

## **SPO<sub>2</sub> PRIMARILY BASED SUPPLEMENTAL SUBSTANCE CONSTITUENT DELIVERY SYSTEM FOR TROOPERS AT EXCESSIVE ALTITUDES**

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### **ABSTRACT**

This idea presents Associate in Nursing automatic system to deliver supplemental gas to troopers patrolling at extreme altitudes supported their SpO<sub>2</sub> (blood gas saturation) levels. The thought emphasizes on electronic hardware designed for engaging at extreme altitudes that includes low measuring instrument pressures, low temperatures and wetness. The package safety checks incorporated into the system and vital in guaranteeing the useful dependableness of the system in field conditions. The system reads SpO<sub>2</sub> levels of the topic from a wrist-worn pulse measuring instrument module through wireless interface and controls a proportional magnet valve to manage the gas provide to the topic. The gas is delivered from a light-weight moveable gas cylinder through nasal nares.

**Keywords:** *Altitude, hypoxia, pulse oximetry, spo<sub>2</sub>, supplemental oxygen, acclimatization*

### **INTRODUCTION**

A large range of trooper's area unit often deployed in extreme altitude areas like Sachem ice mass and range of mountains regions of Indian borders thanks to military and strategic reasons. These extreme altitudes create a significant threat to physiological functions and physical performance of a private. The foremost vital feature of utmost altitude is drive or deficiency of element in body. Supplemental element dose will greatly facilitate relieve a private from hypoxic stress. Thanks to constraints within the support needed at extreme altitudes, supplemental element dose is needed to incline in a cheap however adequate manner. This paper presents a system developed to fulfill the higher than field needs and conjointly track the troopers via GPS and also the health constraints are going to be updated victimization internet server.



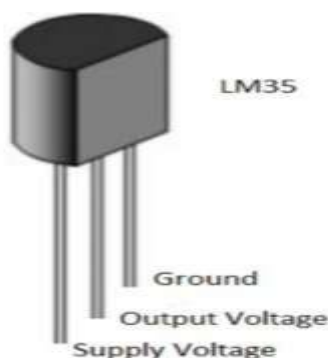
**Figure 1: Node –MCU is a module based on ESP8266 Wifi module. USB TTL included ,plug and play module.**

### Node-MCU

Node-MCU is an open source LUA based firmware developed for ESP8266 wi-fi chip. By exploring functionality with ESP8266 chip, Node-MCU firmware comes with ESP8266 Development board/kit i.e. Node-MCU Development board. Since Node-MCU is open source platform, their hardware design is open for edit/modify/build. Node-MCU Dev Kit/board consist of ESP8266 wi-fi enabled chip. The **ESP8266** is a low-cost WiFi chip developed by Espressif Systems with TCP/IP protocol. Node-MCU Dev Kit has **Arduino like** Analog (i.e. A0) and Digital (D0D8) pins on its board. It supports serial communication protocols i.e. UART, SPI, I2C etc. Using such serial protocols we can connect it with serial devices like I2C enabled LCD display, Magnetometer HMC5883, MPU-6050 Gyro meter +Accelerometer, RTC chips, GPS modules, touch screen displays, SD cards etc.

### Temperature Sensor:

LM35 is a temperature measuring device having an analog output voltage proportional to the temperature. It Provides output voltage in Centigrade (Celsius). It does not require any external calibration circuitry. The sensitivity of LM35 is 10 mV/degree Celsius.



**Figure 2: LM35 is a precision temperature sensor IC .Voltage supply 4 to 30volt. Typical operating voltage 5volt.Current drain 60μA. Accuracy ±5°C.Ranging temperature -55°C to +150°C.**

### SpO<sub>2</sub> Sensor

This sensor is useful in making Pulse oximetry, which is a test that measures what proportion of the oxygen-carrying molecules in the blood (called hemoglobin) are actually carrying oxygen. This is known as oxygen saturation or SpO<sub>2</sub>. One hundred percent oxygen saturation is attained when all hemoglobin in the blood is completely saturated with oxygen. This simple test does not require a blood sample and is called non-invasive. A pulse oximeter is a medical device that indirectly measures the oxygen saturation of a patients blood (as opposed to measuring oxygen saturation directly through a blood sample) and changes in blood volume in the skin, producing a **photoplethysmograph**. It is often attached to a medical monitor so staff can see a patients oxygenation at all times. Portable battery-operated pulseoximeters are also available for home blood-oxygen monitoring.

