Solar Panel LoRa RS485 Sensor Model LS820

V1.0

## Catalogue

1、Product Overview

LS820 is a high-performance, low power consumption, long distance RS485 sensor reading device. LS820 can be connected to any RS485 sensor and actively power the RS485 sensors at regular period to achieve long-distance, ultra-low power wireless transmission. LS820 consists of Solar panel, Lithium battery, GPS module and LoRa radio board. It can support the sensor for pressure, liquid level, liquid flow and other related industries.

- LS820 always goes sleep with ultra-low power consumption.
- The standby current less than 6uA;
- Built-in large capacity lithium battery and solar panel. User do not need to charge and change the battery;
- IP65 waterproof design, screw holes at both ends are fixed, small size and easy installation;
- LS820 can set the sampling time and upload the sensor data periodically;
- Sensor data can upload to the cloud server.
- Support pressure liquid level sensors, liquid pressure sensor, liquid flow management and other RS485 sensor.
- LS820 can support customized sensors and apply for customized services from business or personally

Wireless data transmission uses LoRa, LoRaWAN and NB-IoT solutions:

LoRa Solution (LS820L): Semtech's low-power long-range LoRa spread spectrum wireless data transmission solution Sx1276, with a signal coverage of 1km.
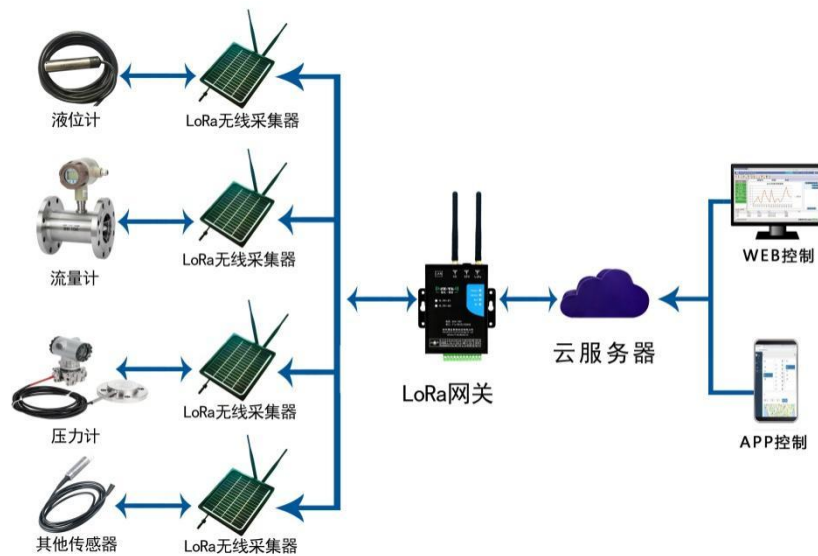
NB-IoT solution (LS820N): Based on MTK high-performance NB-IoT chip, full Netcom network standard, adapting to the three major operator networks, low-power design, data is uploaded directly to the user cloud platform through NB base stations.
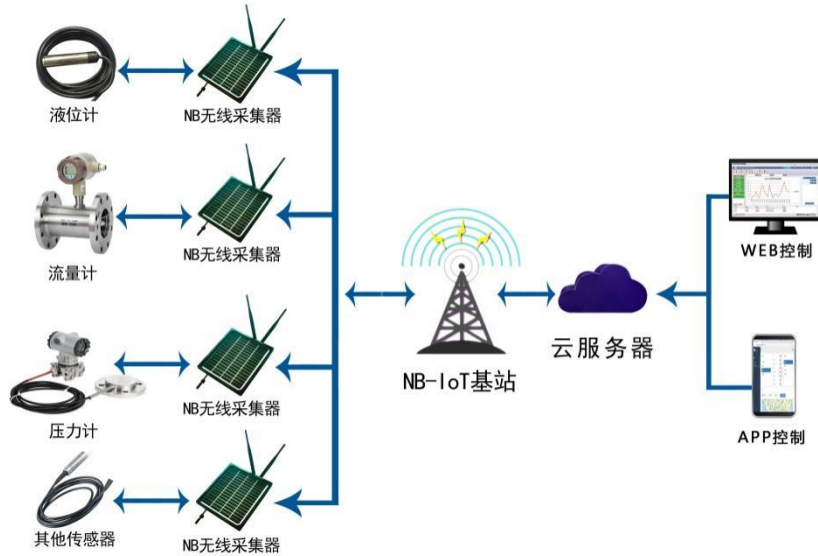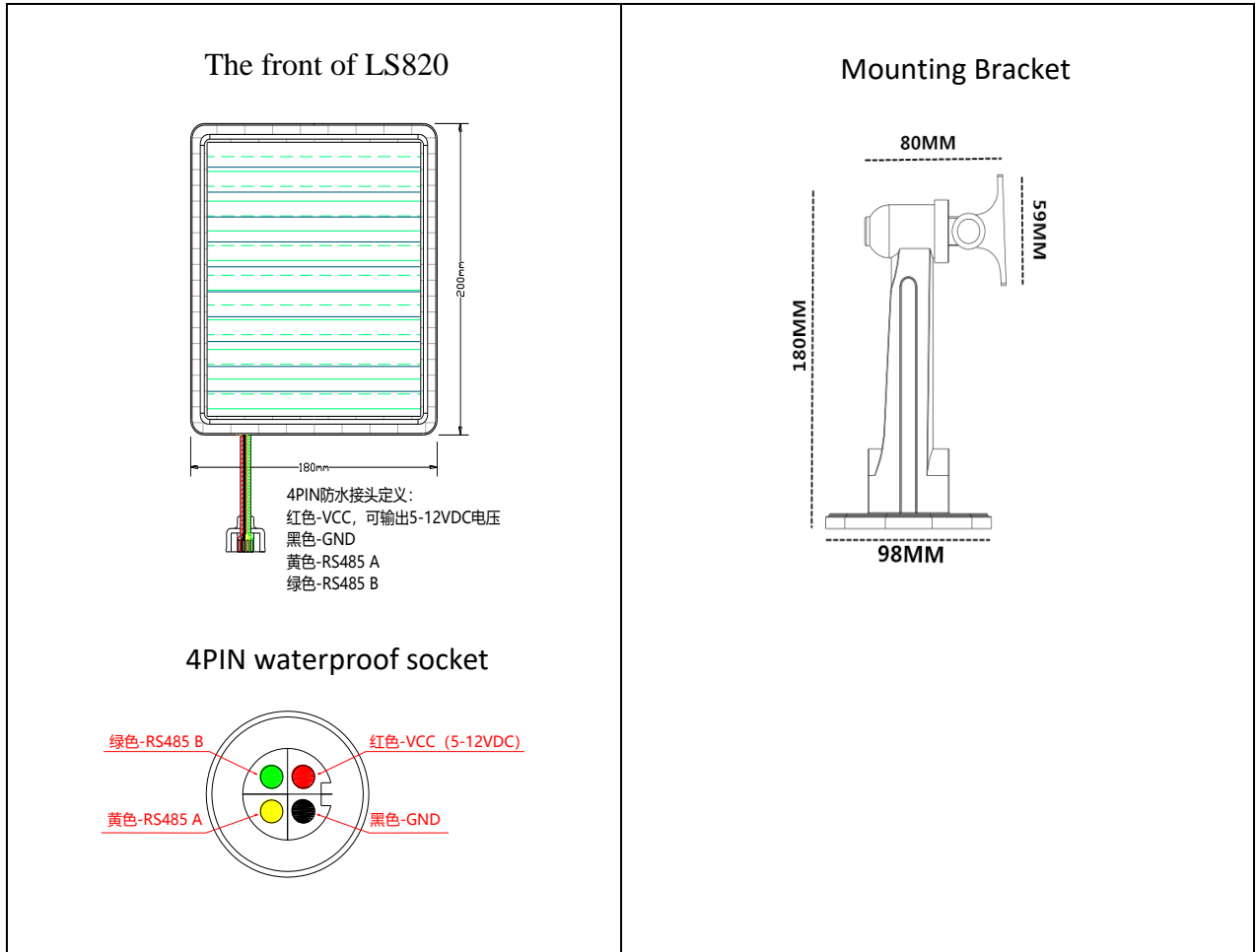
2、Sensor Specifications

