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1. Introduction

1.1 What is SE0X-NB/NS NB-IoT Soil Moisture & EC Sensor

The Dragino SE0X-NB/NS is a **NB-IoT Soil Moisture & EC Sensor** for Agri-IoT with up to 4 sensor probes. It is designed to measure the **soil moisture of saline-alkali soil and loamy soil**. The soil sensor uses **FDR method** to calculate the soil moisture with the compensation from soil temperature and conductivity. It also has been calibrated in factory for Mineral soil type.

It detects **Soil Moisture**, **Soil Temperature** and **Soil Conductivity**, and then upload to IoT server via NB-IoT network*.

SE0X-NB/NS supports different uplink methods include **TCP, MQTT, UDP, MQTTs or CoAP** for different application requirement. and Support Uplinks to various IoT Servers.

SE0X-NB/NS **supports BLE configure** and **wireless OTA update** which make user easy to use.

SE0X-NB/NS is powered by **8500mAh Li-SOCI2 battery** or **solar powered + Li-ion battery**, it is designed for long-term use up to several years.

Green House

Orchard Nursery

Farmland

Soil Research

1.2 Features

- NB-IoT Bands: B1/B2/B3/B4/B5/B8/B12/B13/B17/B18/B19/B20/B25/B28/B66/B70/B85 @H-FDD
- Ultra-low power consumption
- Up to 4 external sensor probes, probe length: 3.5 meters
- Monitor Soil Moisture
- Monitor Soil Temperature
- Monitor Soil Conductivity
- IP66 Waterproof Enclosure
- Multiply Sampling and one uplink
- Support Bluetooth v5.1 remote configure and update firmware

- Uplink on periodically
- AT Commands to change parameters
- Downlink to change configure
- 8500mAh Li/SOCl2 Battery (SE0X-NB)
- Solar panel + 3000mAh Li-ion battery (SE0X-NS)
- Nano SIM card slot for NB-IoT SIM

Common DC Characteristics:

- Supply Voltage: Built-in Battery , 2.6v ~ 3.6v
- Operating Temperature: -40 ~ 85°C

Soil Moisture:

- Range: 0-100.00 V/V %
- Resolution: 0.01 V/V %
- Accuracy: ±3% (0-53%)V/V %, ±5% (>53%) V/V %
- Measure Method: FDR , with temperature &EC compensate

Soil Temperature

- Range: -40.00℃ ~ 85.00℃
- Resolution: 0.01℃
- Accuracy: -10℃ ~ 50℃:<0.3℃ ,All other: <0.6℃
- Measure Method: RTD, and calibrate

Soil Conductivity

- Range: 0-20000 uS/cm(25℃)(0-20.0EC)
- Resolution: 1 uS/cm
- Accuracy: 2%FS
- Measure Method: Conductivity , with temperature compensate

NB-IoT Spec:

NB-IoT Module: BC660K-GL

Support Bands:

- B1 @H-FDD: 2100MHz
- B2 @H-FDD: 1900MHz
- B3 @H-FDD: 1800MHz
- B4 @H-FDD: 2100MHz
- B5 @H-FDD: 860MHz
- B8 @H-FDD: 900MHz
- B12 @H-FDD: 720MHz
- B13 @H-FDD: 740MHz
- B17 @H-FDD: 730MHz
- B18 @H-FDD: 870MHz
- B19 @H-FDD: 870MHz
- B20 @H-FDD: 790MHz
- B25 @H-FDD: 1900MHz
- B28 @H-FDD: 750MHz
- B66 @H-FDD: 2000MHz
- B70 @H-FDD: 2000MHz

- B85 @H-FDD: 700MHz

Battery:

- Li/SOCI2 un-chargeable battery
- Capacity: 8500mAh
- Self-Discharge: <1% / Year @ 25°C
- Max continuously current: 130mA
- Max boost current: 2A, 1 second

Power Consumption

- Sleep Mode: 5uA @ 3.3v
- LoRa Transmit Mode: 125mA @ 20dBm, 82mA @ 14dBm

1.4 Applications

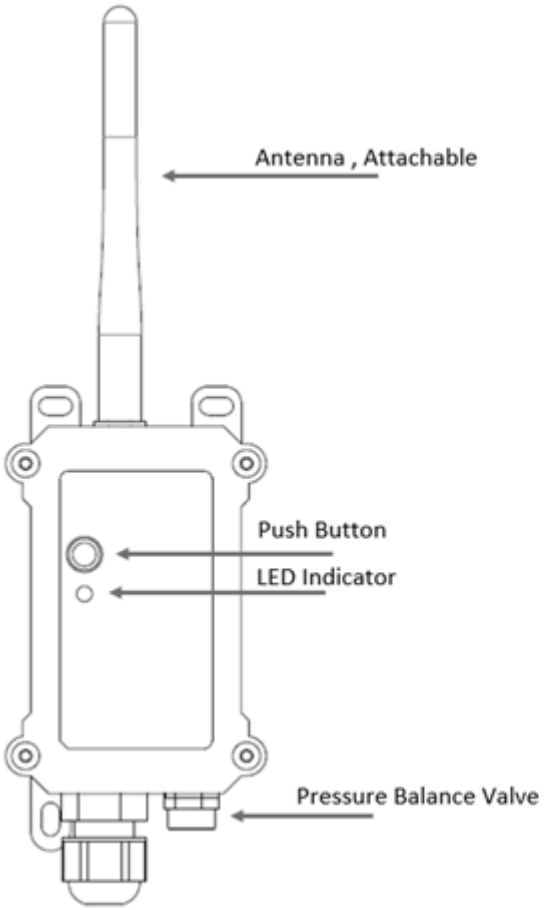
- Smart Agriculture

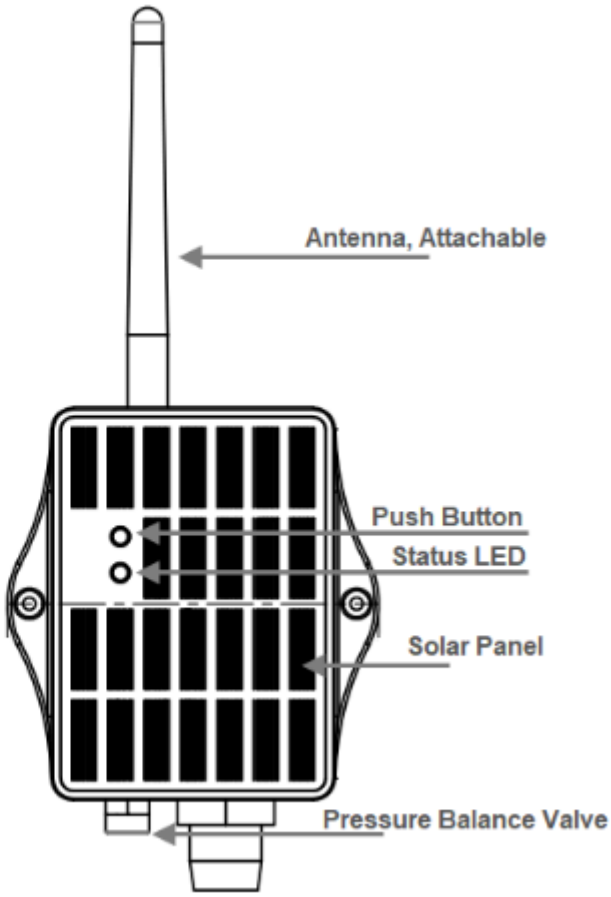
1.5 Sleep mode and working mode

Deep Sleep Mode: Sensor doesn't have any NB-IoT activate. This mode is used for storage and shipping to save battery life.

Working Mode: In this mode, Sensor will work as NB-IoT Sensor to Join NB-IoT network and send out sensor data to server. Between each sampling/tx/rx periodically, sensor will be in IDLE mode), in IDLE mode, sensor has the same power consumption as Deep Sleep mode.

1.6 Button & LEDs





Behavior on ACT	Function	Action
1~3s	Send an uplink	If sensor has already attached to NB-IoT network, sensor will send an uplink packet, **blue led** will blink once. Meanwhile, BLE module will be active and user can connect via BLE to configure device.
>3s	Active Device	**Green led** will fast blink 5 times, device will enter **OTA mode** for 3 seconds. And then start to attach NB-IoT network. Once sensor is active, BLE module will be active and user can connect via BLE to configure device, no matter if device attach NB-IoT network or not.
x5	Deactivate Device	**Red led** will solid on for 5 seconds. Means device is in Deep Sleep Mode.

Note: When the device is executing a program, the buttons may become invalid. It is best to press the buttons after the device has completed the program execution.

1.7 BLE connection

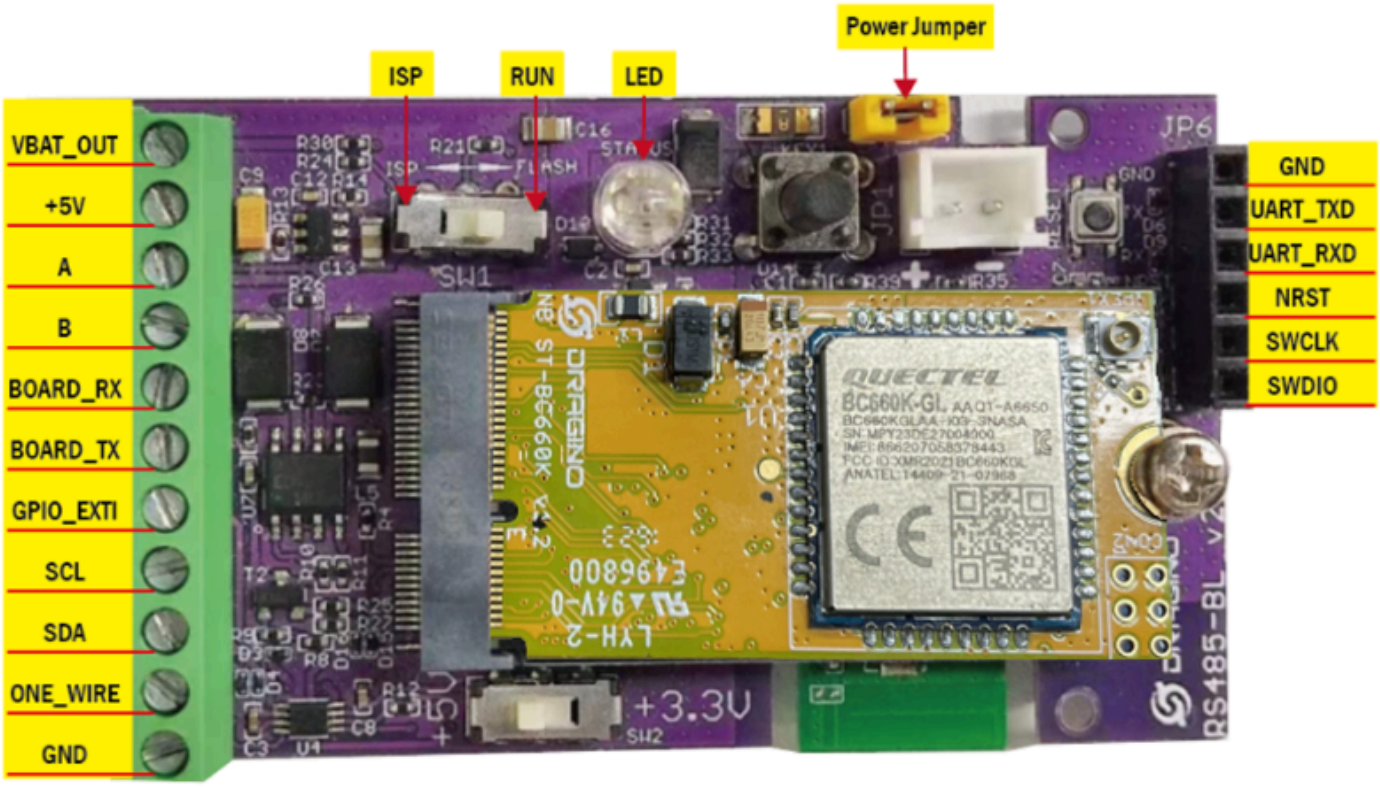
SE0X-NB/NS support BLE remote configure and firmware update.

BLE can be used to configure the parameter of sensor or see the console output from sensor. BLE will be only activate on below case:

- Press button to send an uplink
- Press button to active device.
- Device Power on or reset.

If there is no activity connection on BLE in 60 seconds, sensor will shut down BLE module to enter low power mode.

1.8 Pin Definitions



1.8.1 Jumper JP2

Power on Device when put this jumper.

1.8.2 BOOT MODE / SW1

1) ISP: upgrade mode, device won't have any signal in this mode. but ready for upgrade firmware. LED won't work. Firmware won't run.

2) Flash: work mode, device starts to work and send out console output for further debug

1.8.3 Reset Button

Press to reboot the device.

