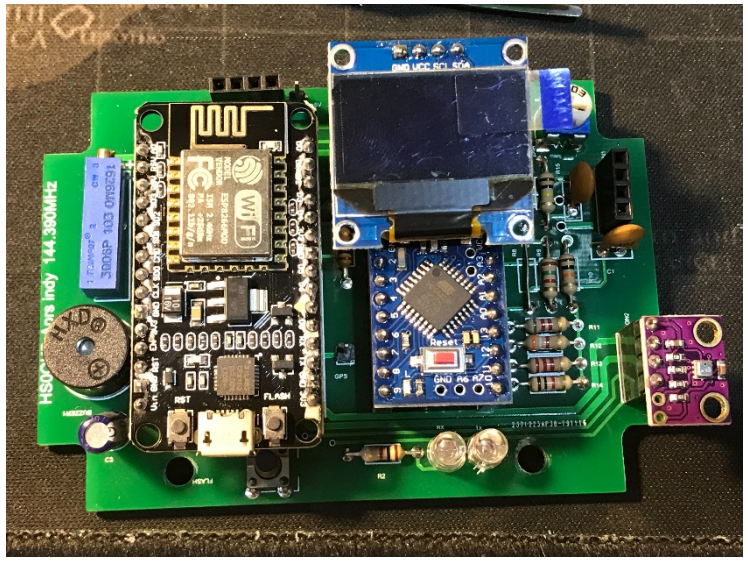
DIY. APRS
WiFi iGate, Tracker and Weather Station



Nimit Hongyim,

Bangkok, Thailand

Grid location : OK03HU

Credit firmware and schematic by HS3LSE, E27ASY and Indy Team

Outline

- Introduction
- How to DIY Wifi iGate + WX
- How to wifi Tracker
- Thailand iGate project funded by *NBTC (similar to FCC)
- Portable WX + GPS funded by NBTC
- Working on my Research paper, M.ENG and Doctoral ENG.

Office of The NBTC
Office of The National Broadcasting and Telecommunications Commission

*

Nimit Hongyim – K6XOX / HS1IFU

Brief Profile:

- email: k6xox@arrl.net
- Facebook /k6xox
- Worked @ On semiconductor (Santa Clara) since 1999 and then 2013 resided from San Jose to Bangkok, Thailand
- General Class (FCC) , Extra Class (NBTC)
- Currently - Doctoral Candidate of Electrical Engineering at King Mongkut's Institute of Technology Ladkrabang (KMIT'L)
- Graduated Master Computer Engineer (KMIT'L) and Master of Business Administration (Kasetsart University)

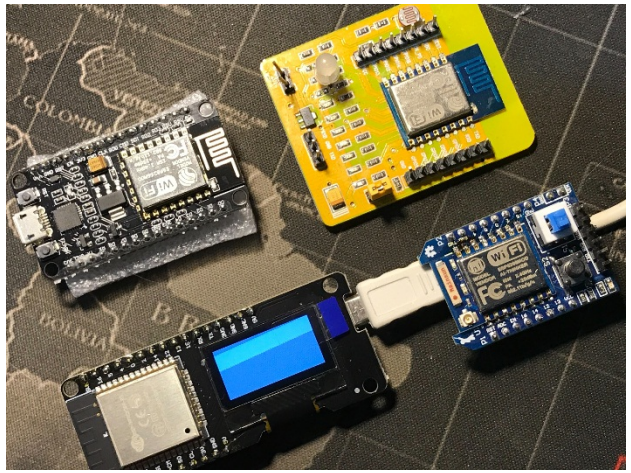
Career @Thailand:-

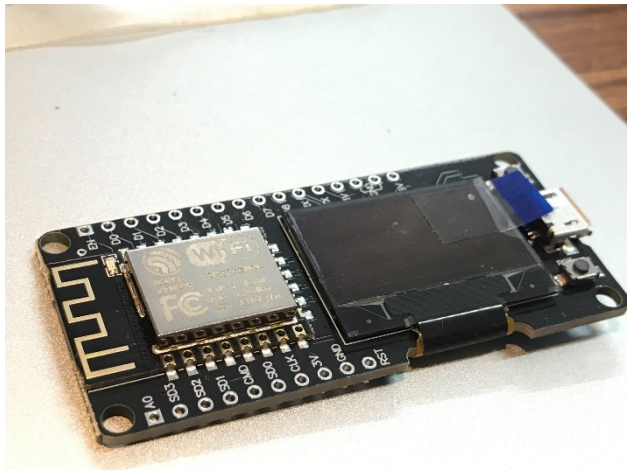
- Lecturer @ Rajapruk University , Nonthaburi, Thailand
- Owner Dragon Security Guard company
- Owner Naiyim Garage Custom built Electric Vehicle
- Engineering Advisor to Radio Amateur Society of Thailand (RAST)
- Freelance Researcher for The National Science and Technology Development Agency (NSTDA)

Introduction

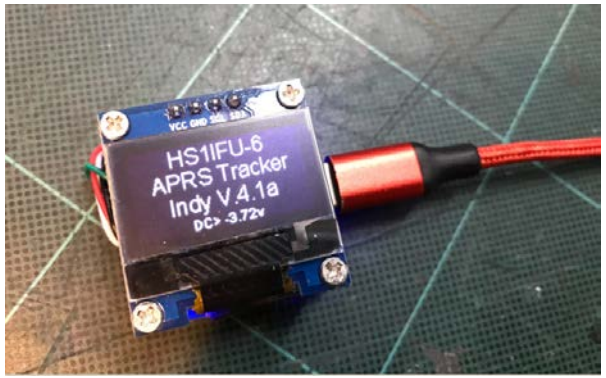
Using the low cost and effective for APRS iGate with ESP8266

(estimated cost <20$)





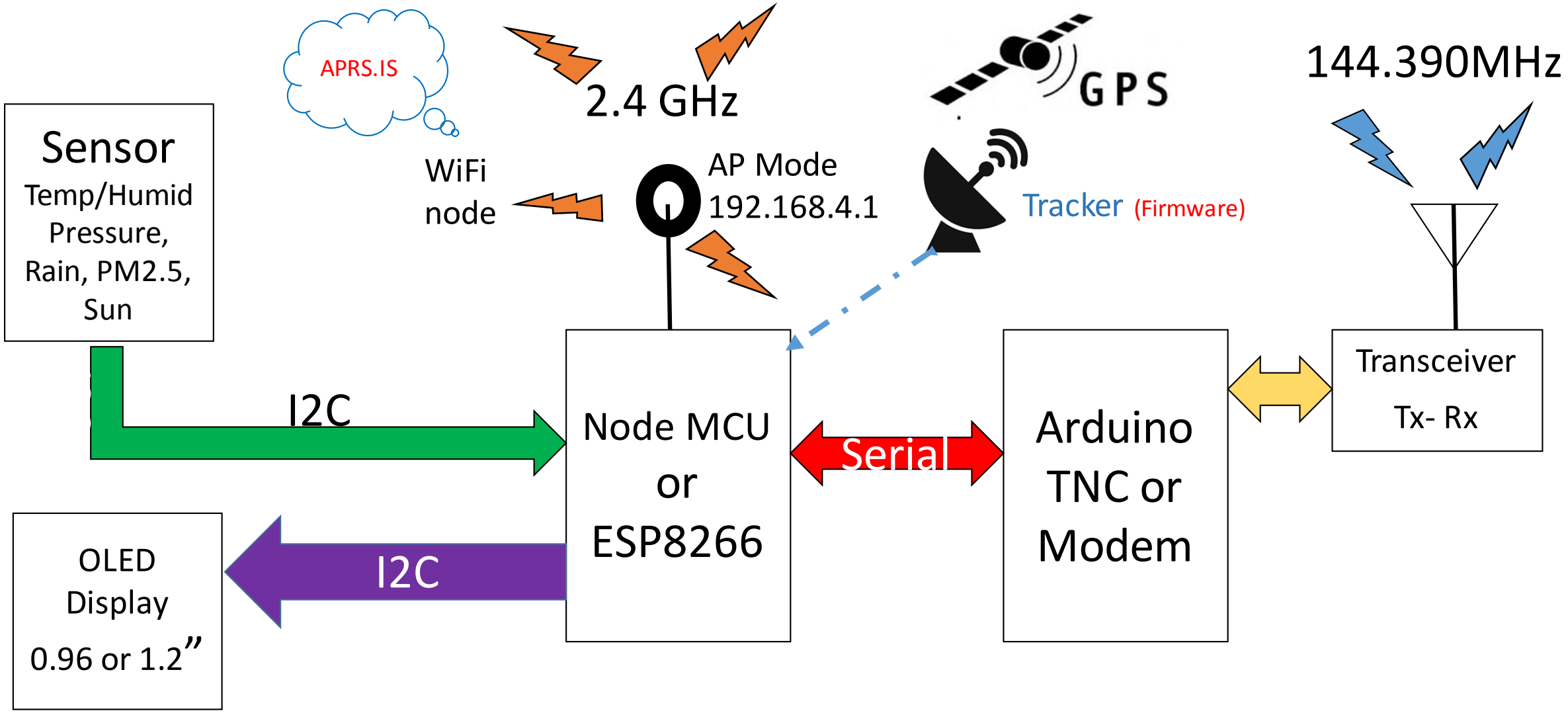
- DIY , iGate and Tracker without knowledge of programming