Type of wireless	LoRa solution	NB-IoT solution
Frequency	433MHz、490MHz,868MHz, 915MHz	All bands
Range	2 km line of sight	NB-IoT network coverage
Power	2600mAh lithium battery (high and low temperature battery is optional)	
	5W charging solar panel (charging current max 300mA)	
Port	RS485 port, the red is VCC(12V). the black is GND. The yellow is 485A, The Green is 485B.	
Transmitting Currency	<130mA	
GPS paramter	Support GSP and BD position positioning accuracy：≤2.5m	
Standby Currency	6uA	
Use environment	Outdoor, -20~55 ℃ humidity 0–95%;	
Waterproof	IP67	
Sleep power	10uA	

consumption	
LED Indication	Enter the configuration mode, blue slow flashing (if there is no operation, it will automatically exit after 30 seconds and start sleep); When sending data, the blue light flashes. Detect every 10 seconds and the red light flashes one time. When the solar panel is charged, the red light is on, and the light is off after full charge.
Parameter configuration	Connect the data cable, the magnet attracts the Hall switch to enter the configuration mode, configure the parameters and collect data commands
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.
Alarm threshold	The sensor 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	200*180*30mm, 770g (with lithium battery)

3. Dimension of LS820.

The front of LS820

4PIN防水接头定义：
红色-VCC，可输出5-12VDC电压
黑色-GND
黄色-RS485 A
绿色-RS485 B

4PIN waterproof socket

绿色-RS485 B
红色-VCC（5-12VDC)
黄色-RS485 A
黑色-GND

Mounting Bracket

80MM
59MM
180MM
98MM

4、Installation of LS820

When installing LS820, try to make the antenna perpendicular to the horizontal plane, and the wireless communication is the best.

When installing the LS820, as shown in the figure below, it can be installed close to the wall in parallel or fixed, or parallel to the ground. It can be relatively open (within 1 meter) around the collector, without obstruction, and the wireless communication effect is the best.
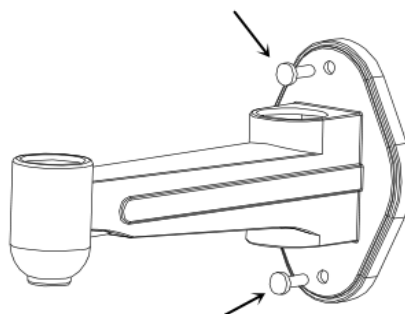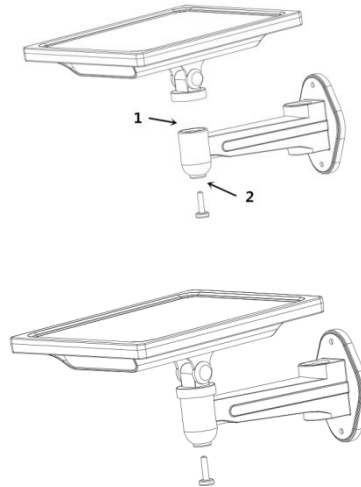
a. There are three parts of bracket.
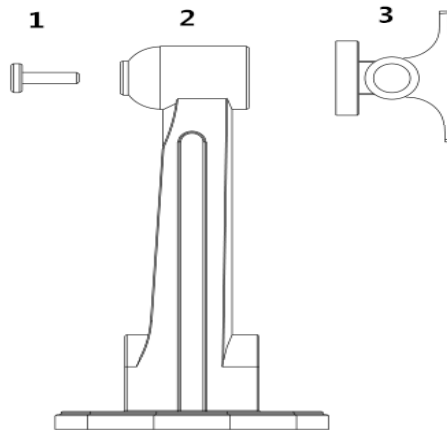
b, Install the bracket on the solar panel
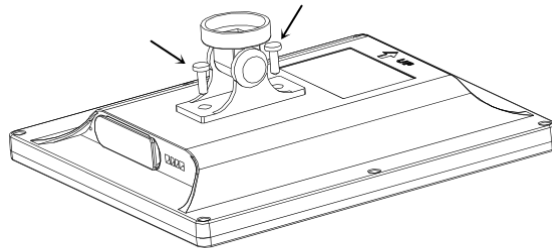