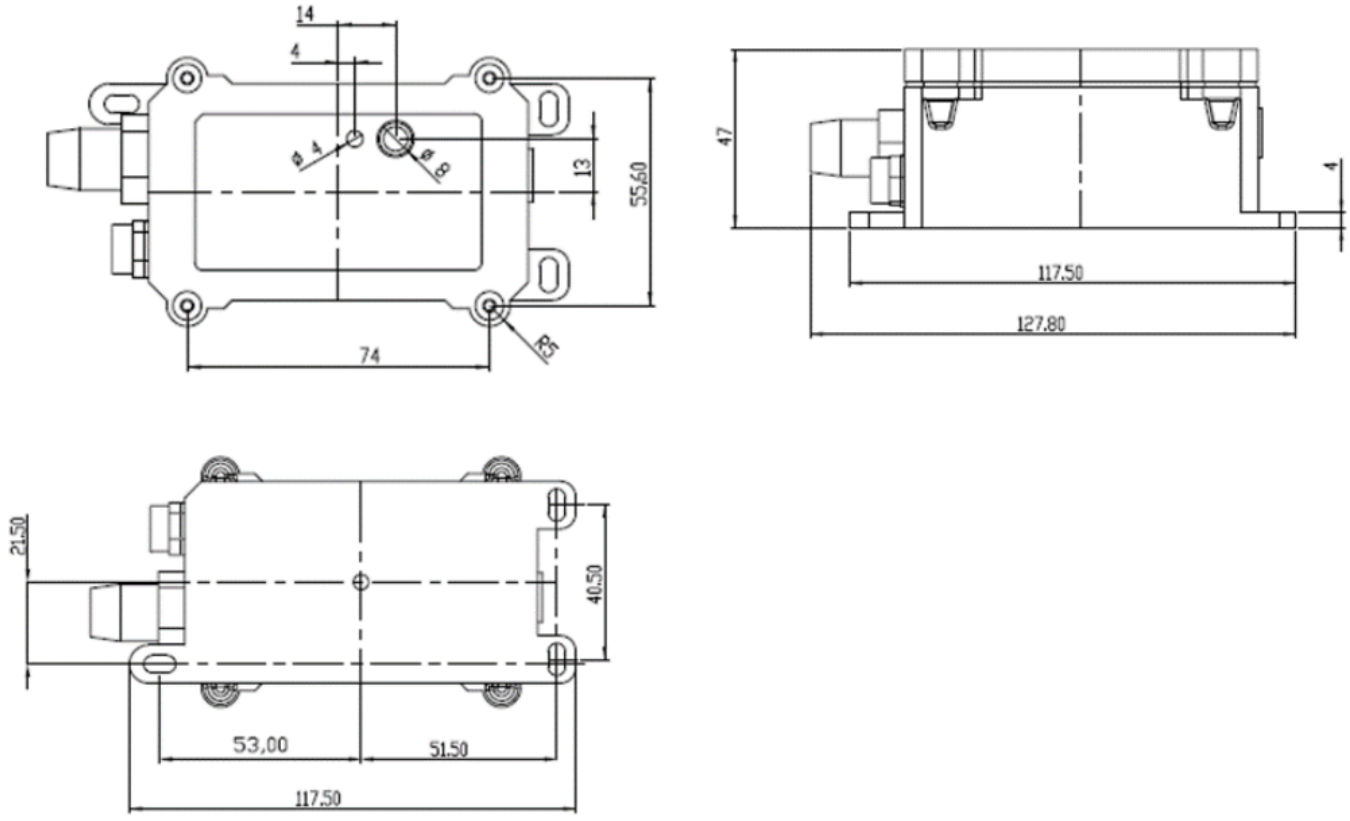
1.8.4 SIM Card Direction

See this link. How to insert SIM Card.

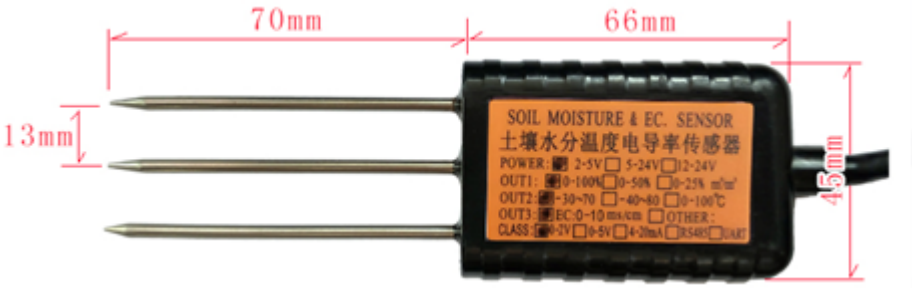
1.9 Mechanical

1.9.1 for NB version

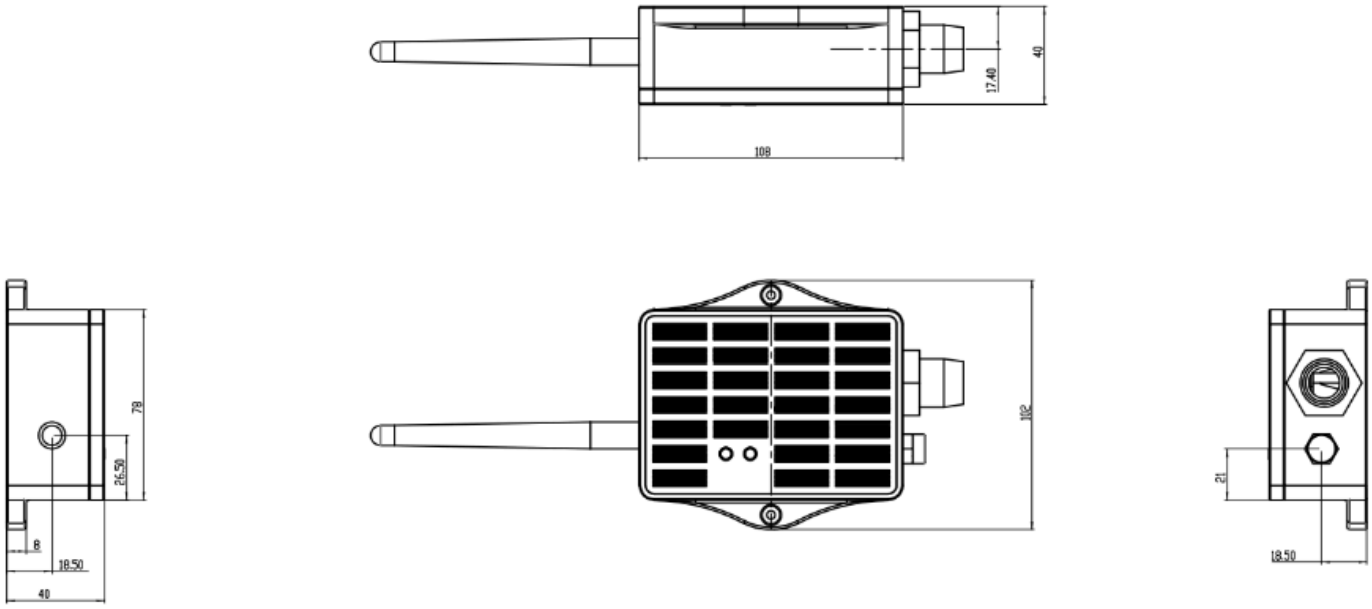
Main Device Dimension:



Probe Dimension:



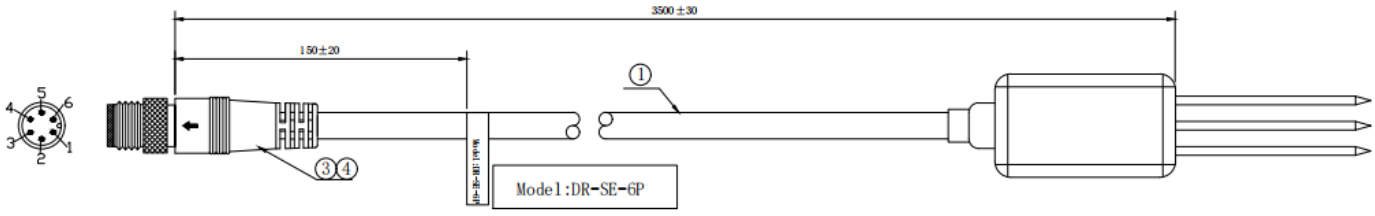
1.9.2 for NS version



1.9.3 for sensor cable

Cable size:

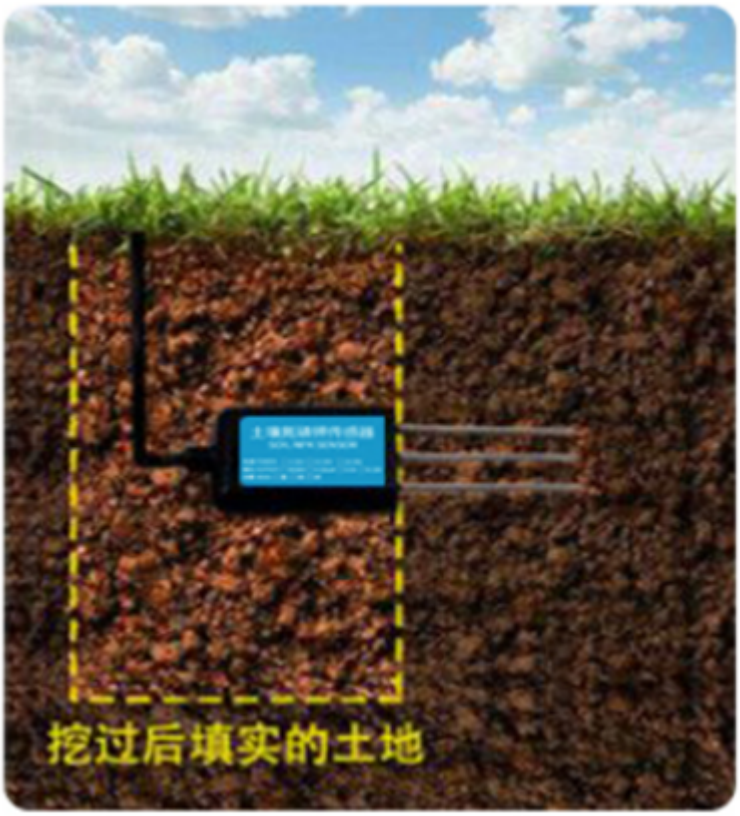
Total cable length: 3500mm, deviation ±30mm



1.10 Installation in Soil

Measurement the soil surface

Choose the proper measuring position. Avoid the probe to touch rocks or hard things. Split the surface soil according to the measured deep. Keep the measured as original density. Vertical insert the probe into the soil to be measured. Make sure not shake when inserting.



Dig a hole with diameter > 20CM.

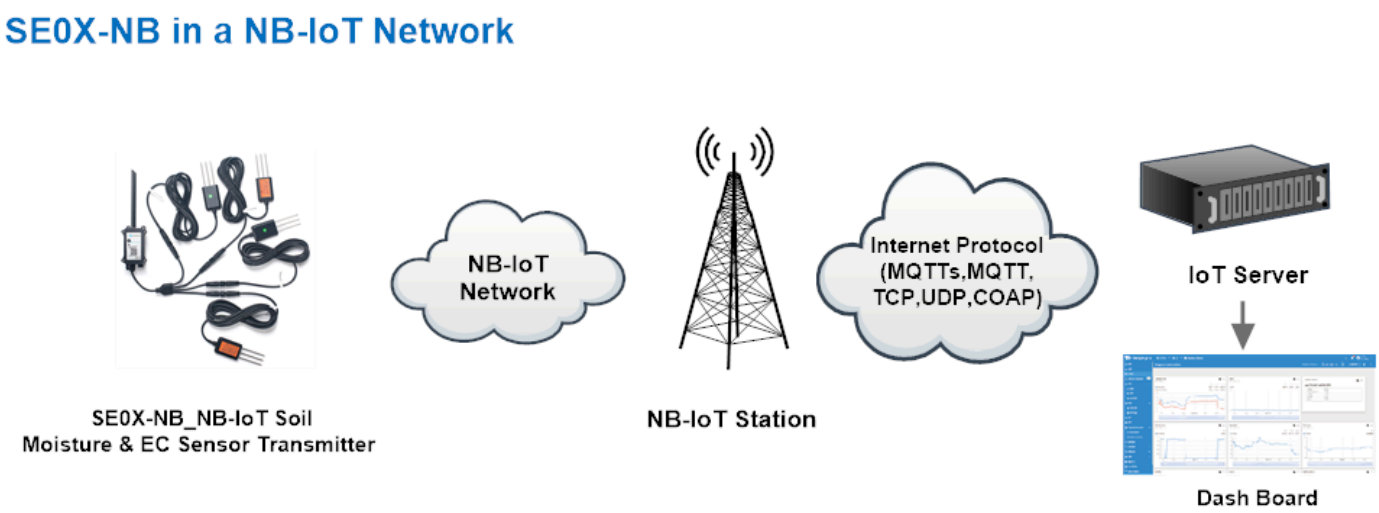
Horizontal insert the probe to the soil and fill the hole for long term measurement.

2. Use SE0X-NB/NS to communicate with IoT Server

2.1 Send data to IoT server via NB-IoT network

The SE0X-NB/NS is equipped with a NB-IoT module, the pre-loaded firmware in SE0X-NB/NS will get environment data from sensors and send the value to local NB-IoT network via the NB-IoT module. The NB-IoT network will forward this value to IoT server via the protocol defined by SE0X-NB/NS.