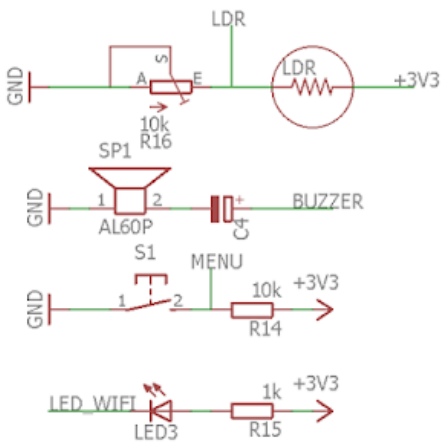
Or you can purchase MicroSat iGate

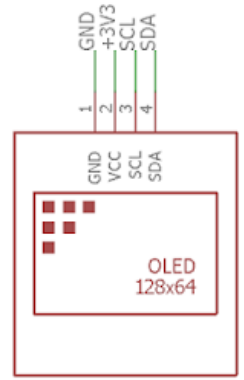
WX3in1 Mini Gate $122.00

Block Diagram iGate + WX or Tracker

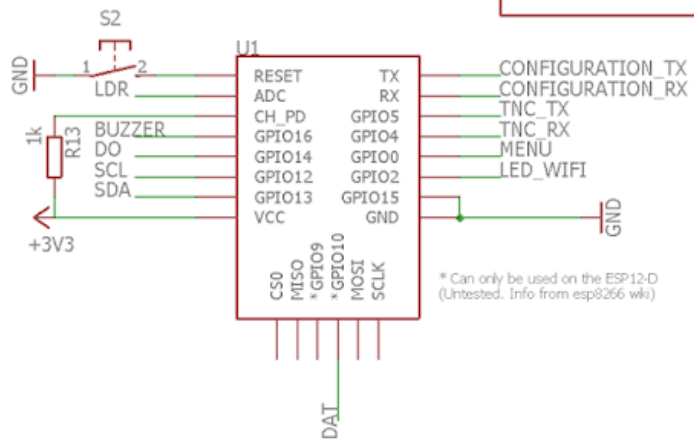


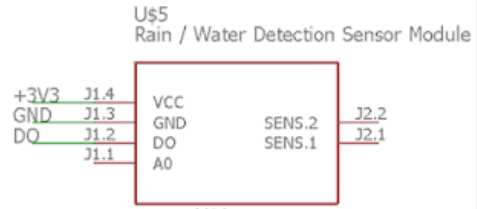
APRS INDY WX IGATE / DIGI

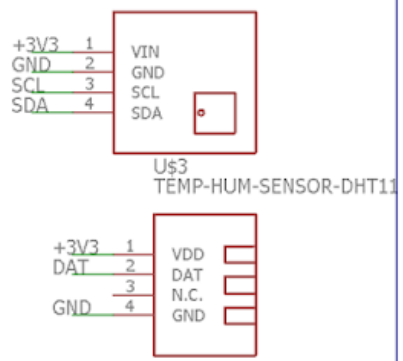




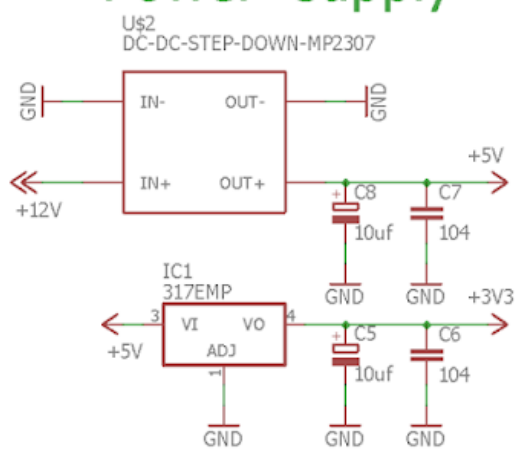
U$4
DISPLAY-OLED-128X64-I2C



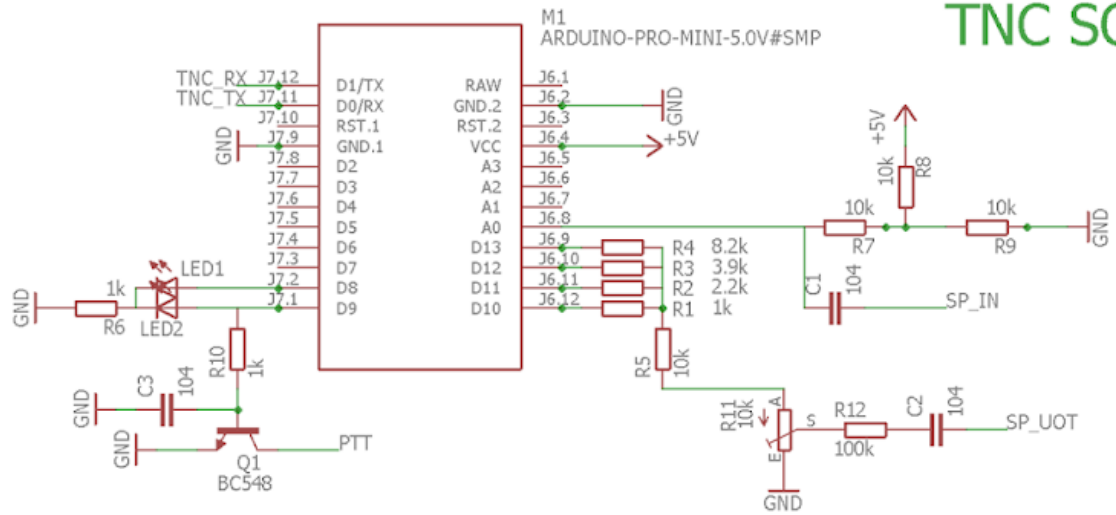




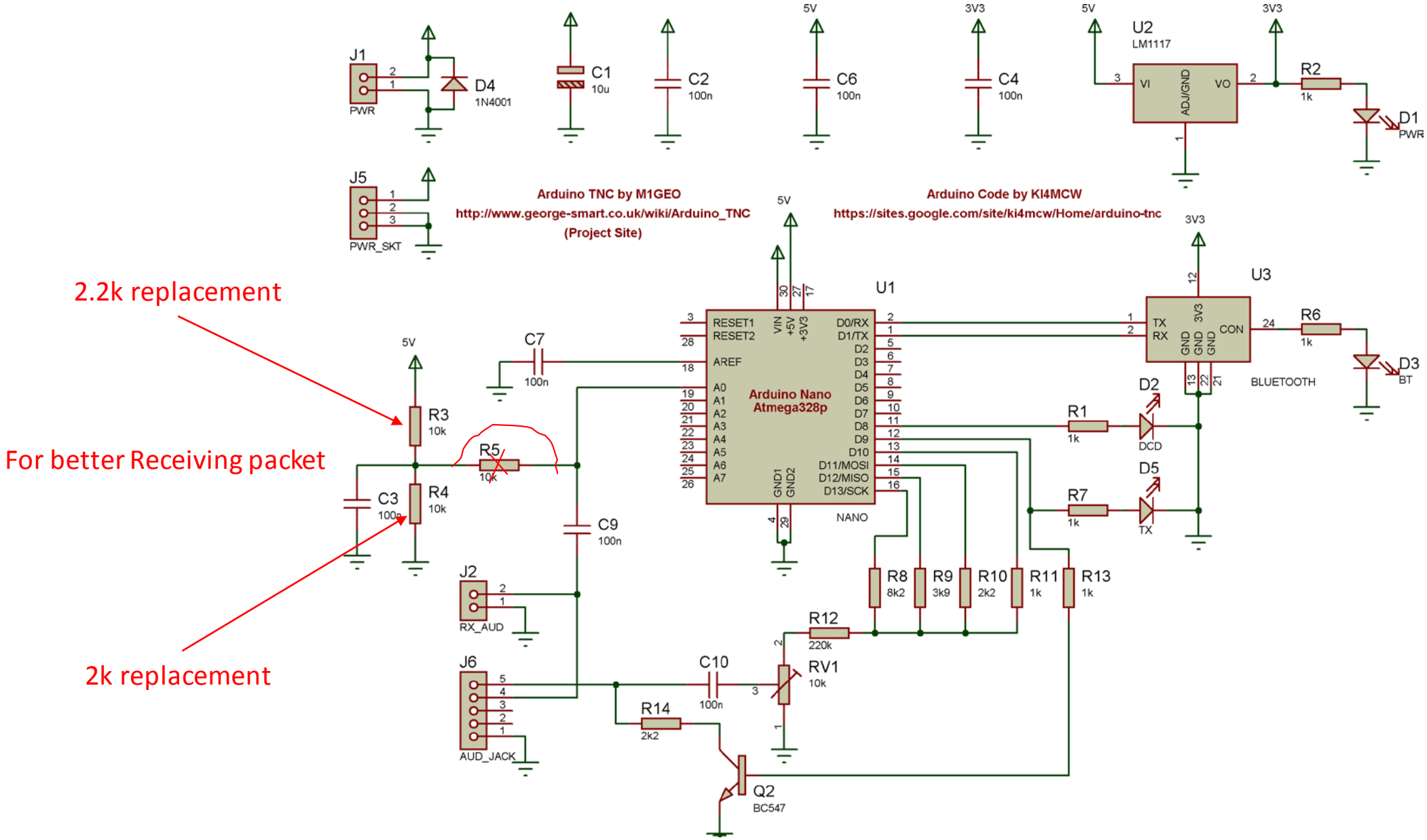
Power supply



TNC SQ9MDD

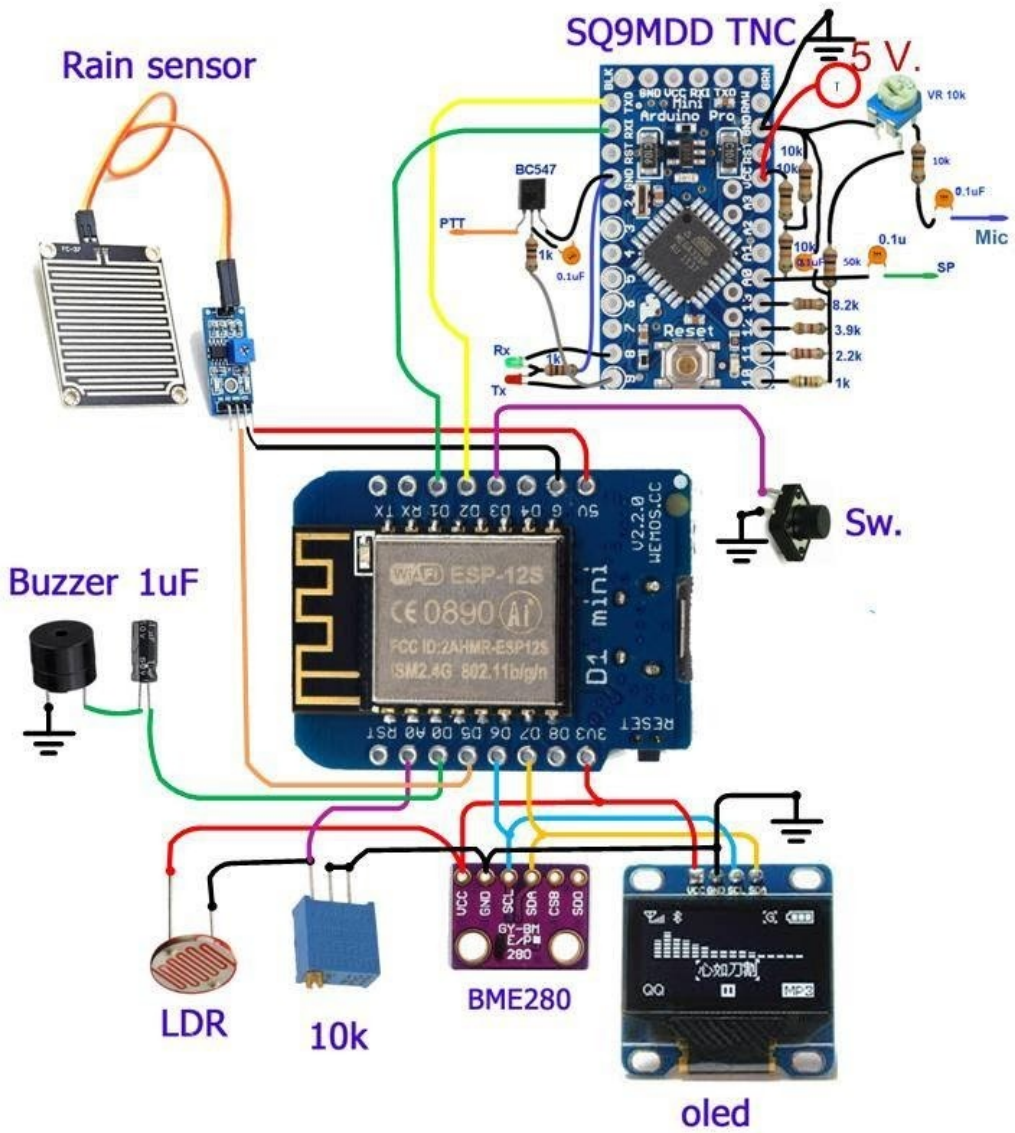


Modem on Arduino Pro mini (SQ9MDD)



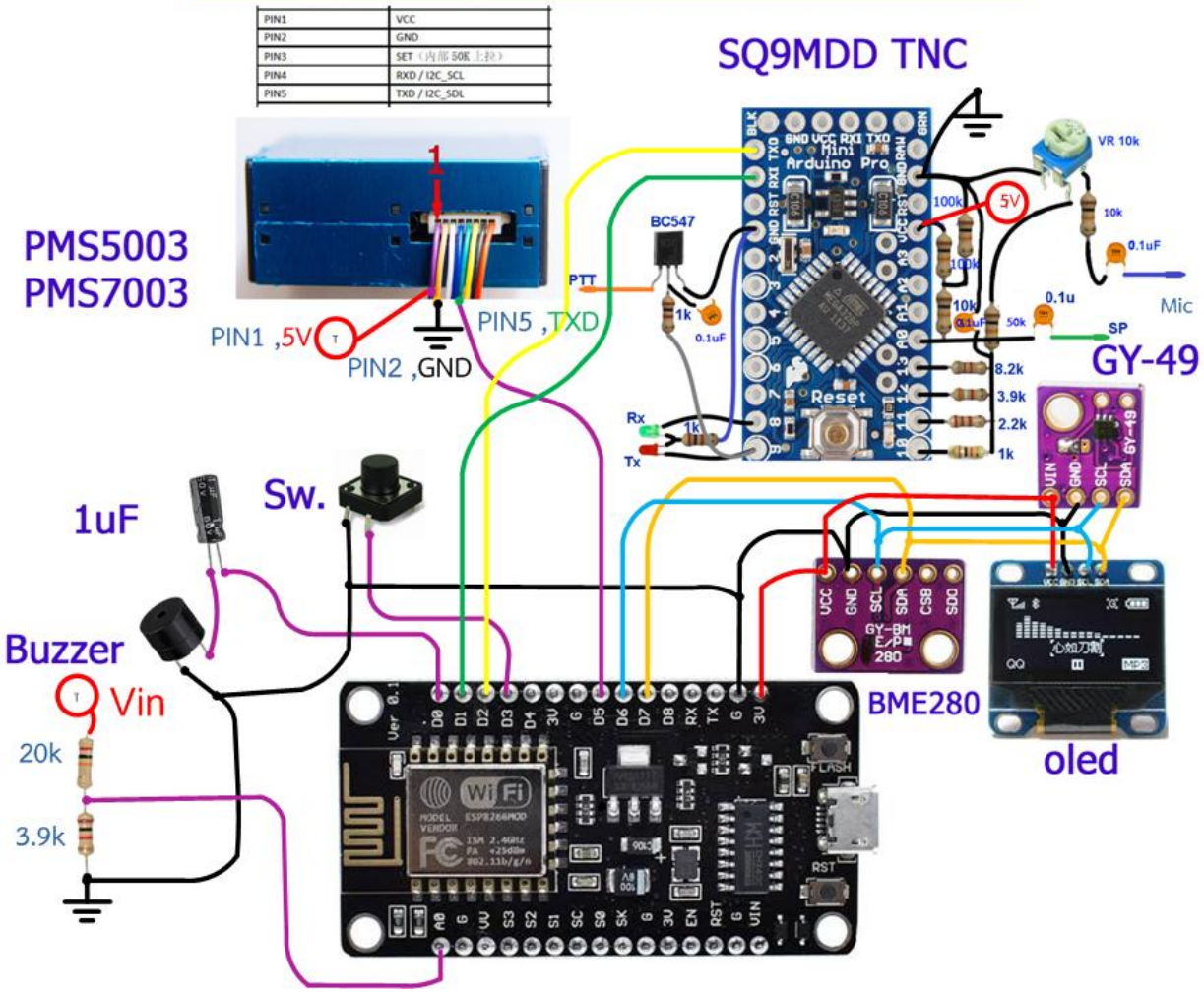
Indy Wx Igate

Wemos®



Indy Wx Igate V4.2

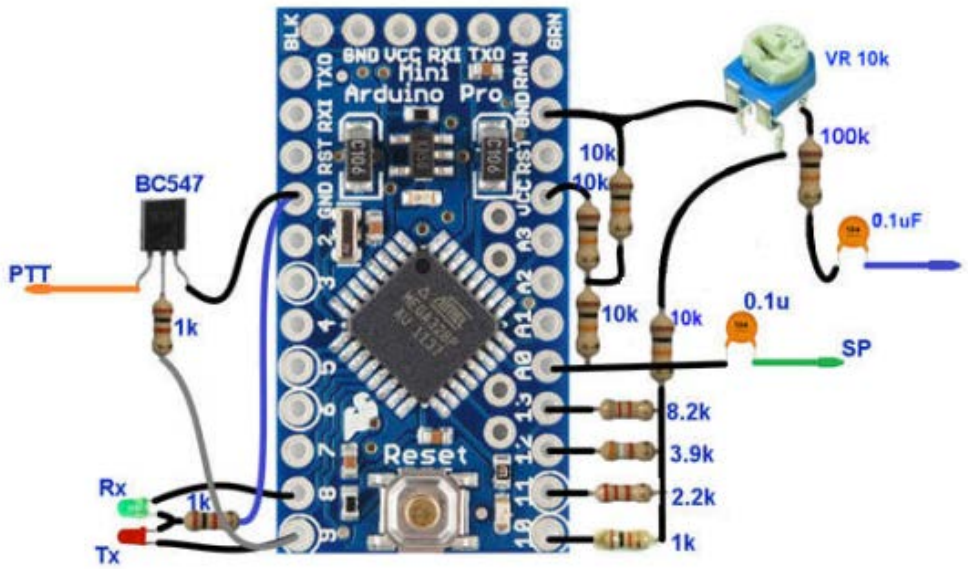
NodeMCU ,GY-49 or GY-302 ,PMS5003 or PMS7003

