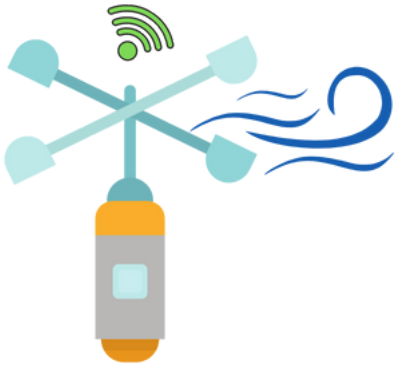


Smart Wind Speed Monitor

Smart Wind Speed Monitor

Table of Contents

About

This repo contains

- Backend
- Firmware
- Detailed instructions

for Smart Wind Speed Monitor.

Getting Started

These instructions will get you a copy of the project up and running on your system.

Prerequisites

Things you need to install the FW.

```
- Raspberry Pi Zero W
- PiSugar
```

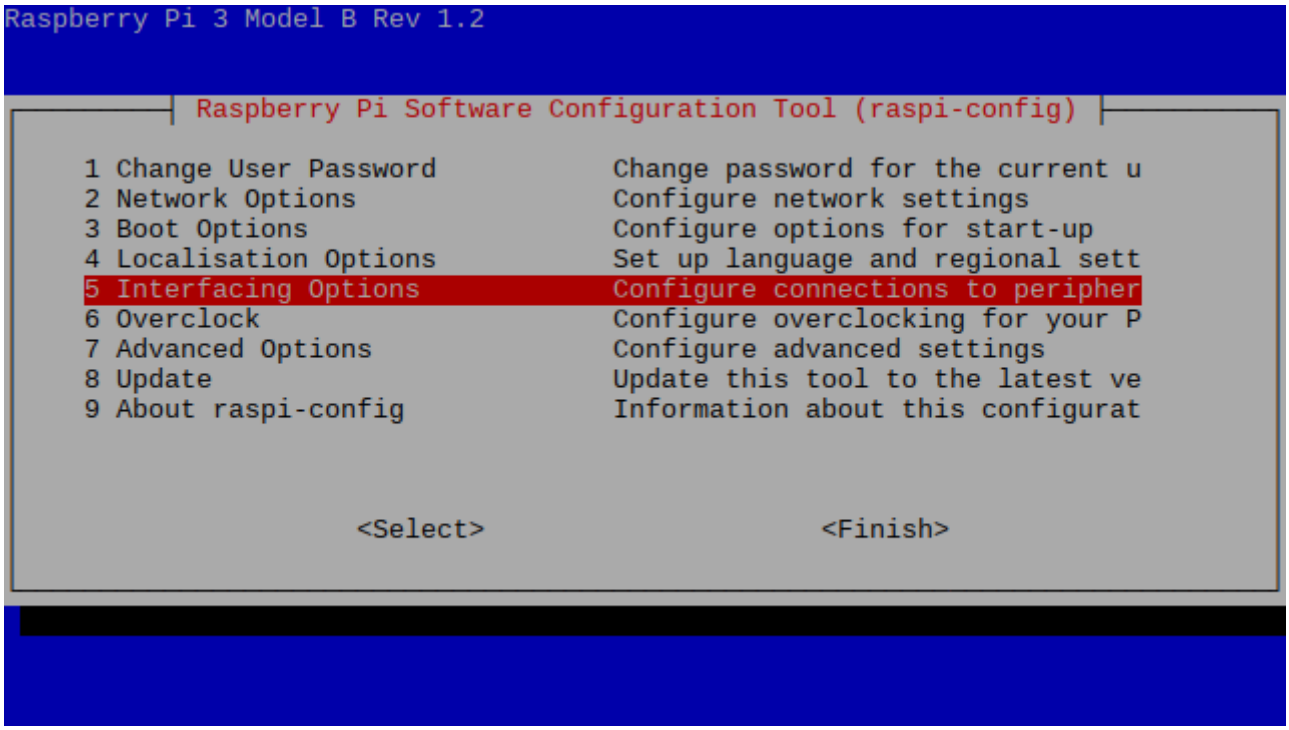
```
- SIM7600-X
```

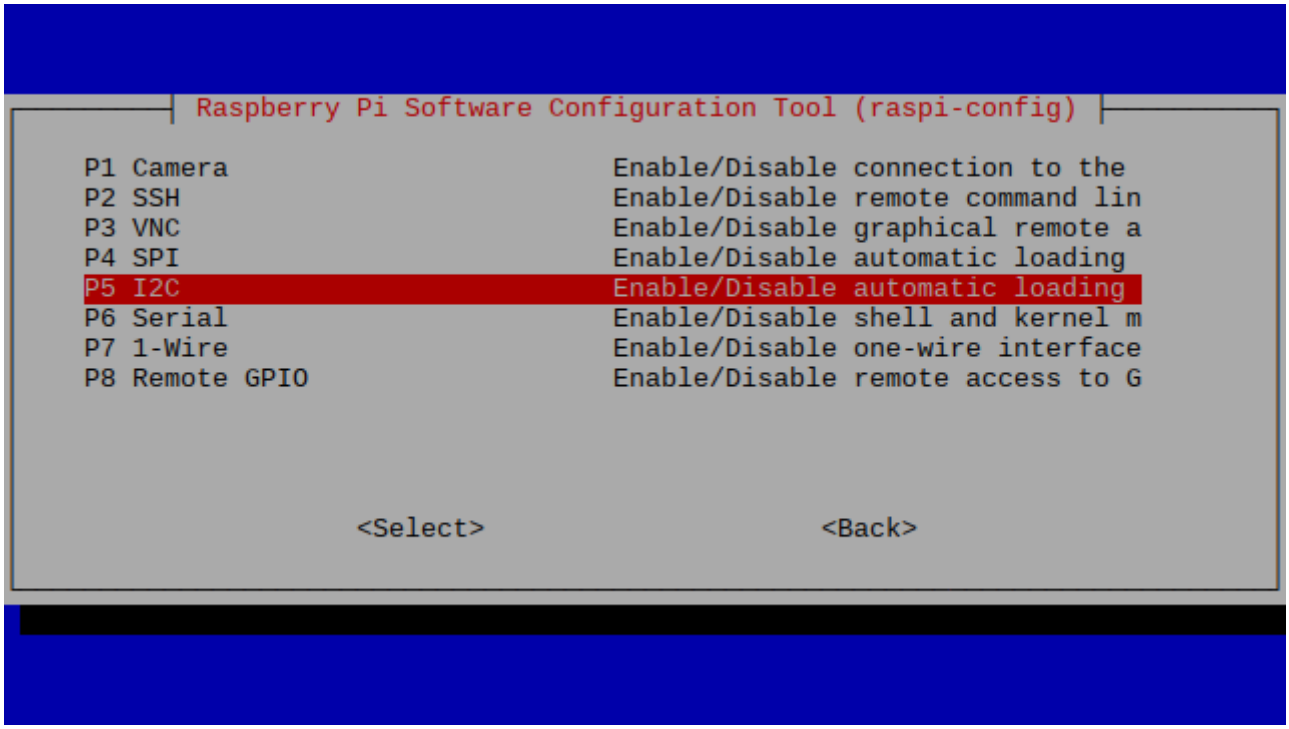
Installing

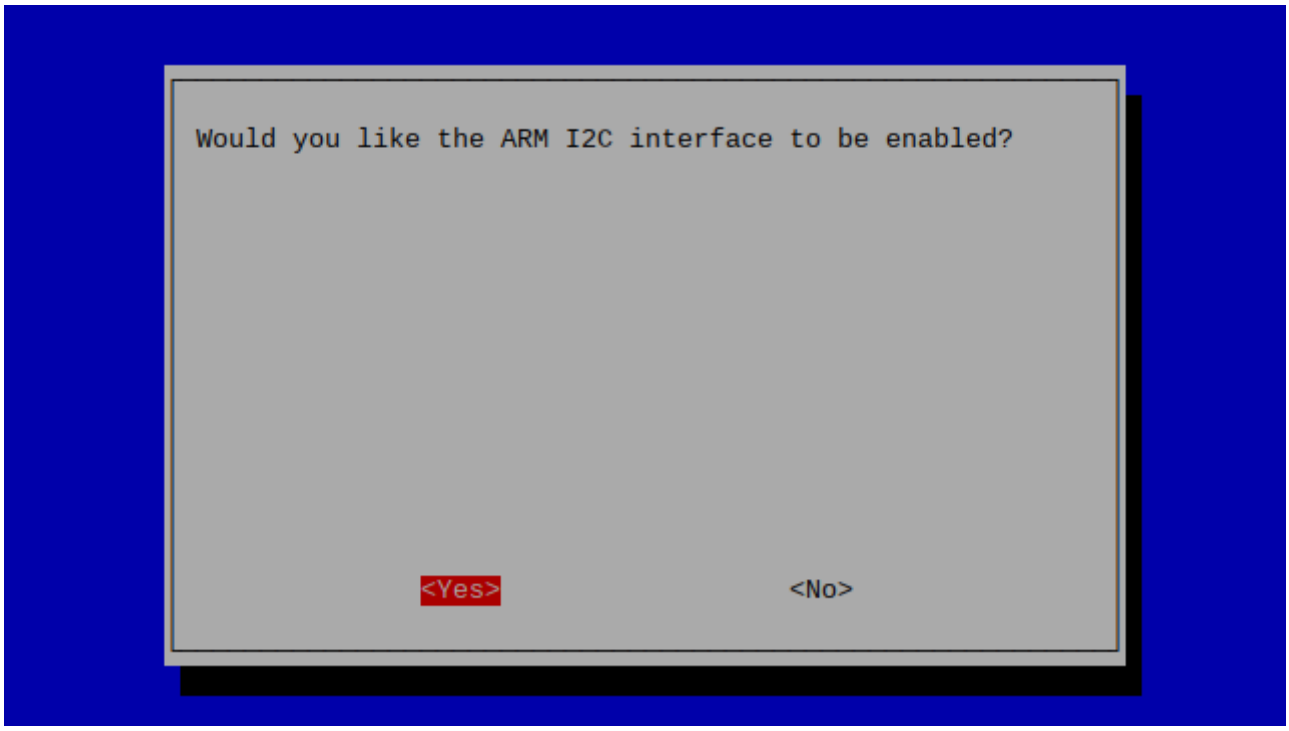
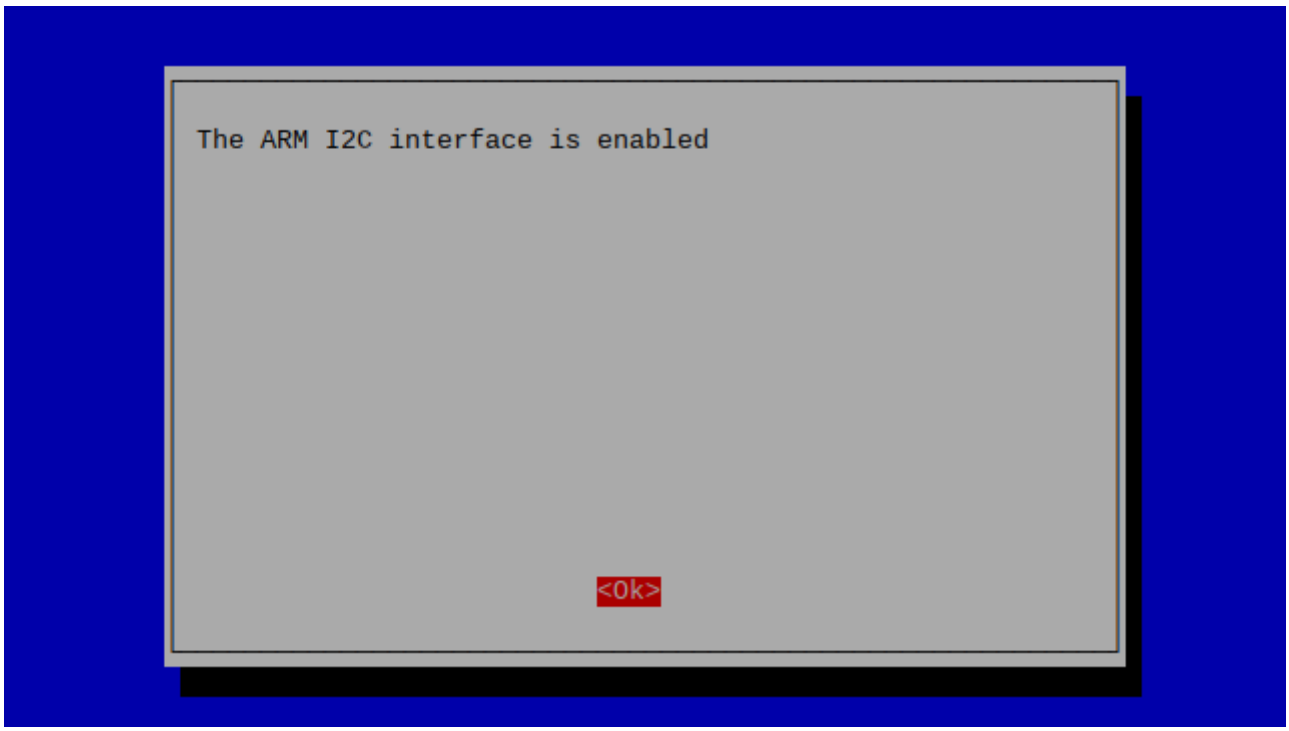
A step by step series that tell you how to get the Firmware and Backend running

