Smart-Kettle-Module

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Introduction

The project is a portable Smart-Kettle-Module that is designed to improve user's experience with kettles.

Objective

Problem:

The functions of kettles existing in the market are not ideal enough.

- Requires users to wait for filling water.
- Unknown boiling time.

Objective

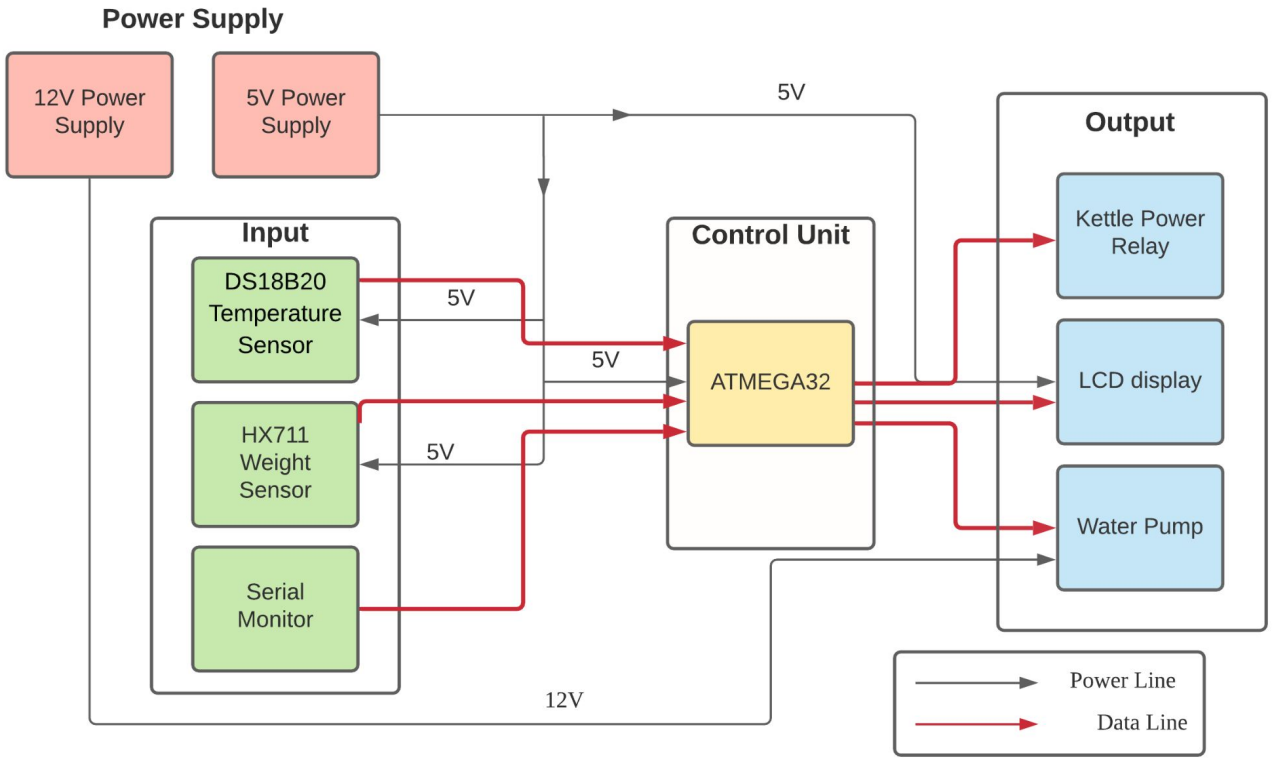
Solution:

We propose a kettle-module that has three main features

- Enables the kettle to be filled with water automatically. (mode1)
- Displays the remaining time to reach the target temperature on an LCD screen. (mode2)
- The time of keeping warm is also controllable. (mode3)