Below shows the network structure:



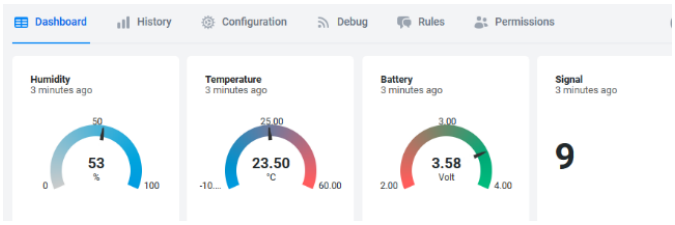
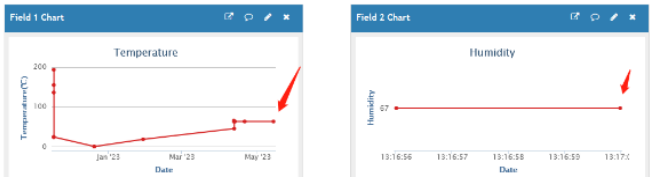
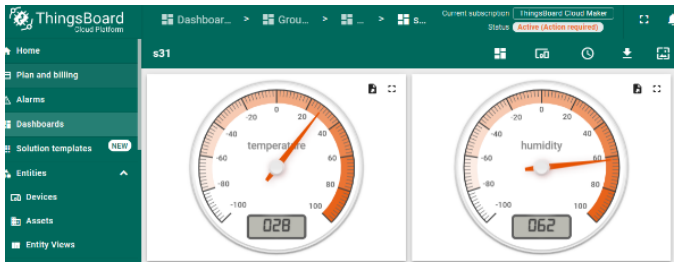
There are two version: **-GE** and **-1T** version of SE0X-NB/NS.

GE Version: This version doesn't include SIM card or point to any IoT server. User needs to use AT Commands to configure below two steps to set SE0X-NB/NS send data to IoT server.

- Install NB-IoT SIM card and configure APN. See instruction of Attach Network.
- Set up sensor to point to IoT Server. See instruction of Configure to Connect Different Servers.

Below shows result of different server as a glance.

Servers	Dash Board	Comments
Node-Red		

DataCake		
Tago.IO		
General UDP	Raw Payload. Need Developer to design Dash Board	
General MQTT	Raw Payload. Need Developer to design Dash Board	
ThingSpeak		
ThingsBoard		

1T Version: This version has 1NCE SIM card pre-installed and configure to send value to ThingsEye. User Just need to select the sensor type in ThingsEyeand Activate SE0X-NB/NS and user will be able to see data in ThingsEye. See here for ThingsEye Config Instruction.

Soil Sensor Address Configuration

All soil sensors are shipped with **default address 0x01**.

Do not use the same address repeatedly on the same node, otherwise the data will conflict, so if you connect more than 1 sensor to the SE0X-NB/NS node, you need to follow the steps below to change the address (supported addresses: **01-04**):

Step 1: Keep the default address **01** for the **first sensor**. No modification or operation is required.

Step 2: Connect the **second sensor**, and change its address to **02**.

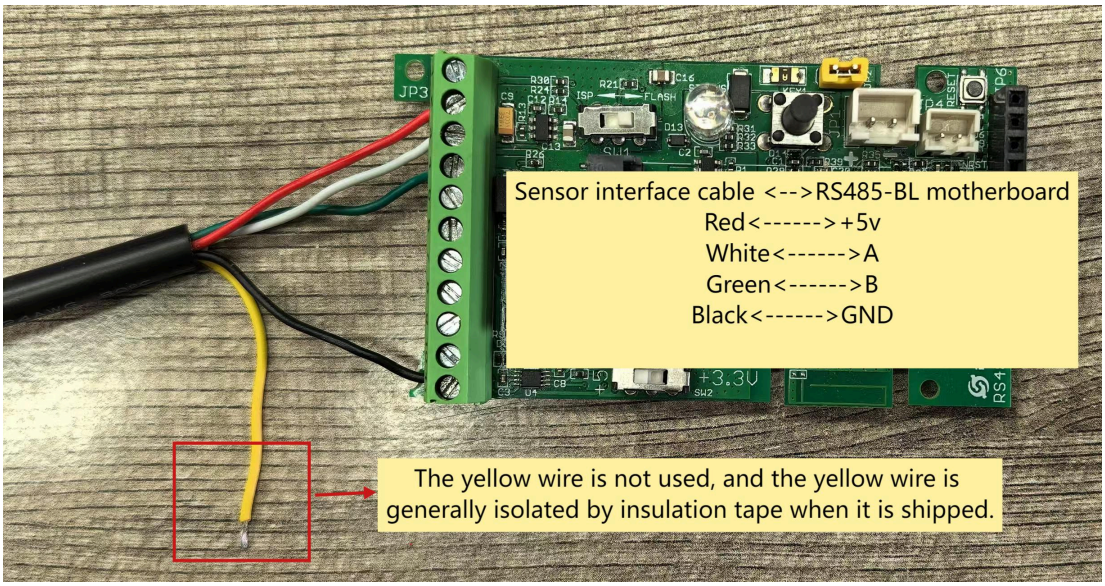
Step 3: Disconnect the second sensor, connect the **third sensor**, and change its address to **03**.

Step 3: Repeat Step 3 to assign address **04** to the **fourth sensor**.

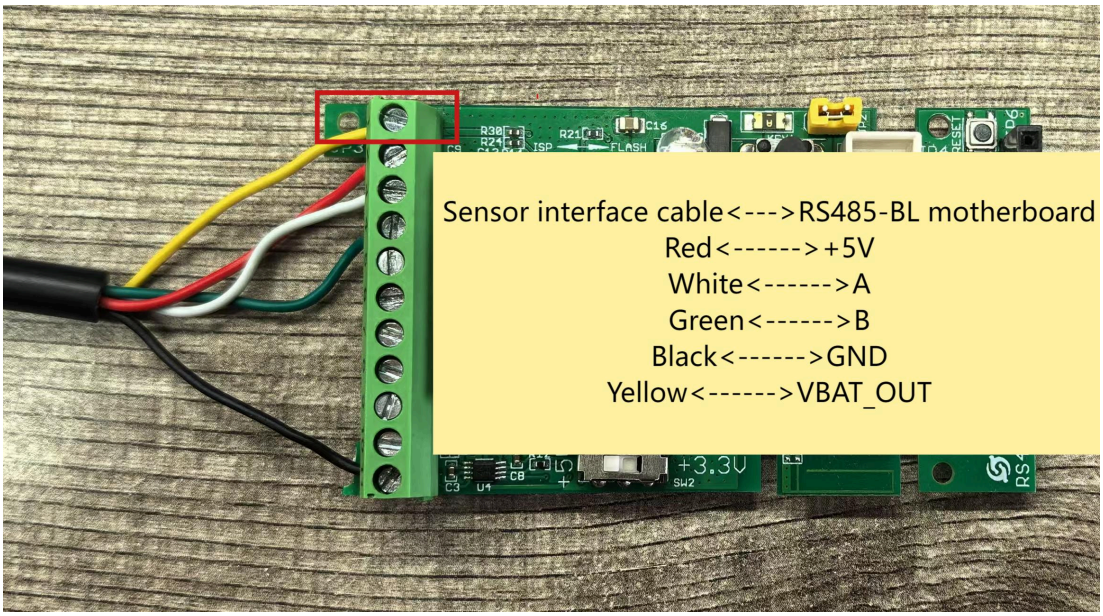
For details, see Configure Methods in 3.1 and Command Description in 3.16.

Connection:

- Wiring during sensor operation:



- Wiring when changing the sensor address:



Note: The yellow wire is only used when the address of the sensor is modified. After the address of the sensor is successfully modified, please disconnect the yellow cable and use tape to isolate the wire core to prevent the yellow wire from touching the motherboard element and causing a short circuit.

2. Payload Types

To meet different server requirement, SE0X-NB/NS supports different payload type.

Includes:

- General JSON format payload. (Type=5)

- HEX format Payload. (Type=0)
- ThingSpeak Format. (Type=1)
- ThingsBoard Format. (Type=3)

User can specify the payload type when choose the connection protocol. Example:

AT+PRO=1,0 // Use COAP Connection & hex Payload

AT+PRO=1,5 // Use COAP Connection & Json Payload

AT+PRO=2,0 // Use UDP Connection & hex Payload

AT+PRO=2,5 // Use UDP Connection & Json Payload

AT+PRO=3,0 // Use MQTT Connection & hex Payload

AT+PRO=3,5 // Use MQTT Connection & Json Payload

AT+PRO=4,0 // Use TCP Connection & hex Payload

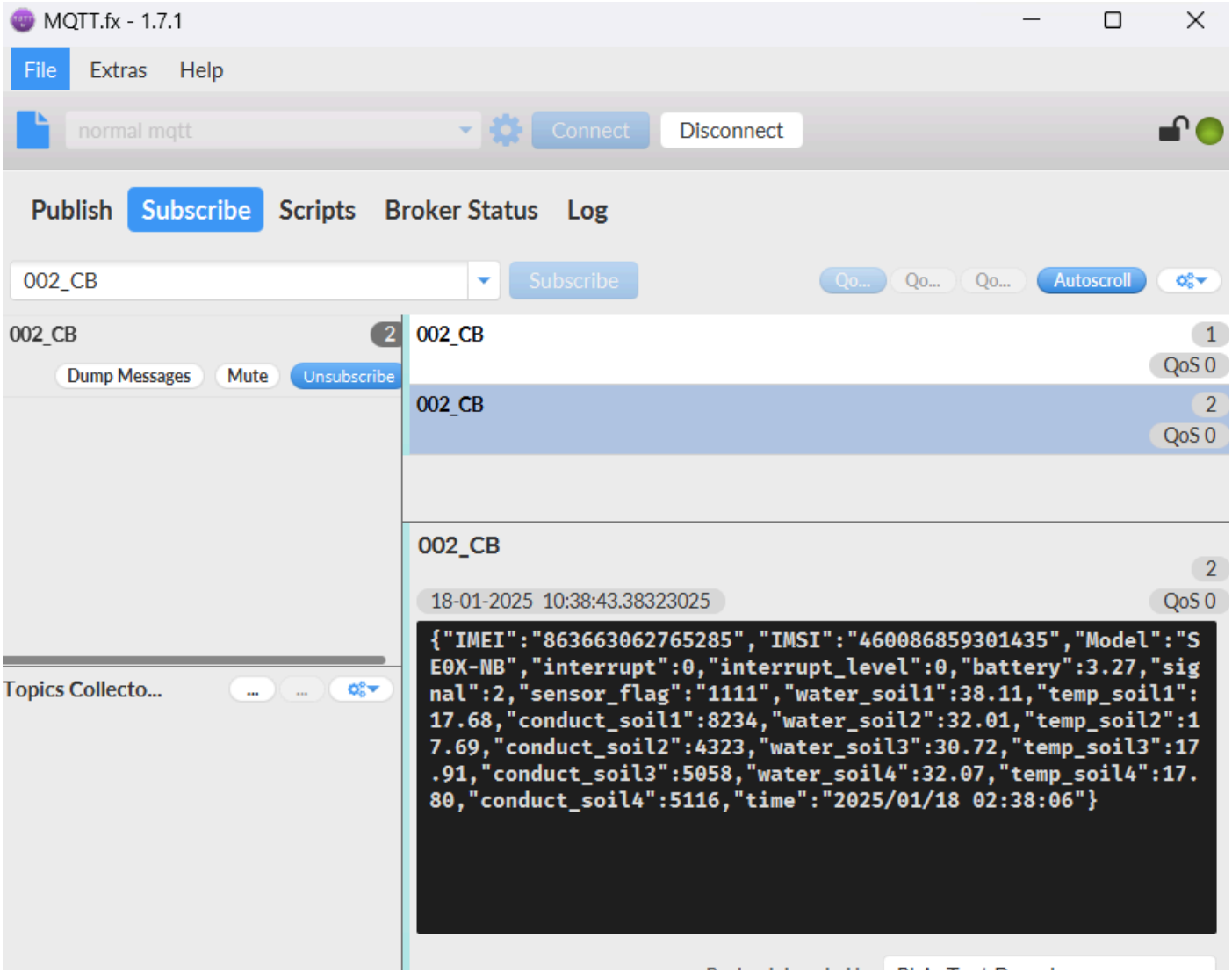
AT+PRO=4,5 // Use TCP Connection & Json Payload

2.2.1 General Json Format(Type=5)

2.2.1.1 AT+CFGMOD=0(Default Mode)

This is the General Json Format. As below:

{"IMEI":"863663062765285","IMSI":"460086859301435","Model":"SE0X-NB","interrupt":0,"interrupt_level":0,"battery":3.27,"signal":2,"sensor_flag":"1111","water_soil1":38.11,"t 02:38:06"}



Notice, from above payload:

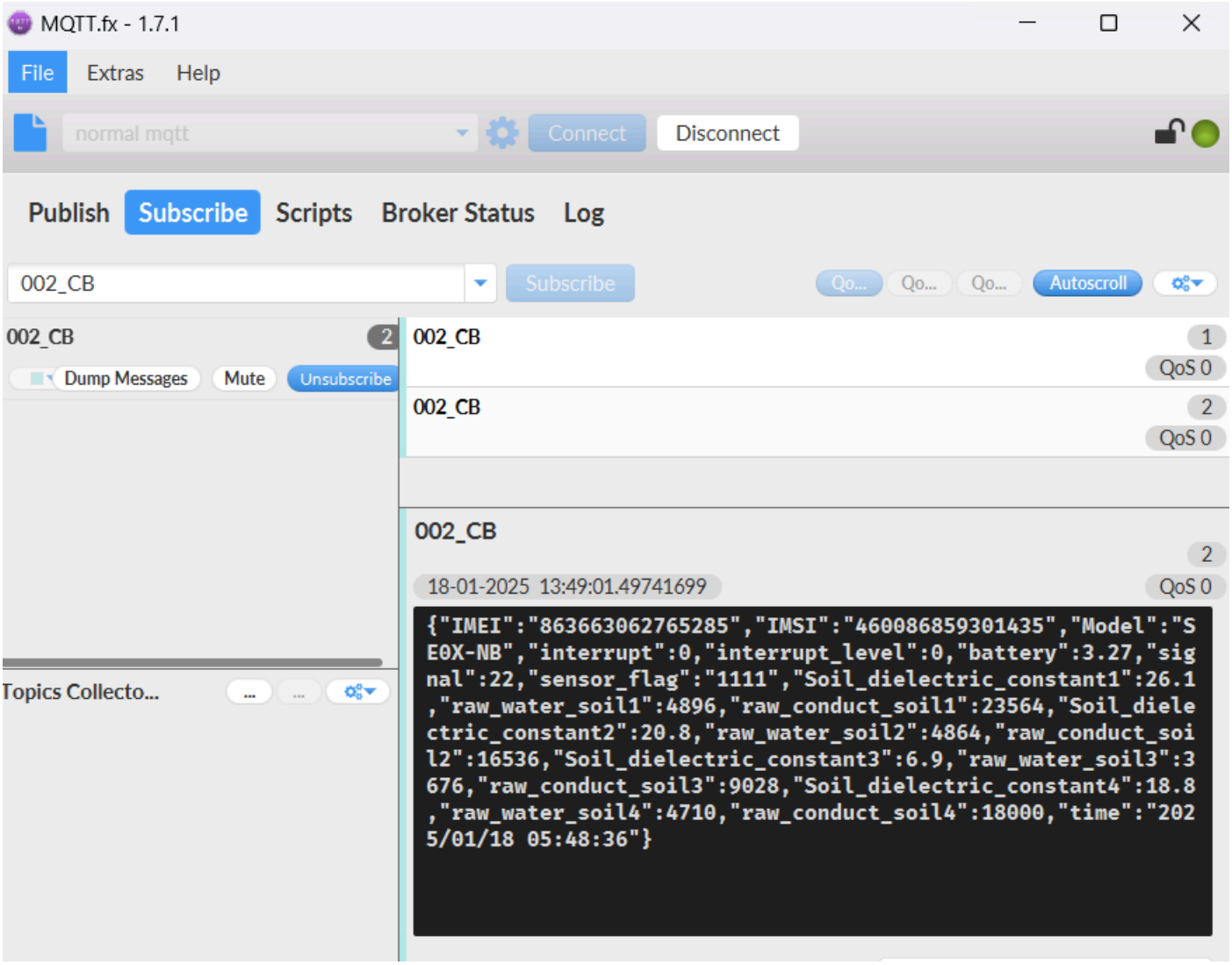
- interrupt, interrupt_level, battery, signal, sensor_flag, water_soil1, temp_soil1, conduct_soil1, water_soil2, emp_soil2, conduct_soil2, water_soil3, temp_soil3, onduct_soil3, water_soil4, temp_soil4,

  conduct_soil4 & time are the value at uplink time.

2.2.1.2 AT+CFGMOD=1(Original value)

This is the General Json Format. As below:

{"IMEI":"863663062765285","IMSI":"460086859301435","Model":"SE0X-NB","interrupt":0,"interrupt_level":0,"battery":3.27,"signal":22,"sensor_flag":"1111","Soil_dielectric_cons
05:48:36"}



Notice, from above payload:

- interrupt, interrupt_level, battery, signal, sensor_flag, Soil_dielectric_constant1, raw_water_soil1, raw_conduct_soil1, Soil_dielectric_constant2, raw_water_soil2, raw_conduct_soil2,

Soil_dielectric_constant3, raw_water_soil3, raw_conduct_soil3, Soil_dielectric_constant4, raw_water_soil4, raw_conduct_soil4 & time are the value at uplink time.

2.2.2 HEX format Payload(Type=0)

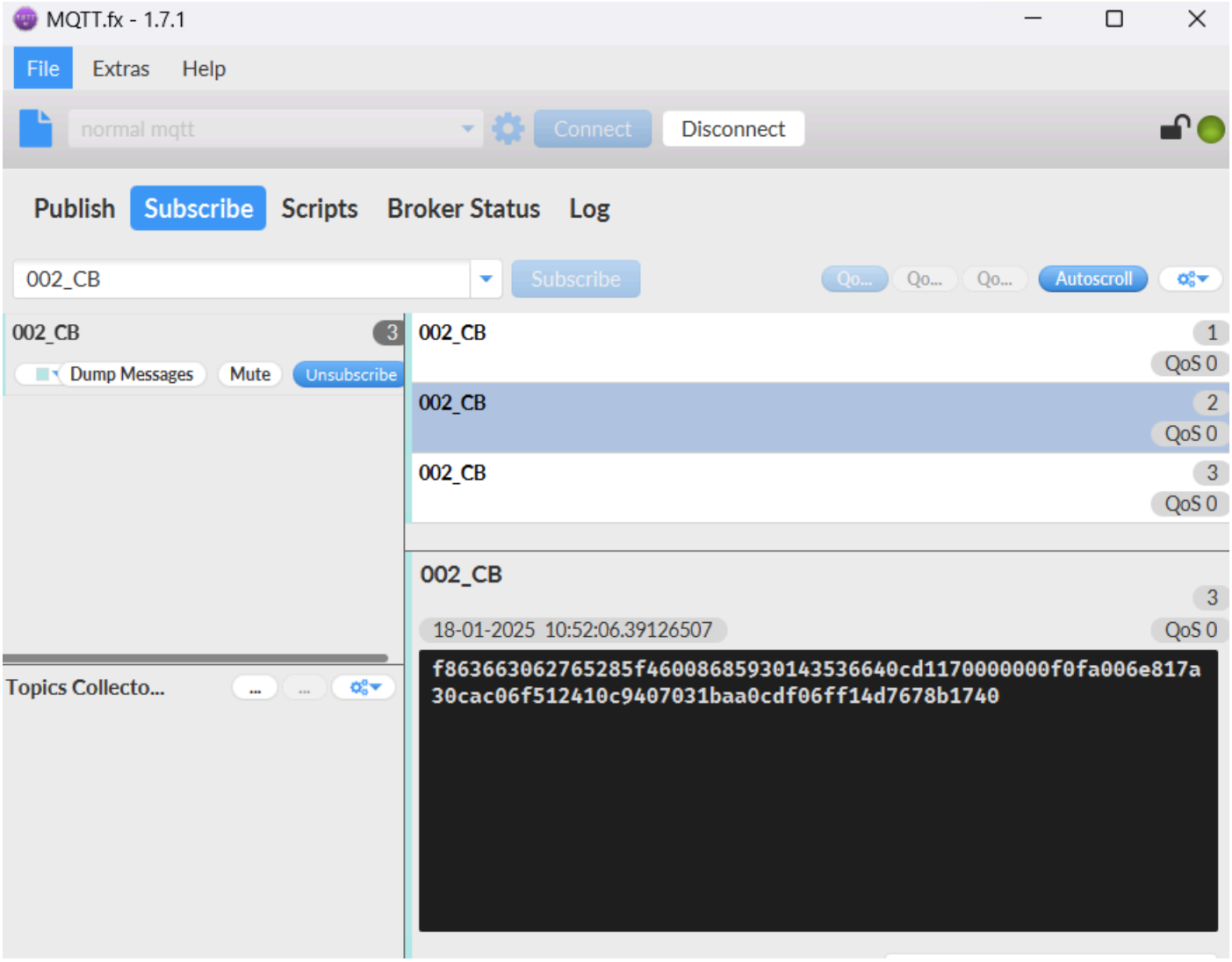
2.2.2.1 AT+CFGMOD=0(Default Mode)

This is the HEX Format. As below:

f863663062765285f460086859301435 36640cd1170000000f0fa006e817a30cac06f512410c9407031baa0cdf06

HEX Format for SE0X-NB(AT+CFGMOD=0)																					
f863663062765285	f460086859301435	3664	0cd1	17	00	00	00	0f	0fa0	06e8	17a3	0cac	06f5	1241	0c94	0703	1baa	0cdf	06ff	14d7	678b1740
f+IMEI	f+IMSI	Version	BAT	signal	Mod	Interrupt	Interrupt_level	sensor_flag	hum	temp	EC1	hum2	temp2	EC2	hum3	temp3	EC3	hum4	temp4	EC4	Timestamp
8 Bytes	8 Bytes	37 Bytes																			

If we use the MQTT client to subscribe to this MQTT topic, we can see the following information when the NB sensor uplink data.



Device ID(f+IMEI): f863663062765285 =863663062765285

SIM Card ID(f+IMSI): f460086859301435 =460086859301435

Version:

These bytes include the hardware and software version.

Higher byte: Specify Sensor Model: 0x36 for SE0X-NB/NS

Lower byte: Specify the software version: 0x64=100, means firmware version 1.0.0

BAT (Battery Info):

Ex1: 0x0CD1 = 3281mV

Signal Strength:

NB-IoT Network signal Strength.

Ex1: 0x17 = 23

0 -113dBm or less

1 -111dBm

2...30 -109dBm... -53dBm

31 -51dBm or greater

99 Not known or not detectable

MOD

This data field shows the current working mode.

Ex1: 0x00 default mode.

Ex2: 0x01 original mode.

Interrupt

This data field shows if this packet is generated by interrupt or not.

Example:

If byte[0]&0x01=0x00 : Normal uplink packet.

If byte[0]&0x01=0x01 : Interrupt Uplink Packet.

Interrupt_level:

This byte shows whether the interrupt is triggered by a high or low level.

Ex1: 0x00 Interrupt triggered by falling edge (low level)

Ex2: 0x01 Interrupt triggered by rising edge (high level)

Sensor_flag

Displays whether sensors are connected.

0: Sensor connection not detected.

1: Sensor connection detected.

For example, s_flag=1111,.Represents recognition to four sensors.

Counting from left to right,

The first number represents the **01** address sensor,

The second number represents the **02** address sensor;

The third number represents the **03** address sensor;

The fourth number represents the **04** address sensor.

Soil Moisture

Get the moisture content of the soil. The value range of the register is 0-10000(Decimal), divide this value by 100 to get the percentage of moisture in the soil.

For example, if the data you get from the register is **0x05 0xDC**, the moisture content in the soil is **05DC(H) = 1500(D) /100 = 15%.**

Soil Temperature

Get the temperature in the soil. The value range of the register is -4000 - +800(Decimal), divide this value by 100 to get the temperature in the soil. For example, if the data you get from the register is 0x09 0xEC, the temperature content in the soil is

Example:

If payload is 0105H: ((0x0105 & 0x8000)>>15 === 0),temp = 0105(H)/100 = 2.61 °C

If payload is FF7EH: ((FF7E & 0x8000)>>15 ===1),temp = (FF7E(H)-FFFF(H))/100 = -1.29 °C

Soil Conductivity (EC)

Obtain **soluble salt concentration** in soil or **soluble ion concentration in liquid fertilizer** or **planting medium**. The value range of the register is 0 - 20000(Decimal)(Can be greater than 20000).

For example, if the data you get from the register is 0x00 0xC8, the soil conductivity is 00C8(H) = 200(D) = 200 uS/cm.

Generally, the EC value of irrigation water is less than 800uS / cm.

TimeStamp:

Unit TimeStamp Example: 678B1740(H) = 1737168704(D)

Put the decimal value into this link(https://www.epochconverter.com) to get the time.