### GPS MODEM

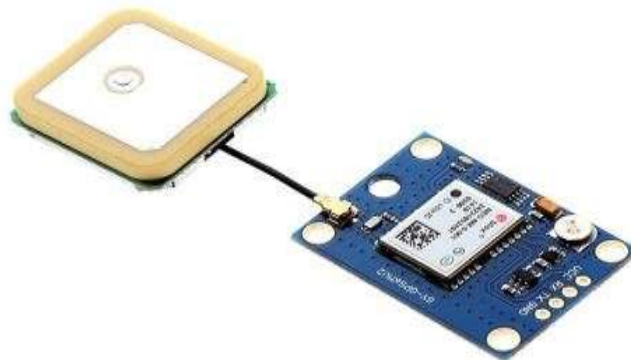
The Global Positioning System (GPS) comprises three segments:

- The space segment (all functional satellites).
- The control segment (all ground stations involved in the monitoring of the system master control station, Monitor stations, and ground control stations).

- The user segment (all civil and military GPS users).



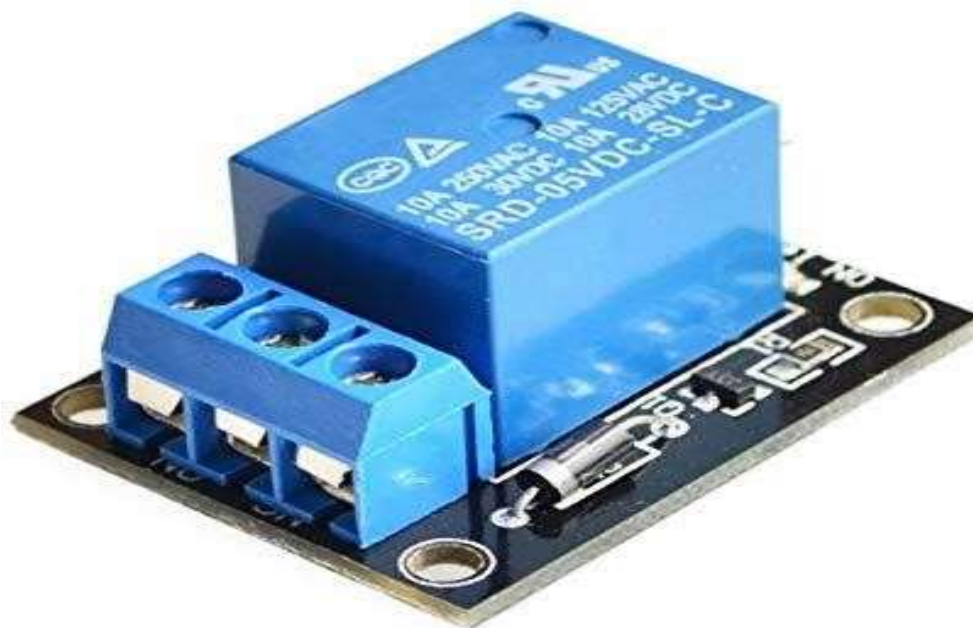
**Figure 3:** MAX 30100 is an integrated pulse oximeter and herat rate monitor sensor solution . Input voltage 1.8v to 5.5v.



**Figure 4:** This is a complete GPS module that is based on Ublox NEO-6M. 5Hz position update rate. Operating temperature range -40 to 85°C.

