

YL-103 LoRa Tag

Version: V1.0



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1、Product Overview

Adopt high-performance low-power single-chip STM8L, taking into account sensor data acquisition and wireless data transmission.

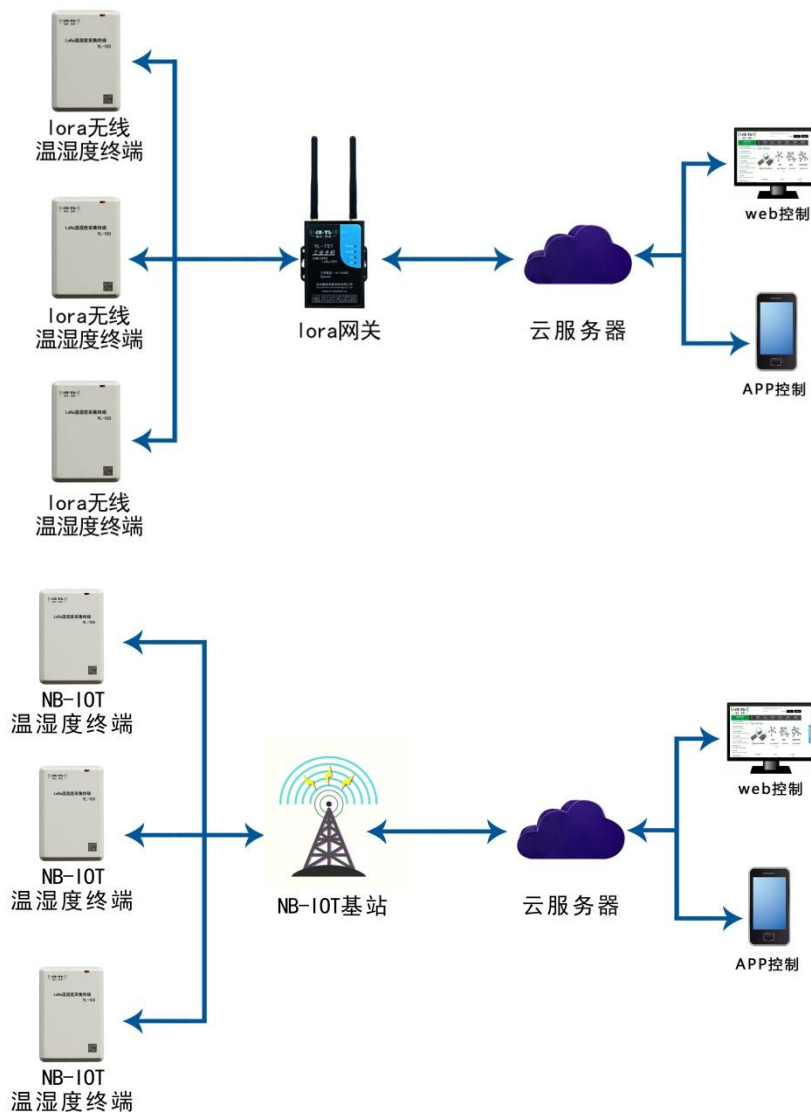
Built-in low-power high-precision digital temperature and humidity sensor chip, measurement and accuracy range:

Temperature: $\pm 1\text{ }^{\circ}\text{C}$ (max) @-10 to 85 $^{\circ}\text{C}$, -40 to +125 $^{\circ}\text{C}$

Humidity: $\pm 5\%$ RH(max)@0 - 90%RH, 0 to 100% RH.

Wireless data transmission uses LoRa and NB-IoT solutions:

LoRa solution (YL-103L): Based on Semtech's low-power long-distance LoRa spread spectrum wireless data transmission scheme Sx1278, it has a sleep wireless wake-up function with a signal coverage of 2km.



Built-in 1800mAH/2300mAH rechargeable lithium battery, long battery life, reusable.

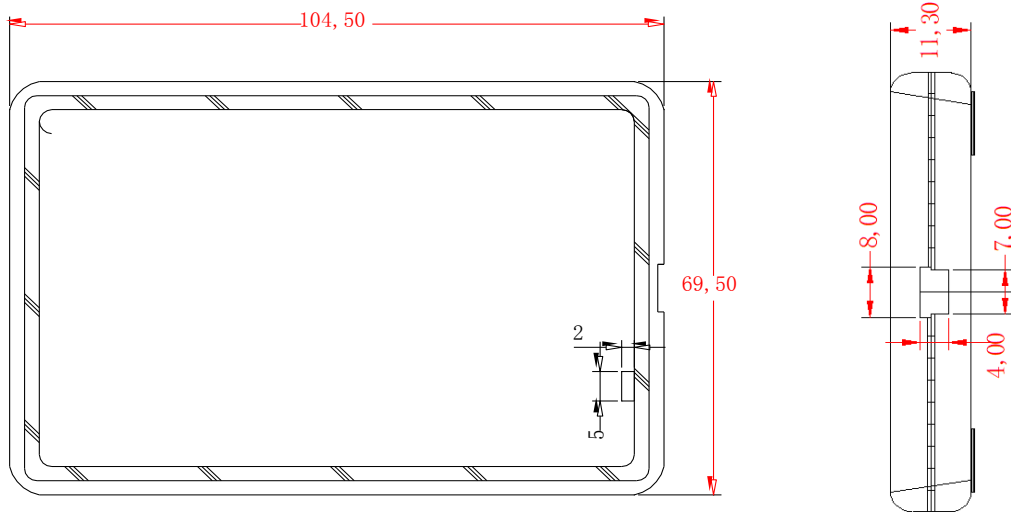
The card type is ultra-thin design, small in size and easy to install.

It is widely used in communication equipment room, workshop production line, drug warehouse, large-scale logistics warehouse, agricultural greenhouse, greenhouse flower greenhouse, archives, museum, HVAC control and other IoT application scenarios that require temperature and humidity monitoring and alarming.