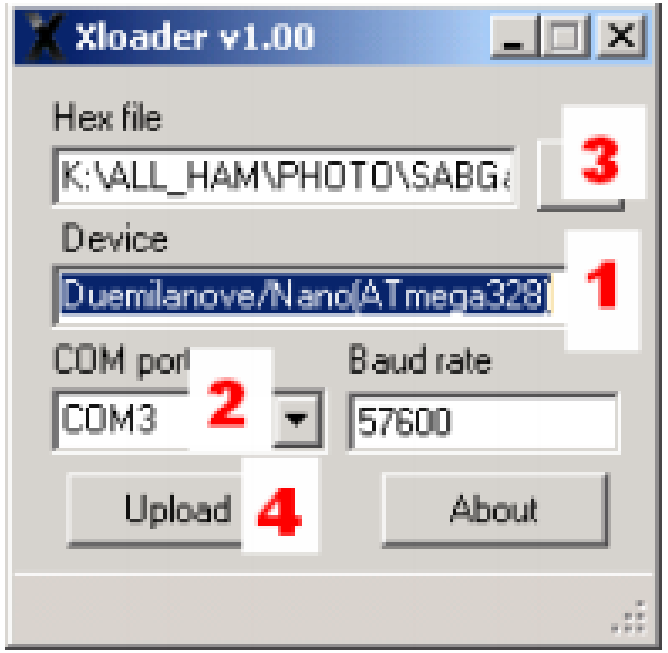


Modem (TNC)

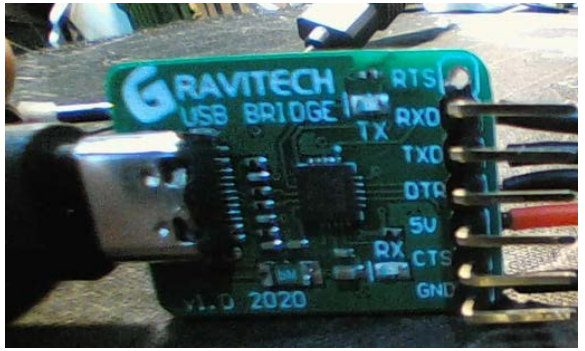
YouTube™ Video Detail https://youtu.be/dUapi9I3LP4

- Flash Arduino Pro-mini or any of Arduino 328 for Modem by using Xloader software





USB to TTL		Arduino TNC
VCC	< ---------->	VCC
GND	< ---------->	GND
Tx	< ---------->	Rx
Rx	< ---------->	Tx
DTR	————	DTR



Xloader Download

https://drive.google.com/file/d/0B1XXGsB4J5lESVZWYkoxZjJ5b3M/view?usp=sharing

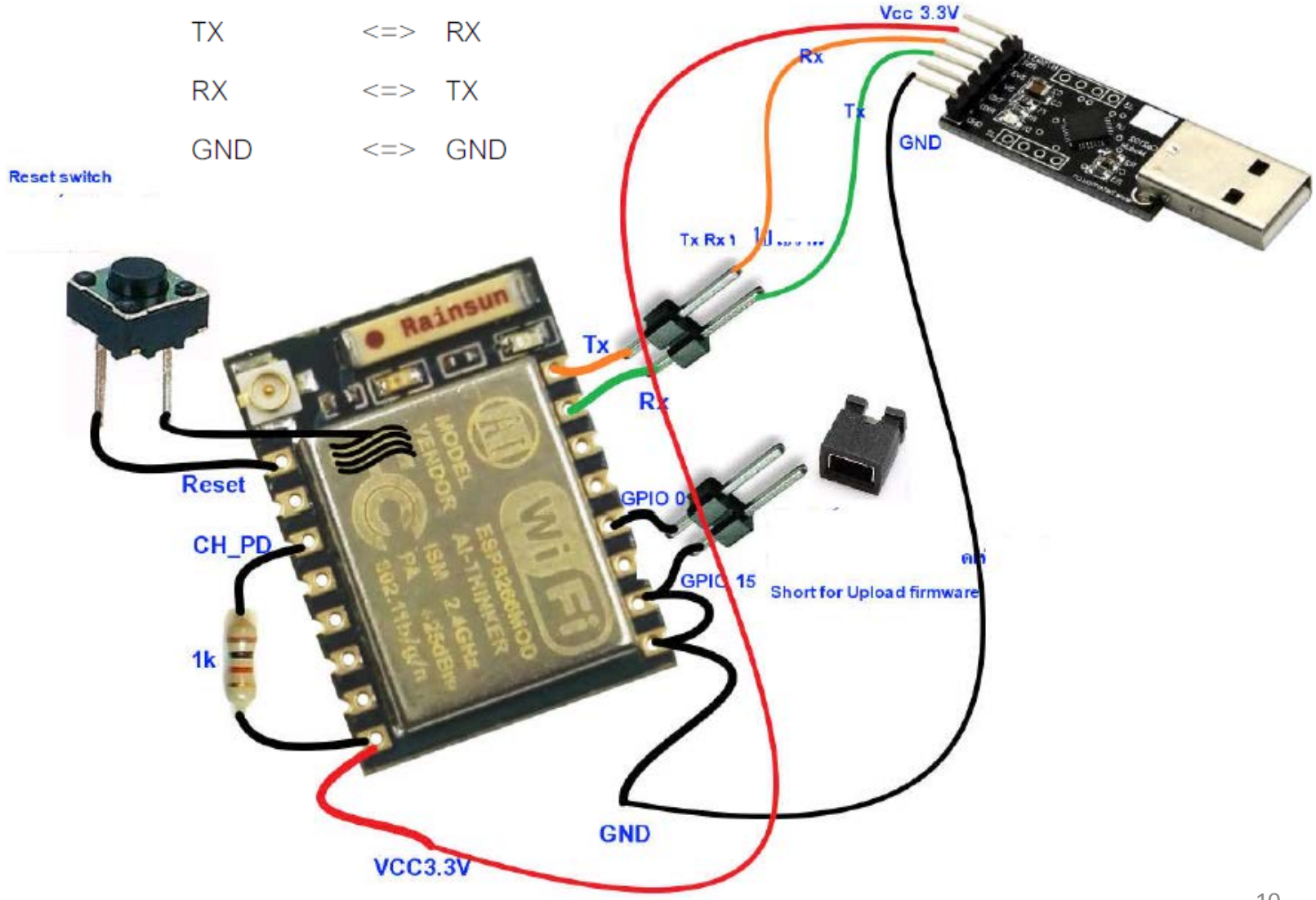
Firmware Download

https://drive.google.com/file/d/0B1XXGsB4J5lEdENyNW9IdDBfZ1U/view?usp=sharing

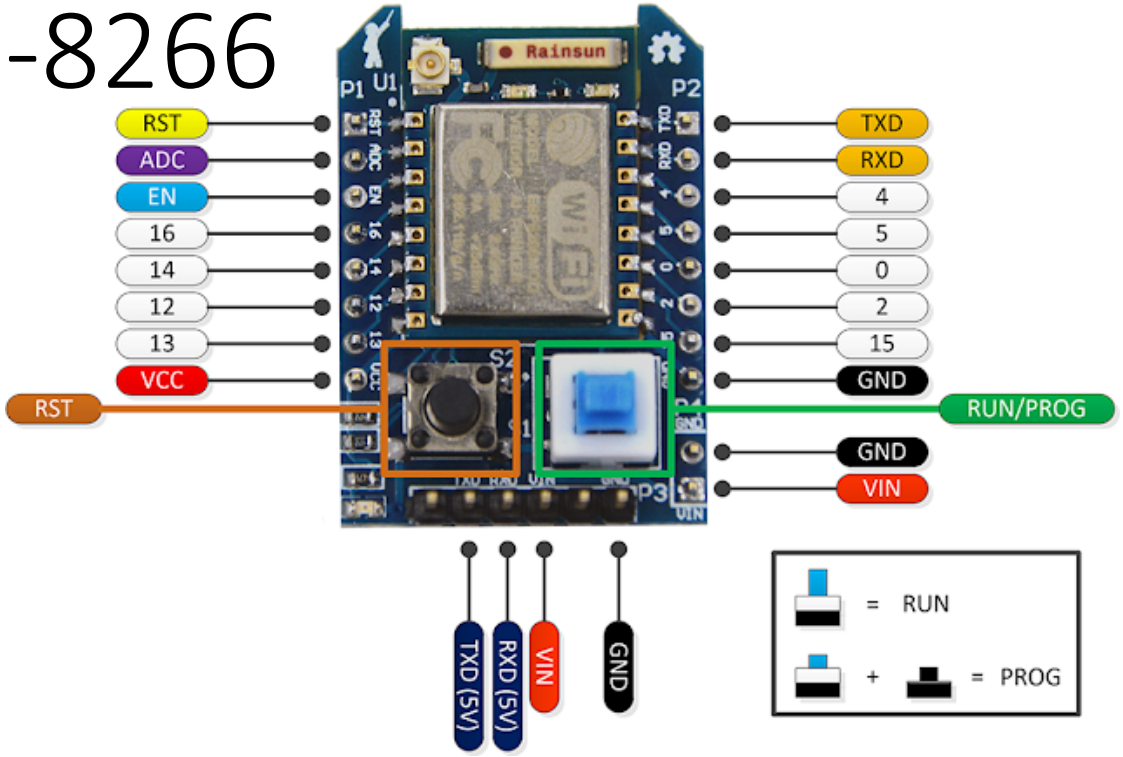
Flash ESP8266-07

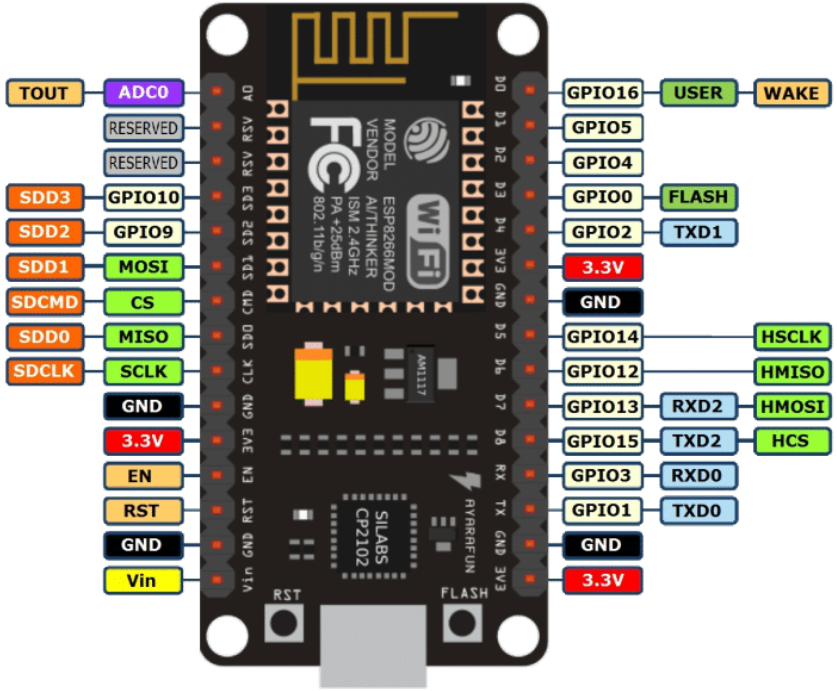
USBtoTTL		ESP8266
VCC	<=>	VCC
TX	<=>	RX
RX	<=>	TX
GND	<=>	GND