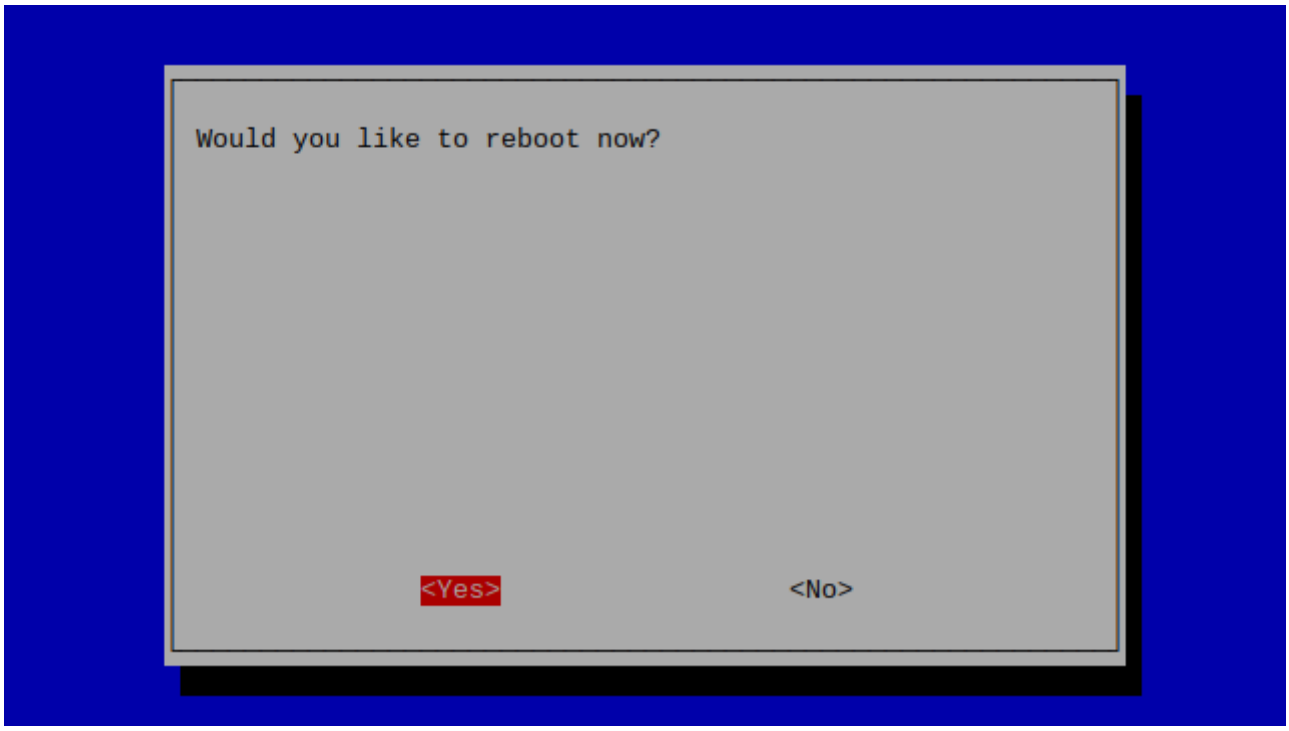
Raspberry Pi Firmware Pre-Reqs

1. Download and install the latest Raspberry Pi OS Desktop image to your SD card
2. Open the terminal and execute the following command `sudo raspi-config`
3. Then follow the following pictures to enable I2C bus on you raspberry pi