2、Sensor Specifications

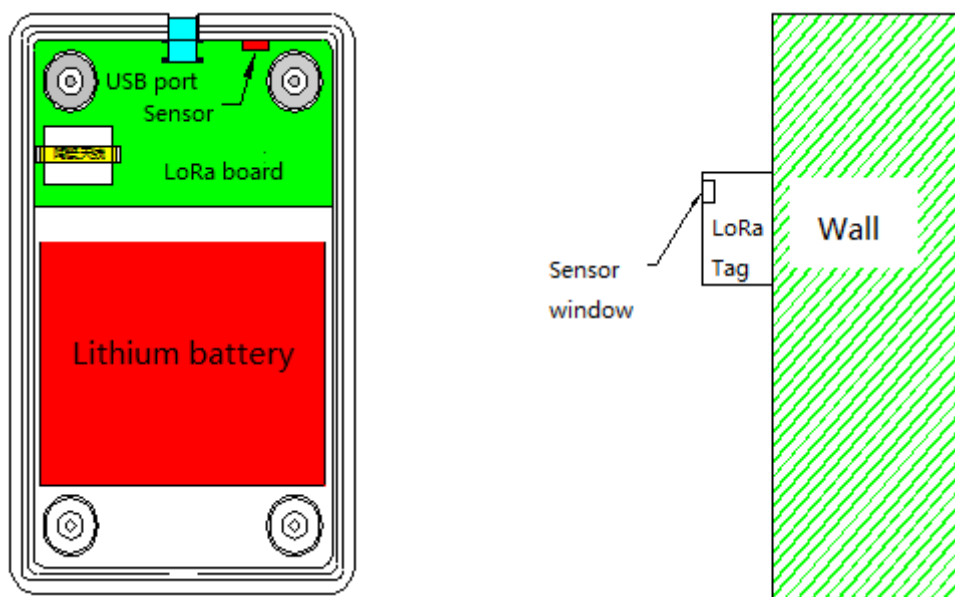
Type of wireless	LoRa solution	NB-IoT solution
Frequency	433MHz、490MHz	All bands
Range	2 km line of sight	NB-IoT network coverage
Power	Built-in1000mAh rechargeable lithium battery (high and low temperature battery is optional)	
Port	Mini-USB, the red and blue lights are always on when charging, fully charged, and the blue light is off.	
Temperature measurement	-20~60 ℃ (conventional lithium battery), -40~60 ℃ (low temperature lithium battery), -40~85 degrees (lithium battery), ± 1 ℃;	
Humidity measurement	0~99%RH, $\pm 5\%$ RH	
Sleep power consumption	10uA	
Parameter configuration	UART-TTL (Mini-USB connector form) or wireless connection configuration	
method of data collection	Timing report, the minimum can be set for 1 minute, the longest is 65536 minutes, if not set, it will not be reported.	
Period of detection	10 seconds, the red indicator light flashes	
Alarm threshold	The temperature and humidity alarm value can be set. When an alarm occurs, it will be reported three times within 1 minute; if it is not set, it will not be reported.	
size and weight	104.5*69.5*11.3mm, 85g (with lithium battery)	

3、 Dimension of the Tag.



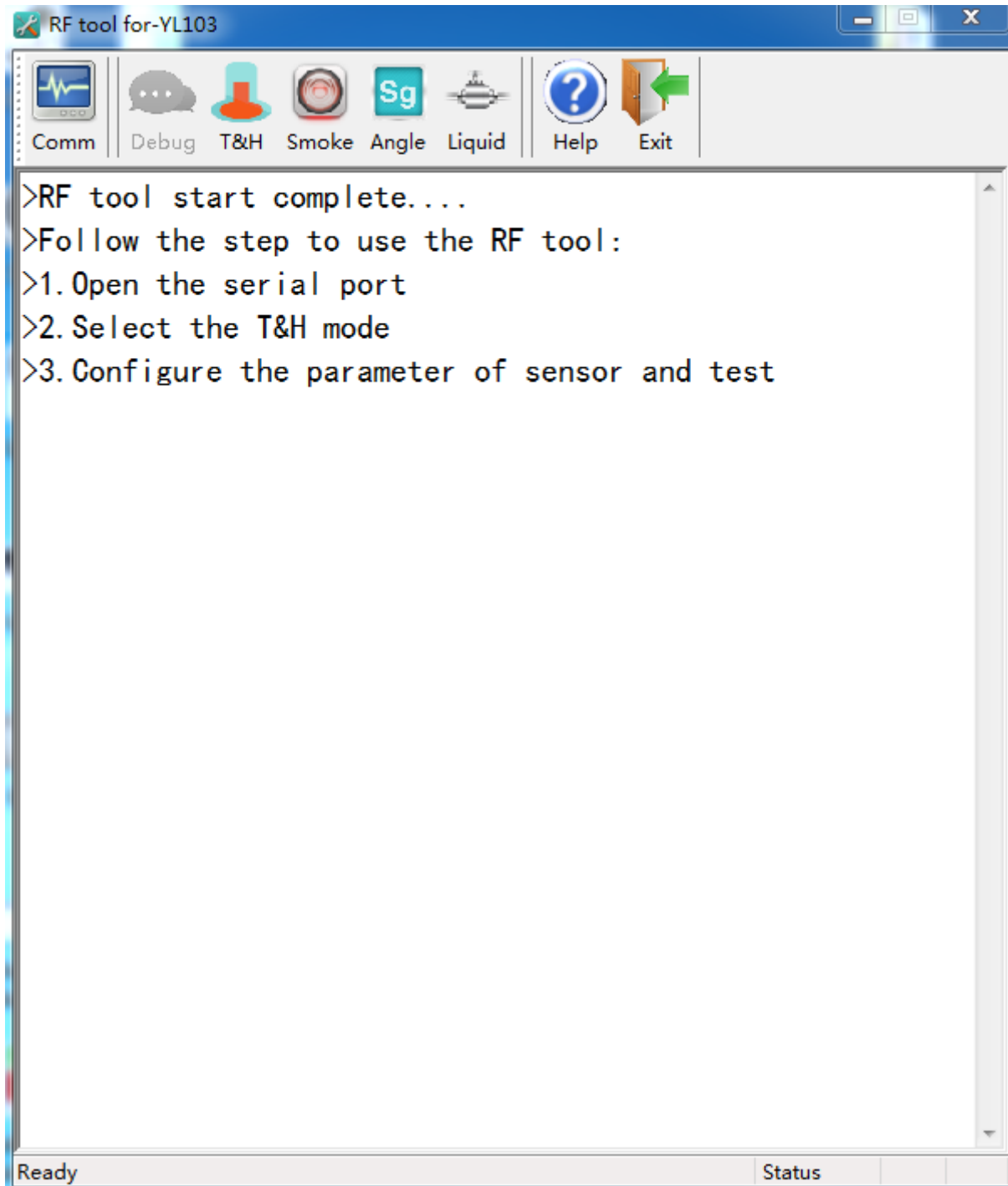
4、 Structure of the sensor and installation method

When installing the sensor, try to make the antenna perpendicular to the horizontal plane, and the wireless communication is the best.