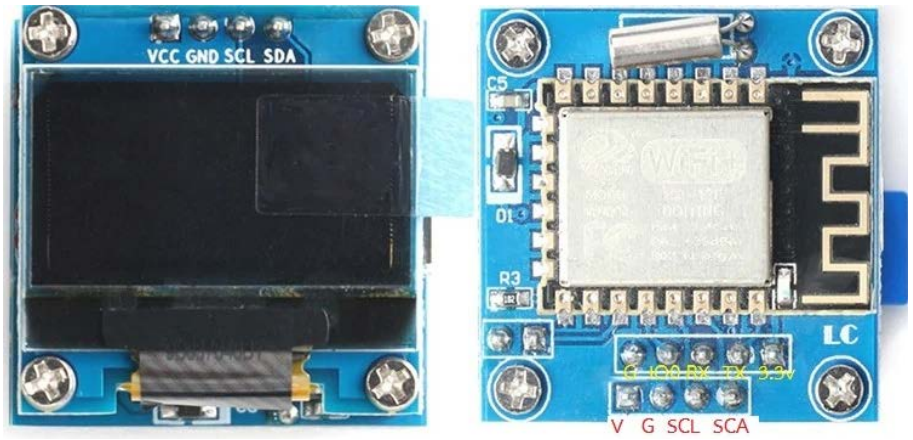
3.3V ***

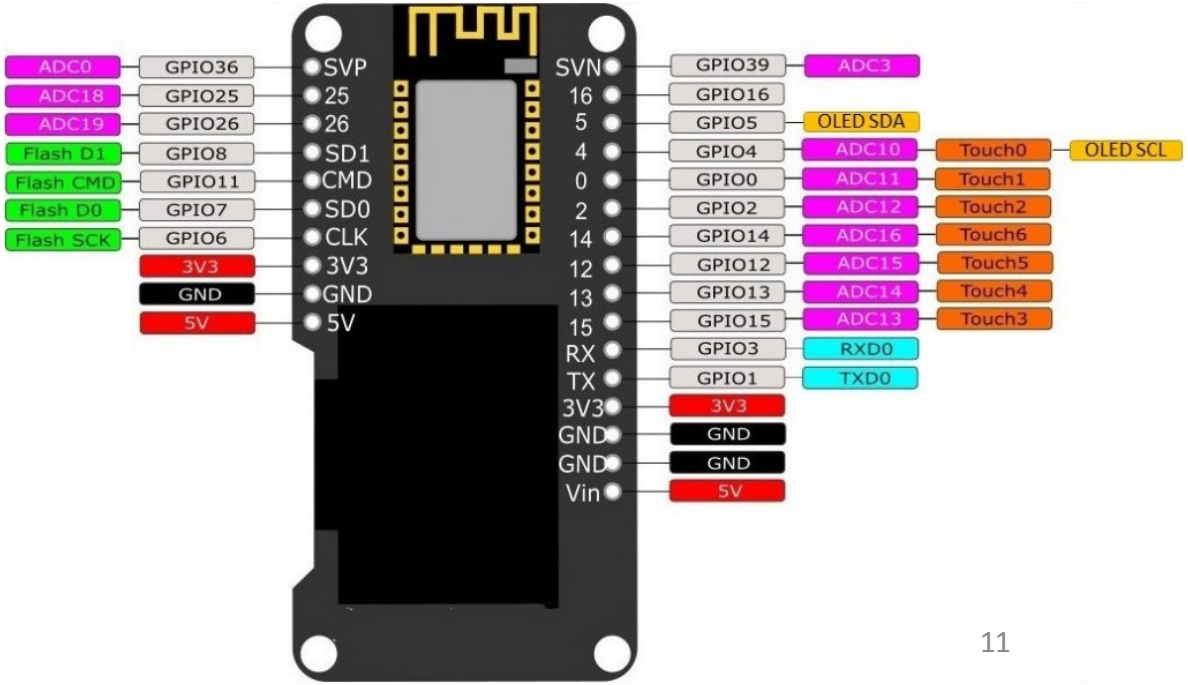


ESP-8266

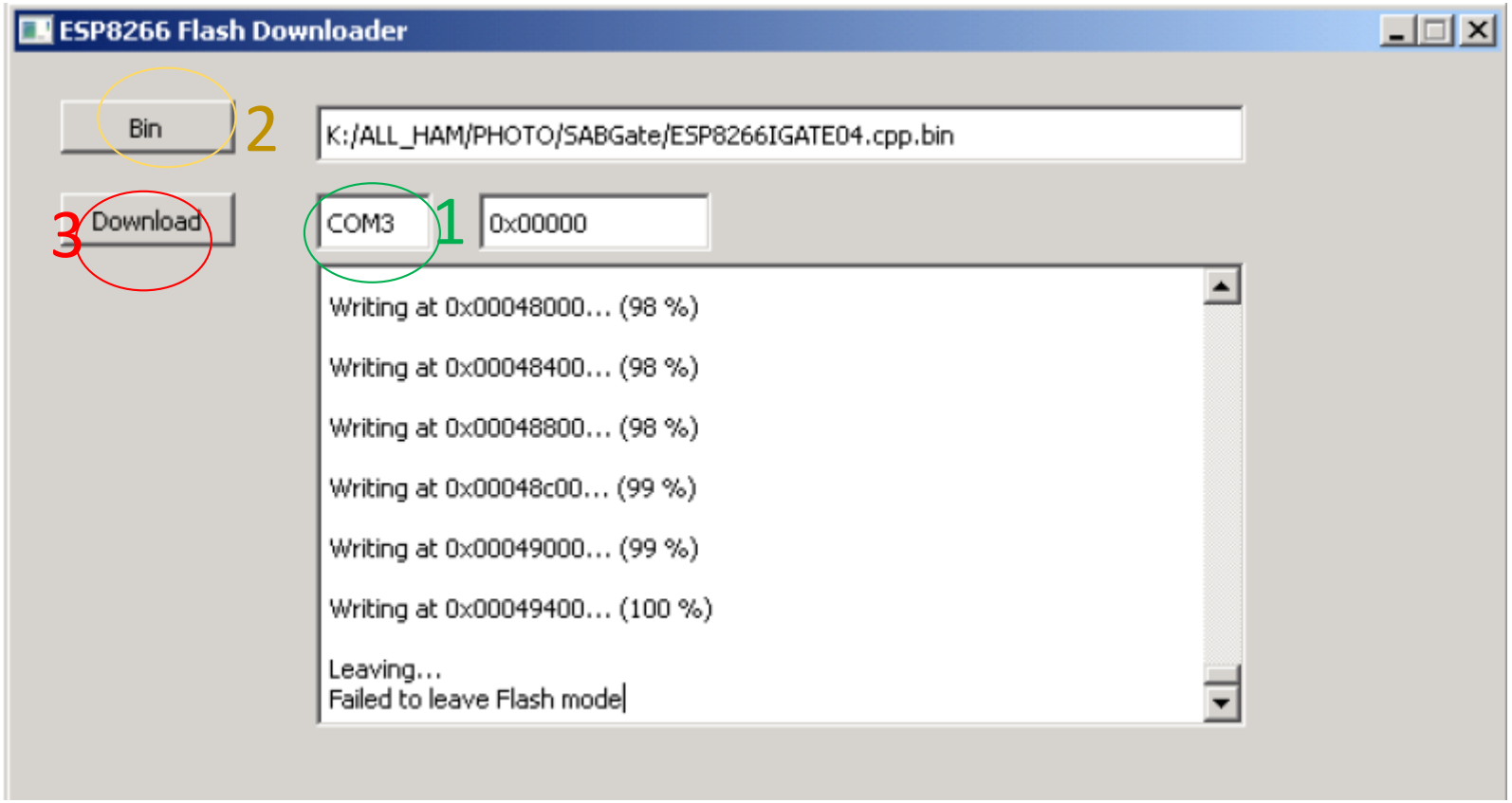

RST
ADC
EN
16
14
12
13
VCC
RST
TXD
RXD
4
5
0
2
15
GND
RUN/PROG
GND
VIN
TXD (5V)
RXD (5V)
VIN
GND
= RUN
+ = PROG


TOUT ADC0
RESERVED
RESERVED
SDD3 GPIO10
SDD2 GPIO9
SDD1 MOSI
SDCMD CS
SDD0 MISO
SDCLK SCLK
GND
3.3V
EN
RST
GND
Vin
GPIO16 USER WAKE
GPIO5
GPIO4
GPIO0 FLASH
GPIO2 TXD1
3.3V
GND
GPIO14 HSCLK
GPIO12 HMISO
GPIO13 RXD2 HMOSI
GPIO15 TXD2 HCS
GPIO3 RXD0
GPIO1 TXD0
GND
3.3V
RST
FLASH


VCC GND SCL SDA
V G SCL SCA

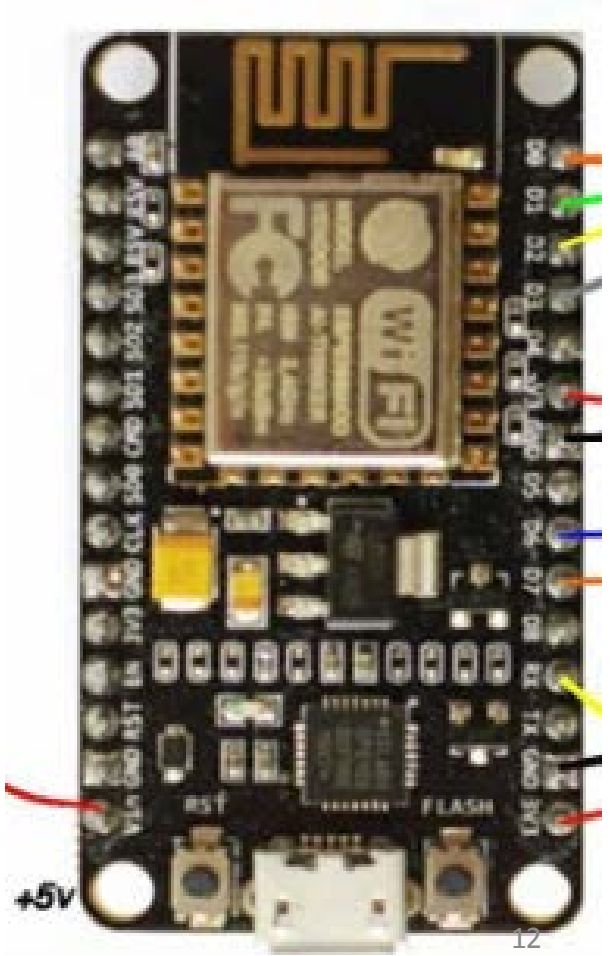

ADC0 GPIO36 SVP
ADC18 GPIO25 25
ADC19 GPIO26 26
Flash D1 GPIO8 SD1
Flash CMD GPIO11 CMD
Flash D0 GPIO7 SD0
Flash SCK GPIO6 CLK
3V3 3V3
GND GND
5V 5V
SVN GPIO39 ADC3
16 GPIO16
5 GPIO5 OLED SDA
4 GPIO4 ADC10 Touch0 OLED SCL
0 GPIO0 ADC11 Touch1
2 GPIO2 ADC12 Touch2
14 GPIO14 ADC16 Touch6
12 GPIO12 ADC15 Touch5
13 GPIO13 ADC14 Touch4
15 GPIO15 ADC13 Touch3
RX GPIO3 RXD0
TX GPIO1 TXD0
3V3 3V3
GND GND
GND GND
Vin 5V