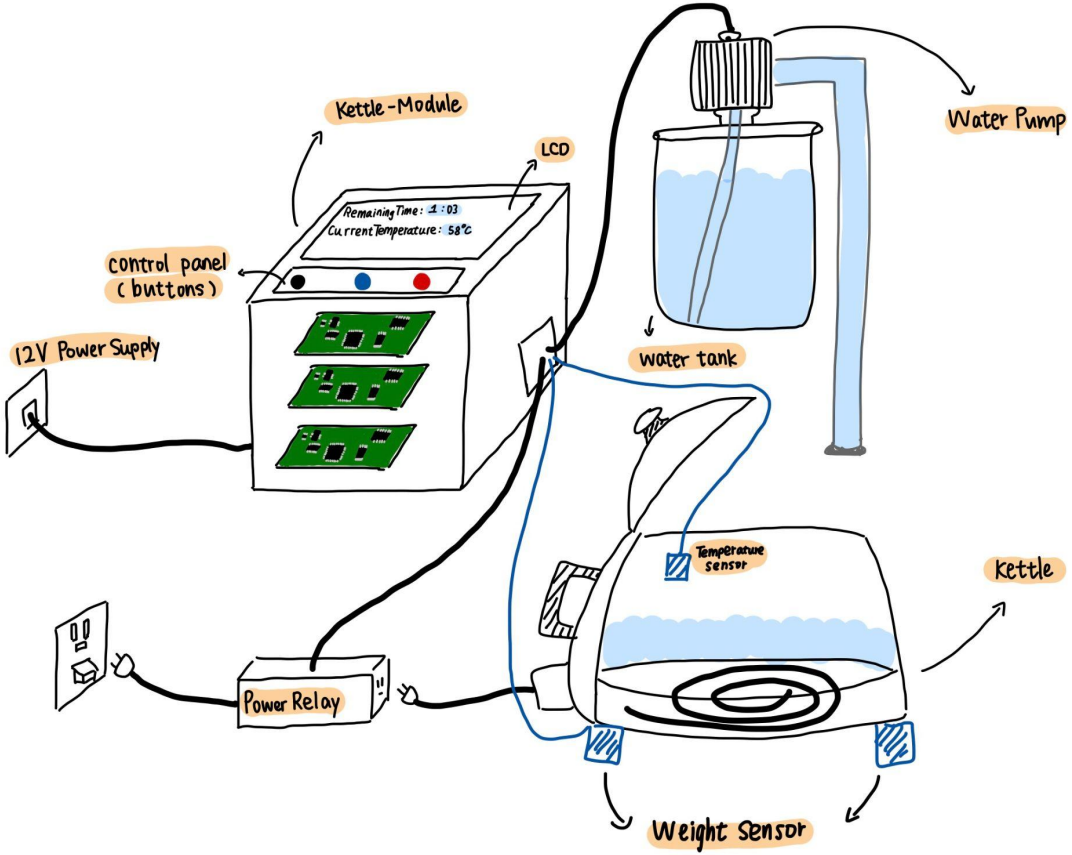
Design

Block Diagram



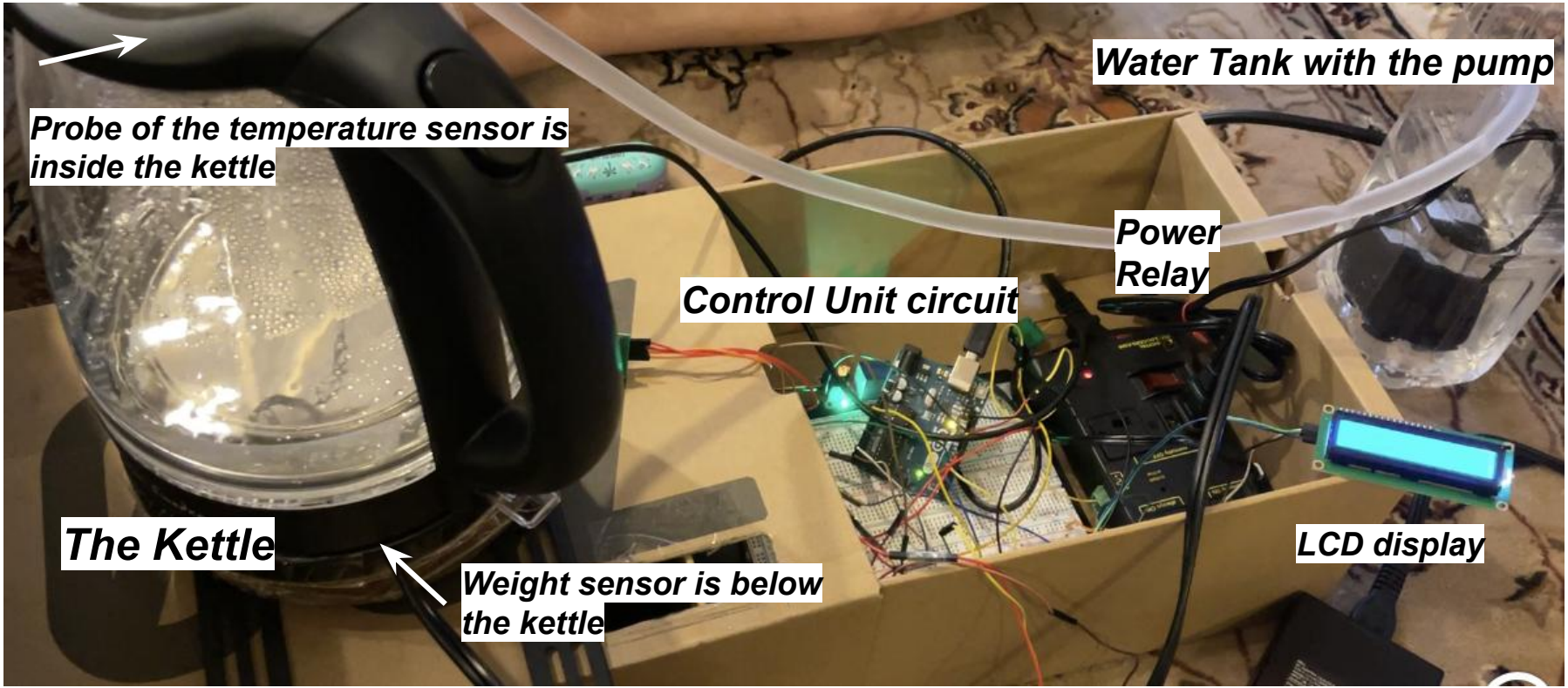
Design

Physical Diagram



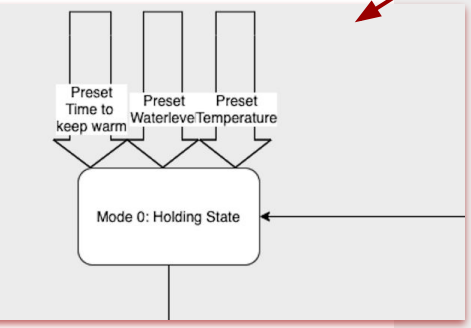
Design

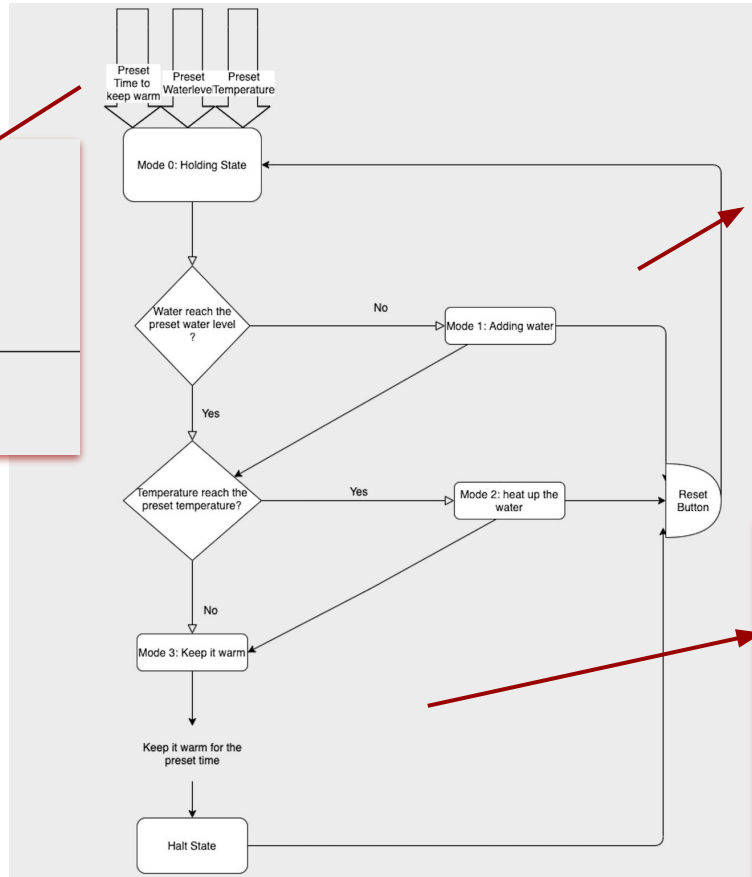
Actual project

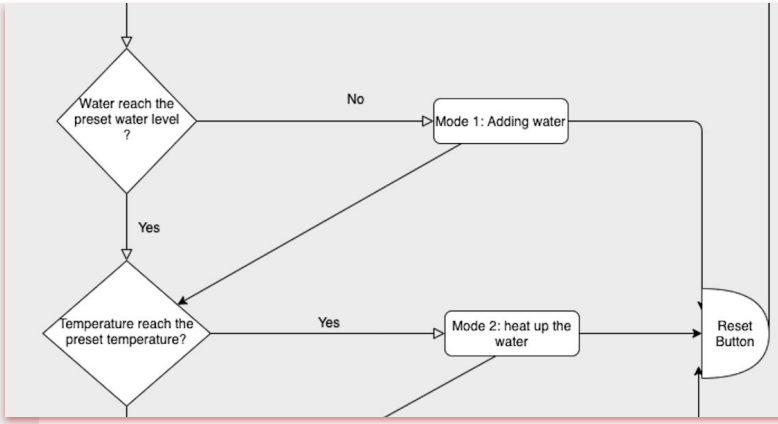


Design

Flowchart







Control unit