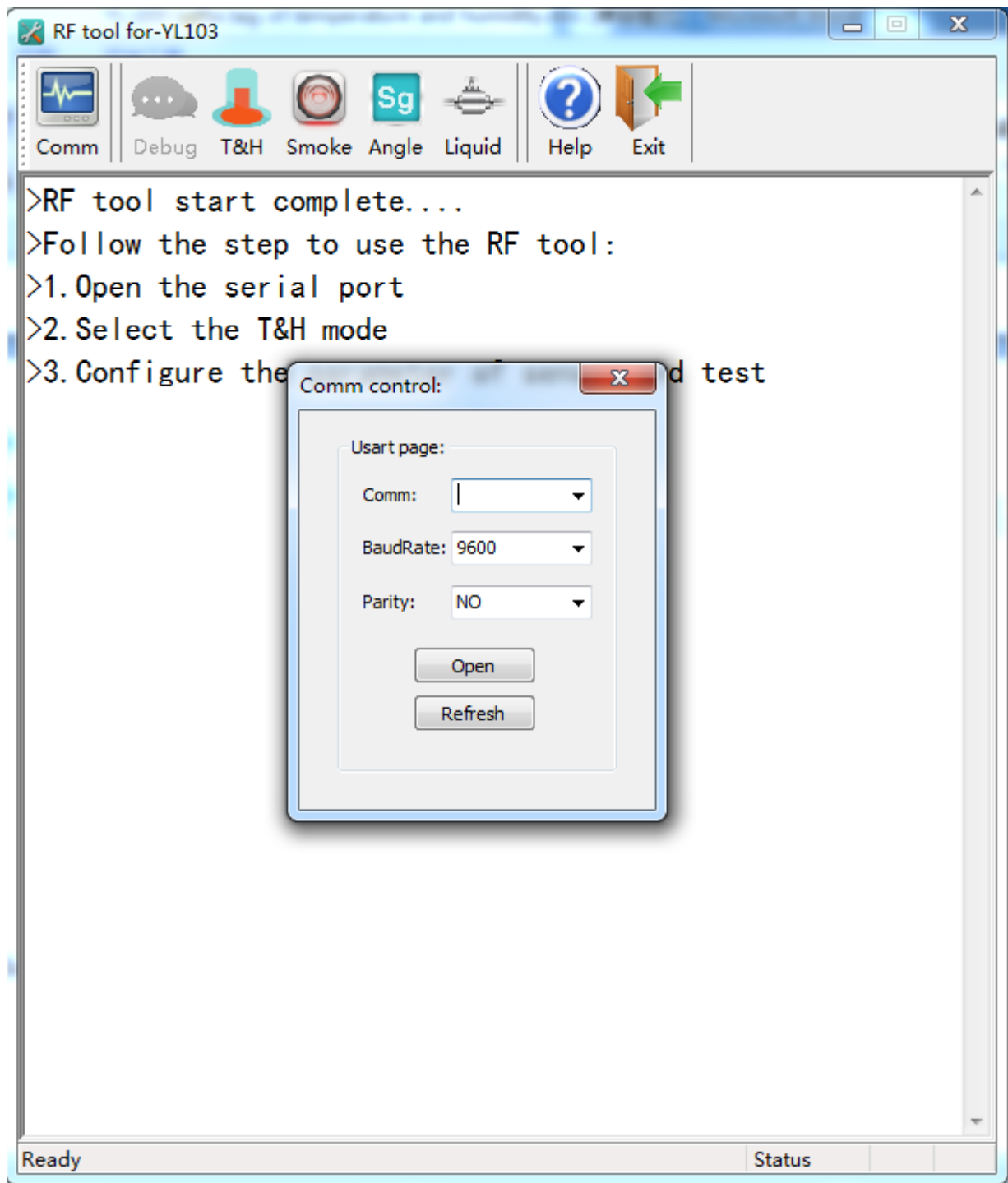


5、 Parameter configuration

The company provides parameter setting software for this sensor (LoRa version), wireless parameters such as frequency, breathing time, node address, network address, and transmission power, as well as sensing parameters such as sampling time, high temperature alarm, and humidity alarm.



After connecting the sensor to the computer through the USB-TTL data cable (mini-USB connector), the sensor is in the setting state, open the “Sensor Terminal Configuration Tool”, click “Serial Port”, pop-up “Serial Port Configuration Page”, select the sensor to connect to the computer. The COM port, with a baud rate of 9600, validates the NO open.



Click “Temperature” to pop up the sensor parameter configuration interface:

Parameter	Clarification							
Frequency	433MHz、490MHz							
Breath	2,4,8,16,32,64ms							
Node ID	0-65535							
Net ID	0-255							
Output power	Level	7	6	5	4	3	2	1
	dBm	19.5-20	17.5-18	14.5-15.5	11.5-12.5	8.5-9.5	5.5-6.5	5.5-6.5
	mA	110-120	90-100	60-70	45-55	40-45	30-40	30-40
Sample period	0-65535mins, set'0'means the YL-103 is closed.							
High temperature alarm	From-40°C to 85°C							
Humidity alarm	From 0 to 100%RH							
Write	Write the parameter.							
Read	Read the parameter.							