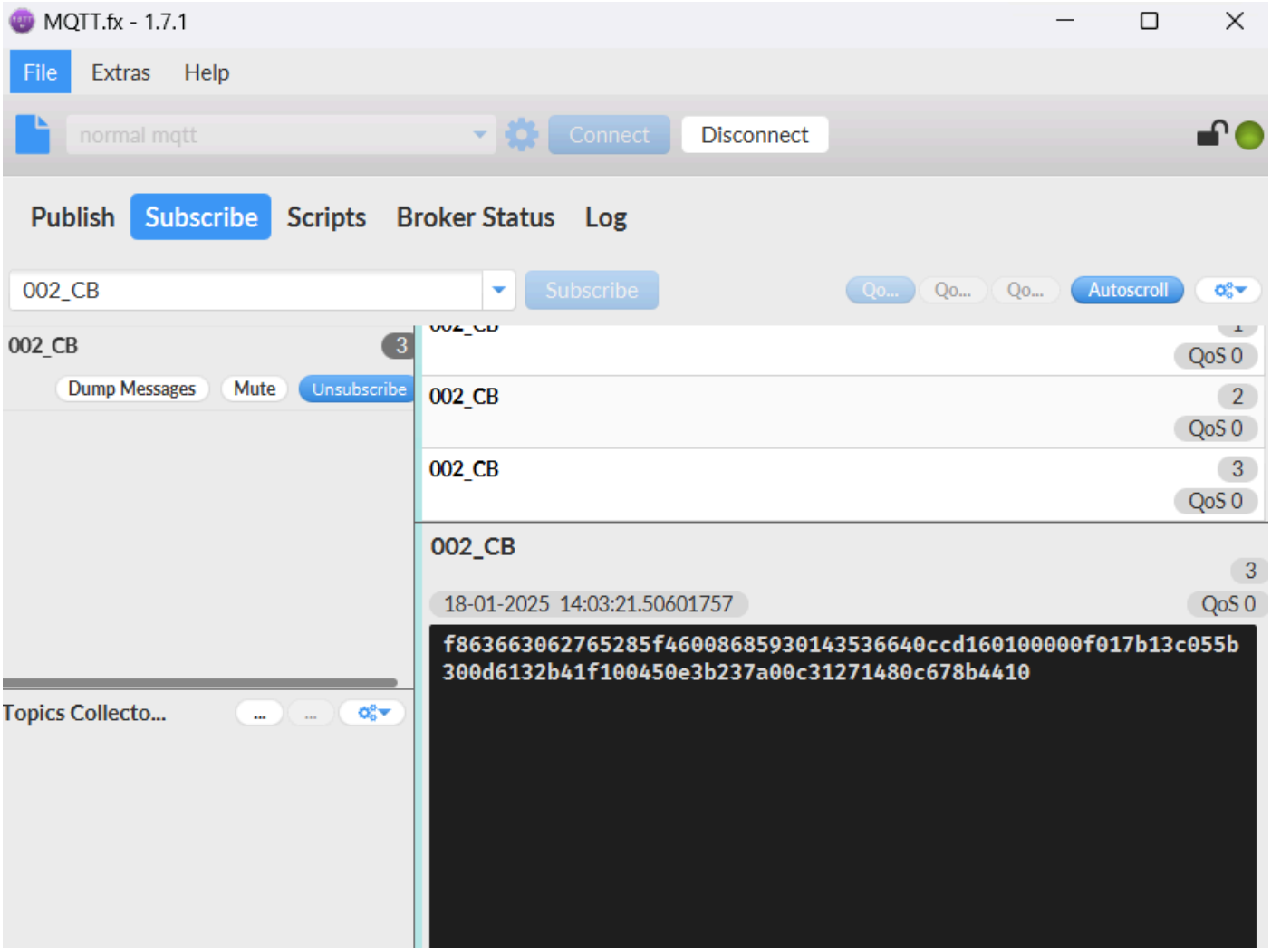
2.2.2.2 AT+CFGMOD=1(Original value)

This is the HEX Format. As below:

f863663062765285f460086859301435360640ccd160100000f017b13c055b300d6132b41f100450e3b237a00c31

HEX Format for SE0X-NB(AT+CFGMOD=1)																						
f863663062765285	f460086859301435	3664	0ccd	16	01	00	00	0f	017b	13c0	55b3	00d6	132b	41f1	0045	0e3b	237a	00c3	1271	480c	678b441
f+IMEI	f+IMSI	Version	BAT	signal	Mod	Interrupt	Interrupt_level	sensor_flag	hum	temp	EC1	hum2	temp2	EC2	hum3	temp3	EC3	hum4	temp4	EC4	Timestamp
8 Bytes	8 Bytes	37 Bytes																			

If we use the MQTT client to subscribe to this MQTT topic, we can see the following information when the NB sensor uplink data.

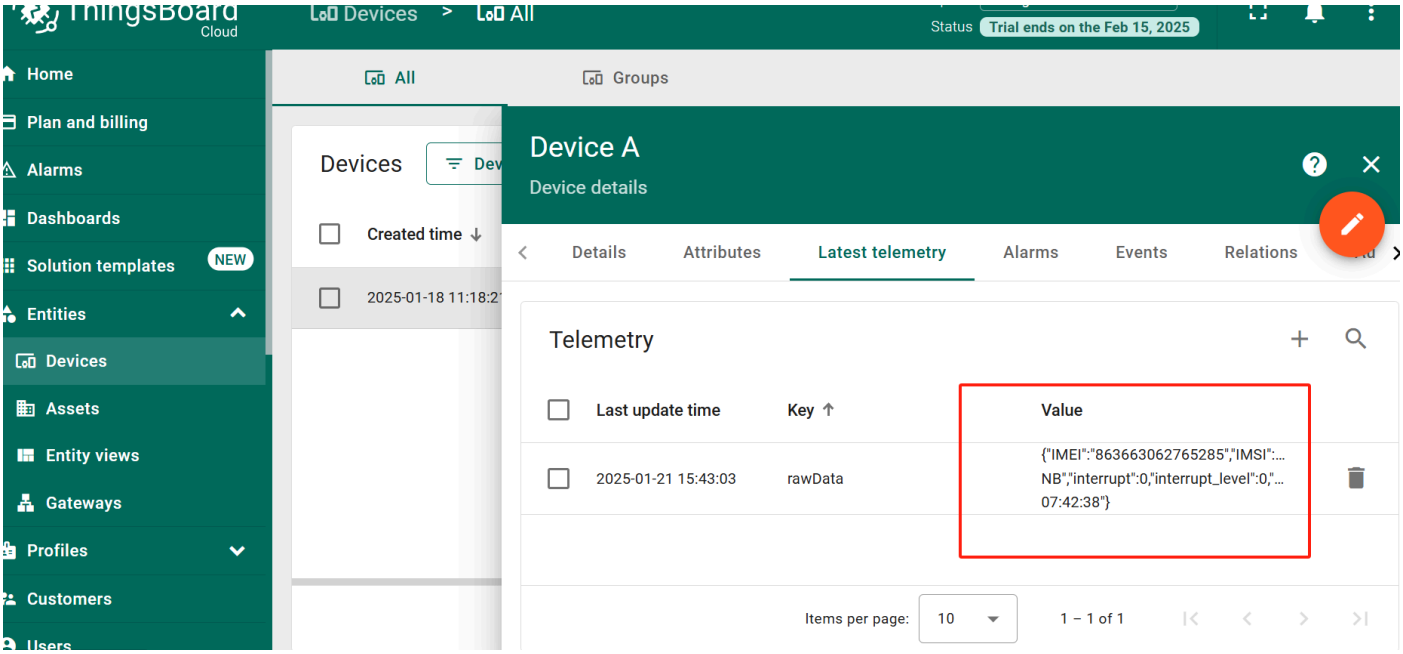


2.2.3 ThingsBoard Payload(Type=3)

2.2.3.1 AT+CFGMOD=0(Default Mode)


```
{
 "IMEI": "863663062765285",
 "IMSI": "460086859301435",
 "Model": "SE0X-NB",
 "interrupt": 0,
 "interrupt_level": 0,
 "battery": 3.27,
 "signal": 20,
 "sensor_flag": "1111",
 "water_soil1": 38.02,
 "temp_soil1": 19.41,
 "conduct_soil1": 5761,
 "water_soil2": 41.96,
 "temp_soil2": 19.75,
 "conduct_soil2": 6544,
```

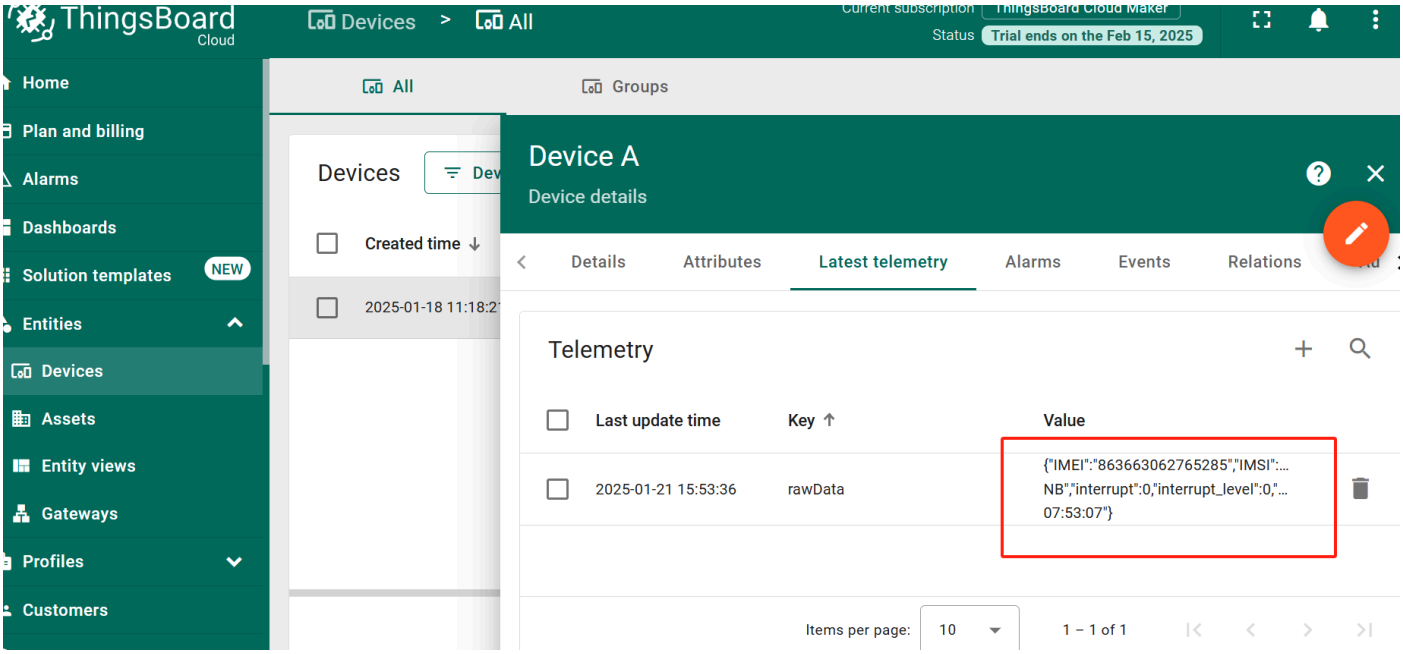
```
  "water_soil3": 34.29,
  "temp_soil3": 19.71,
  "conduct_soil3": 5653,
  "water_soil4": 0,
  "temp_soil4": 20.56,
  "conduct_soil4": 0,
  "time": "2025/01/21 07:42:38"
}
```

2.2.3.2 AT+CFGMOD=1(Original value)


```
{
  "IMEI": "863663062765285",
  "IMSI": "460086859301435",
  "Model": "SE0X-NB",
  "interrupt": 0,
  "interrupt_level": 0,
  "battery": 3.27,
  "signal": 23,
  "sensor_flag": "1111",
  "Soil_dielectric_constant1": 23.4,
  "raw_water_soil1": 4835,
  "raw_conduct_soil1": 19052,
  "Soil_dielectric_constant2": 27.3,
  "raw_water_soil2": 5106,
  "raw_conduct_soil2": 17278,
  "Soil_dielectric_constant3": 19.8,
  "raw_water_soil3": 4646,
  "raw_conduct_soil3": 18886,
  "Soil_dielectric_constant4": 1,
  "raw_water_soil4": 2507,
```

```
  "raw_conduct_soil4": 0,
  "time": "2025/01/21 07:53:07"
}
```

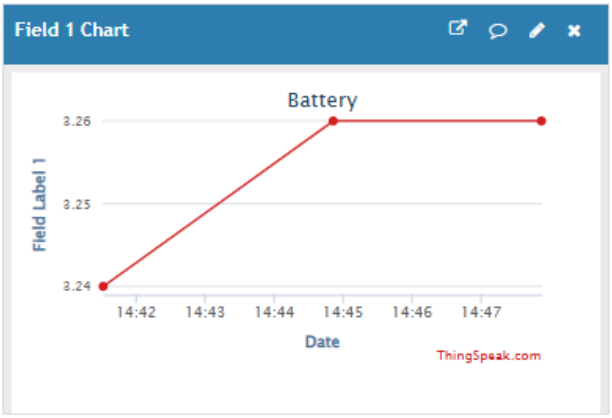
2.2.4 ThingSpeak Payload(Type=1)

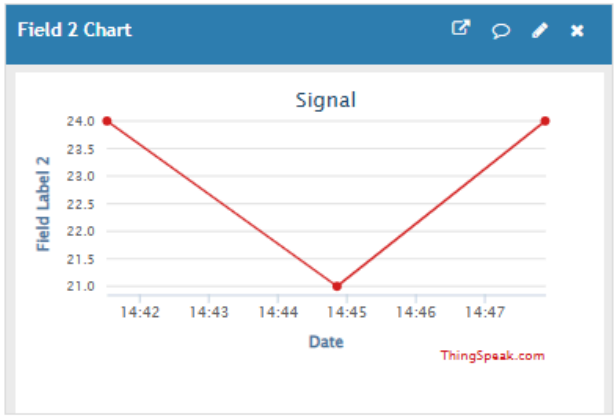
This payload meets ThingSpeak platform requirement.

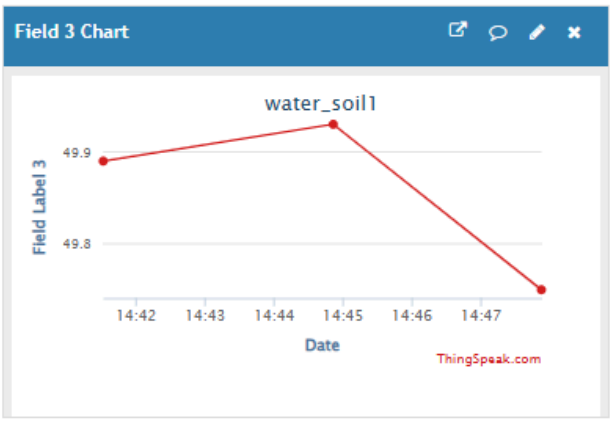
ThingSpeak only supports a maximum of 8 field charts per channel, so the sample screenshot contains only 8 fields charts.