Flashing ESP8266 with Flasher Downloader



Video YouTube TH

https://youtu.be/0JsIqY72Qos

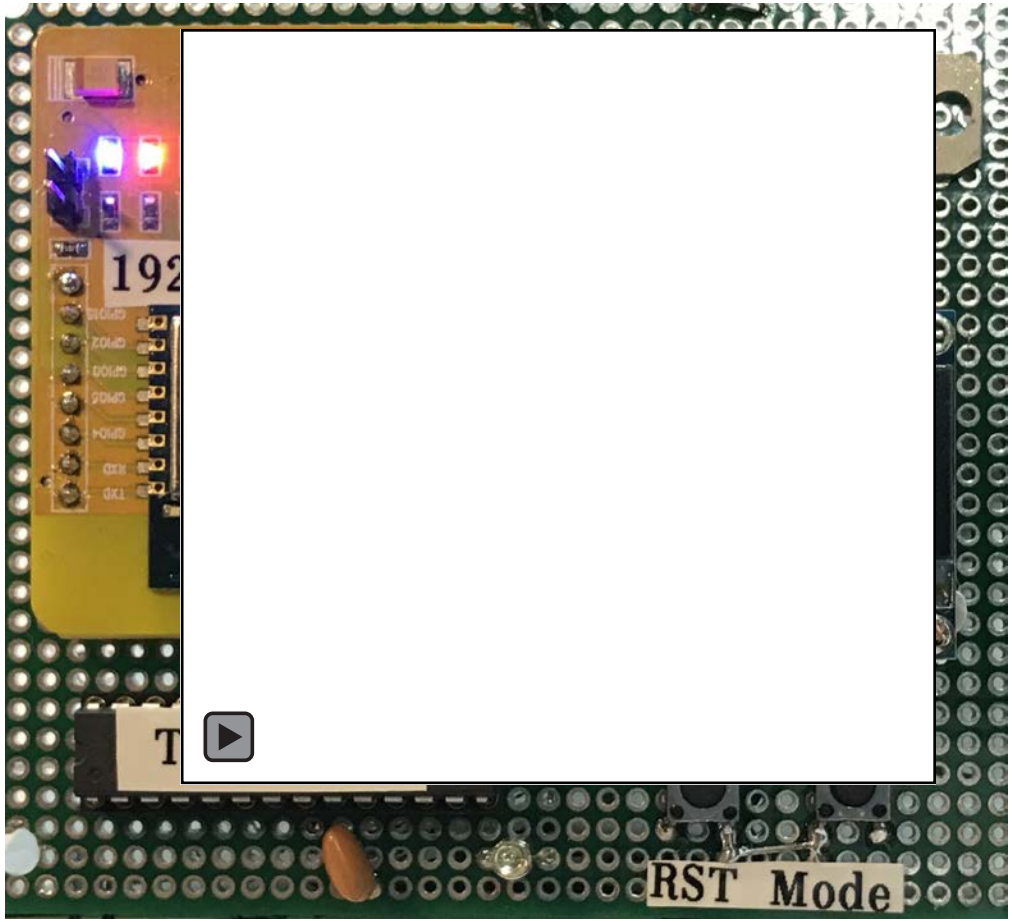


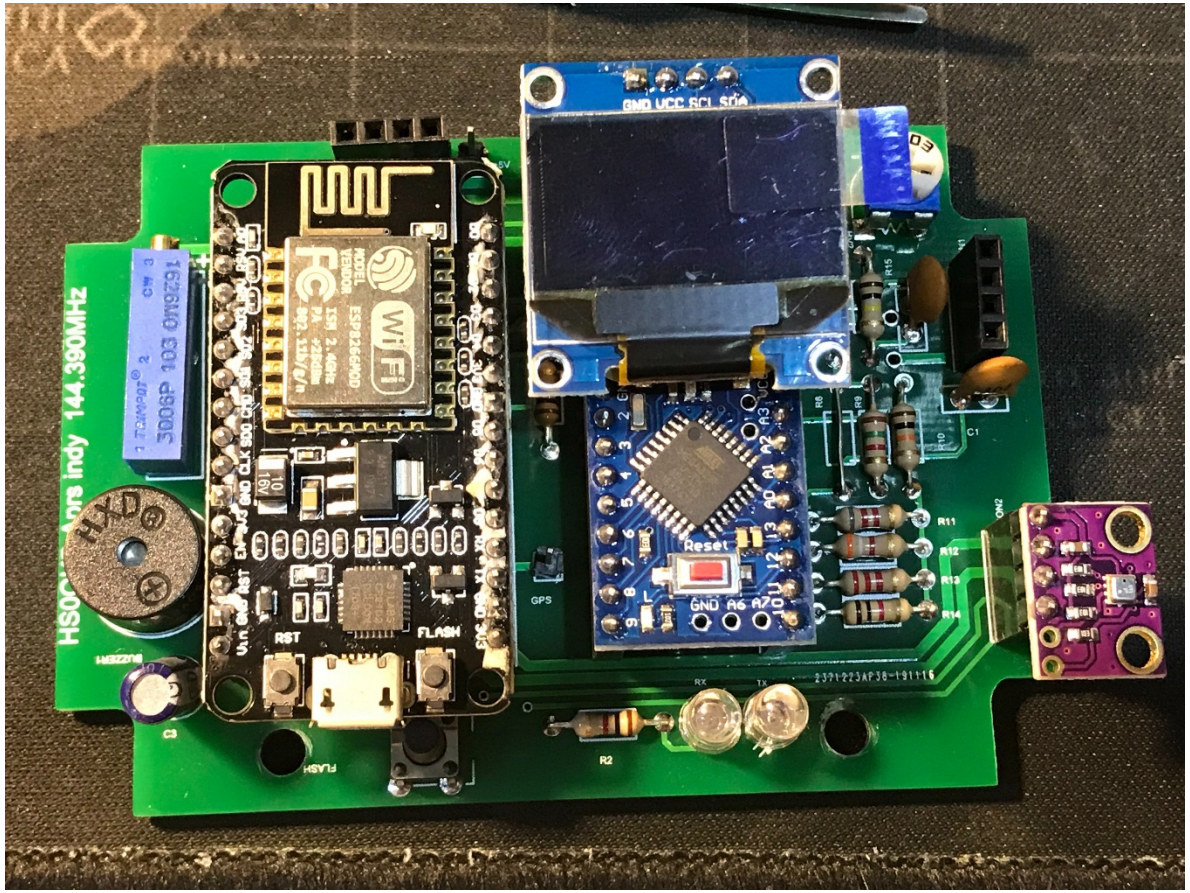
1. Select the comm port
2. Select Bin file from the location
3. Jumper on IO0 then Click Download then push reset bottom

Firmware Download:
https://drive.google.com/open?id=1WFZvcmU4q7P14DAonn0Z8WVVF2CyGYoO

Complete

YouTube TH https://youtu.be/7midwPAzNYA





Parameter Setting

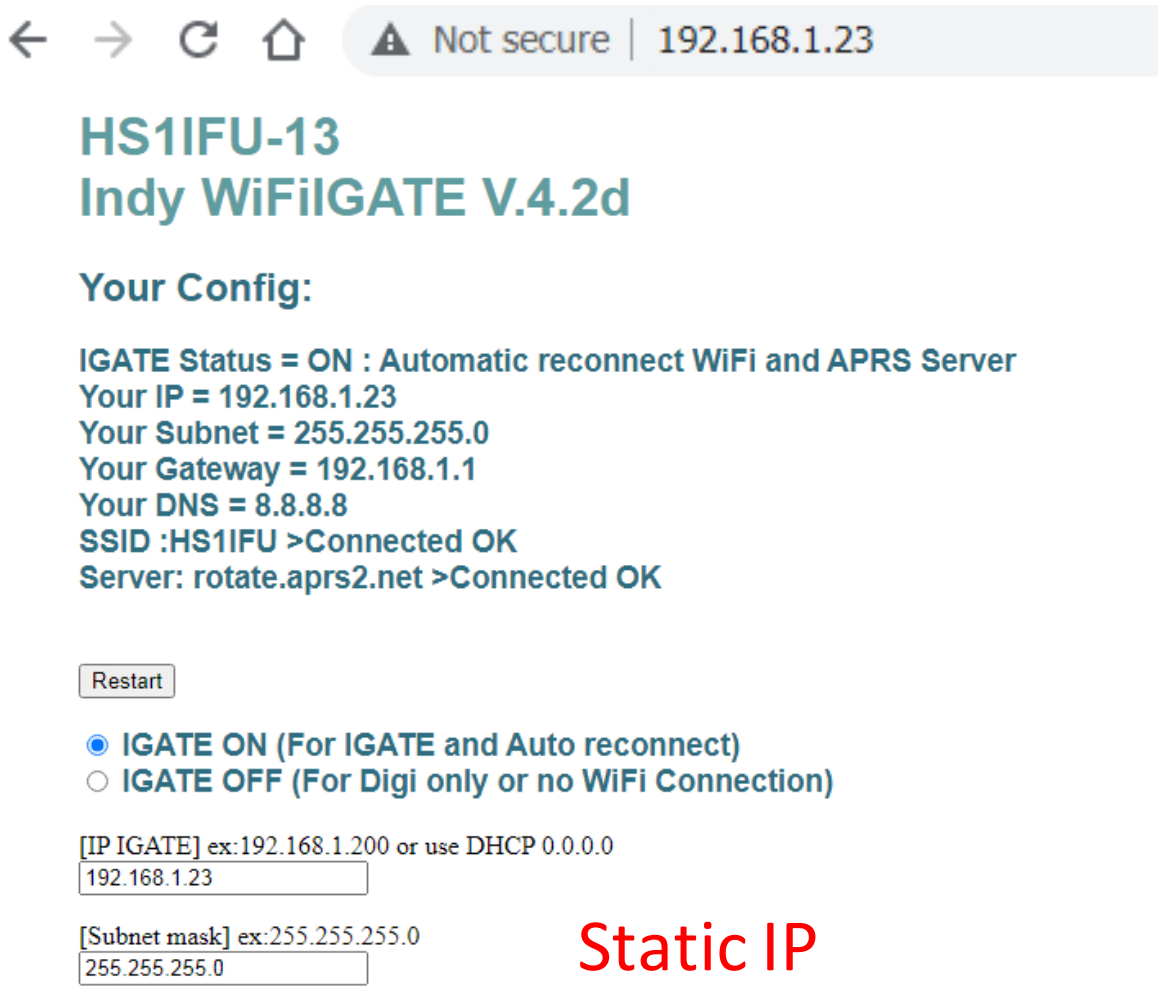
1st time after flashed Firmware to ESP8266 connect USB-TTL then power on then enter '?' to enter the **Config or # Debug**

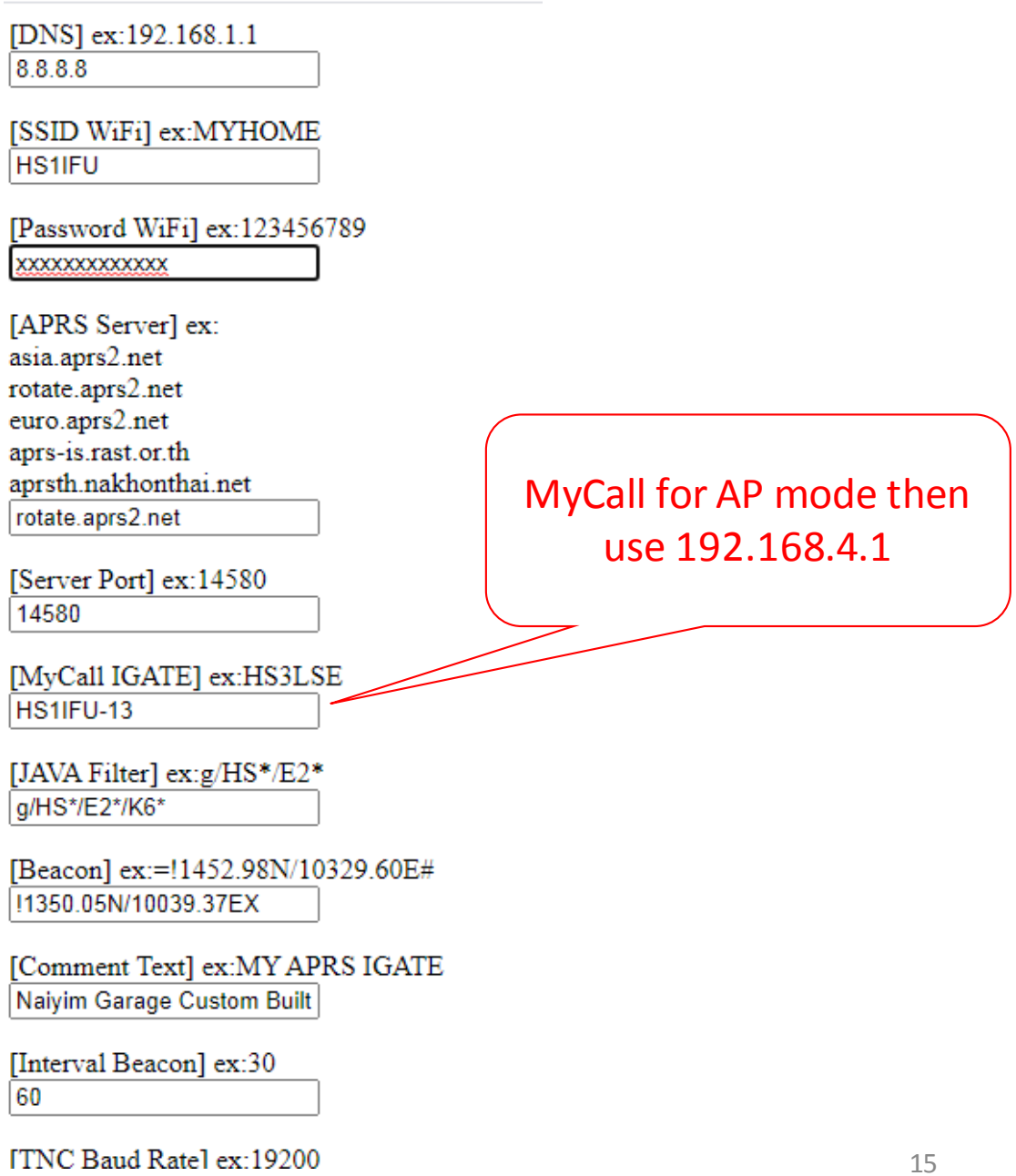
You will need this board to connect to your network then you can use Web Browser on 192.168.1.22 to config. the rest of parameter

Example command type ?wa?192.168.1.22 and enter

- ?wa?192.168.1.22 [Static IP Igate]
- ?wb?255.255.255.0 [Subnet]
- ?wc?192.168.1.1 [Gateway]
- ?wd?8.8.8.8 [DNS]
- ?we?MyhomeWIFI [SSID WIFI] *<<<< enter your own hotspot WiFi SSID*
- ?wf?123456 [Password WIFI] *<<<< enter your own PWD WiFi*

Web Config.