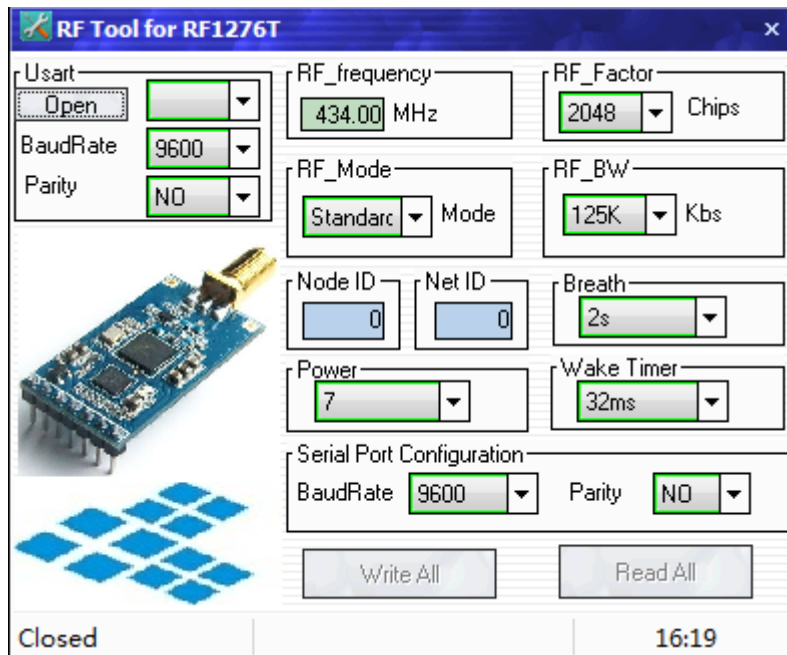
After the sensor parameters are configured, disconnect the data line to put the sensor into operation.

6、Display the sensor data by Rf tool

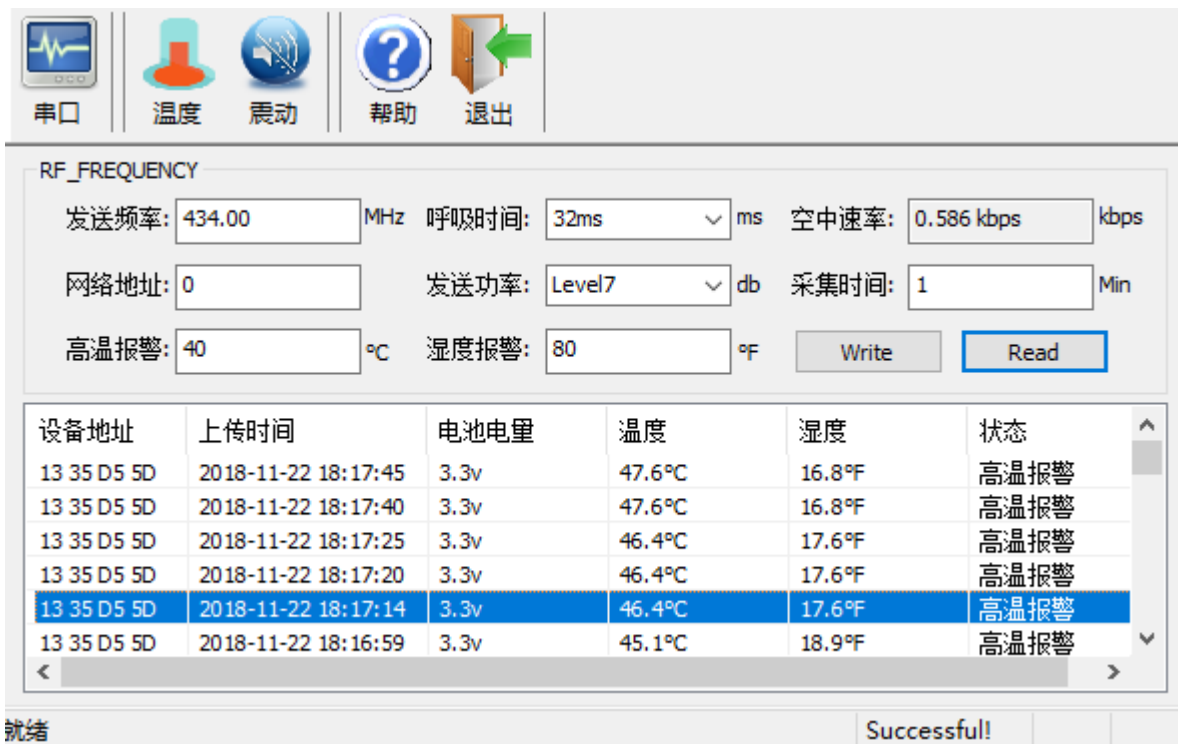
The company provides the RF1276T LoRa wireless data transmission module RF1276T. **Users need to set the RF1276T as Central mode, The Breath of YL-103 should be the same as the wake-timer of RF1276T. The Frequency and the Net ID should be the same for both YL-103 and RF1276T.** After the configuration finish, RF1276T can be used as the host computer module to communicate with the sensor and display the sensor data via RF tool.

Appconwireless provides a matching USB-TTL USB adapter cable, which can connect the TTL host computer module to the computer USB interface for parameter configuration or data acquisition.

The upper computer module has dedicated parameter configuration software, and the wireless parameters (sending frequency, breathing time, network address) need to be set to be consistent with the temperature and humidity sensor.



When the sensor is in the working state, the temperature and humidity data will be reported regularly according to the set collection time. Including: device ID, upload time, battery power, temperature, humidity, status, etc.



设备地址	上传时间	电池电量	温度	湿度	状态
13 35 D5 5D	2018-11-22 18:17:45	3.3v	47.6°C	16.8°F	高温报警
13 35 D5 5D	2018-11-22 18:17:40	3.3v	47.6°C	16.8°F	高温报警
13 35 D5 5D	2018-11-22 18:17:25	3.3v	46.4°C	17.6°F	高温报警
13 35 D5 5D	2018-11-22 18:17:20	3.3v	46.4°C	17.6°F	高温报警
13 35 D5 5D	2018-11-22 18:17:14	3.3v	46.4°C	17.6°F	高温报警
13 35 D5 5D	2018-11-22 18:16:59	3.3v	45.1°C	18.9°F	高温报警

The sensor will perform a temperature and humidity check every ten seconds. If any data exceeds the set alarm threshold, the temperature and humidity data (including the alarm status word) will be reported. The acquisition cycle will be re-timed.