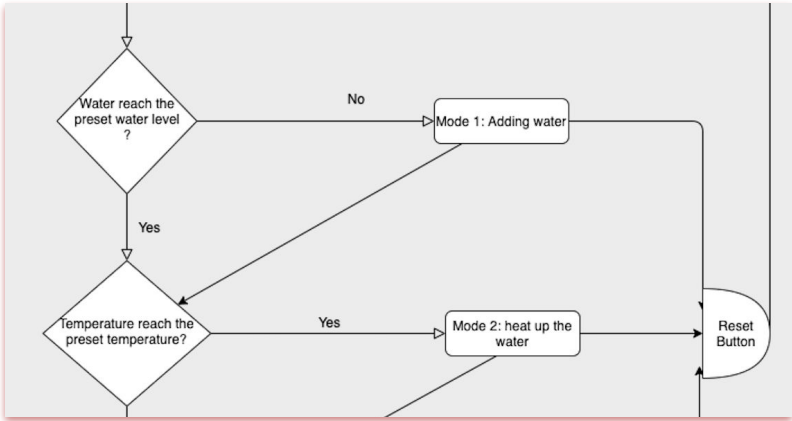
Two main functions:

```
void setup()
void loop()
```

Three timers:

```
float mode_1_timer; mode_1_timer =  (preset_waterlevel*17)/160; //just assmue the water pump goes 160ml per sec
float mode_2_timer; mode_2_timer =  4.1868*(mass-933)*(preset_temp-Celsius)/1200;//empty water bottle weight 933g
float mode_3_timer;
                    timer_3_start = millis();//at the end of mode 2
                    mode_3_timer =millis();// each time in mode 3
```

```
timer 3 start+preset timewarm*60000-mode 3 timer)/1000
```



Unit Test & RV

Component Unit Test: Associated with the arduino code closely.