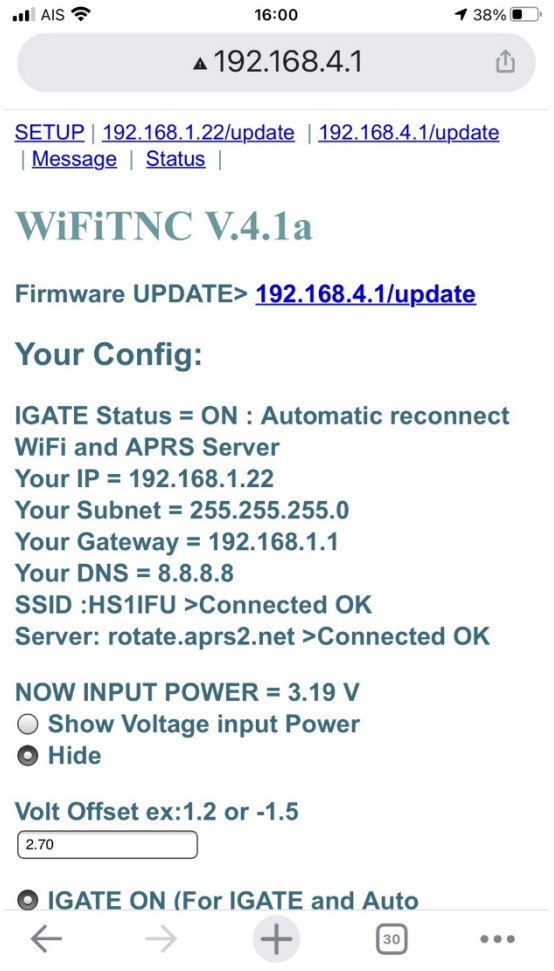

Not secure | 192.168.1.23
HS1IFU-13
Indy WiFiIGATE V.4.2d
Your Config:
IGATE Status = ON : Automatic reconnect WiFi and APRS Server
Your IP = 192.168.1.23
Your Subnet = 255.255.255.0
Your Gateway = 192.168.1.1
Your DNS = 8.8.8.8
SSID :HS1IFU >Connected OK
Server: rotate.aprs2.net >Connected OK
Restart
IGATE ON (For IGATE and Auto reconnect)
IGATE OFF (For Digi only or no WiFi Connection)
[IP IGATE] ex:192.168.1.200 or use DHCP 0.0.0.0
192.168.1.23
[Subnet mask] ex:255.255.255.0
255.255.255.0
Static IP

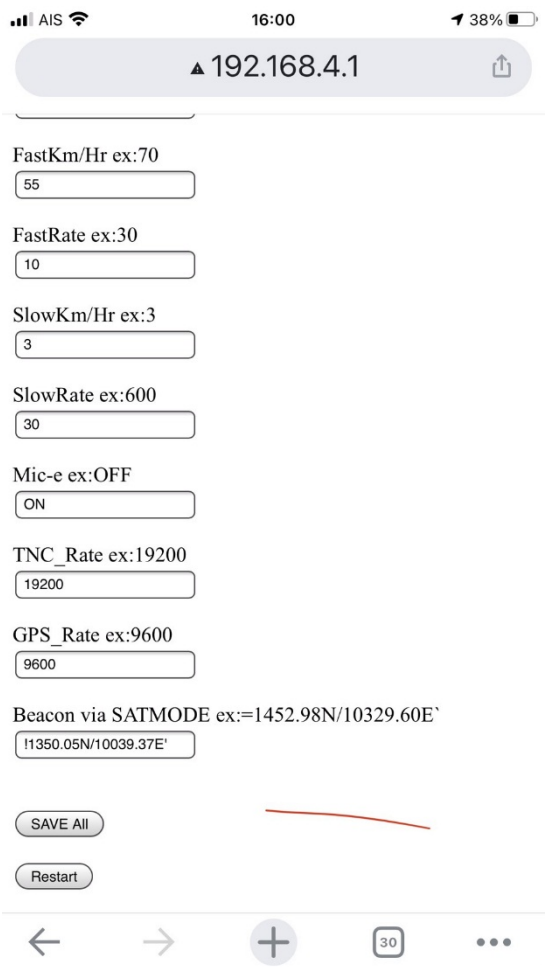

[DNS] ex:192.168.1.1
8.8.8.8
[SSID WiFi] ex:MYHOME
HS1IFU
[Password WiFi] ex:123456789
xxxxxxxxxxxx
[APRS Server] ex:
asia.aprs2.net
rotate.aprs2.net
euro.aprs2.net
aprs-is.rast.or.th
aprsth.nakhonthai.net
rotate.aprs2.net
[Server Port] ex:14580
14580
[MyCall IGATE] ex:HS3LSE
HS1IFU-13
[JAVA Filter] ex:g/HS*/E2*
g/HS*/E2*/K6*
[Beacon] ex:=!1452.98N/10329.60E#
!1350.05N/10039.37EX
[Comment Text] ex:MY APRS IGATE
Naiyim Garage Custom Built
[Interval Beacon] ex:30
60
[TNC Baud Rate] ex:19200
MyCall for AP mode then use 192.168.4.1

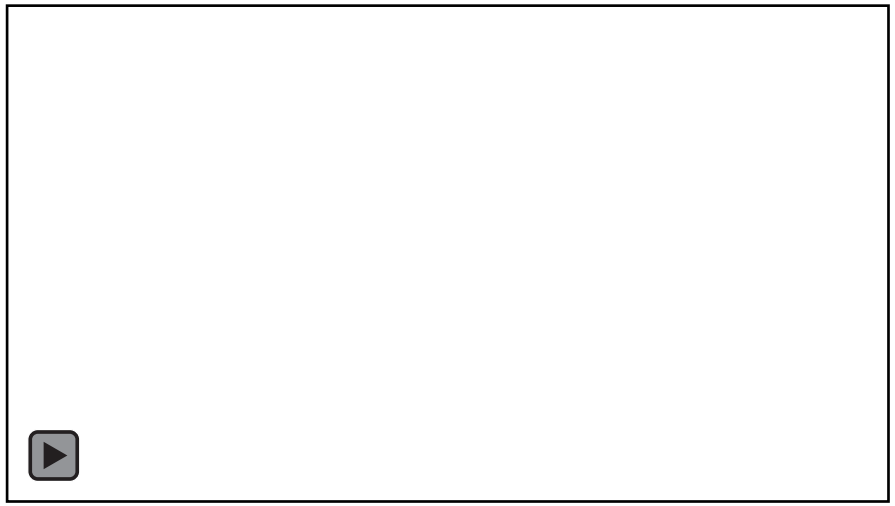
Firmware update

Firmware location :
https://drive.google.com/drive/folders/0B1XXGsB4J5lEZWUwWUxWWlJla00

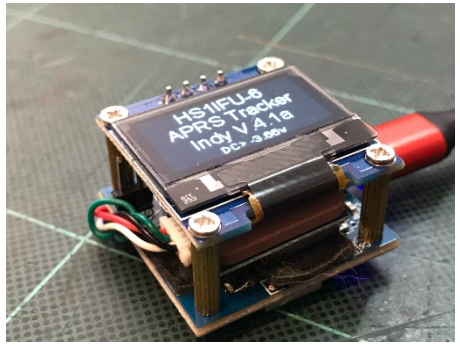
You can used AP mode by connect to ESP 8266 SSID : callsign with PWD: 123456789
As below shown that you can use IP address 192.168.4.1 on web browser

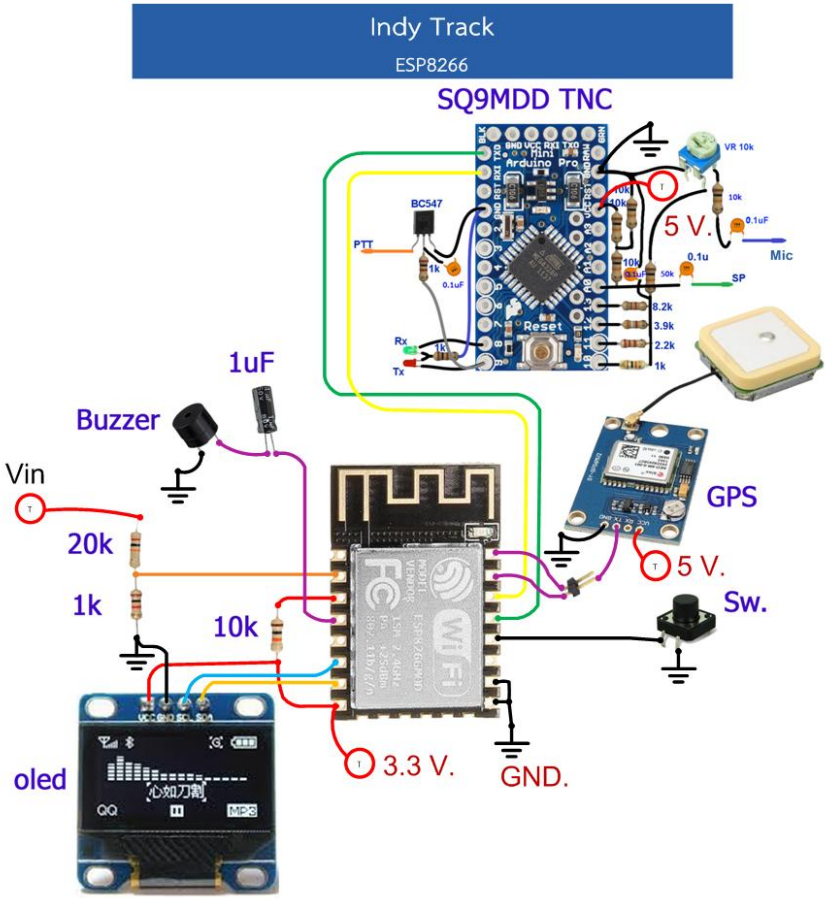


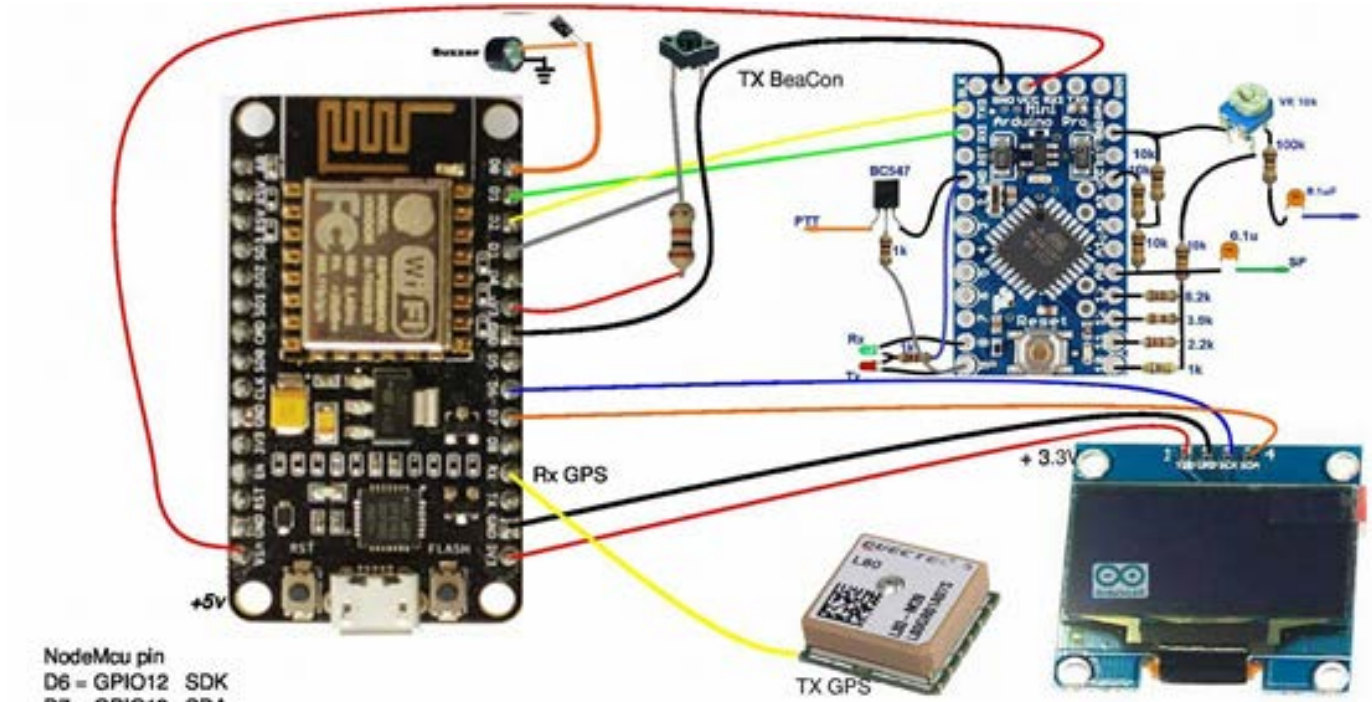




APRS WiFi Tracker







NodeMcu pin
D6 = GPIO12 SDK
D7 = GPIO13 SDA
D5 = GPIO14 สายฝน
A0 = ADC LDR
D0 = GPIO16 Buzzer
D1 = GPIO5 Tx Node to Rx TNC
D2 = GPIO4 Rx Node to Tx TNC
D3 = GPIO0 Tx Send Beacon
D8 = GPIO15 LED IGATE online / GPS Status
Rx = GPIO3 to Tx GPS
Tx = GPIO1

Credit of Firmware and Schematic

Thank you team : HS3LSE , E27ASY for distributed the information ,Firmware on how to DIY iGate , Tracker , WX

Download link for the information :
https://sites.google.com/view/aprs-indy/circuitfirmware?authuser=0

Download link for the Firmware and software for flashing ESP :
https://drive.google.com/drive/folders/0B1XXGsB4J5lENTBCTFVJYy04RGs

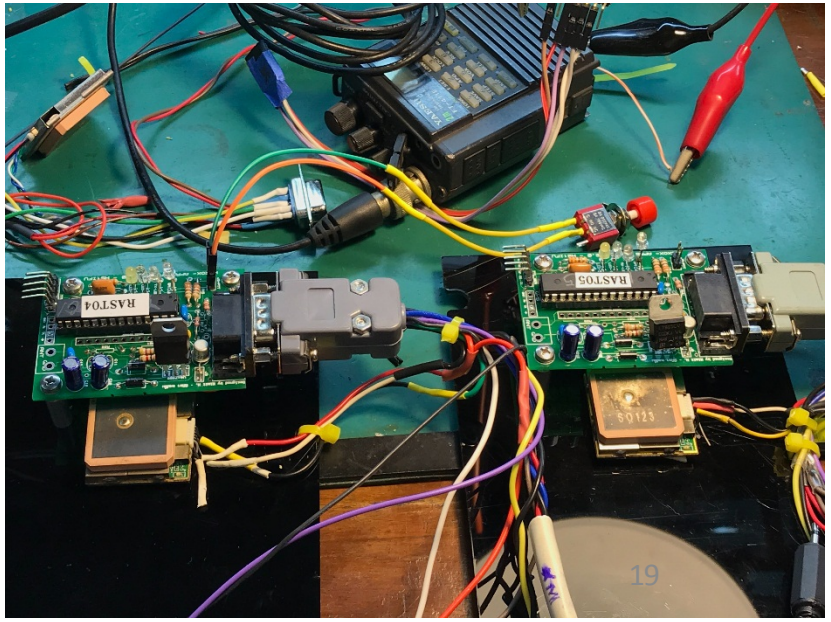
My Youtube Video explain more detail for this project in 3 parts:
Part 1: How to Flash ESP8266 https://youtu.be/0JsIqY72Qos
Part 2: How to Flash TNC-Arduino https://youtu.be/dUapi9I3LP4
Part 3: Conclusion https://youtu.be/7midwPAzNYA