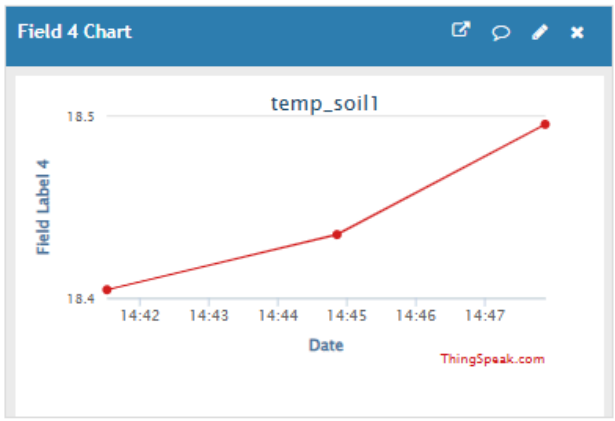
2.2.4.1 AT+CFGMOD=0(Default Mode)

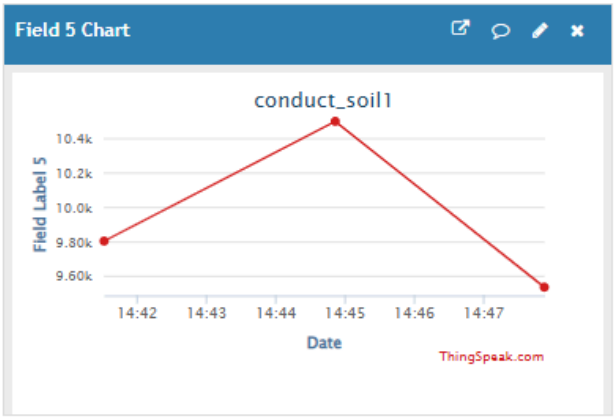
field1=Battery value&field2=Signal value&field3=water_soil1 value&field4=temp_soil1 value&field5=conduct_soil1 value&field6=water_soil2 value&field7=temp_soil2 value&field8=conduct_soil2 value

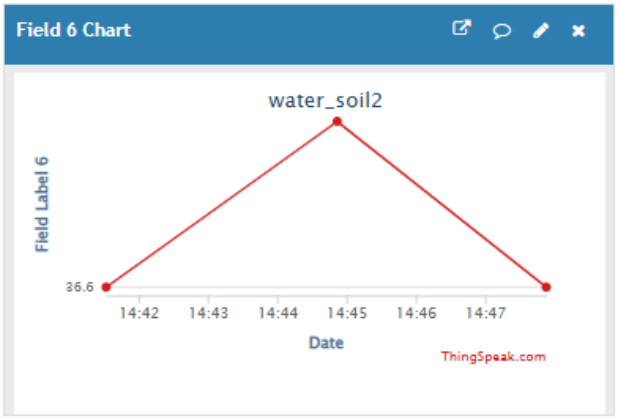


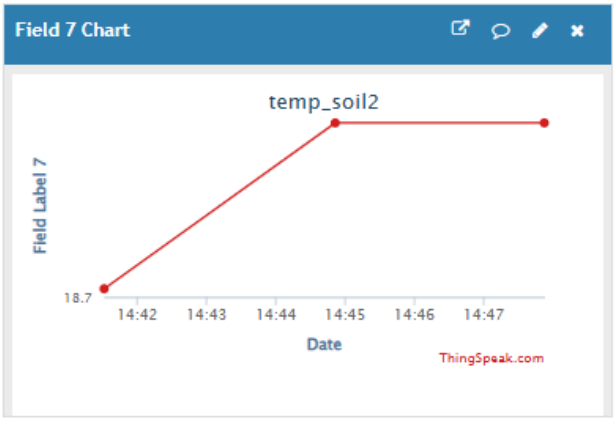


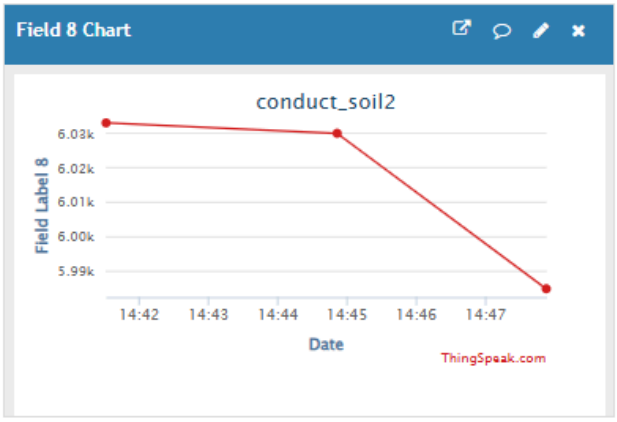






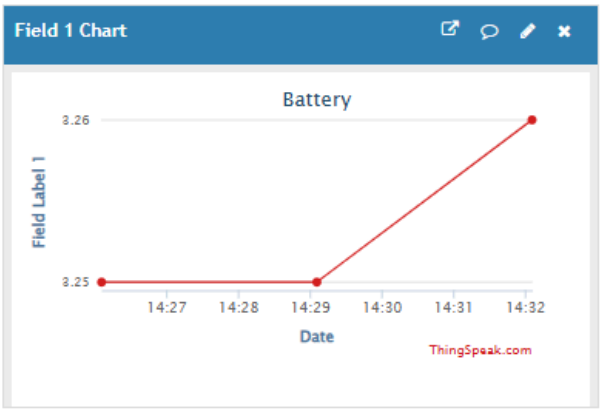


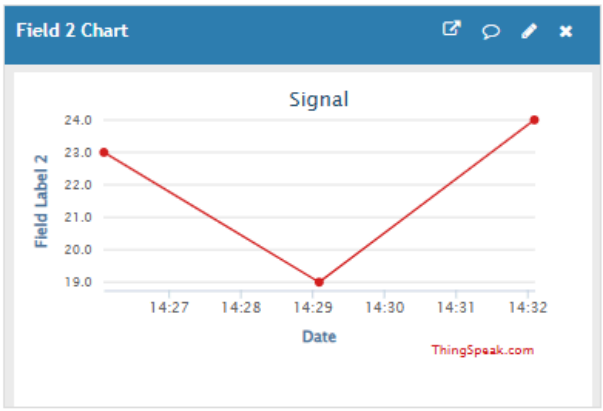


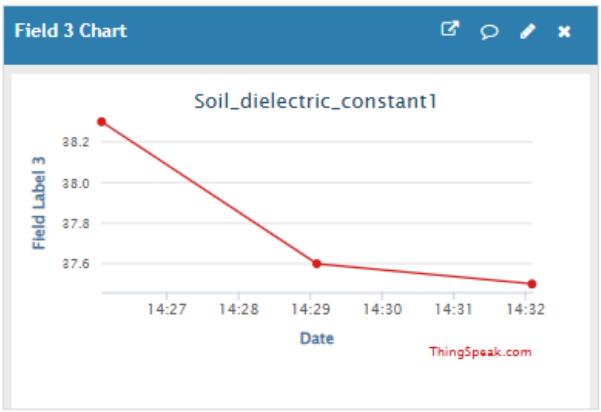


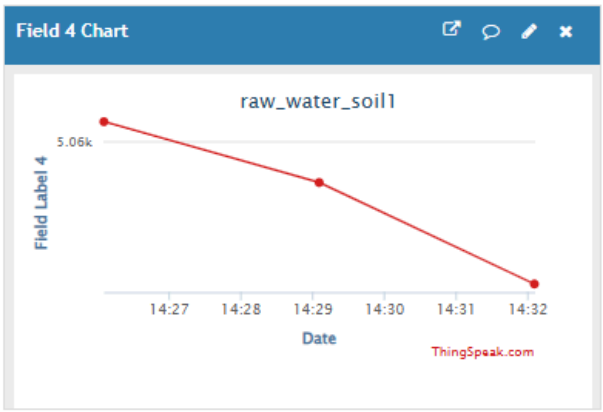
2.2.4.2 AT+CFGMOD=1(Original value)

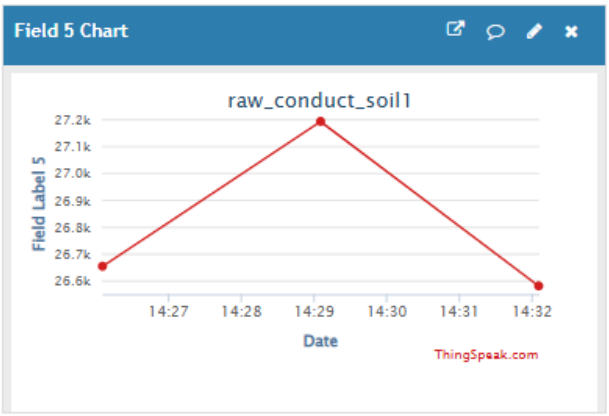
field1=Battery value&field2=Signal value&field3=Soil_dielectric_constant1 value&field4=raw_water_soil1 value&field5=raw_conduct_soil1 value&field6=Soil_dielectric_constant2 value&field7=raw_water_soil2 value&field8=raw_conduct_soil2 value

