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PORTFOLIO

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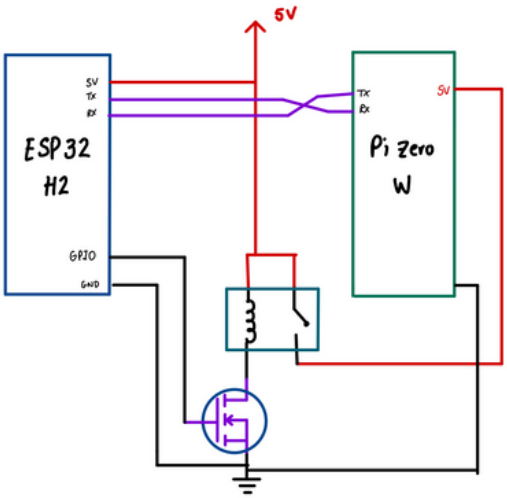
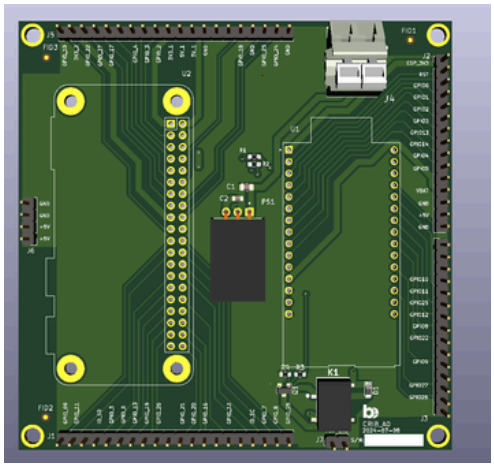
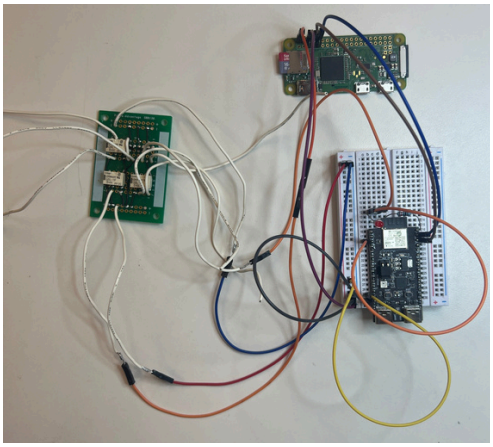
CRIB - SLEEPING PI PROJECT

brickeye







Project Goal

- Reduce the sleep current of the Pi Zero W from current 180 mA for battery powered applications
- Design for future expansion such as adding sensors, support for other MCUs
- Track time spent asleep during operation