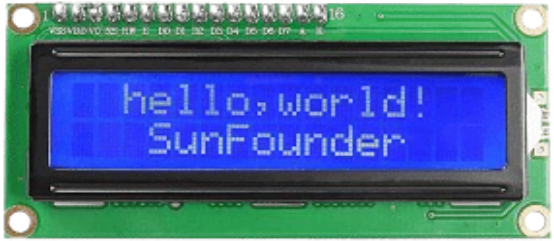
```
if(digitalRead(8)==HIGH)

 digitalWrite(12,HIGH);
```

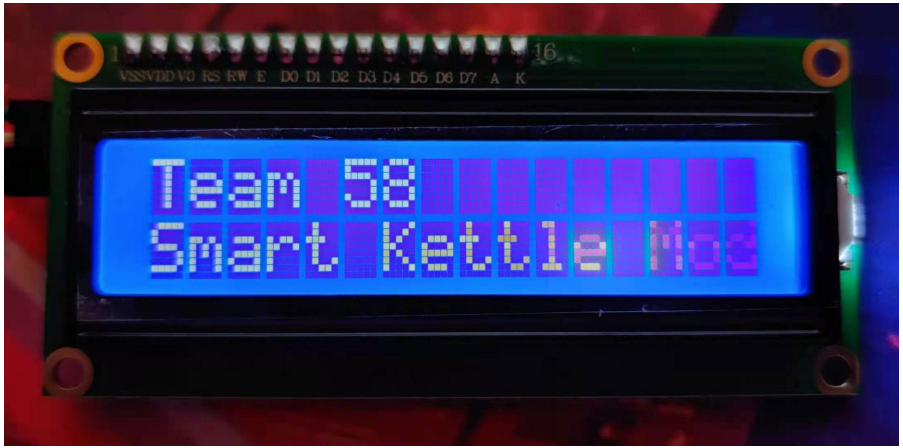
Unit Test & RV

LCD Requirements:

- Display at the designed location
- Display the same data showed on the Serial monitor with no delay

```
lcd.begin(16, 2);// set up the LCD's number of columns and rows:
                 lcd.setCursor(8,1);
                 lcd.print("Mode: ");
```





Unit Test & RV

HX711 Weight Sensor

- Operation supply voltage range: **2.6 ~ 5.5V**
- Operation temperature range: **-40 ~ +85℃**

Requirements:

- Be able to scale weight with **+- 10g** error within the weight range (0-20kg)