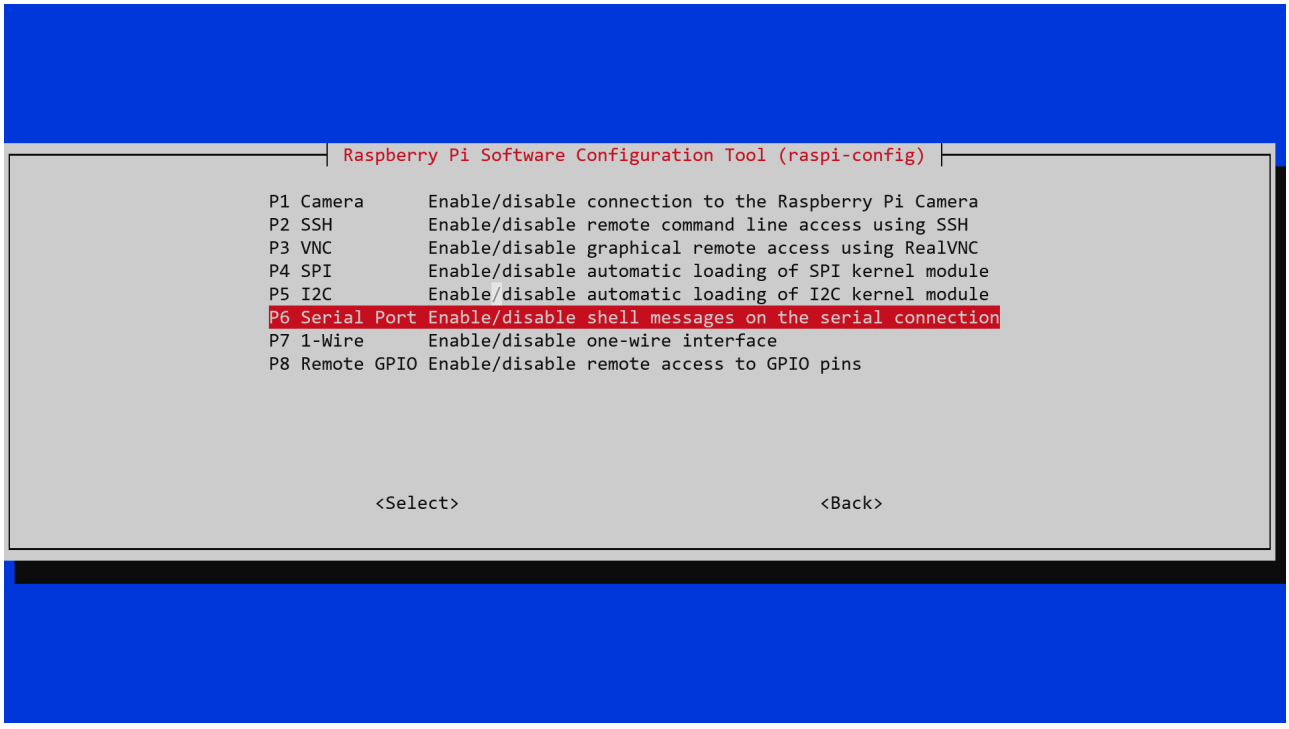


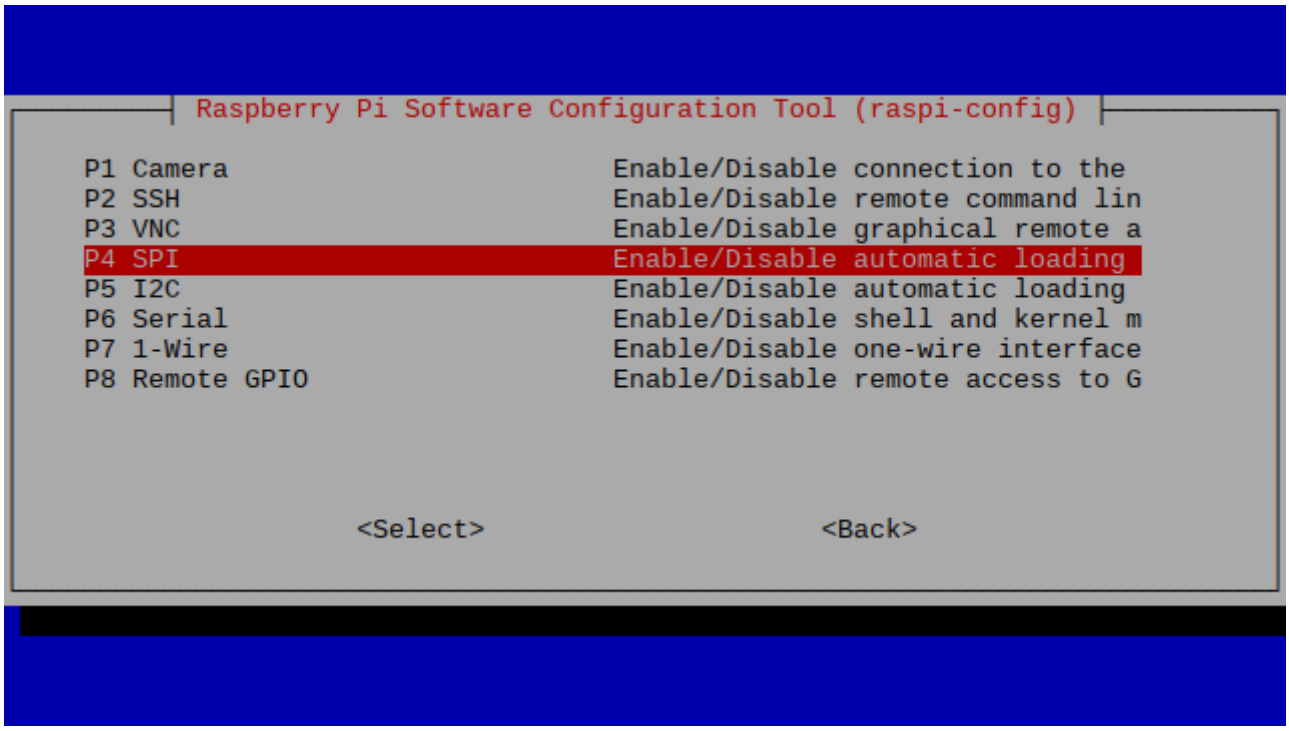


- 
Would you like the ARM I2C interface to be enabled?
<Yes>
<No>
- 
The ARM I2C interface is enabled
<Ok>

- 

- Then do the same for Serial(UART) and SPI

- 



Configuring Raspberry Pi

1. Copy Firmware folder to the desktop of your Raspberry Pi, open the terminal of your Raspberry Pi and execute the following commands

- `sudo apt-get update`
- `sudo apt-get upgrade`
- `cd ~/Desktop/Firmware/`
- `sudo chmod a+rx starter.sh`
- `sudo apt install python3-pip`
- `sudo pip3 install --upgrade setuptools`
- `pip3 install paho-mqtt`
- `pip3 pip3 install get-mac`
- `sudo pip3 install RPi.bme280`
- `pip3 install smbus-cffi==0.5.1`