#### **RELAY (SPST)**

A hand-off is an electrically worked switch. Relays utilize an electromagnet to mechanically work a switch. Relays were utilized broadly in phone trades and early PCs to perform coherent operations. Relays are utilized where it is important to control a circuit by a different low-control flag, or where a few circuits must be controlled by one signal. They gets the rehashed flag rolling in from one circuit and re-transmitted it on another circuit. At the point when a present moves through the loop an electro-attractive field is set up. The field pulls in an iron armature, whose flip side pushes the contacts together, finishing the circuit.



**Figure 5:** This is one channel 5v relay board module for Arduino PIC AVR DSP ARM. Max current 20mA. Triode drive increasing relay coil.

### SOLENOID VALVE

A solenoid valve is an electromechanical controlled valve. The valve features a solenoid, which is an electric coil with a movable ferromagnetic core in its center. This core is called the plunger. In rest position, the plunger closes off a small orifice. An electric current through the coil creates a magnetic field. The magnetic field exerts a force on the plunger. As a result, the plunger is pulled toward the center of the coil so that the orifice opens. This is the basic principle that is used to open and close solenoid valves.



**Figure 6:** Robocraze Solenoid valve 230v. Pressure 1 to 10kg/cm<sup>2</sup> . Working medium air, water, oil , gas state . pipe size 1/2" MALE x 1/2" MALE.

## OBJECTIVES

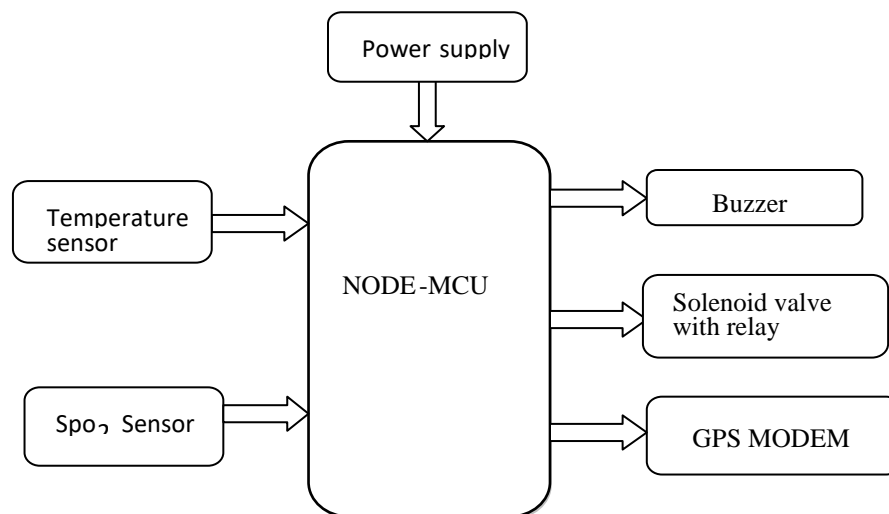
Proposed system for watching of gas level conditions of troopers within the main victimization sensors, GPS, IOT-based technologies. However, most of those solutions solely address information assortment and information observation. So as to tackle the matter of watching with avoiding health risks, it's imperative that the system ought to collect information via a self-sufficing system that is applicable for observations and relocate to a server remotely.

## MATERIALS AND METHODS

The proposed framework manages the way toward monitoring and providing the oxygen for the troopers at high altitude and also the parameters including with location details are updated with the idea of IOT. The working model of The SpO<sub>2</sub> primarily based supplemental substance constituent delivery system for troopers at excessive altitudes contains the accompanying units and sensors:

- Node-MCU
- GPS Modem
- SPO<sub>2</sub> Sensor
- Temperature Sensor
- Relay and Solenoid valve

## BLOCK DIAGRAM:



## CONCLUSION

The proposed framework manages the way toward monitoring and providing the oxygen for the troopers at high altitude and also the parameters including with location details are updated with the idea of IOT. The working model of The SpO<sub>2</sub> primarily based supplemental substance constituent delivery system for troopers at excessive altitudes contains the accompanying units and sensors. In future we have extend that application to communications between defense server and the troopers turn secured and cloud based monitoring and rescuing over the world.



**Figure 7: SpO<sub>2</sub> primarily based supplemental substance constituent delivery system for troopers at excessive altitude.**

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