7、Communication Protocol.

The user can make the host computer software or dock other systems according to the serial communication protocol of the host computer module.

Segment	Head	Node ID	The Catalog of sensor	Command type	Data length	Battery voltage	Temperature	Humidity	CRC	End Byte
Byte	1	4	1	1	1	2	2	2	1	1
Clarification	Head start 5E	The Node ID of YL-103(the address of YL-103)	'B0' is the humidity and temperature sensor	01= Data is normal , No Ack 82= Temperature alarm , need Ack 83= Humidity alarm, need ACK	The data length from the following byte to the 'CRC' byte.	Value= Transfer the hex to decimal. And multiply by 0.1			CRC	End byte is 16

“CRC” is the last two bit about the sum of previous data.

For example, the setting command is ‘‘ 0xAE 0xAE 0x00 0x00 0xAE 0x80 0x03 0x02 0x00 0x00 CRC 0x0D 0x0A’’ The sum of data before CS is

“0xAE+0xAE+0x00+0x00+0xAE+0x80+0x03+0x02+0x00+0x00=0x28F”. CRC is the low bit of the sum. CRC=0x8F.

Once the sensor has an alarm, it will report the message three times in a row for 5 seconds, until the host computer acknowledges receipt of the alarm signal.

Host computer back code communication format:

Segment	Head	Node ID	End
Bytes	1	4	1
Clarification	5E	Node ID of YL-103	16

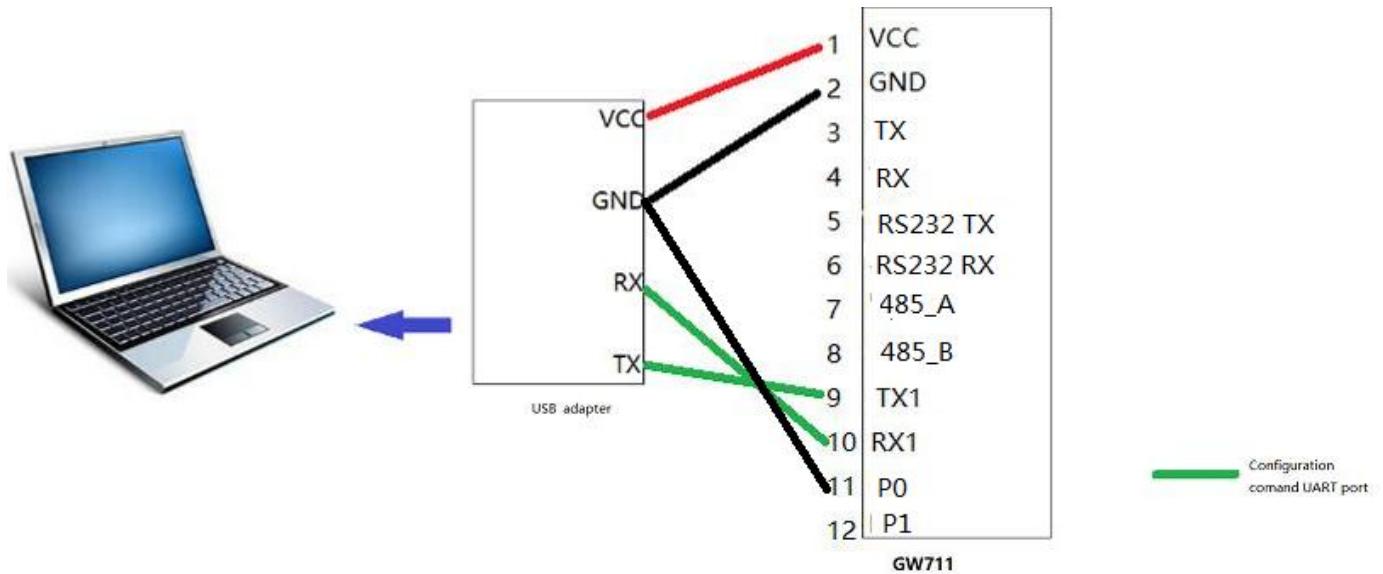
E.g. :

Example	Alarm status	Voltage	Temperature	Humidity
5E 00 00 00 01 B0 <u>01 06 00 26 00 D2 01</u> AF BE 16	No alarm	3.8V	21.0°C	43.1%RH
5E 00 00 00 01 B0 <u>82 06 00 26 01 7E 00</u> B3 EF 16 Ack from Master device : 5E 00 00 00 01 16	Humidity alarm	3.8V	38.2°C	17.9%RH
5E 00 00 00 01 B0 <u>83 06 00 26 00 D2 01</u> EA 7B 16 Ack from Master device : 5E 00 00 00 01 16	Temperature alarm	3.8V	21.0°C	49.0%RH

8, Connect the YL-103 with LoRa gateway GW711.



GW711 is lora gateway that can upload the YL-103 sensor data to cloud server. Connecting gateway with the Windows Laptop. User can adopt USB adapter connect gateway with laptop via USB port. As it is shown as below.



After finish the hardware connection, users can insert the SIM card into the gateway and power it on.

For 2G: The red light is always on. When the yellow light flashes and the green light flashes slowly, the Gateway initialization is complete before the setting operation can be performed.