Running the Firmware

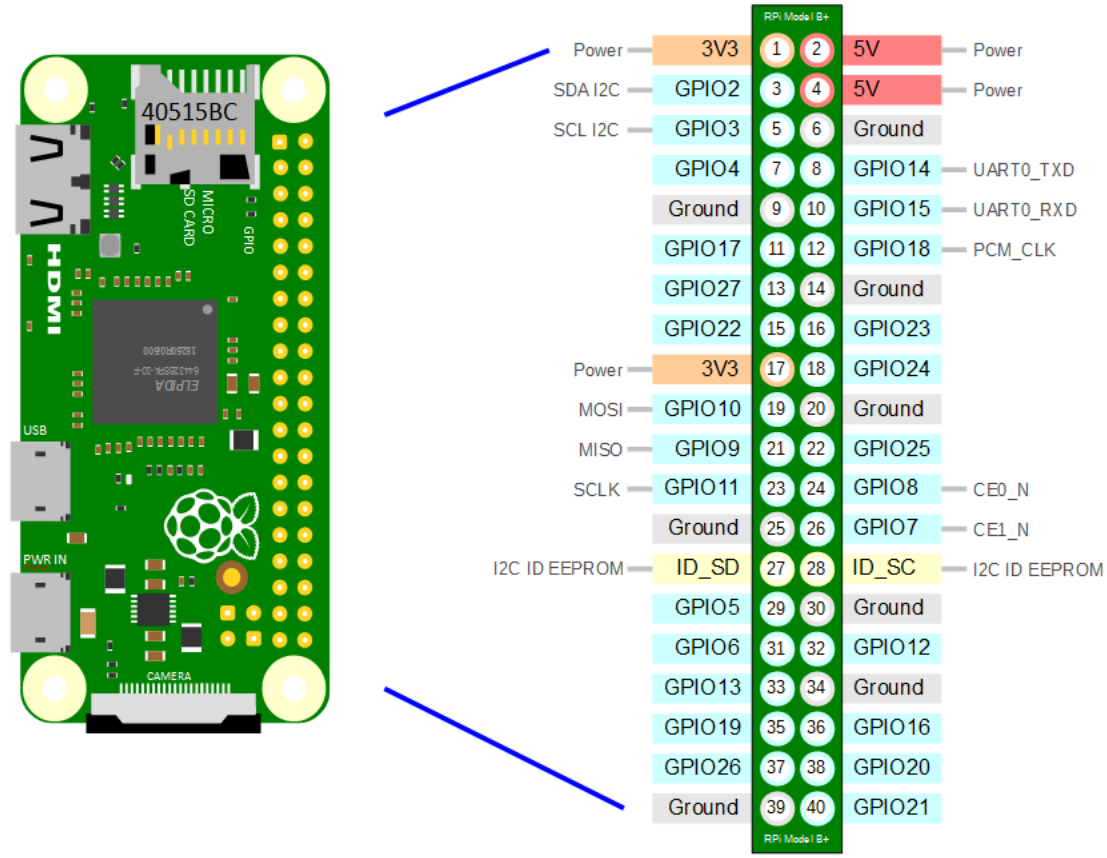
- Execute the following command to run the firmware

```
./home/pi/Firmware/starter.sh
```

Circuit

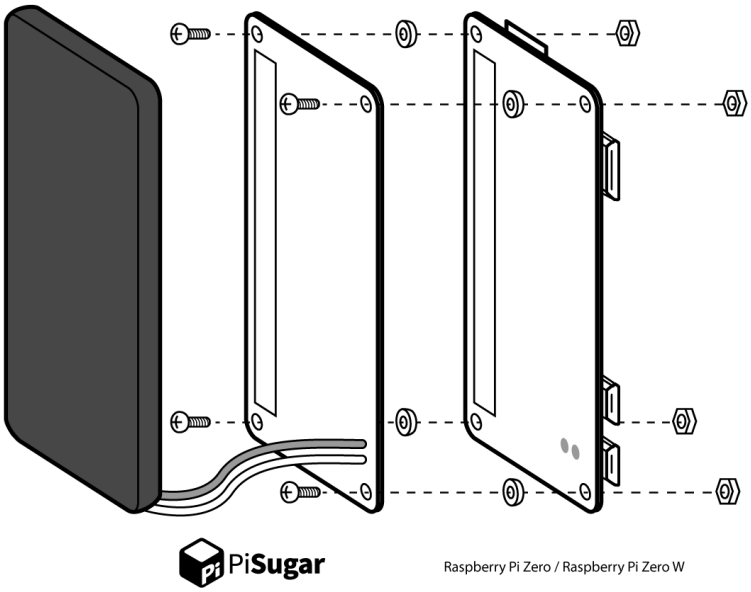
Raspberry Pi Zero W Pinout

Follow the pinout diagram given below to connect different components to your Raspberry Pi Zero W.



Pi Sugar Connection with Raspberry Pi Zero W

The Pi Sugar will be placed beneath the Raspberry Pi Zero W as shown in the sketch below.