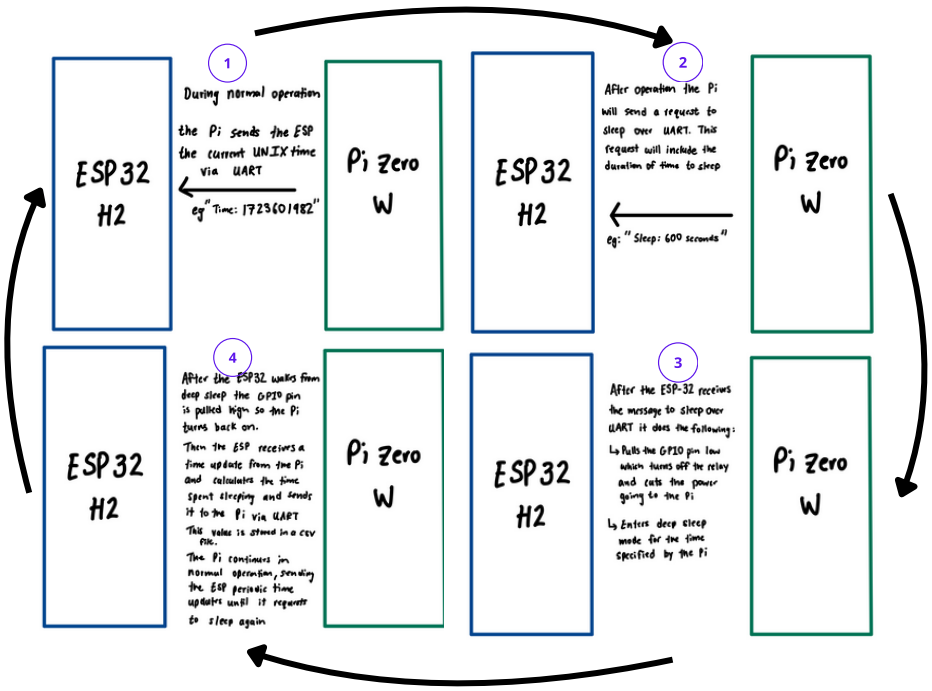
Key Skills

- PCB Design (KiCAD)
- ESP32
- UART (Software & Elec)
- C Programming
- FreeRTOS
- RTC
- Raspberry Pi
- Python

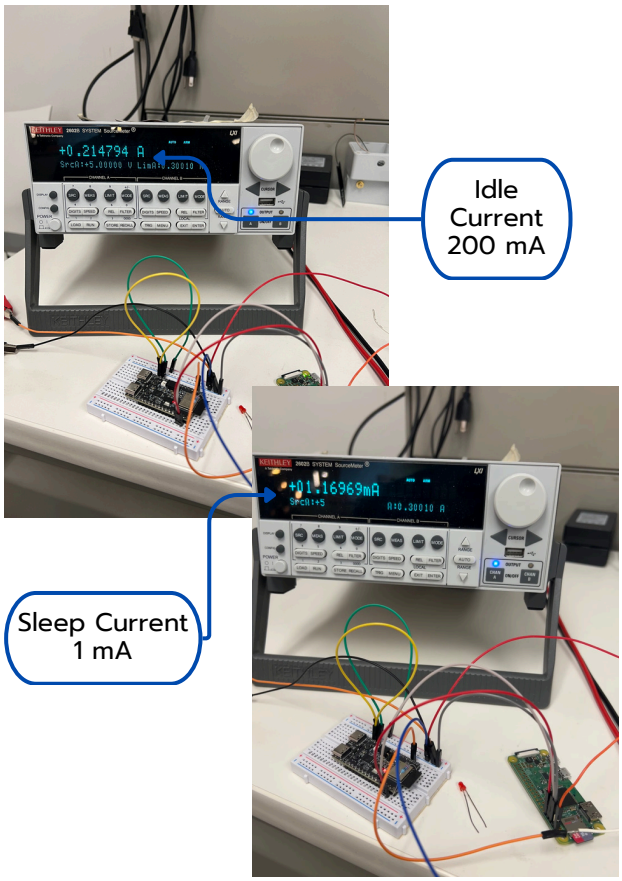
Project Features

- **UART** interface between ESP and Pi Zero
- Pi power controlled by Signal Relay
- Relay controlled by **MOSFET** and ESP GPIO
- On board 24V to 5V DC Converter
- Breakout Headers for expansion
- V2 PCB features support for Adafruit M0
- Sleep Current of **1 mA**

