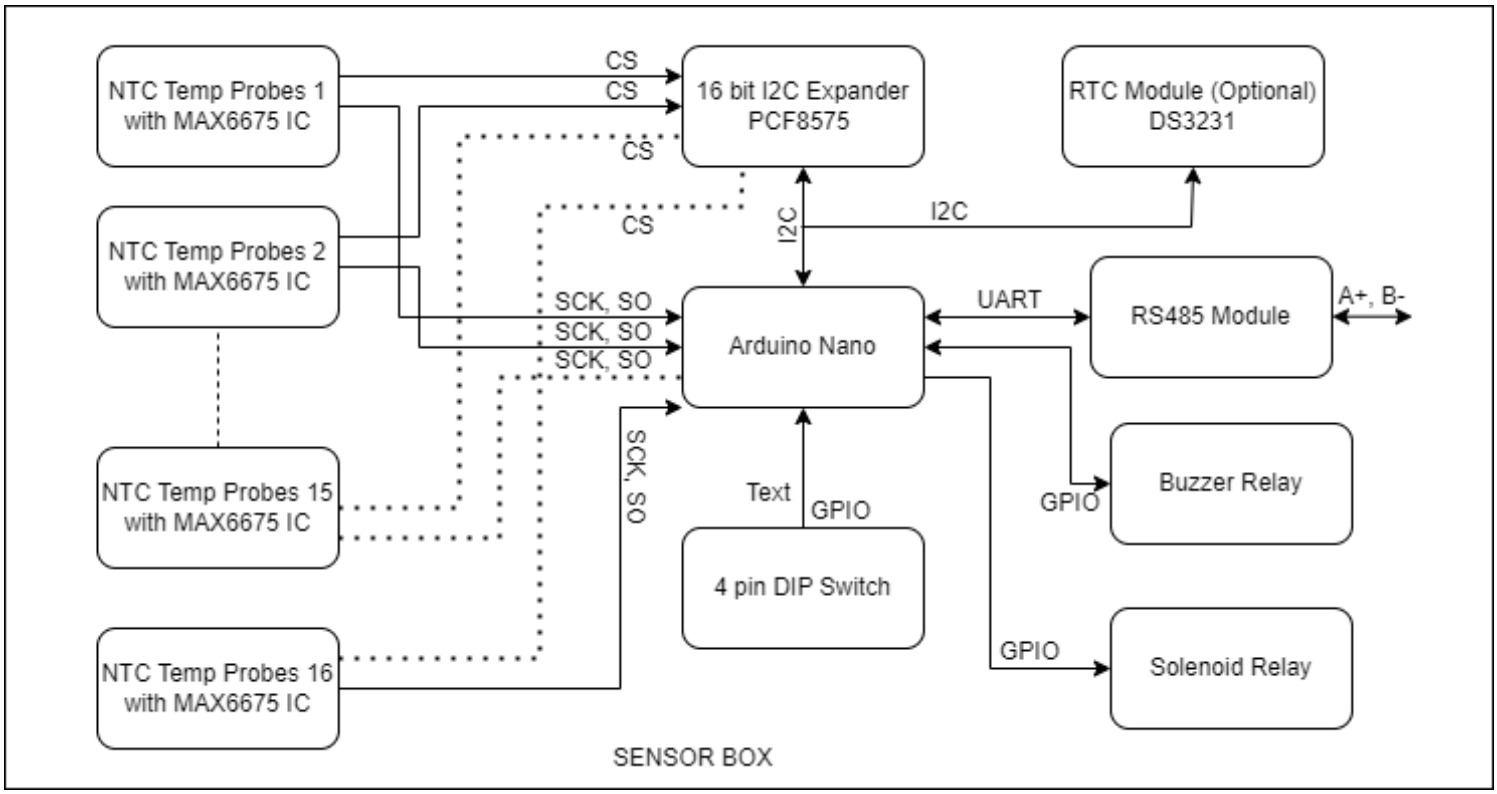
SENSOR BOX



Temp probes 1 to 15(MAX6675):

- It will monitor all the temperature data with SPI communication in a single bus.
- It starts to count down the main timer when temperature rises greater than 60 degree or the value received from the web server.
- After the timer elapses, Microcontroller will send a message via UART.
- After the timer elapses, it will ignore any temperature reading of that probe for 2 minutes.