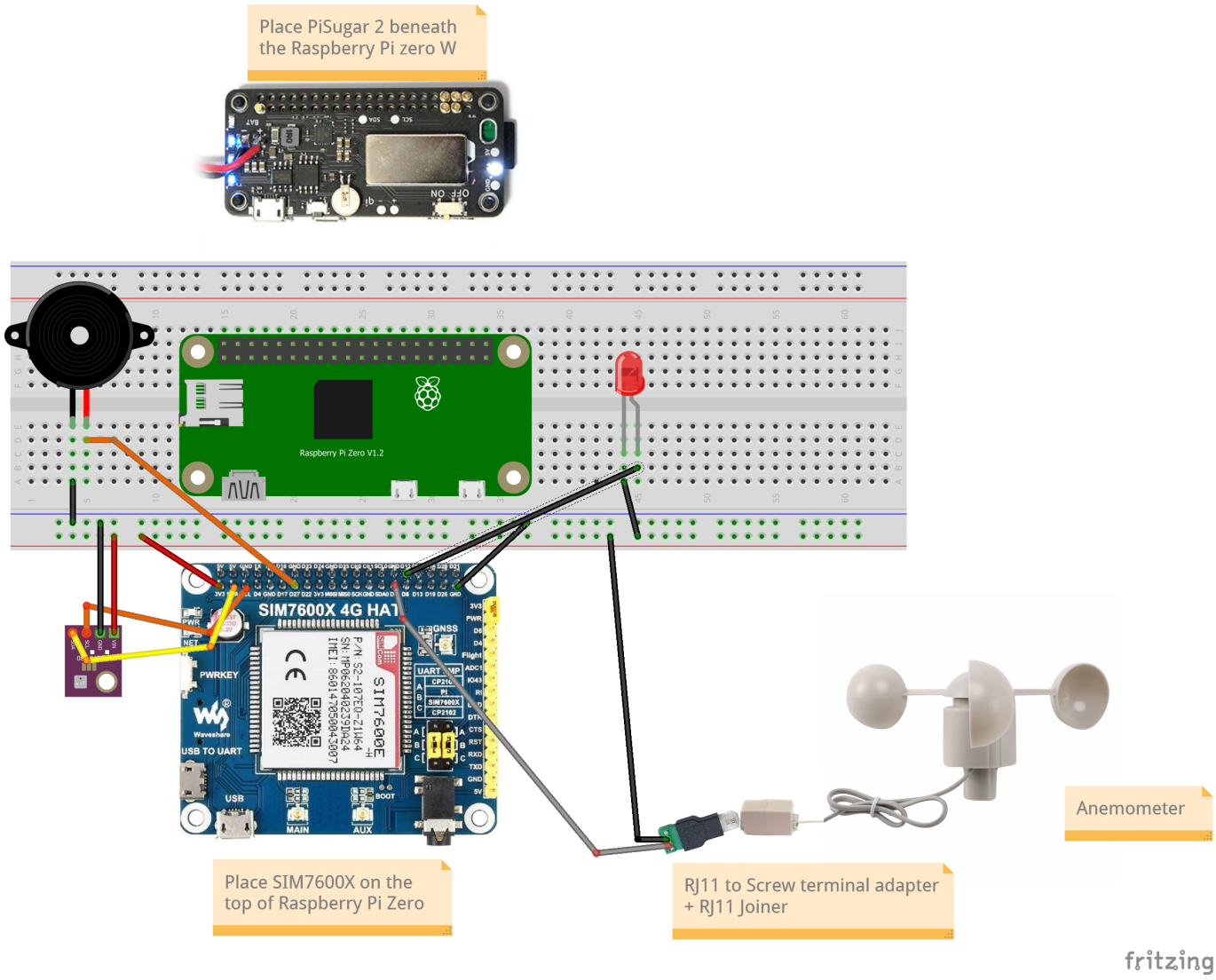


Sim7600E Connection with Raspberry Pi Zero W

The Pi Sugar will be placed above the Raspberry Pi Zero W as shown in the pciture below. Moreover, the antennas for GPS and GPRS can be easily connected.

Complete Circuit Diagram

Here's the complete circuit diagram of the system.



Components Pin Connection Details

```
Components pin connection details
```

LED Light

LED Light Connected with Rapberry Pi Zero W

LED Pins	Raspberry Pi Zero W
Pin 1 (longer pin)	D12
Pin 2 (shorter pin)	GND

Buzzer

Buzzer Connected with Rapberry Pi Zero W

Buzzer Pins	Raspberry Pi Zero W
Pin 1 (red)	D27

Buzzer Pins	Raspberry Pi Zero W
Pin 2 (black)	GND

Anemometer

`Anemometer Connected with Rapberry Pi Zero W`

Anemometer Pins	Raspberry Pi Zero W
Pin 1	D5
Pin 2	GND

Temperature and Humidity Sensor (BME280)

`BME280 Connected with Rapberry Pi Zero W`

BME280 Pins	Raspberry Pi Zero W
VIN	3.3V
GND	GND
SCL	SCL
SDA	SDA

WebApp

- Web App is deployed and accessible from the link below
  - https://windspeedmonitor-frontend.production.rehanshakir.com/
  - Email Address: admin@smartsm.com
  - Password: admin

Backend

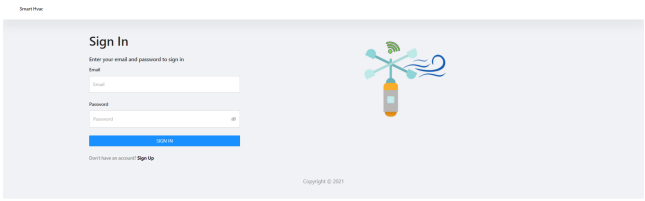
- Data from ESP32 to Dashboard is published on the topic `wsmdata/macAddress` where macAddress is the MAC Address of the Raspberry Pi.
- Alarm/warning data is published from the dashboard to the Raspberry Pi on topic `macAddress/wsm`

Usage

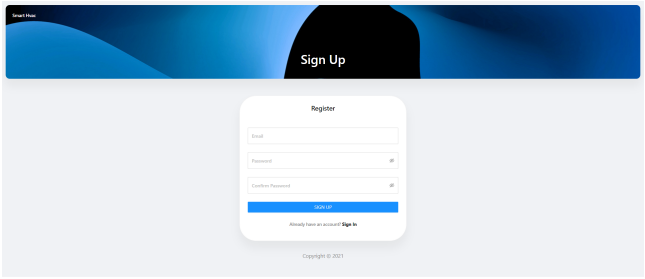
1. Power on your Device and get its MAC Address. You can get the MAC Address as soon as you run the firmware
2. Log-in to the dashboard or create a new account