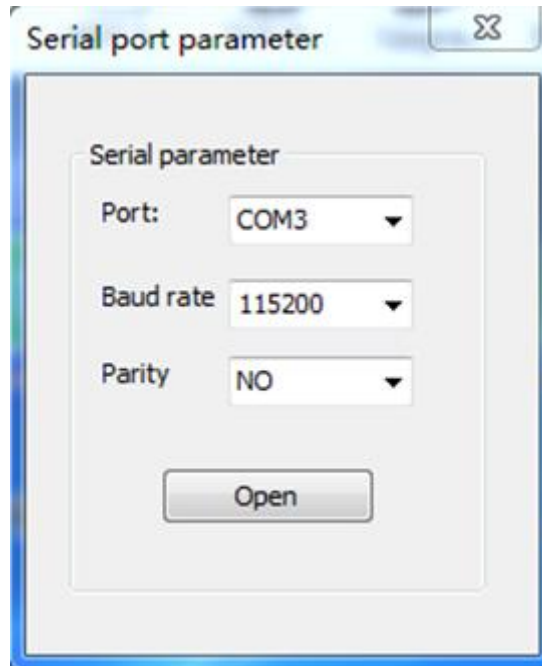
For 4G: The red light is always on, waiting for the yellow light to finish flashing, the blue light is on to indicate that there is 4G signal, the red light is on to indicate that there are other network signals, and the Gateway initialization is completed before the setting operation can be performed.

According to the GW711, we develop this RF tool to configure the parameter of Gateway GW711.

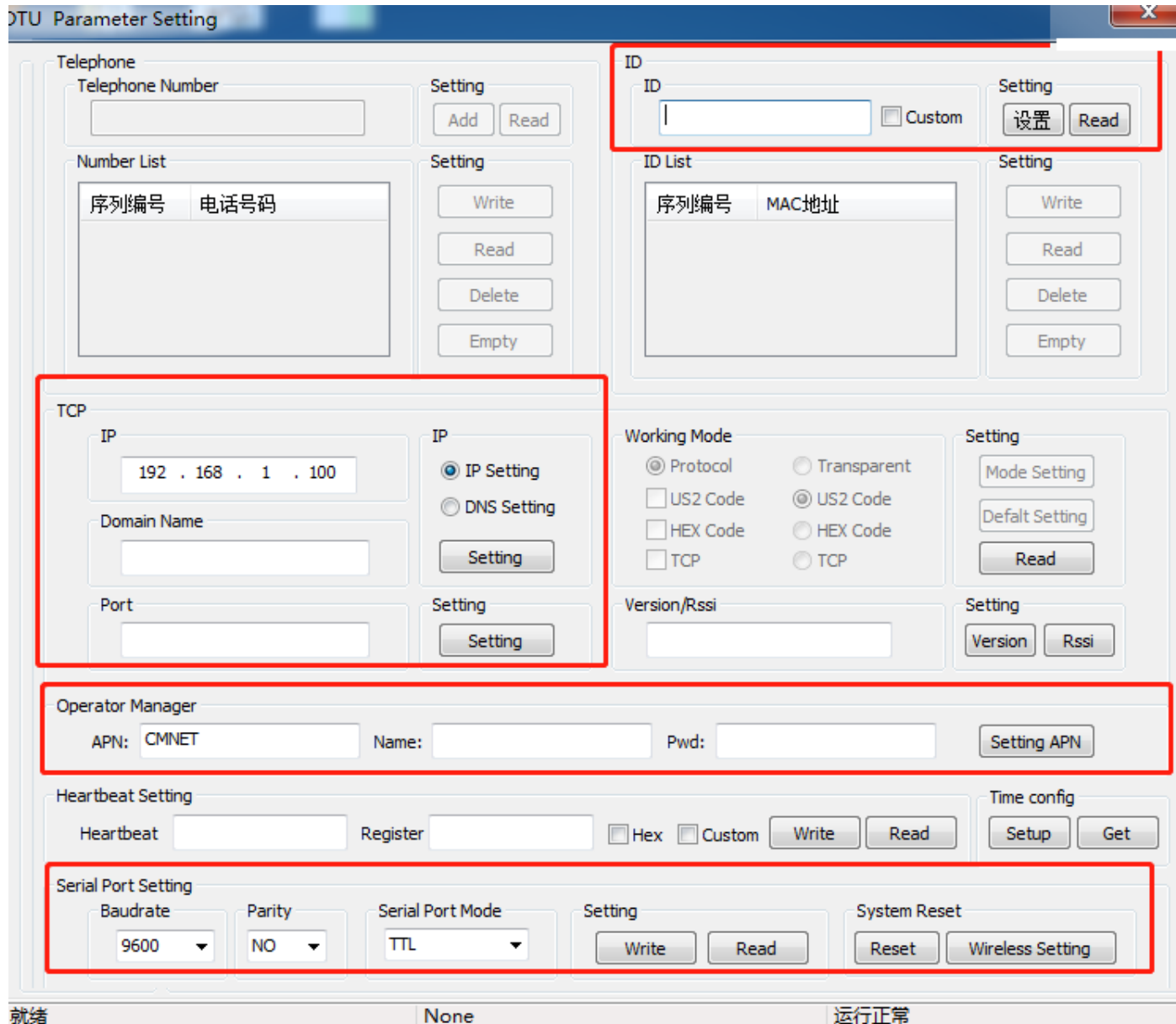
The RF tool consists of serial port parameter, DTU parameter. We will introduce the RF tool as follow:



Serial port parameter: mainly for the connection between the computer and GW711, you can select the serial port, choose to set the serial port number of the serial port connection, select the baud rate 115200, verify the default NO, open the serial port.



Commonly used setting function parameters include: TCP server management, carrier management, serial port parameter management, LoRa wireless parameter configuration, and so on. As shown in the red box below.

