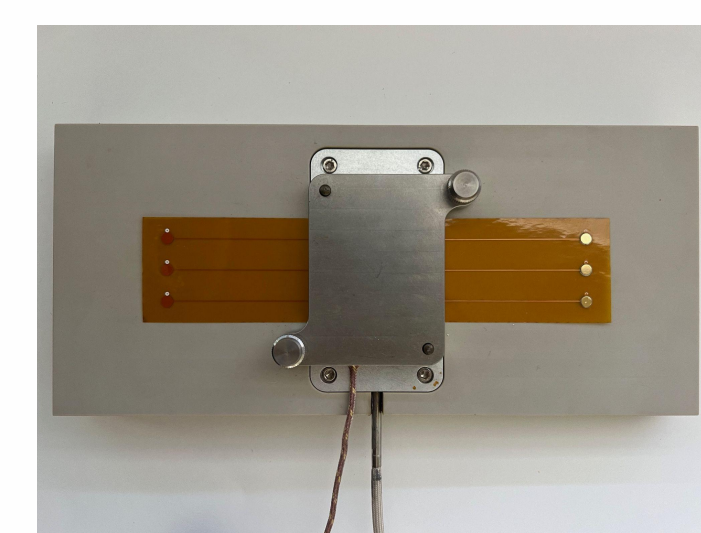
Solid-State Relay:
6410AXXSZS-DC3



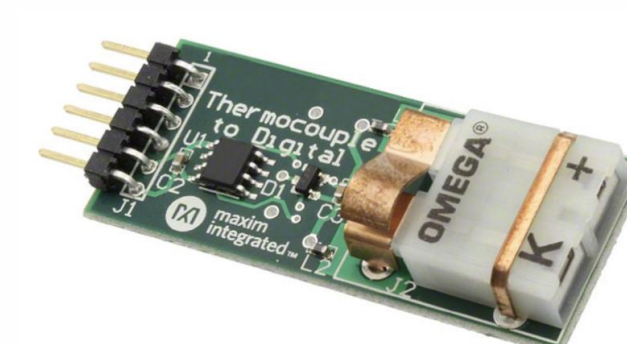
Heater Element:
1/8 inch Watlow Cartridge Heater