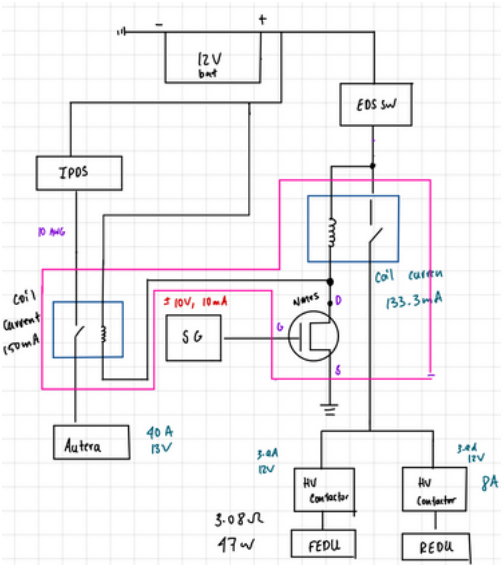
Sequence of Operation

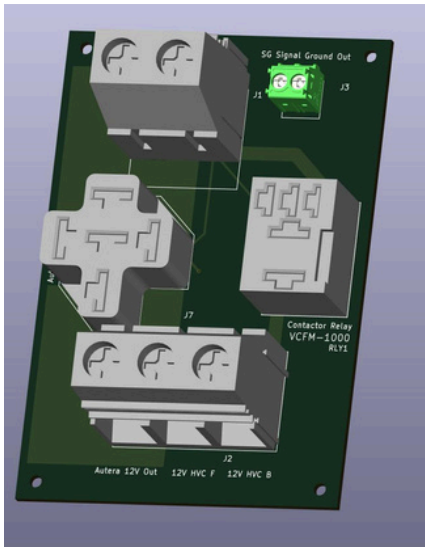


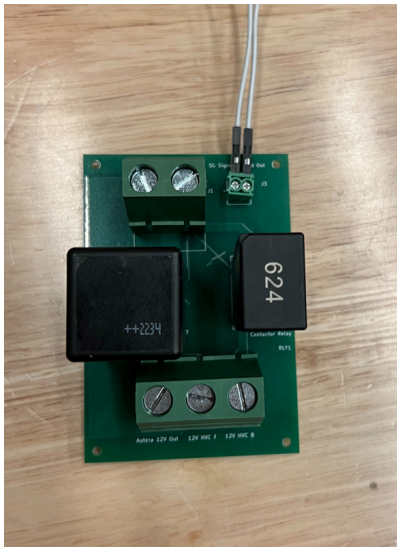
Idle vs Deep Sleep Current



HV CONTACTOR PCB UWAFT







Project Goal

- Design **PCB** capable of switching the power to the Autera and HV Contactors based on **3.3V signal** from Speedgoat
- Be able to handle the max current draw of **40A** and **8A** respectively

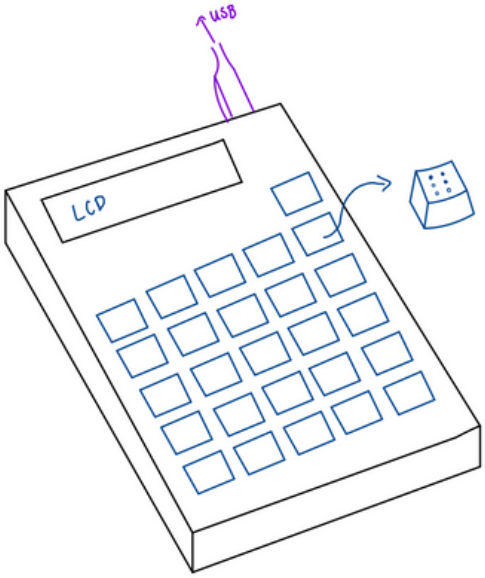
Key Skills

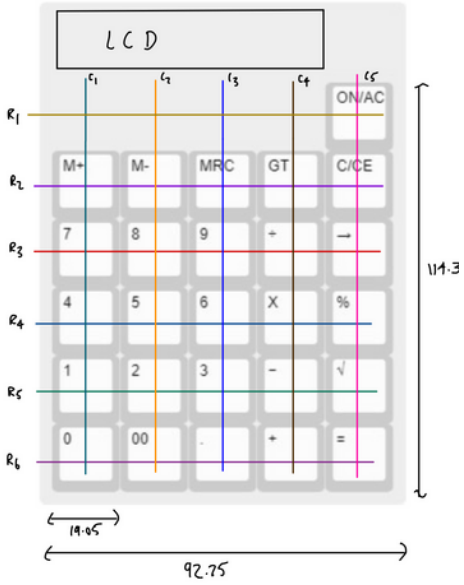
- High Current PCB Design (**KiCAD**)
- High Capacity Power Relay
- MOSFET Relay Control