Unit Test & RV

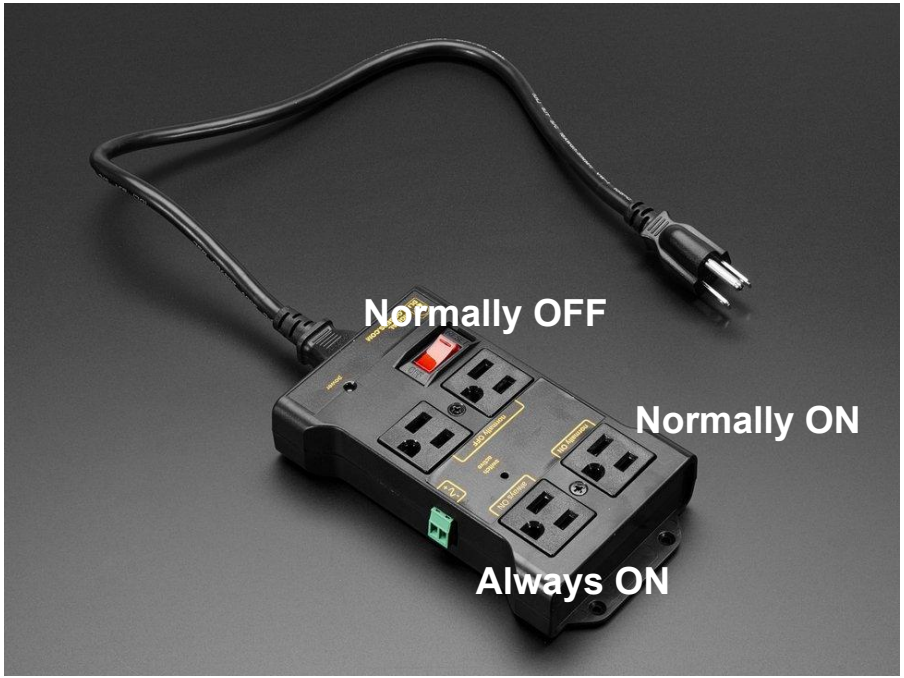
DS18B20 Temperature Sensor

- Measures Temperatures from -55°C to +125°C
- ±0.5°C Accuracy from -10°C to +85°C
- Voltage Range on Any Pin Relative to Ground: -0.5V to +6.0V

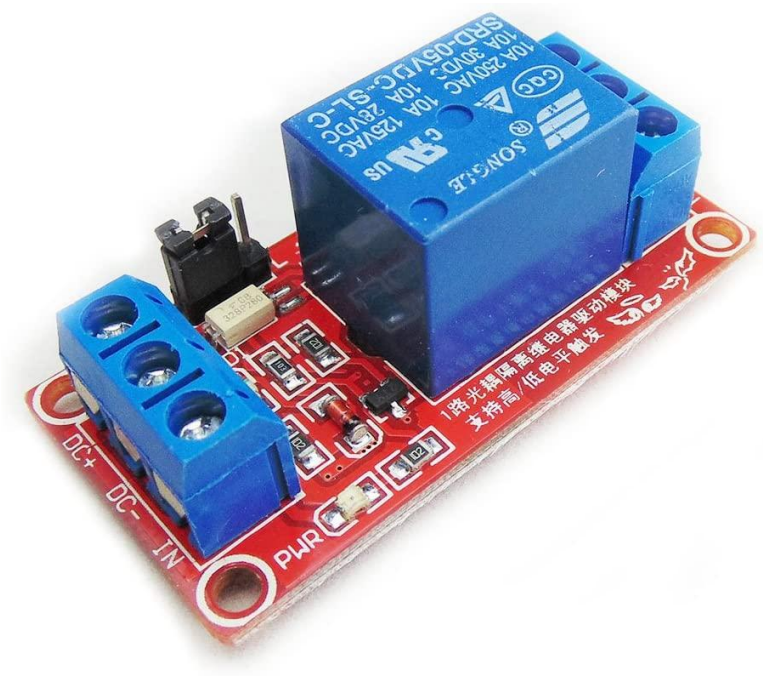
Requirements:

- Needs to be waterproof.
- The accuracy of the sensor should be within ± 2 °C when operating in temperature range.