Thermocouples:
K-type

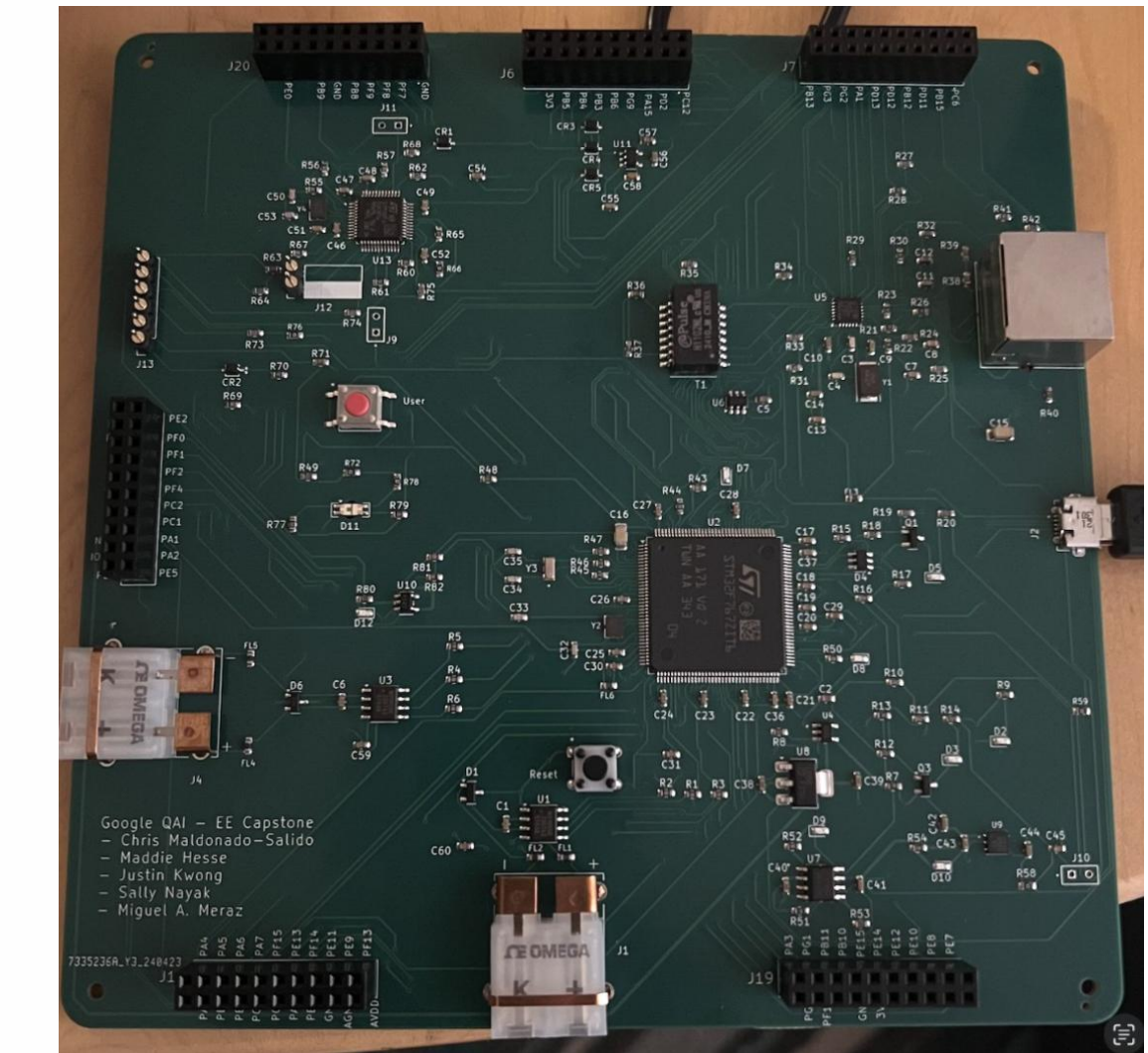


Solder Jig
Google QAI Design



Analog-to-Digital Converter:
MAX31855PMB1

PCB



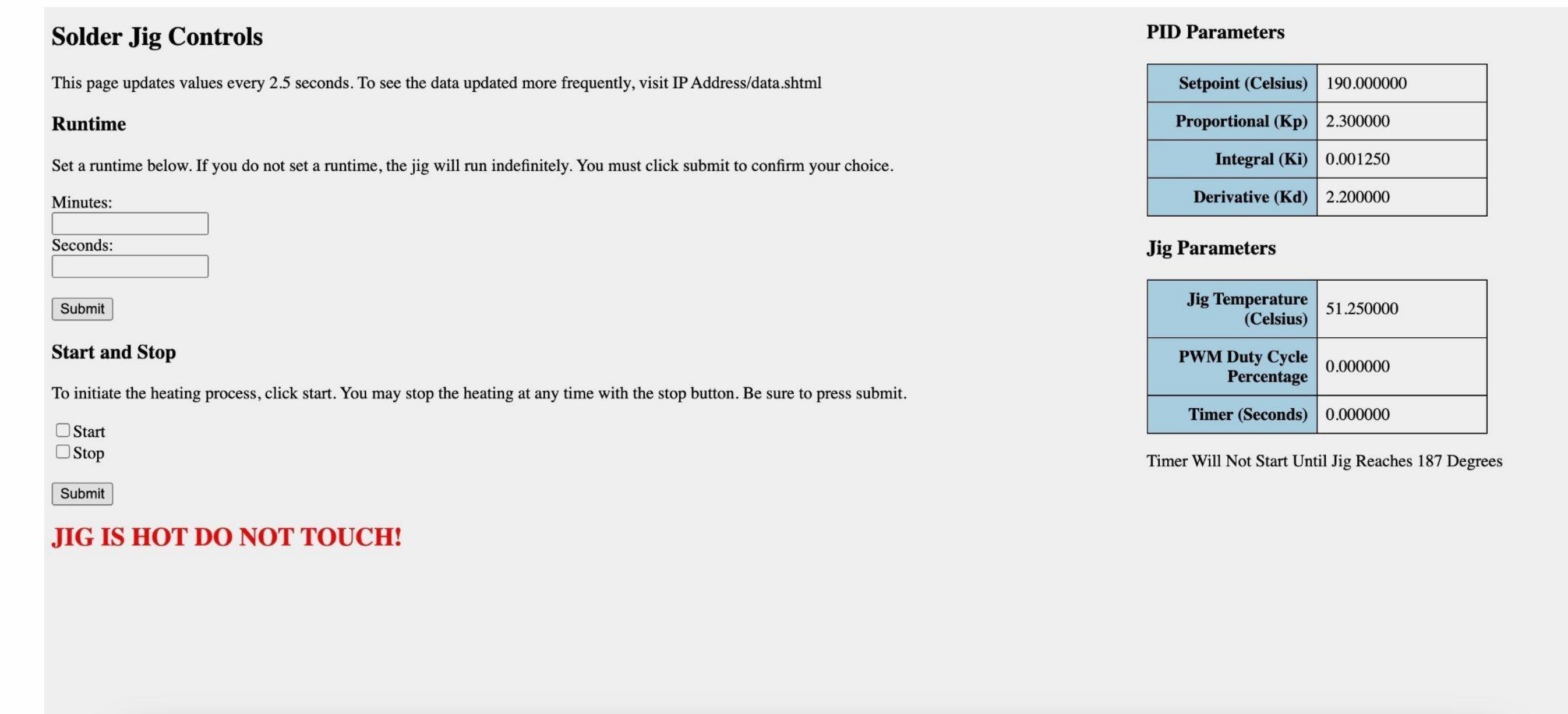
PCB design to streamline wiring.

Soldered Flex PCBs



The left image shows solder on the flex PCB's pads, and the right image shows a successful connection.

GUI



The server-hosted HTTP web page uses lightweight IP, CGI, and SSI for real-time control over the jig and parameter display.



Sponsor:
Google Quantum AI

Acknowledgements:

Special thanks to our Project Advisors: Frank Arute and Jenna Bovaird, our Capstone Advisor: Ilan Ben-Yaacov, and our TA: Camille Wardlaw