PWS (Portable Weather Station)

กทปส.จัดสรรเงิน
กองทุน2,600ล.ลุยต้นแบบสถานี
ตรวจอากาศอัตโนมัติ

เผยแพร่: 6 พ.ย. 2563 13:27 โดย: ผู้จัดการออนไลน์

Press conference for funding



Engineering Research Publication

- *"Building Automatic Packet Report System to report position and radiation data for autonomous robot in the disaster area."* Control, Automation and Systems (ICCAS), 2015 15th International Conference on. IEEE, 2015. Soul, Korea
- *"Building Automatic Antenna Tracking system for Low Earth Orbit (LEO) satellite communications."* 2015 International Computer Science and Engineering Conference (ICSEC). IEEE, 2015.
- *"USING RFID I²C NODE TO STORE SENSORS DATA FOR SMART FARMING PURPOSES"* International Journal of Soft Computing and Artificial Intelligence, ISSN: 2321-404X, Volume-3, Issue-2, Nov-2015
- *"The Grow Rate tracking System of the tree for Forest Industry"* The International Conference on Intelligent Systems and Image Processing 2016 (ICISIP 2016) Osaka, Japan
- *"Designing and Implementation Exploration Vehicle Remote Controller Using APRS Protocol"* 2017 International Computer Science and Engineering Conference (ICSEC). IEEE, 2017.
- *"Microcontroller Based for Smart Mushroom Cropping"* ECTI-CARD 2016, Hua Hin, Thailand, 27-29 July **2016** *(*Best Paper Award)*
- "*การออกแบบระบบควบคุมและการบันทึกข้อมูลระยะไกลเพื่อโรงเรือนสำหรับการเกษตรอัจฉริยะโดยใช้ APRS โปรโตคอล*", วารสารวิศวกรรมศาสตร์ มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา, ปี 3, ฉบับที่ 1, น. 19-29, ม.ค. 2018.
- "*Designing and Implementation Wildlife Tracking System Using APRS Protocol*". In *2019* 5th International Conference on Engineering, Applied Sciences and Technology (ICEAST) (pp. 1-4). IEEE.
- *"A Design and Implementation of an Emergency Message Beacon System Using APRS Protocol"*. In 2020 17th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-CON) (pp. 21-24). IEEE.

Publications #1

Building Automatic Packet Report System to report position and radiation data for autonomous robot in the disaster area

2015 15th International Conference on Control, Automation and Systems (ICCAS 2015)
Oct. 13-16, 2015 in BEXCO, Busan, Korea

Building Automatic Packet Report System to report position and radiation data for autonomous robot in the disaster area.

Sawatsakorn Chaiyasoonthorn[1*] ,Nimit Hongyim[2], and Somsak Mitatha[2]

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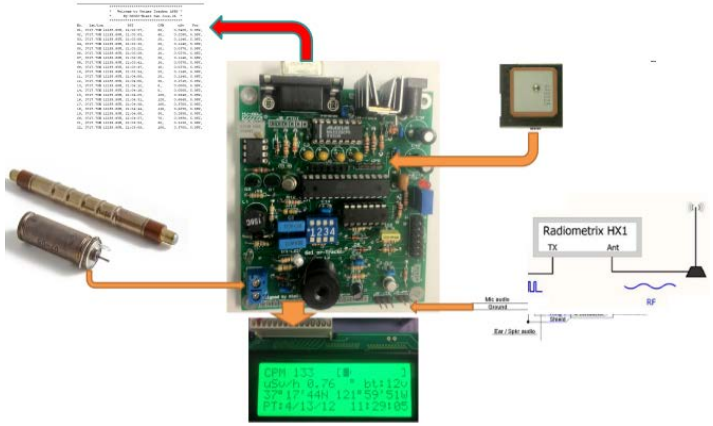
Abstract:
This paper purposed to implement long range data communication by using APRS protocol to send location with Radiation measuring of Geiger Counter system, conceptual that automatically collects data and send the entries packet to the internet stream and be able to pinpoint the location of the Autonomous Robot (while deploy around the radiation disaster area) via Online Maps, the main goal, expected to able to establish long distance data communication network between APRS Robot and Internet Gateway(I-Gate) approx radius of 10 Kilometers.

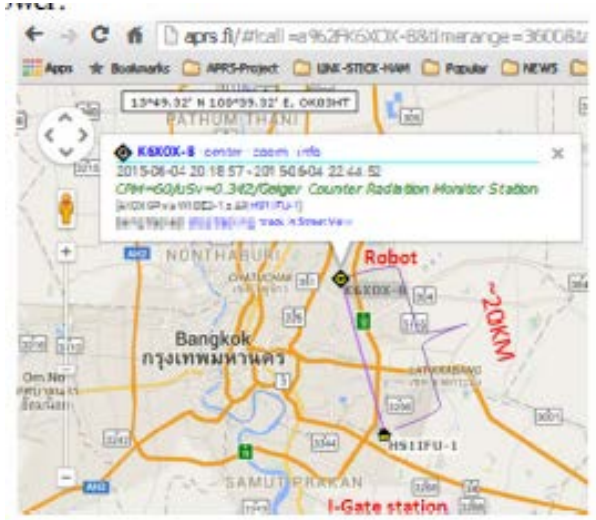
Keywords: Robotic Application, Geiger Counters system, APRS, Radiation, Service and Field Robots

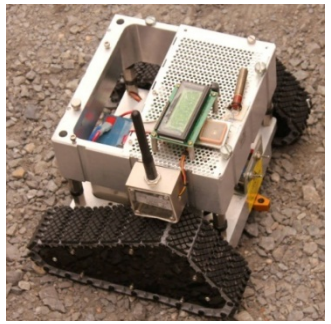
area, APRS operates entirely in an unconnected broadcast fashion, using unnumbered AX.25 frames[3].

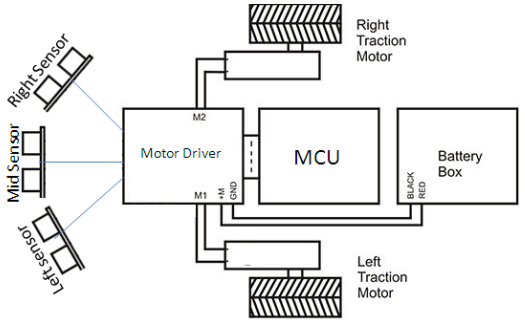
The main idea of this design intent to focus on the long range communication install on vehicle or Robots just to tracking the position or called "vehicle locating system" and will be able to inspect or appear via online Maps system such as Google maps, by using this APRS data format which used and experimented by Amateur Radio around the world. This data is sent/received via VHF radio signal and aggregated into APRS internet. The concept of the APRS system is to provide the option that normally used for identify only for GPS information. This paper mainly to improve and apply to the feature of the extend packet format with add on other information.

This research paper focus on the design of beacon









Publications #2

USING RFID I2C NODE TO STORE SENSORS DATA FOR SMART FARMING PURPOSES

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USING RFID I2C NODE TO STORE SENSORS DATA FOR SMART FARMING PURPOSES

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Abstract- The purpose of this paper is the implement of UHF RFID memory via I²C interface with Micro Controller Unit to read Temperature, Humidity and other meteorology data then store the update data to RFID memory. With the new Generation RFID can be accessed to read data in RFID memory via RF reader and interface with MCU which will send data to output device such as WIFI or Radio Modem in this case using APRS (Automatic Packet Report System) for the long distance Communication Network.

Index Terms- UHF I²C RFID, IOT, APRS, SMART FARM

I. INTRODUCTION

The RFID (Radio Frequency Identification)Tag is widely use with many applications as the smart label which basic of RFID perform data exchange via RF only but in this paper, Selected new generation of I²C RFID chip which I²C [1] can be performed as data storage for MCU and can be able to perform data exchange to outside world even without power supply to MCU but via tradition UHF RFID reader and provided the concept for Smart Farming application which in need of reading many kind of sensor with positioning. In this case we used Temperature, Humidity sensor and GPS as the example. While normal operation the MCU will perform the polling data reading or measure from sensor and store to RFID memory which called "EPC (Electronic Product Code) memory" and in the same time sending out the data to VHF RF signal by using APRS (Automatic Packet Report system) [2].

II. DESIGN CONCEPT

and in order to extend the wide area network for the RFID that can be access by RFID reader via Fly by Drone or Drive by Vehicle reader

A. RFID Module

There are couple of the RFID product which found very popular in RFID product which has I2C interface feature that Impinj Monza-X[3] and NXP UCODE by using *NXP UHF I²C RFID chip LXMS2HACNF-165[4]* with I²C interface as well as various RF features. I²C[5] interface will connect to MCU by using SCL, SDA and Ground pin in order to perform data exchange as FIG. 2 which appeared that RFID can be communicated in 2 difference ways.

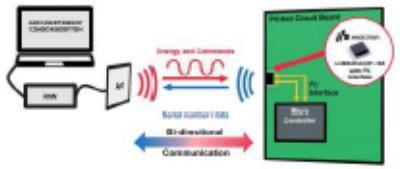
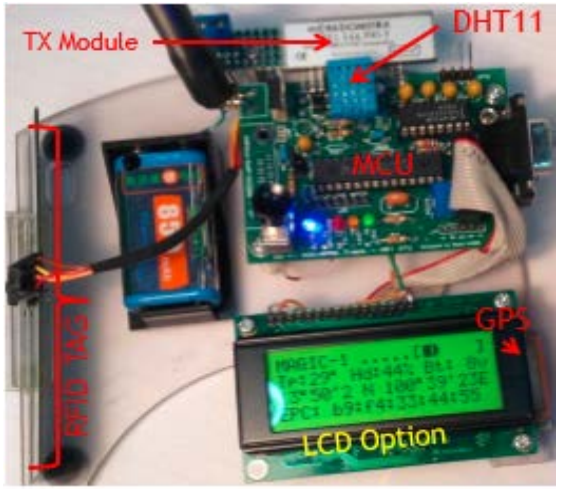
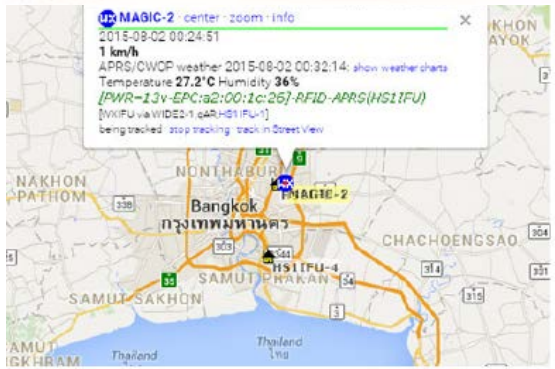
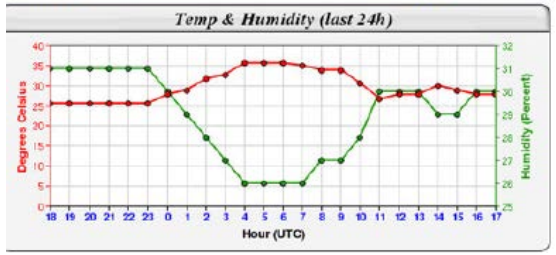


Fig. 2: The 2 methods of I²C RFID Communication [6]







Publications #3

Microcontroller Based for Smart Mushroom Cropping

บทความวิจัย

การประชุมวิชาการ งานวิจัยและพัฒนาเชิงประยุกต์ ครั้งที่ 8

8th ECTI-CARD 2016, Hua Hin, Thailand

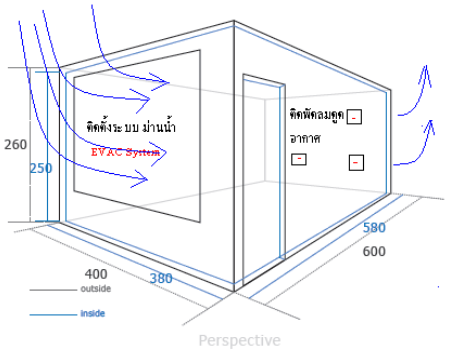
การใช้ไมโครคอนโทรลเลอร์เพื่อการปลูกเห็ดระบบอัจฉริยะ