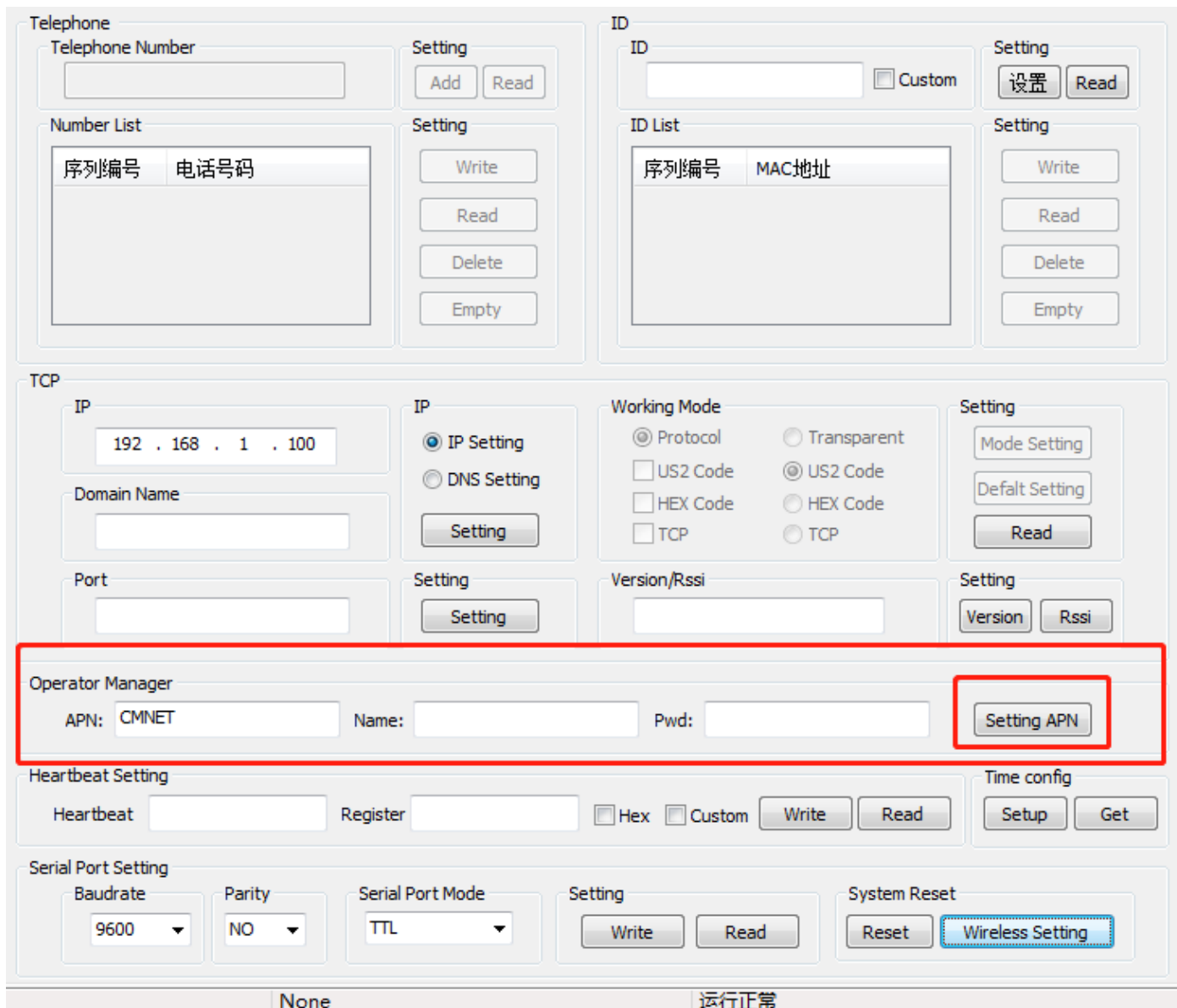


TCP server management:

1. "Remote Server" can set the remote server IP, domain name and port.
2. Click the "Settings" button to save the current settings.
3. Click the "Default" button to restore the "TCP Settings Parameters" to the factory settings.
4. Click the "Read" button to read the current "TCP Settings Parameters".
5. The status bar under all successful operating software has a "Success" prompt.

Telecom Operator Management:

By default, the SIM cards of the three major operators in China are supported. Other operators need to set the APN. The value of APN can enquiry from SIM card operator.



The screenshot shows the configuration interface for the YL-103 LoRa Tag. The 'Operator Manager' section is highlighted with a red box, indicating the APN setting process. The APN is set to 'CMNET'. The 'Name' and 'Pwd' fields are empty. A 'Setting APN' button is also highlighted with a red box.

Other sections visible include:

- Telephone:** Telephone Number, Number List (with columns for 序列编号 and 电话号码), and Setting buttons (Add, Read, Write, Read, Delete, Empty).
- ID:** ID field, Custom checkbox, ID List (with columns for 序列编号 and MAC地址), and Setting buttons (设置, Read, Write, Read, Delete, Empty).
- TCP:** IP (192 . 168 . 1 . 100), Domain Name, Port, IP Setting (IP Setting selected, DNS Setting), Working Mode (Protocol selected, US2 Code, HEX Code, TCP, Transparent, US2 Code, HEX Code, TCP), Version/Rssi, and Setting buttons (Mode Setting, Default Setting, Read, Version, Rssi).
- Heartbeat Setting:** Heartbeat, Register, Hex, Custom, Write, Read, Time config (Setup, Get).
- Serial Port Setting:** Baudrate (9600), Parity (NO), Serial Port Mode (TTL), Setting (Write, Read), System Reset (Reset, Wireless Setting).

At the bottom, the status is shown as 'None' and '运行正常'.

APN setting

Serial port parameter management:

1. The serial port baud rate can be set: 1200/240/4800/9600/38400/57600/115200bps, the default is 9600bps;
2. The parity of serials can be set: NO check / odd check ODD / even check EVEN, the default is no check NO;
3. Select the interface mode: TTL/RS232/RS485, three choices, the default is TTL;
4. After setting the parameters, you can click “Reset” to quickly restart the GW711 to enable the new parameters;

Wireless configuration:

1. This is used to configure the LoRa parameters of GW711.
2. The radio frequency, breath period, Wake timer and network ID. These parameters must be compatible with the salve YL-103 LoRa tag.
3. The output power has 7 levels. The defaults is 7.