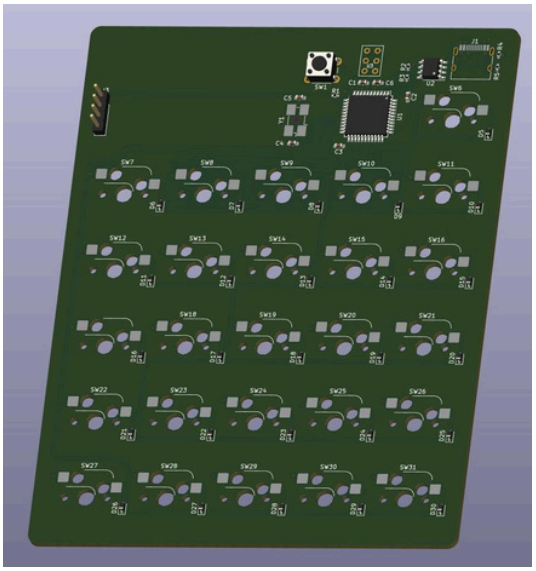
Project Features

- Automotive grade **Relays** to control Power going to Autera and Contactors
- Large terminal blocks for 10 AWG wire
- **nMOS** to control relays from Speedgoat input

BRAILLE KEYBOARD







Project Goal

- Design a calculator interface that allows users with visual impairment to perform basic calculations and have audible feedback
- Utilize components such as mechanical switches and LCD that are already on hand

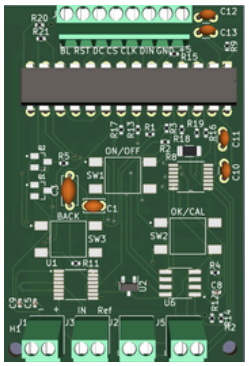
Key Skills

- PCB Design (KiCAD)
- ATmega MCU
- I2C
- USB
- Python

Project Features

- **ATmega32U4** for detecting input from keys and performing arithmetic
- **Diode** array for preventing key ghosting
- **ISP** header as alternate flashing method
- **USB** connection for power and serial communication with computer
- **I2C** LCD for debugging purposes

MULTI-PARAMETER WATER TESTER



Project Goal

- Design a handheld device capable of measuring the parameters of a water sample such as PH, Temperature, Conductivity and ORP
- Modular design such that it can be interchanged for different applications and parameters

Key Skills

- Low-Voltage PCB Design (KiCAD)
- High Resolution Sensor Measurement (ADC)
- Signal Amplification (Op-Amp)
- Digital Circuits (Latch Circuit)
- SPI (LCD)
- Fusion360
- C++
- ATMega328

Project Features

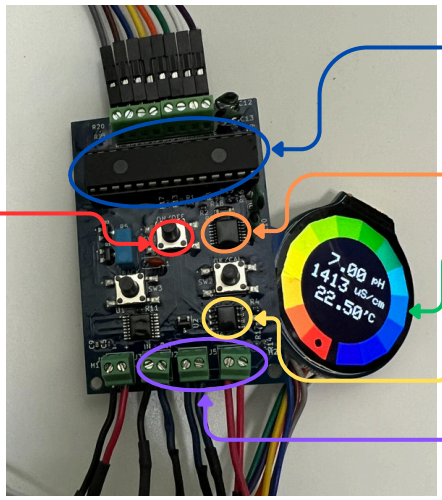
- 2 Layer **PCB** to interface sensors with MCU and LCD
- 12 Bit 4 channel **ADC** for increased resolution
- Power latch circuit for auto-shutoff
- Op-amp circuit for PH Sensor amplification
- Custom GUI to display measurements
- 3D printed enclosure for prototype

Version 1

Increased Resolution with ADC

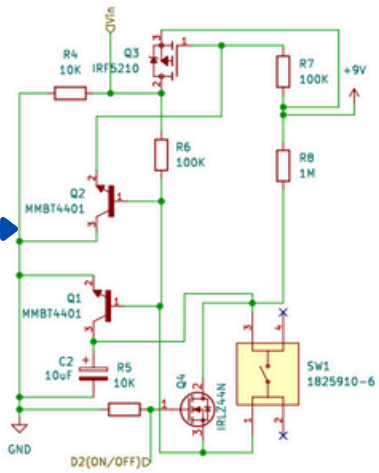
Shrunk PCB size with improved routing and SMT components

Version 2



Power Latch Circuit

Designed Power Latching Circuit with power button that allowed for timed auto-shutoff of device, as a result saved battery usage



Version 1

Version 2