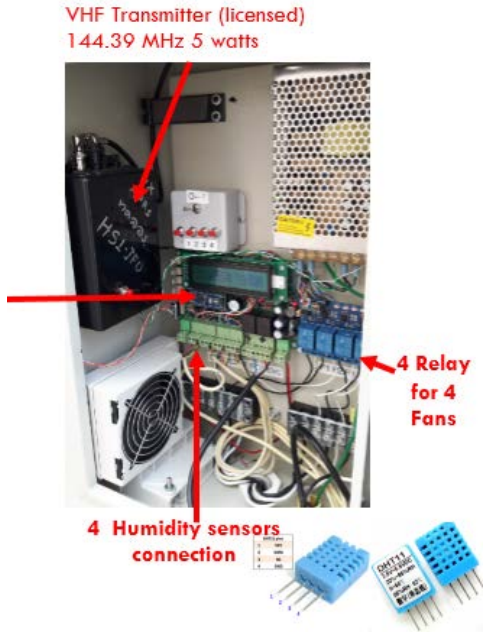
Microcontroller Based for Smart Mushroom Cropping

นิมิตร หงษ์ยิ้ม[1] สมศักดิ์ มิตะจา[1] และ ศวัสกร ไชยสุนทร[2]

[1]สาขาวิชาวิศวกรรมคอมพิวเตอร์ คณะวิศวกรรมศาสตร์ สถาบันเทคโนโลยีพระจอมเกล้าเจ้าคุณทหารลาดกระบัง
เลขที่ 1 ถนนฉลองกรุง เขตลาดกระบัง กรุงเทพฯ 10520, E-mail: nimith@ciamsq.net

[2]สาขาวิชาเทคโนโลยีอิเล็กทรอนิกส์ คณะวิทยาศาสตร์ มหาวิทยาลัยรามคำแหง
แขวงหัวหมาก เขตบางกะปิ กรุงเทพมหานคร 10240, E-mail: sawatsakorn_c@hotmail.com





บทคัดย่อ

ระบบไมโครคอนโทรลเลอร์ได้ถูกนำมาใช้ในการควบคุมสภาพแวดล้อมภายในโรงปลูกเห็ดอาศัยความสัมพันธ์ของอุณหภูมิต่อความชื้นที่มีความละเอียดถึง +/-5 % โดยการคำนวณมาจากค่าเฉลี่ยของเซ็นเซอร์จำนวน 4 ตัว ที่ติดตั้งไว้ภายในโรงปลูกเห็ดรวมไปถึงการบันทึกข้อมูลในฐานข้อมูลเพื่อการวิเคราะห์และควบคุมการเพิ่มผลผลิตของการปลูกเห็ดให้แน่นอนอย่างเป็นระบบ แต่ข้อจำกัดสำหรับบางพื้นที่ๆไม่มีอินเตอร์เน็ตซึ่งงานวิจัยนี้ได้แก้ปัญหาโดยการนำการส่งข้อมูลเพื่อผ่านคลื่นวิทยุโดยใช้หลักการส่งข้อมูล APRS (Automatic Position Report System) โปรโตคอล ได้นำข้อมูลอุณหภูมิและความชื้นไปบันทึกผลเข้าสถานีรับเพื่อส่งเข้าฐานข้อมูลผ่านระบบอินเตอร์เน็ตในอีกพื้นที่ๆอยู่ห่างไปได้มากกว่า 2 กิโลเมตร

คำสำคัญ: ระบบปลูกเห็ด, การวัดอุณหภูมิ ความชื้น, APRS, ไมโครคอนโทรลเลอร์

Abstract

Microcontroller can be used to control the temperature and humidity by the ability of the system to control inside enclosure has

Keywords: Mushroom Cropping, Environment measurement, APRS, Microcontroller

1. บทนำ

โรงปลูกที่ใช้สำหรับการปลูกเห็ดมีข้อกำหนดของสภาพแวดล้อมที่มีรายละเอียดและมีความจำเป็นที่ต้องควบคุมระดับของอุณหภูมิและความชื้นโดยปัญหาสำคัญในการควบคุมสภาพแวดล้อมภายในโรงปลูกถือว่าการควบคุมเป็นสิ่งจำเป็นอย่างมากต่อการปลูกเห็ดที่อาจจะนำความเสียหายได้ถ้าไม่มีดูแลอย่างใกล้ชิด ตัวอย่างเช่นการระบายอากาศซึ่งถูกควบคุมตามธรรมชาติหรือจับเวลาที่ตั้งไว้ล่วงหน้า [1] แต่การออกแบบระบบอาจนำไปสู่การสูญเสียความชื้นเพราะว่าความชื้นที่ลดลงอาจเกิดได้จากความร้อนหรือความเย็นโดยขึ้นอยู่กับพื้นที่ในการออกแบบสร้างมาในการปลูกเห็ดและทำให้เห็ดแห้งเสียหายได้ ดังนั้นจำเป็นต้องนำระบบเกษตรอัจริยะที่มีคุณภาพ มาตรฐานและระบบอัตโนมัติมาใช้ โดยที่ผ่านมาการออกแบบในอดีตมีการสร้างระบบปลูกเห็ดโดยคอมพิวเตอร์ควบคุมสภาพแวดล้อมในโรงปลูกโดยวัดจากเซ็นเซอร์ การใช้งานของระบบการควบคุมสภาพแวดล้อมซึ่งคอมพิวเตอร์ที่ใช้สำหรับการเพาะปลูกส่วนใหญ่พัฒนาสำหรับเรือนกระจกอ้างอิงจากงานวิจัยที่ผ่านมา[2-4] ที่มีอยู่ในเชิงพาณิชย์ การพัฒนาระบบสำหรับโรงปลูกที่ใช้ในการผลิตเห็ดในตอนนั้นแต่ข้อเสียที่สำคัญ

รูปที่ 8 ผลของการวัดค่าความชื้นบันทึกบน Database Server

Publications #4

The Growth rate Tracking System of the Tree for Forest Industry

The Growth rate Tracking System of the Tree for Forest industry

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Abstract

This paper described on how to use the Automate system for Growth Rate tracking of each tree in the forest industry which will help to solve the problem to predict the cycle time of each tree will be grown after previous batch of tree has been cut down for forest industry. System designed to keep track of Tree body when it expand to larger and Flex sensor used to wrap around detected the changing while the tree body is getting larger and the percent of the expand of tree body will convert to be growth rate then send them to database server wirelessly both short distance between tree to outpost station by using X-Bee and long length from outpost to Gateway station where more than 1-3 Km away by using Packet Radio or APRS protocol. The growth rate data will use to create the profile of growth rate which will use to forecasting of wood production consist of the timeline of each batch in the next plantation of new trees.

Keywords: Flex Sensor, Packet Radio, APRS, X-Bee module,

larger and that the characteristic of Flex Sensor which wrap around the trunk change angle which translate to result of resistance to the form of bent by the change in the rate of bending to voltage divider schematic which will feed in to Analog to Digital will be entered to Microcontroller for processing and sending the converted value of the growth rate of the period and the value of each local station to receive data using X-Bee, and will then communicate with the database server. By using data transmission to remote offices or stations connected to the network by sending data through the use of Radio Frequency in VHF 144.390 MHz by this Packet radio or APRS protocol[1-3] could have transmission distance of 1-2 kilometers away which this protocol is the most stable for long length data communication for the instant that also used for Satellite communication that is the reason why Packet Radio or APRS is the right choice for protocol to send data from rural area to gateway station that connected to main network system.

2. Design Concept

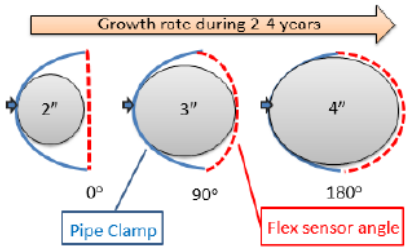


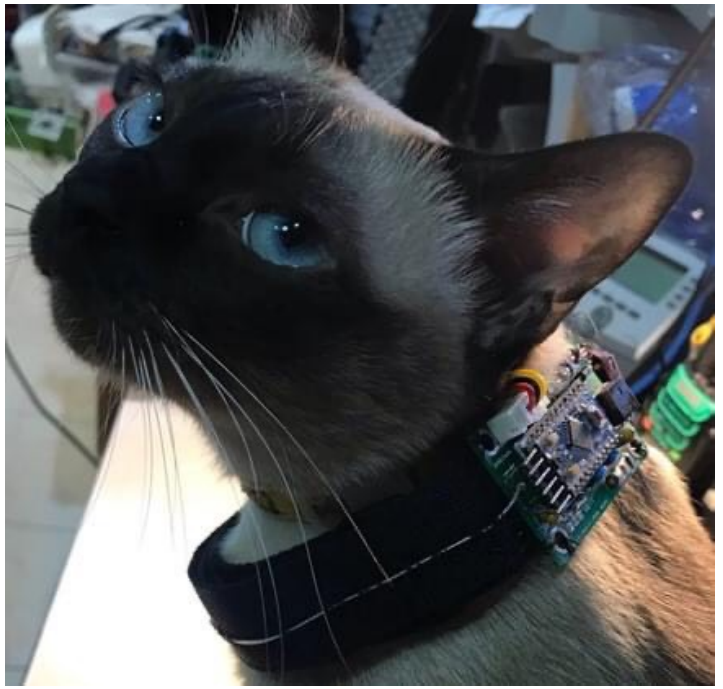
Fig. 6. Flex Sensor Condition with Growth Rate

The sensor installation was mounting by using PVC Pipe clamping and Flex Sensor as shown in Fig 7

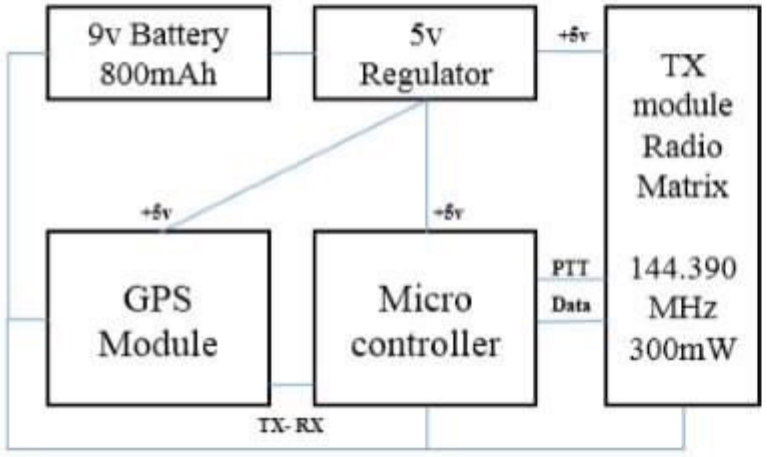
Fig. 7. Flex sensor Mouthing

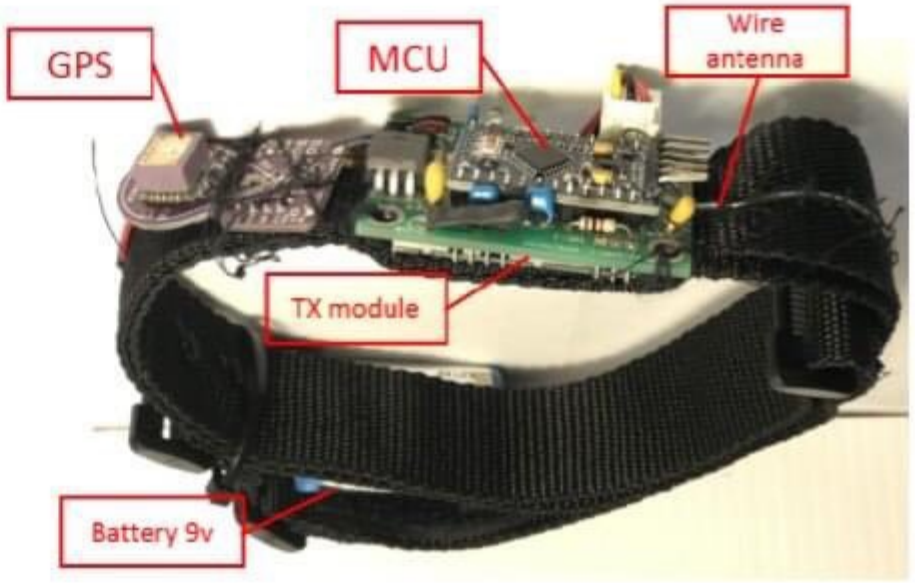
Fig. 8 Infrastructure of system

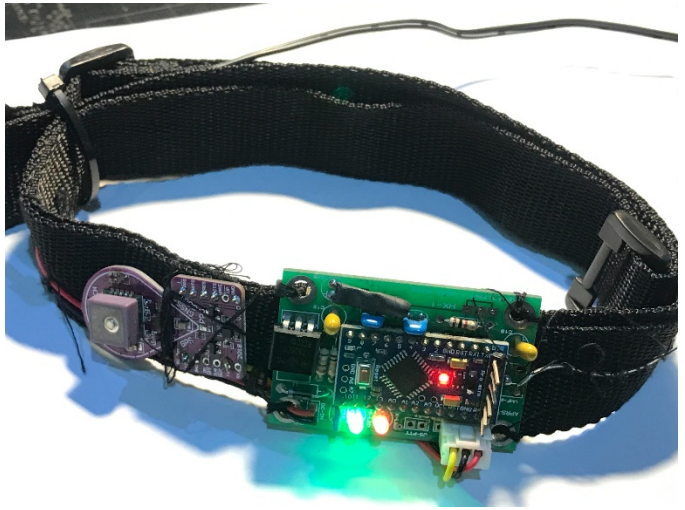
“*Designing and Implementation Wildlife Tracking System Using APRS Protocol*”. In *2019* 5th International Conference on Engineering, Applied Sciences and Technology (ICEAST) (pp. 1-4). IEEE.



My Animal Tracker







My Garage project

NAIYIM Garage

Thank you - Question & Answer?