Temp probes 16(MAX6675):

- This 16th probe has a different functionality with other 15 probes.
- If the temperature is greater than 325°C, the solenoid Relay toggles.
- If the temperature is less than 310°C, the solenoid Relay toggles.
- Based upon this probe's temperature the main timer will vary with a provided equation.

I2C Expander PCF8575:

- All the 16 chip select lines (CS) are connected with the I2C expander in order to read the temperature individually.

Arduino Nano:

- It will simultaneously read all 16 temperature data in a loop.
- Based upon 16th temperature data it will toggle the Solenoid relay.
- It will toggle the buzzer relay for 10 seconds when any of the timers elapsed from 1 to 15.
- It will toggle the buzzer when half of the elapse time is over. It will also send a message to the UART.
- An additional 2 minutes countdown timer will start after the main timer. It will activate the buzzer and UART signal.
- It will simultaneously send all the temperature and count down timer data through UART.
- It will only send data after receiving a send message from UART.
- It will change the probes number in-between 1 - 16, 17 - 32, 33 – 48, 49 - 64 based upon the dip switch.
- It will receive mode and threshold temperature reading from the web server.

4 pin DIP Switch:

- It will be used as an address identification for multiple sensor boxes.

Solenoid Relay:

- It will toggle its state based upon 16th temperature sensor reading.

Buzzer Relay:

- It will turn on for 10 seconds when any of the 15 temperature sensor timers elapsed.
- It will turn on for 5 seconds when any of the 15 temperature sensor timers reach half of the elapsed time.

RS485 Module:

- It will convert UART data to RS485 for long distance transmission and multiple sensor box connection.

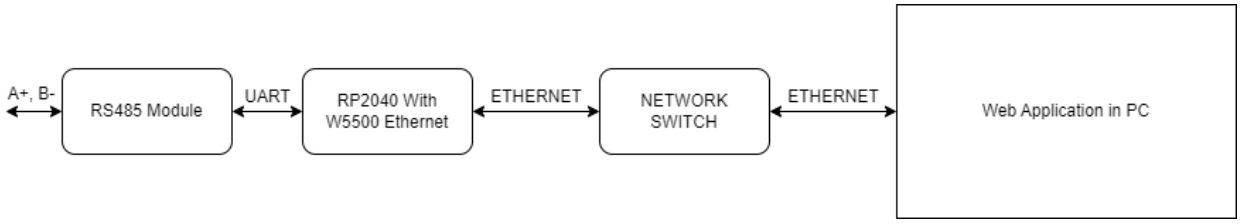
RTC Module (Optional):

- It can be used for precise timing.

Mode Functionality:

- There is a 5 mode functionality.
- It will subtract between 1 to 5 minutes for each temperature probe from its main timer. functionality

WEB SERVER BOX



RS485 Module:

- It helps to communicate long distance and multiple sensor boxes over the same bus.

RP2040 with W5500 Ethernet:

- It ask for the data transmission one by one from all sensor boxes.
- It will run a HTML web server to show all the data in a single web page.
- It will also accept mode and temperature changes from the web page and send through UART.

Network Switch:

- It is just a common network switch to handle multiple ethernet ports between the desktop and the Cloud Server Unit.

Web Application in PC:

- This unit consists of a web application which monitors and displays all the temperature nodes in a single page in a grid format. This application is secured by a predefined user id and password. And by clicking any temperature grid one can set the temperature threshold and Mode. This

unit is externally powered and it communicates with the desktop browser application with ethernet protocol.