MINESAFE INNOVATORS PROJECT

EXTENDED USER MANUAL

THIS IS THE FURTHER ELABORATION OF THE USER MANUAL:

For SX1278 LoRa Module:

- Vcc (Power) is connected to 3.3V.
- MISO is connected to D12.
- MOSI is connected to D11.
- SCLK (Serial Clock) is connected to D13.
- NSS (Slave Select) is connected to D10.
- GND (Ground) is connected to GND.

For MAX30102 Pulse Oximeter and Heart-Rate Sensor Module:

- Vcc (Power) is connected to 5V.
- SDA (Serial Data) is connected to A4.
- SCL (Serial Clock) is connected to A5.
- GND (Ground) is connected to GND.

For MQ4 Gas Sensor Module:

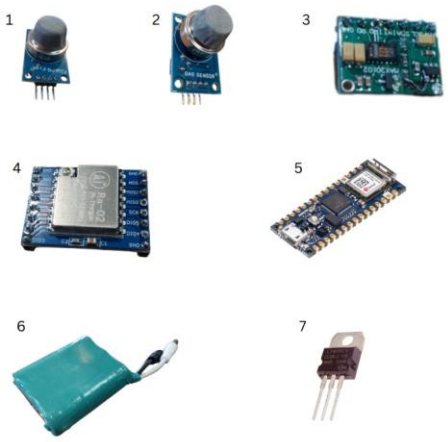
- Vcc (Power) is connected to 5V.
- AO (Analog Output) is connected to A0.
- GND (Ground) is connected to GND.

For MQ5 Gas Sensor Module:

- Vcc (Power) is connected to 5V.
- AO (Analog Output) is connected to A1.
- GND (Ground) is connected to GND.

Hardware Requirements:

- MQ4 sensor x 1
- MQ9 sensor x 1
- MAX30102 pulse sensor x 1
- SX1278 LoRa module x 2
- Arduino Nano 33 IOT x 2
- 3S Lithium-Ion 12v battery
- LM7805 voltage regulator
- Jumper Wires
- Breadboard
- Worker Helmet with headphone (Enclosure)
- General PCB (Optional)
- Soldering Iron (Optional)
- Suitable antenna for LoRa



Software Requirements:

- Arduino IDE
- Google Firebase (with an account)
- Node JS

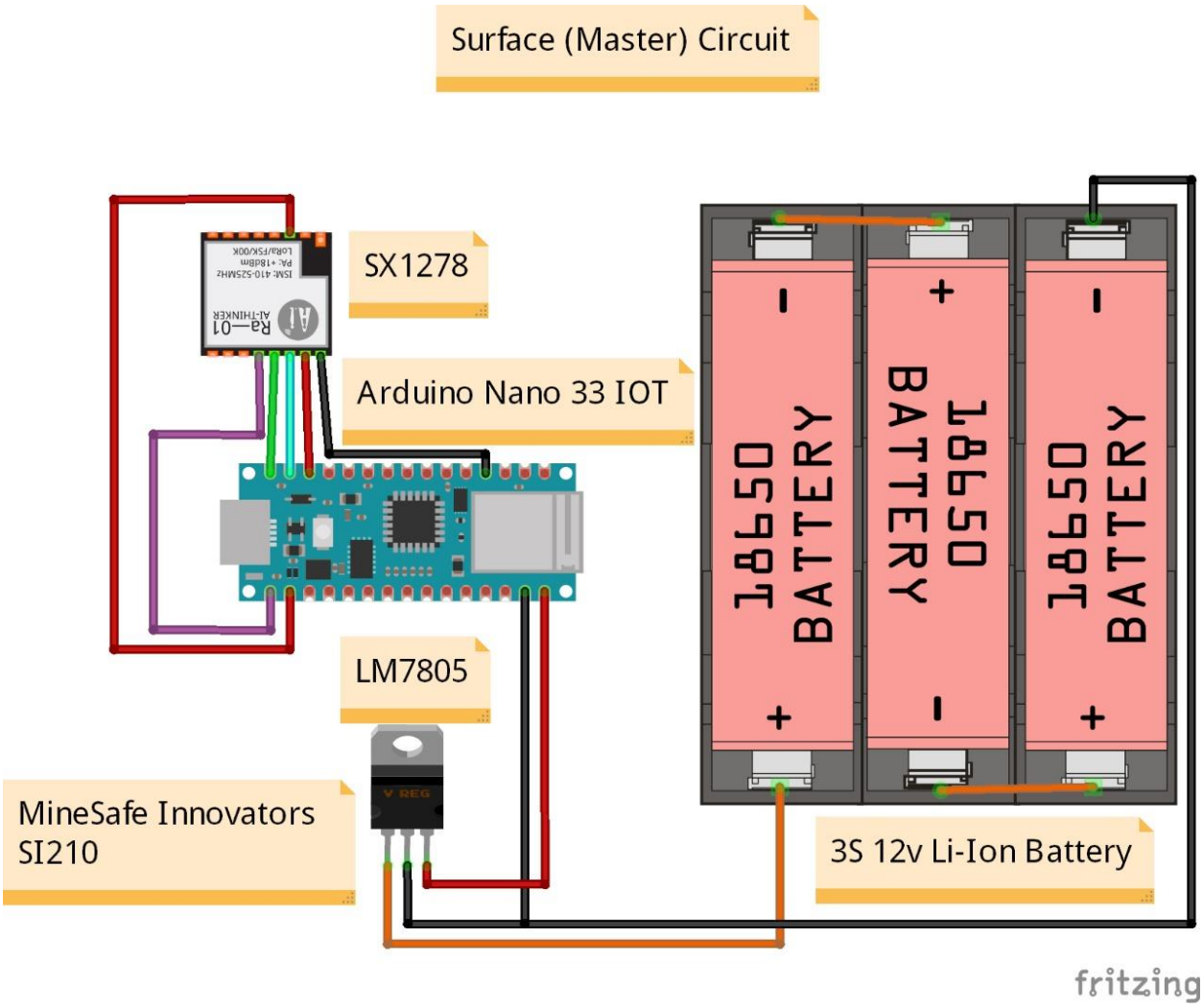
In deployment, there is a master node present (on surface) and one slave node (in helmet)

What is Master Node?