Log-In	Sign-up

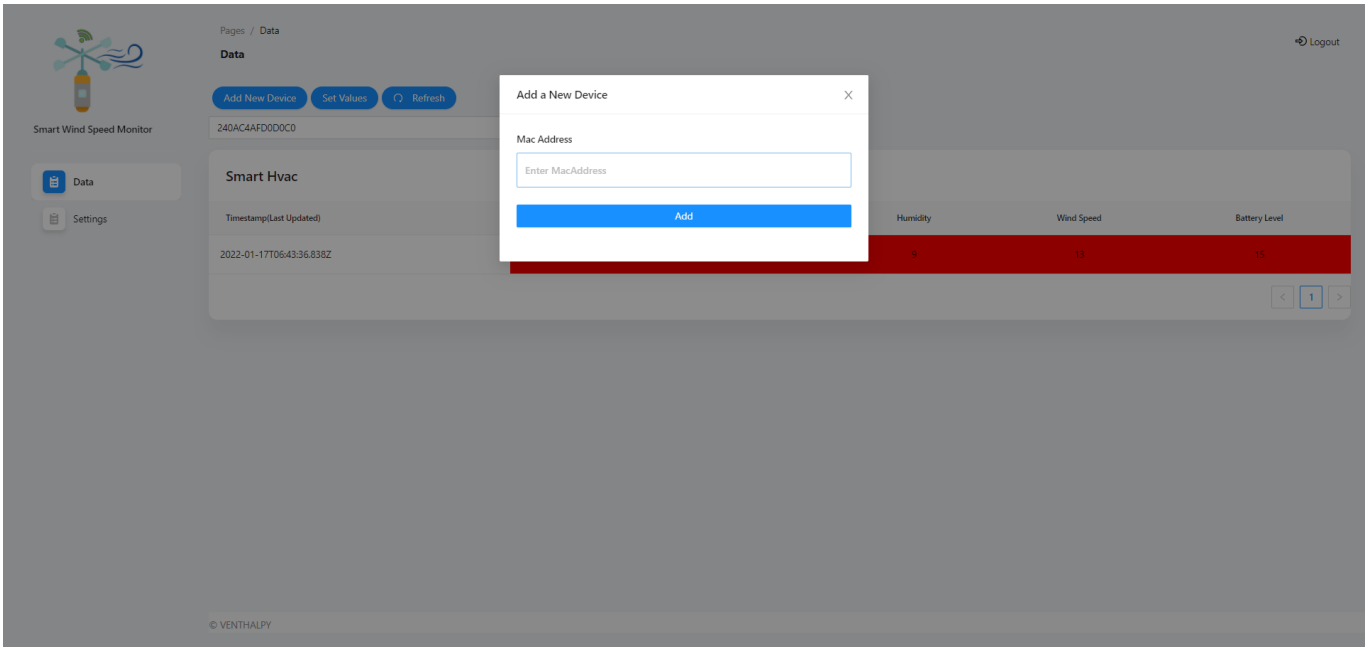
Log-In



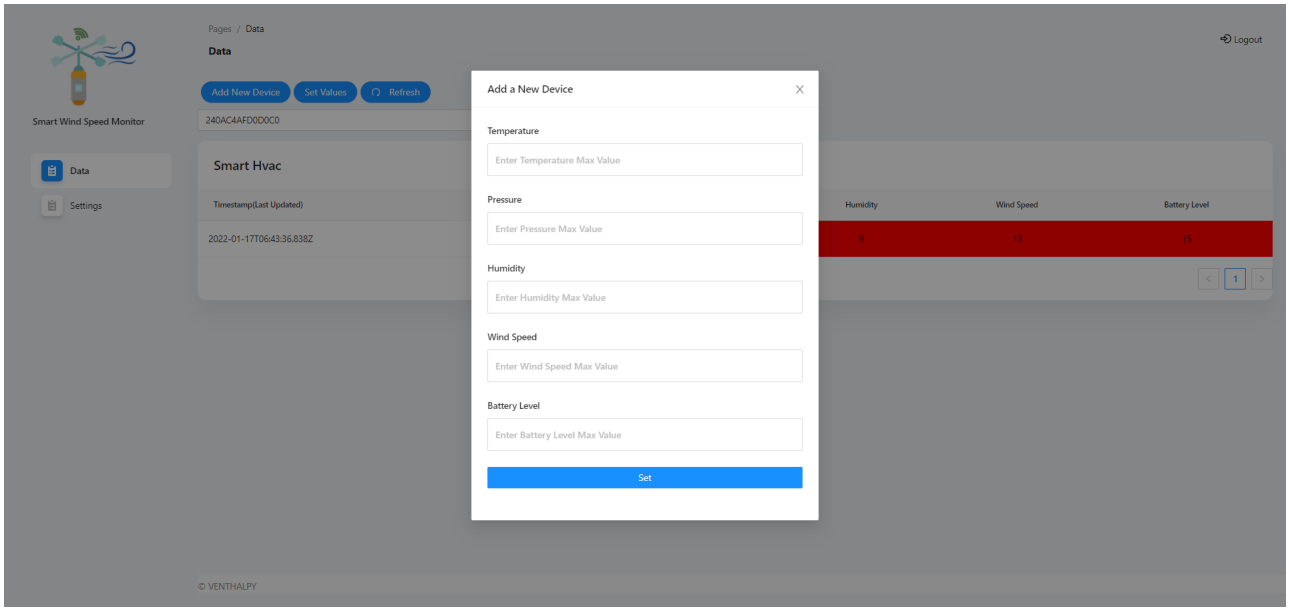
Sign-up



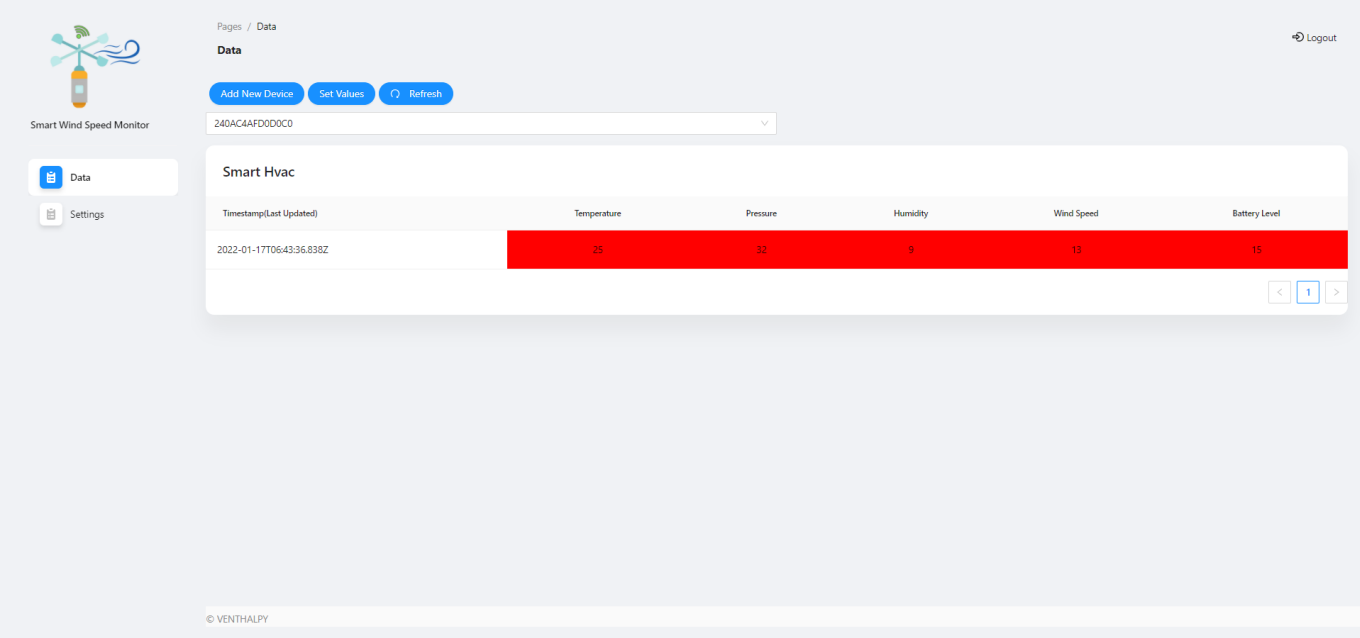
3. Add a new device with its MAC Address