Telephone

Telephone Number

Setting

Number List

序列编号	电话号码

Setting

ID

ID Custom

ID List

序列编号	MAC地址

Setting

TCP

IP

Domain Name

Port

IP IP Setting DNS Setting

Setting

Working Mode

Protocol Transparent

US2 Code US2 Code

HEX Code HEX Code

TCP TCP

Setting

Setting

Version/Rssi

Setting

Operator Manager

APN: Name: Pwd:

Heartbeat Setting

Heartbeat Register Hex Custom

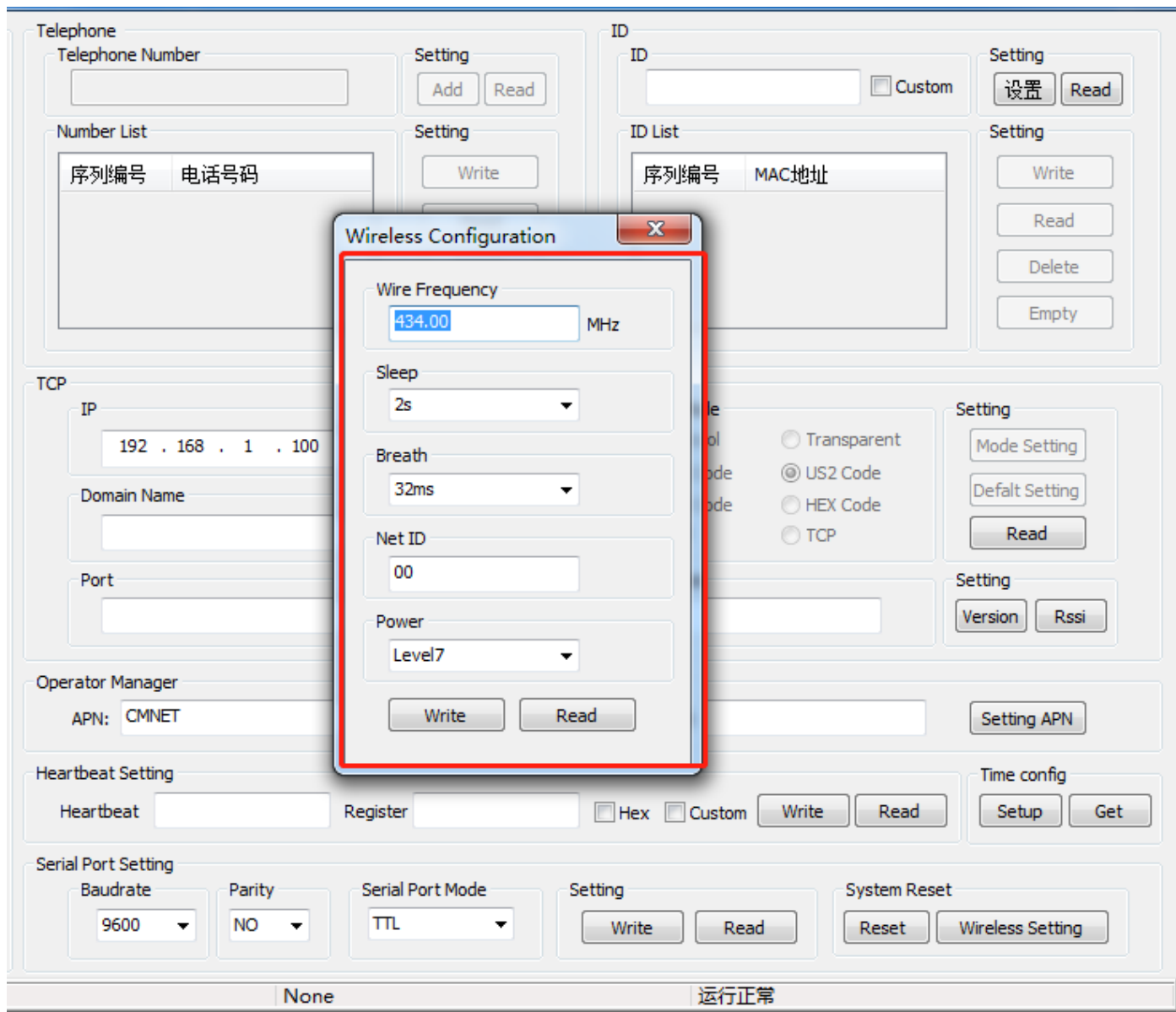
Serial Port Setting

Baudrate Parity Serial Port Mode

Setting System Reset

None 运行正常

Wireless Setting



LoRa parameter configuration

9, The LoRa data format of YL-103 sensor data and Cloud server

Radio	Segment	Head	Gateway ID	Command type	Command	Data length	Sensor Node ID	V	T	H	CRC	End Byte
	Byte No.	1	6	1	1	2	4	2	2	2	1	1
LoRa	Clarification	Head 68	Mac address	B0	01= Data is normal , No Ack 82= Temperature alarm , need Ack 83= Humidity alarm, need ACK		Sensor Node ID	Value= Transfer the hex to decimal. And multiply by 0.1				0x16

Data length: The data length from the following byte to the 'CRC' byte.

“CRC” is the last two bit about the sum of previous data.

For example, the setting command is ‘ 0xAE 0xAE 0x00 0x00 0xAE 0x80 0x03 0x02 0x00 0x00 CRC 0x0D 0x0A’ The sum of data before CS is

“0xAE+0xAE+0x00+0x00+0xAE+0x80+0x03+0x02+0x00+0x00=0x28F”. CRC is the low bit of the sum. CRC=0x8F.

Command type=B0 , the sensor data upload successfully .		
01 Regular sensor of YL-103	68 00 00 00 00 00 01 B0 01 00 0A XX XX XX XX MH ML DH DL CH CL CRC 16	Data length : 00 0A XX XX XX XX : sensor node ID
82 Alarm temperature sensor data	68 00 00 00 00 00 01 B0 82 00 0A XX XX XX XX MH ML DH DL CH CL CRC 16	MH ML: YL-103 voltage. e.g. Decimal 33 , is the voltage 3.3V
83 Alarm humidity sensor data	68 00 00 00 00 00 01 B0 83 00 0A XX XX XX XX MH ML DH DL CH CL CRC 16	DH DL is the temperature E.g : Decimal 295 , Temperture 29.5°C
11 Temperature sensor data only	68 00 00 00 00 00 01 B0 11 00 08 XX XX XX XX MH ML DH DL CRC 16	CH CL humidity
12 Humidity sensor data only	68 00 00 00 00 00 01 B0 12 00 08 XX XX XX XX MH ML DH DL CRC 16	E.g : Decimal 153 , Humidity 15.5%

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