This system is a relay system which receives relevant data from the helmet(s) via LoRaWAN and then transmits it to Firebase's Realtime database

What is Slave Node?

This system is located in each helmet which generates the data as discussed previously and then transmits it to the maser node via LoRaWAN technology.


Surface (Master) Circuit
SX1278
Arduino Nano 33 IOT
LM7805
MineSafe Innovators
SI210
18650 BATTERY
18650 BATTERY
18650 BATTERY
3S 12v Li-Ion Battery
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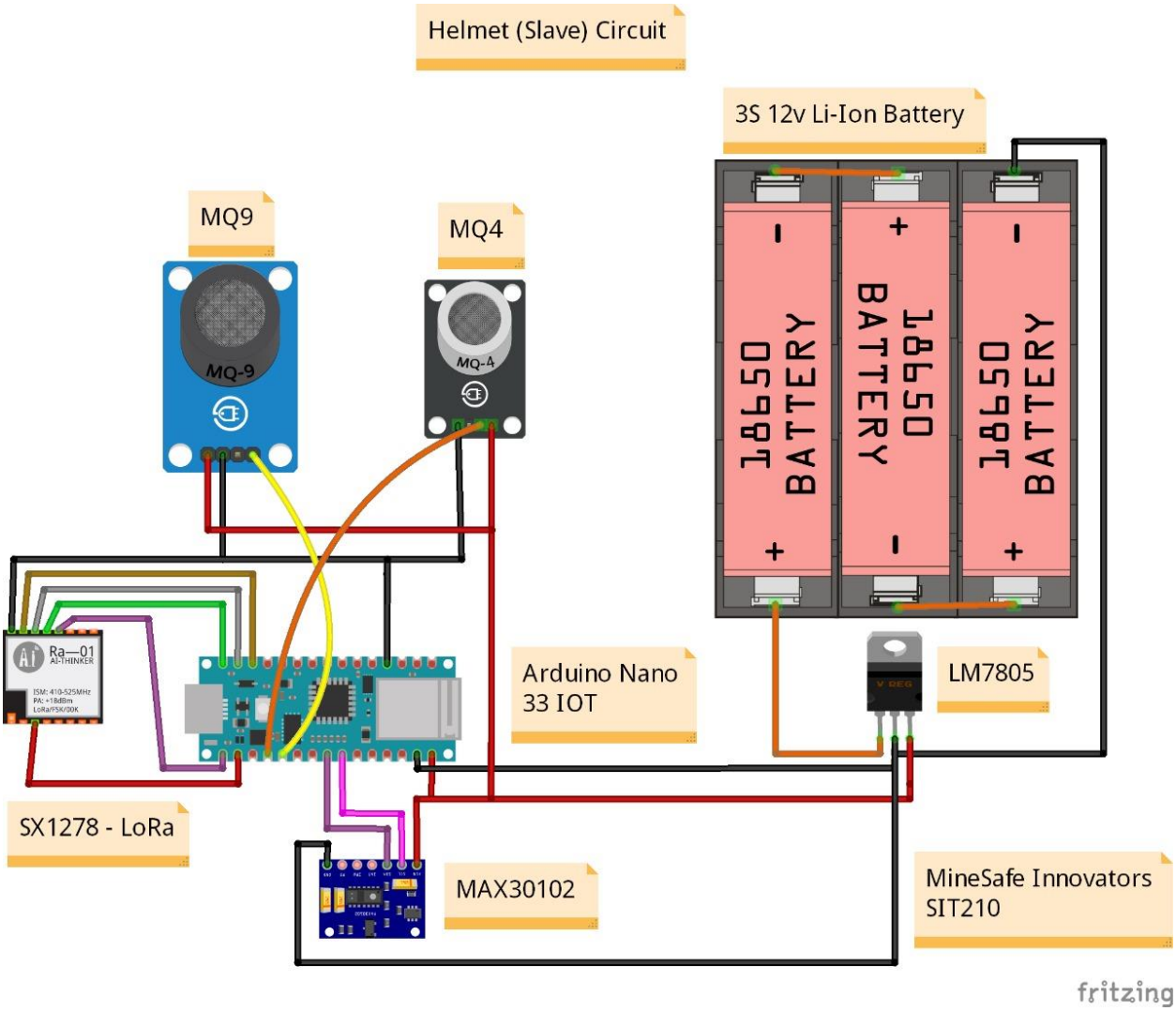
Helmet (Slave) Circuit
3S 12v Li-Ion Battery
MQ9
MQ4
MQ-9
MQ-4
18650 BATTERY
18650 BATTERY
18650 BATTERY
Ra—01
AI-THINKER
Arduino Nano
33 IOT
LM7805
SX1278 - LoRa
MAX30102
MineSafe Innovators
SIT210
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