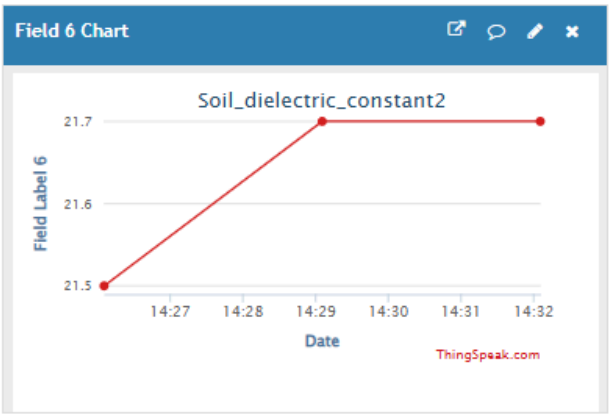


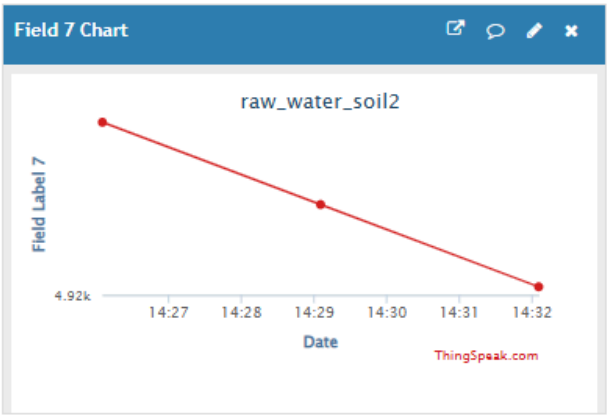


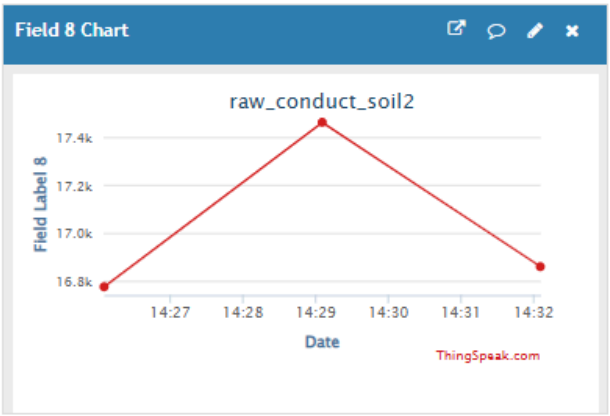












3. Configure SE0X-NB/NS

3.1 Configure Methods

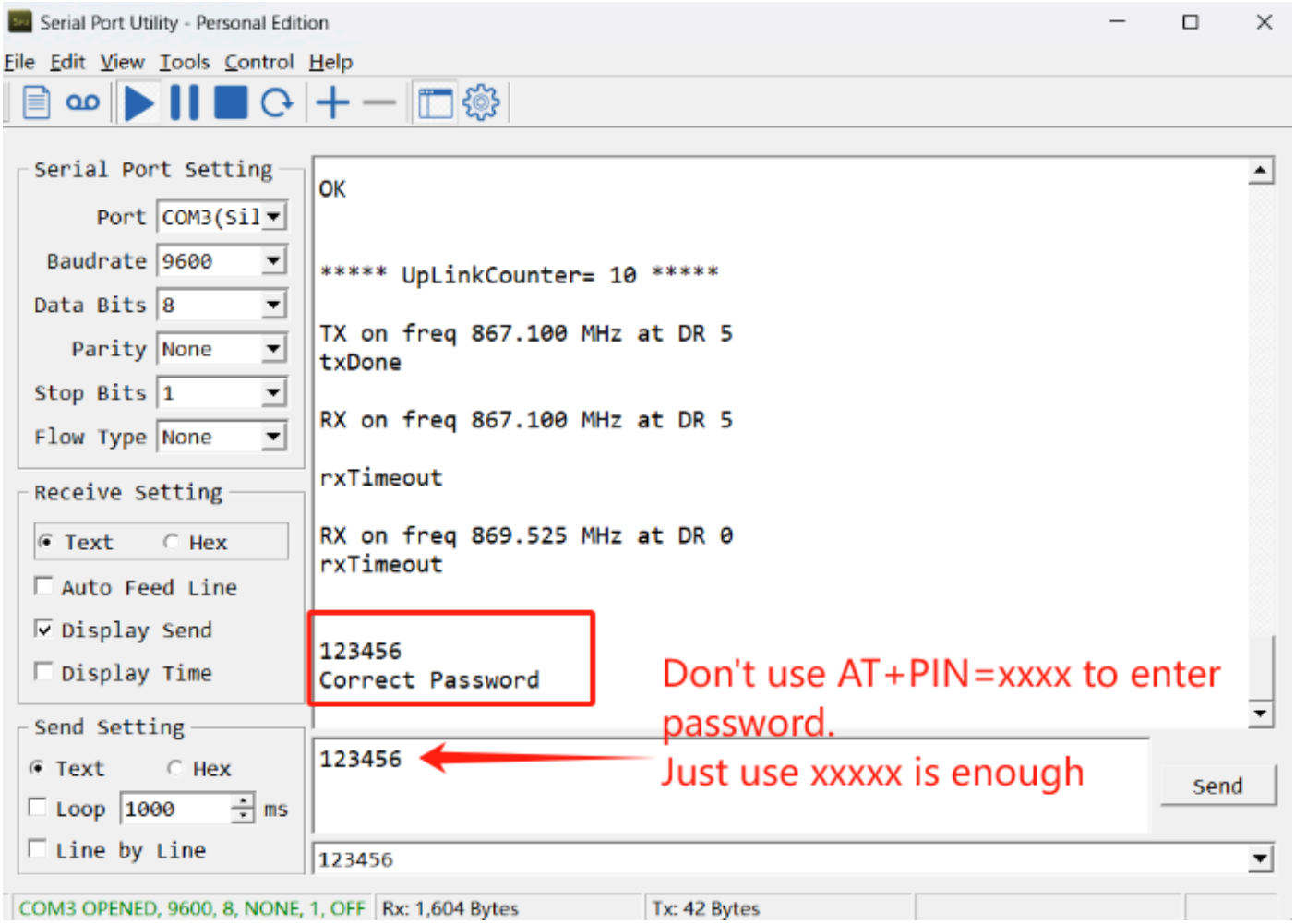
SE0X-NB/NS supports below configure method:

- AT Command via Bluetooth Connection (**Recommended**): BLE Configure Instruction.
- AT Command via UART Connection : See UART Connection.

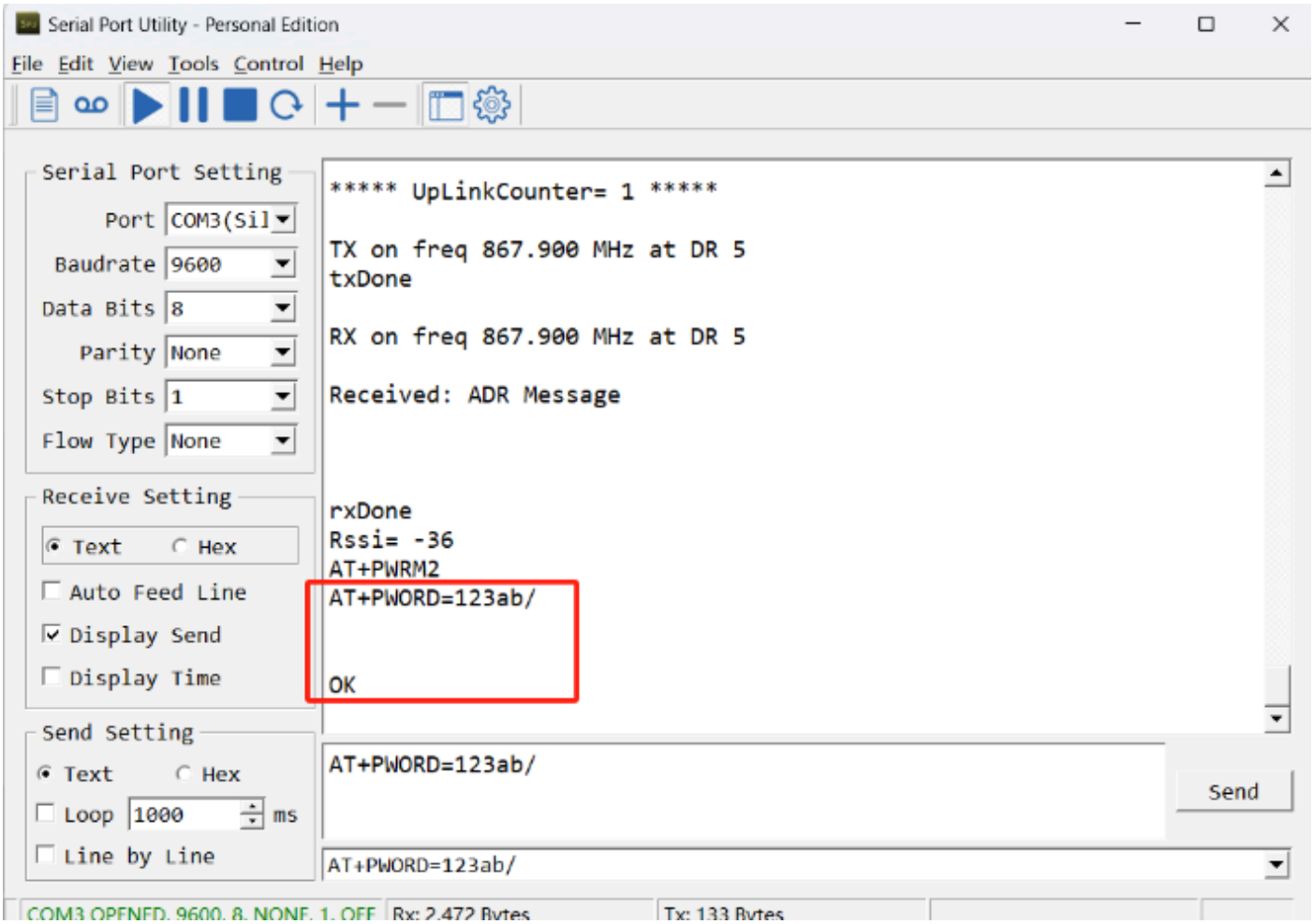
3.2 Serial Access Password

After the Bluetooth or UART connection is successful, use the Serial Access Password to enter the AT command window.

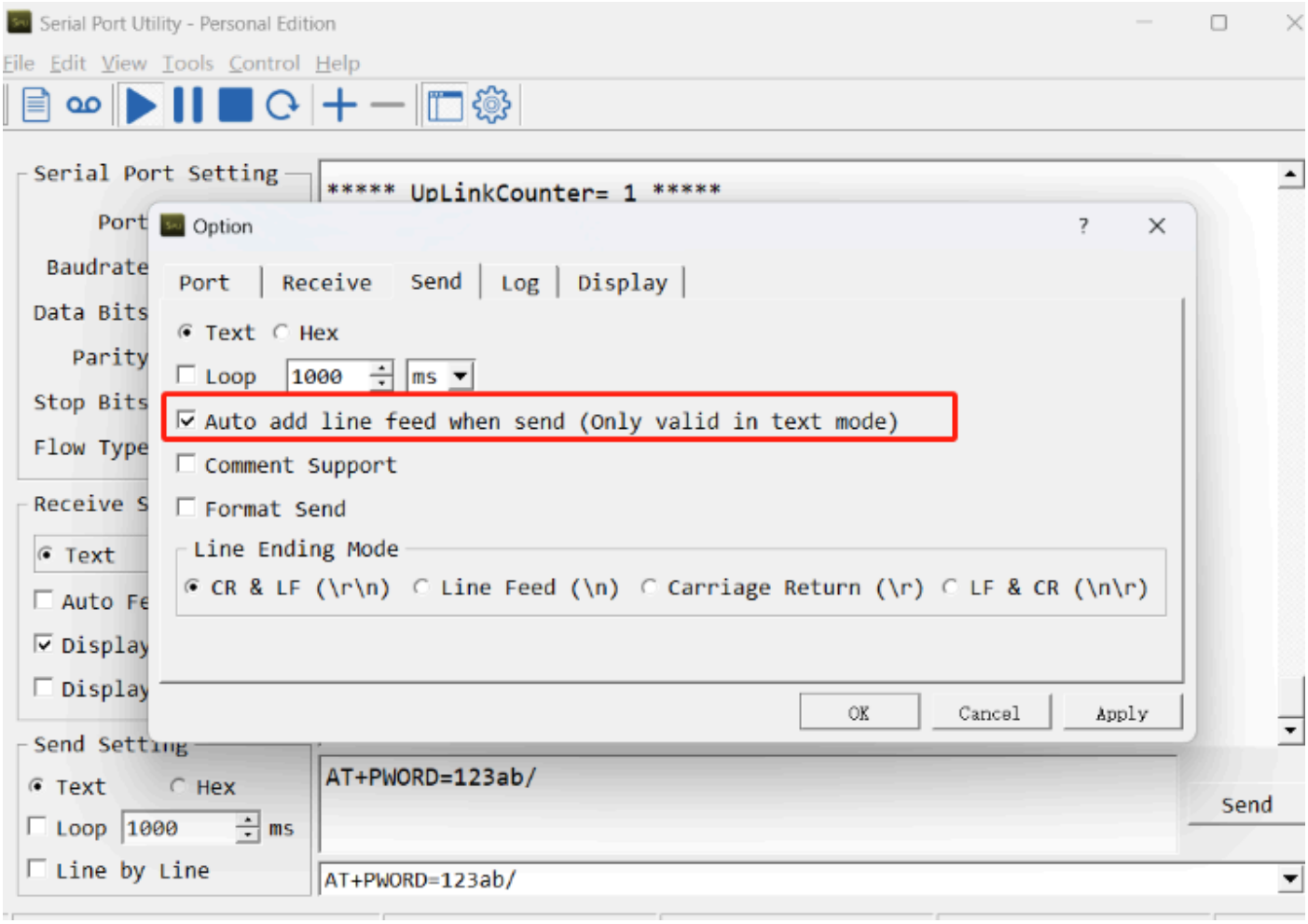
The label on the box of the node will print the initial password: AT+PIN=**xxxxxx**, and directly use the six-digit password to access the AT instruction window.



If you need to change the password, use **AT+PWORD=**xxxxxx (6 characters), -NB nodes only support lowercase letters.



Note: After entering the command, you need to add a line break, and you can also set automatic line breaks in the Bluetooth tool or UART connection tool.



3.3 AT Commands Set

AT+<CMD>? : Help on <CMD>

AT+<CMD> : Run <CMD>

AT+<CMD>=<value> : Set the value

AT+<CMD>=? : Get the value

General Commands

AT : Attention

AT? : Short Help

AT+MODEL : Get module information

ATZ : Trig a reset of the MCU

AT+CFGMOD : Working mode selection

AT+DEUI : Get or set the Device ID

AT+SERVADDR: Get or Set the Server address

AT+TDC : Get or set the application data transmission interval in s

AT+INTMOD : Get or Set the trigger interrupt mode (0:input,1:falling or rising,2:falling,3:rising)

AT+APN : Get or set the APN

AT+5VT : Get or Set extend the time of 5V power

AT+PRO : Get or Set usage agreement (1:COAP,2:UDP,3:MQTT,4:TCP)

AT+RXDL : Get or Set the receiving time

AT+GETSENSORVALUE : Returns the current sensor measurement

AT+DNSCFG : Get or Set DNS Server

AT+CSQTIME : Get or Set the time to join the network

AT+BKDNS : Get or Set dynamic domain name resolution IP

AT+SLEEP : Get or Set the sleep mode

AT+DOWNTE: Get or set the conversion between the standard version and 1T version downlinks

AT+MADD: Change the sensor address to 0x01, 0x02, 0x03, 0x04

MQTT Management

AT+CLIENT : Get or Set the MQTT clientID

AT+UNAME : Get or Set the MQTT Username

AT+PWD : Get or Set the MQTT password

AT+PUBTOPIC: Get or set MQTT publishing topic

AT+SUBTOPIC: Get or set MQTT subscription topic

AT+MQOS : Set the QoS level of MQTT

AT+TLSMOD : Get or Set the TLS mode

COAP Management

AT+URI1: Get or set CoAP option 1

AT+URI2: Get or set CoAP option 2

AT+URI3: Get or set CoAP option 3

AT+URI4: Get or set CoAP option 4

Information

AT+FDR1 : Reset parameters to factory default values except for passwords

AT+FDR : Reset Parameters to Factory Default

AT+CFG : Print all settings

AT+PWORD : Get or set the System password

AT+LDATA : Get the last upload data

AT+GETLOG : Print serial port logs

3.4 Test Uplink and Change Update Interval

By default, Sensor will send uplinks **every 2 hours.**

User can use below commands to change the uplink interval.

AT Command: AT+TDC

Example: AT+TDC=7200 // Set Update Interval to 7200 seconds

Downlink Commands: 0x01

Format: Command Code (0x01) followed by 3 bytes.

Example: 12 hours= 43200 seconds 43200(D)=0xA8C0(H)

Downlink Payload: **01 00 A8 C0** // AT+TDC=43200, Set Update Interval to 12 hours.