Unit Test & RV

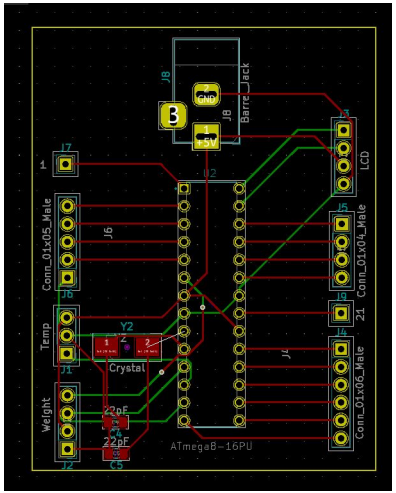


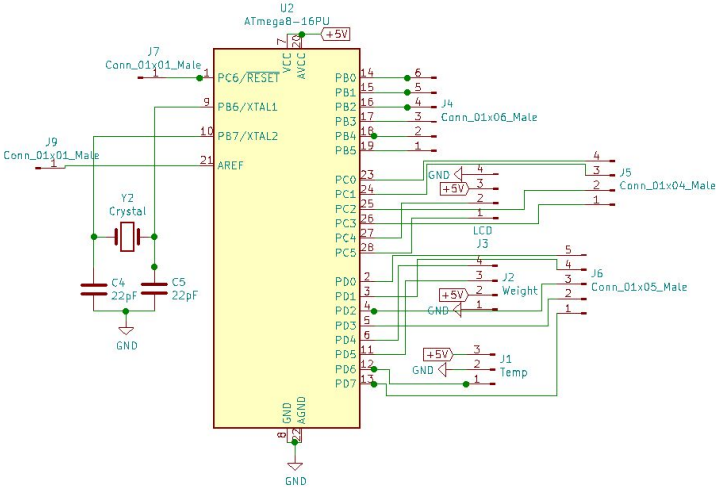
IoT Power Relay

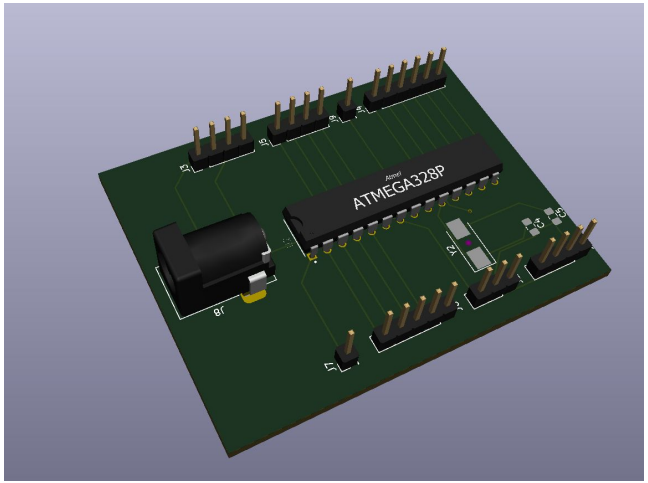


5VDC Power Relay

Challenge



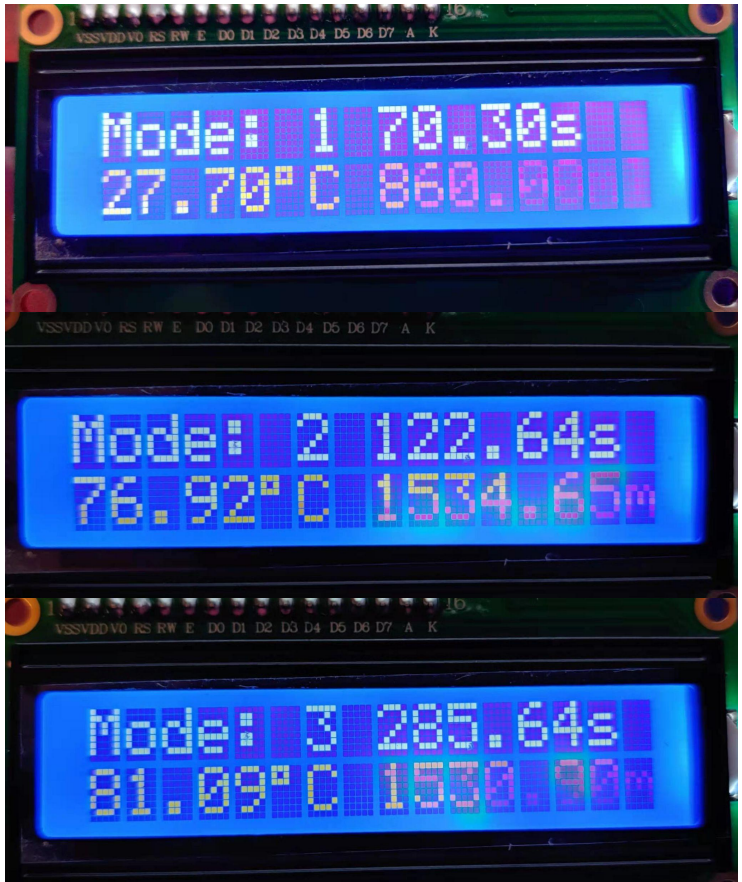




- PCB design
- Probe

Success

- The design is fully functional as intended.
- The remaining time calculation is accurate.
- The overall appearance is clean and tidy.



Conclusion

Thank you! :)