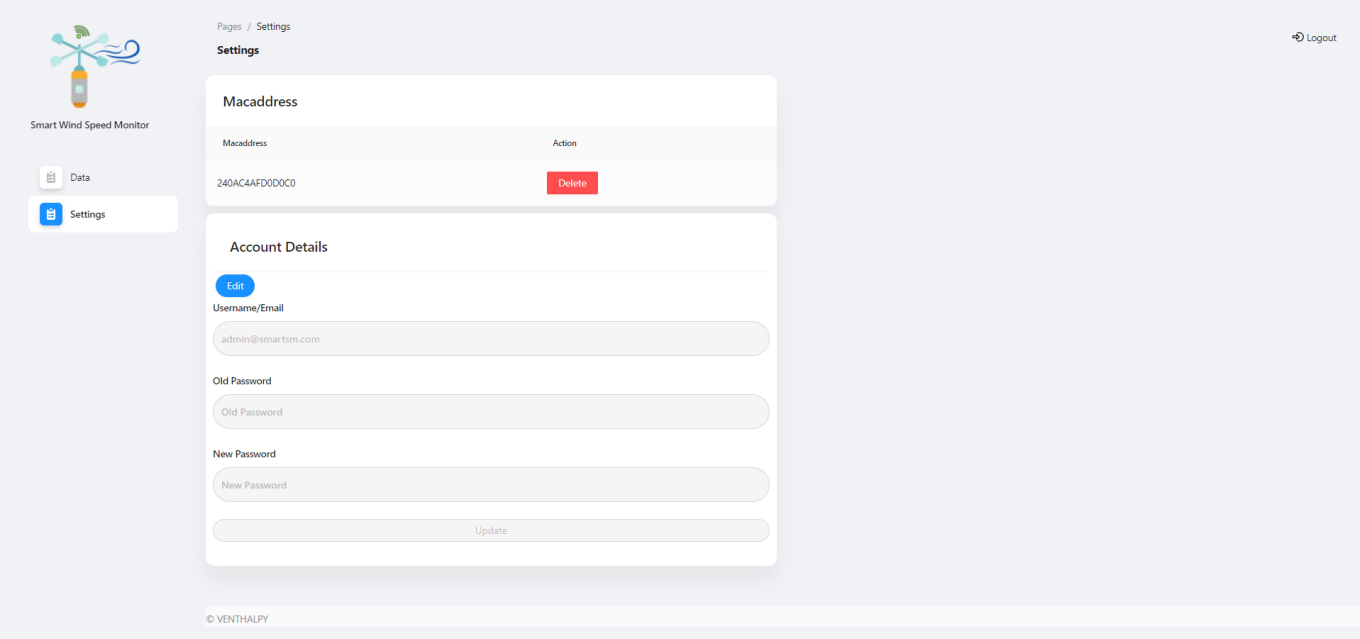
4. Set it's alarm values for turning the buzzer on/off



5. Now you can see the real-time data of the device with the alarm values



6. You can also delete the device or change the user settings from the settings page



List of Components

Following components are used to make this project

1. Raspberry Pi Zero W ○ https://www.amazon.co.uk/CanaKit-Raspberry-Wireless-Complete-Starter/dp/B072N3X39J/ref=sr_1_1?keywords=raspberry+pi+zero+w+w&qid=1639821510&sr=8-1
2. RPi Zero W UPS ○ https://www.amazon.co.uk/Pisugar2-Portable-Lithium-Raspberry-Accessories/dp/B08D678XPR/ref=sr_1_4?keywords=raspberry+pi+ups&qid=1639821580&sr=8-4
3. 4G GPRS and GPS SIM7600E-H ○ https://www.amazon.co.uk/IBest-GSM-GPRS-GNSS-Board/dp/B07PPSTY13/ref=sr_1_3?keywords=raspberry%2Bpi%2B4g&qid=1639821783&sr=8-3&th=1
4. BME280 Temperature, Humidity and Pressure Sensor ○ https://www.amazon.co.uk/CUQI-Barometric-Pressure-Temperature-Humidity/dp/B0991RKZSN/ref=sr_1_1?keywords=bme280&qid=1639822215&sr=8-1

5. Wind Speed Meter ○ https://www.amazon.co.uk/Nephit-Measurement-Meteorological-Instruments-Accessories/dp/B09F64GXQH/ref=sr_1_7?keywords=wind+speed+sensor&qid=1639822540&sr=8-7
6. RJ11 Screw Terminal ○ https://www.amazon.co.uk/JENOR-Terminal-Adapter-Connector-Splitter/dp/B087R3187F/ref=sr_1_2?keywords=rj11+terminal&qid=1639823304&sr=8-2
7. RJ11 Connector ○ https://www.amazon.co.uk/Rhinocables%C2%AE-Coupler-Extender-Extension-connector/dp/B00EVS92KQ/ref=sr_1_3?keywords=rj11+connector&qid=1639823380&sr=8-3
8. Alarm Buzzer ○ https://www.amazon.co.uk/sourcingmap%C2%AE-Continuons-Electronic-Buzzer-Sounder/dp/B010V4UZTK/ref=sr_1_9?keywords=alarm+buzzer&qid=1639823529&sr=8-9
9. 3v-6v LED ○ https://www.amazon.co.uk/Sourcingmap-20pcs-Wired-Light-Flashing/dp/B07DYZ1L3Y/ref=sr_1_12?keywords=led+light+5mm&qid=1639823838&sr=8-12

📽 Demo Videos

- Complete Demo Video - Smart Wind Speed Monitor Complete Demo Video
- Firmware Demo Video - Smart Wind Speed Monitor Firmware Demo Video

🔨 Built Using

- Python - Programming Language - For Raspberry Pi Zero W Firmware
- Fritzing - Circuit Designer

✍ Authors

- @Nauman3S - Development and Deployment