Note: User can also push the button for more than 1 second to activate an uplink.

3.5 Working mode selection

Feature: Working mode selection.

AT command: AT+CFGMOD

Command Example	Function
AT+CFGMOD=0	Set the operating mode to the default mode
AT+CFGMOD=1	Setting the operating mode to the original mode

Downlink Command: 0x02

- Downlink command: 02 01 // Equal to AT+CFGMOD=0
- Downlink command: 02 02 // Equal to AT+CFGMOD=1

3.6 Set the receiving time

Feature: Extend the receiving time

AT Command: AT+RXDL

Example: AT+RXDL=1000 // Set the receiving time delay to 1000ms

Downlink Commands: 0x03

Format: Command Code (0x03) followed by 3 bytes.

Example: Downlink Payload: **03 00 03 E8** // AT+RXDL=1000

3.7 Reset

Feature: Trig a reset of the MCU.

AT Command: ATZ

Downlink Commands: 0x04FF

3.8 +5V

Feature: Set extend the time of 5V power.

AT Command: AT+5VT

Example: AT+5VT=2000 // Set extend the time of 5V power to 2000 ms

Downlink Commands: 0x05

Format: Command Code (0x05) followed by 3 bytes.

Example: Downlink Payload: **05 00 07 D0** // AT+5VT=2000

3.9 Trigger an uplink by external interrupt

SE0X-NB/NS has an external trigger interrupt function. Users can use the GPIO_EXTI pin to trigger the upload of data packets.

AT command:

- **AT+INTMOD** // Set the trigger interrupt mode
- **AT+INTMOD=0** // Disable Interrupt
- **AT+INTMOD=1** // Trigger by rising and falling edge
- **AT+INTMOD=2** // Trigger by falling edge
- **AT+INTMOD=3** // Trigger by rising edge

Downlink Commands: 0x06

Format: Command Code (0x06) followed by 3 bytes.

Example1: Downlink Payload: **06 00 00 01** // AT+INTMOD=1

Example2: Downlink Payload: **06 00 00 03** // AT+INTMOD=3

3.10 Set the QoS level

This command is used to set the QoS level of **MQTT**.

AT command:

- **AT+MQOS=xx** // 0~2

Downlink command: 0x07

Format: Command Code (0x07) followed by 1 byte.

Ex1: Downlink payload: **0x0700** // AT+MQOS=0

Ex2: Downlink payload: **0x0701** // AT+MQOS=1

3.11 Set the TLS mode

Refer to this link (MQTT Connection to send data to Tago.io)to use the TLS mode.

AT Command: AT+TLSMOD

Example 1: AT+TLSMOD=0,0 // Disable TLS Mode.

Example 2: AT+TLSMOD=1,0 // No authentication

AT+TLSMOD=1,1 // Perform server authentication

AT+TLSMOD=1,2 // Perform server and client authentication if requested by the remote server

Downlink command: 0x09

Format: Command Code (0x09) followed by 2 bytes.

Example1: Downlink Payload: **09 00 00** // AT+TLSMOD=0,0

Example2: Downlink Payload: **09 01 02** // AT+TLSMOD=1,2

3.12 Set the search network time

Feature: Get or Set the time to join the network(unit: minutes).

AT Command: AT+CSQTIME

Example: AT+CSQTIME=10 // Set the search time to 10 minutes.

Downlink command: 0x13

Format: Command Code (0x13) followed by 1 byte.

Example: Downlink Payload: **13 0A** // AT+CSQTIME=10

3.13 Factory data reset

Two different restore factory Settings configurations.

AT command:

- **AT+FDR** // Reset Parameters to Factory Default.
- **AT+FDR1** // Reset parameters to factory default values **except for passwords**.

3.14 Set CoAP option

This command sets the connection parameters of the COAP.

AT command: AT+URI1~AT+URI4

- AT+URI1 // CoAP option name, CoAP option length, "CoAP option value"
- AT+URI2 // CoAP option name, CoAP option length, "CoAP option value"
- AT+URI3 // CoAP option name, CoAP option length, "CoAP option value"
- AT+URI4 // CoAP option name, CoAP option length, "CoAP option value"

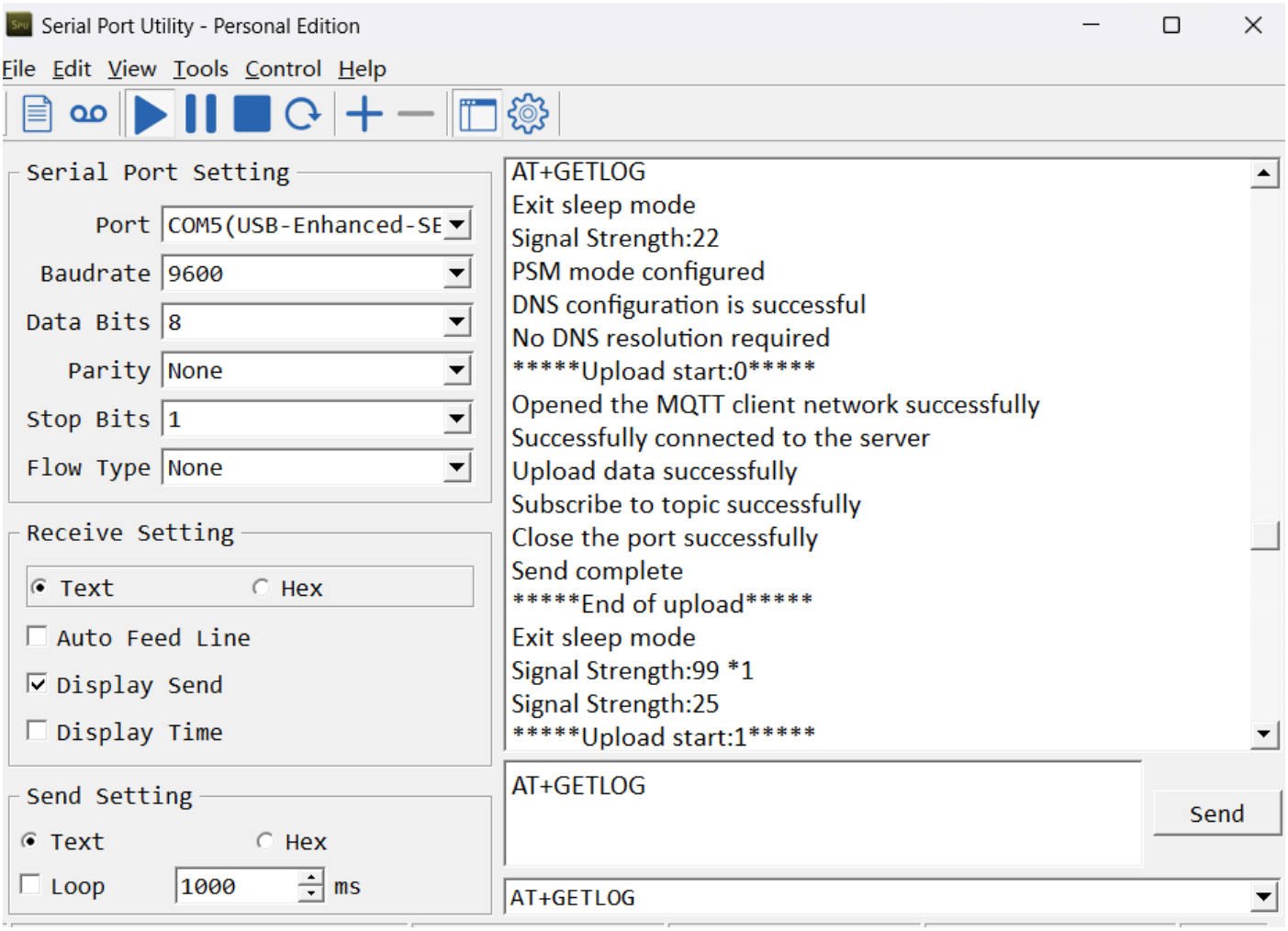
Example:

- AT+URI1=11,38,"i/faaa241f-af4a-b780-4468-c671bb574858"

3.15 Uplink log query

- **AT command: AT+GETLOG**

This command can be used to query upstream logs of data packets.



3.16 Setting the sensor address

Function:Change the sensor address to 0x01, 0x02, 0x03, 0x04

(Note:When setting the address of the sensor, you need to connect the device individually for each one, and when modifying the address, you can't connect more than one sensor at the same time, otherwise it will be impossible to modify it, and when modifying it, you need to connect the yellow wire to VBAT_OUT, and after modifying it, you need to disconnect it.)

AT Command: AT+MADD

Command Example	Function	Response
AT+MADD=1	Set sensor address to 01	Successfully modified sensor address to 0x01 OK
AT+MADD=2	Set sensor address to 02	Successfully modified sensor address to 0x02 OK

Downlink Command:

No downlink command for this feature.

3.17 Domain name resolution settings

Feature: Set dynamic domain name resolution IP.

AT command: AT+BKDNS

Command Example	Function/Parameters	Response/Explanation
AT+BKDNS=?	Get current Settings	0,0,NULL (default) OK

AT+BKDNS=a,b,c	**a**: Enable/Disable dynamic domain name resolution.	**1**: Disable dynamic domain name update. The ip address will be saved after the domain name is resolved, if the next domain name resolution fails, the last saved ip address will be used. **2**: Enable dynamic domain name update. The ip address will be saved after domain name resolution, if the next domain name resolution fails, the last saved ip address will be used, and the domain name resolution will be updated regularly according to the time set by the customer.
	b: Set the time to update the domain name resolution at regular intervals.	Unit: hour
	c: Set the IP address manually.	The format is the same as AT+SERVADDR. If domain name resolution fails, this ip address will be used directly, if domain name resolution succeeds, parameter c will be updated to the successfully resolved IP address.

Example:

- AT+BKDNS=1,0 // Dynamic domain name resolution is disabled.
- AT+BKDNS=2,1 // The dynamic domain name resolution function is enabled and the automatic update time is set to 1 hour.
- AT+BKDNS=2,4,3.69.98.183,1883 // The dynamic domain name resolution function is enabled and the automatic update time is set to 4 hour, and manually set the ip address, if the domain name failed to resolve, it will directly use this ip to communicate. When the next domain name resolution is successful, it will be updated to the ip address of the successful resolution.

Downlink Command:

No downlink commands for feature

3.18 Set the downlink debugging mode

Feature: Enable or disable downlink debugging mode. (Since TE platform update, the platform version selection is no longer needed; only downlink debugging can be toggled.)

AT command: AT+DOWNTE

Command Example	Function/Parameters	Response/Explanation

AT+DOWNTE=?	Get current Settings	0,0 (default) OK
AT+DOWNTE=0,a	a: Enable/Disable downlink debugging	0: Disable downlink debugging mode. 1: Enable downlink debugging mode (users can view original downlink messages).

(Note: The first parameter is fixed to 0 and only the second parameter is configurable.)

Example:

- AT+DOWNTE=0,1 → Enable downlink debugging mode.
- AT+DOWNTE=0,0 → Disable downlink debugging mode.

Downlink Command:

No downlink commands for feature

4. Battery & Power Consumption

SE0X-NB use ER26500 + SPC1520 battery pack and SE0X-NS use 3000mAh Recharable Battery with Solar Panel. See below link for detail information about the battery info and how to replace.

Battery Info & Power Consumption Analyze .

5. Firmware update

User can change device firmware to:

- Update with new features.
- Fix bugs.

Firmware and changelog can be downloaded from : Firmware download link

Methods to Update Firmware:

- (Recommended way) OTA firmware update via BLE: Instruction.
- Update through UART TTL interface : Instruction.

6. FAQ

6.1 AT Commands input doesn't work

In the case if user can see the console output but can't type input to the device. Please check if you already include the **ENTER** while sending out the command. Some serial tool doesn't send **ENTER** while press the send key, user need to add ENTER in their string.

6.2 Can I calibrate SE0X-NB/NS to different soil types?

SE0X-NB/NS can be used to measure EC/Moisture in different type of soil event concrete.

SE0X-NB/NS is calibrated for saline-alkali soil and loamy soil. If users want to use it for other soil, they can calibrate the value in the IoT platform base on the value measured by saline-alkali soil and loamy soil. The formula can be found at this link.

6.3 Why is there no LED response when I press the button on the solar panel model?

If the LED does not light up when you press the button, it may be because the battery has entered protection mode.

Solution: To reactivate the battery, simply expose the solar panel to direct sunlight.
For more details, please refer to: Battery Protection State (Apply to Solar Panel + Li-ion battery)

7. Order Info

Part Number: SE0X-NB/NS-XX

XX:

- **GE**: General version (Exclude SIM card)
- **1T**: with 1NCE * 10 years 500MB SIM card and Pre-configure to ThingsEye server

8. Packing Info

Package Includes:

- SE0X-NB/NS NB-IoT Soil Moisture & EC Sensor Transmitter
- External antenna x 1

Dimension and weight:

- Device Size: cm
- Device Weight: g
- Package Size / pcs : cm
- Weight / pcs : g

9. Support

- Support is provided Monday to Friday, from 09:00 to 18:00 GMT+8. Due to different timezones we cannot offer live support. However, your questions will be answered as soon as possible in the before-mentioned schedule.
- Provide as much information as possible regarding your enquiry (product models, accurately describe your problem and steps to replicate it etc) and send a mail to Support@dragino.cc.