C, Install the bracket on the wall

D, Connects the solar main board with the bracket, insert the bracket into the main part and tighten the reinforcement

5、Parameter configuration

After connecting the collector to the computer through the RS485 data cable, enter the configuration mode through the magnetic control switch (close a magnet close to the magnetic control switch, the indicator light is always on, indicating that the configuration mode has been entered). At this time, the collector is in the setting state. "Sensor Terminal Configuration Tool", click "Serial Port" to pop up the "Serial Port Configuration Page", select the COM port of the collector to connect to the computer, use the baud rate of 9600, and open with NO.

1. The collection period can be customized. When this period expires, the RS485 sensor data is collected and sent to the server.

2. The device has an automatic positioning function, and the positioning is updated once a day.

3. Magnetic suction can trigger the collection of data and report the data.

4. The reported data is stored locally. As a backup, the user can read the saved local data from the local through the serial port, or remotely access the saved data.

5. The server or the master device can send the configuration parameter of LS820 (the sensor data acquisition period)

6. The command to active the sensor can be set.
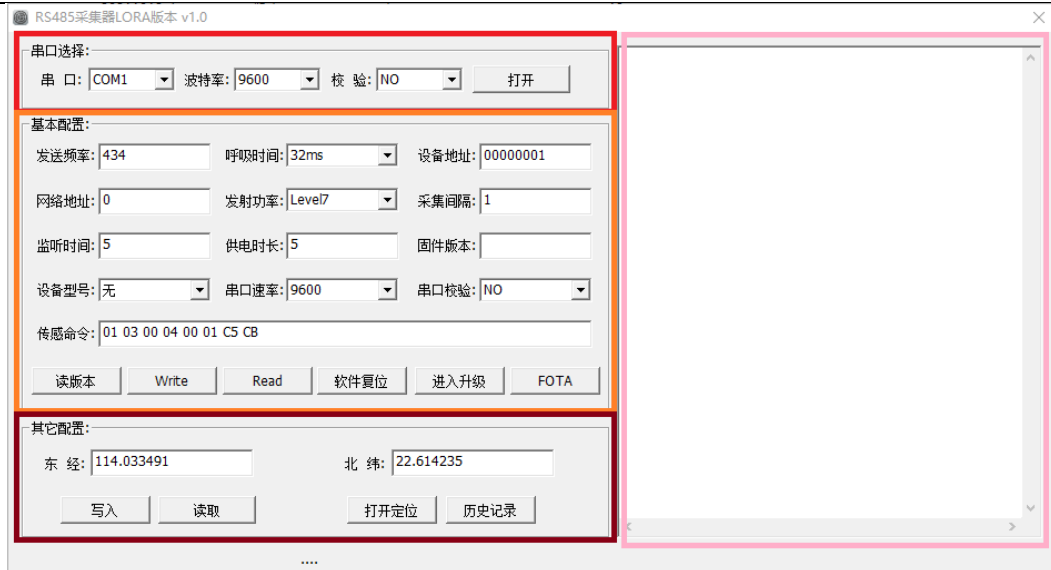
There are 4 parts on the RF tool. The left area is the parameter configuration and the upper part on the left is the serial port configuration area. The middle left is the basic parameter configuration area of LS820. and the following is the positioning and historical record reading area. The blank part on the right is the print area display area, which is the debugging information output window. The collector will output the current debugging information during the working process, which is convenient for users to view.

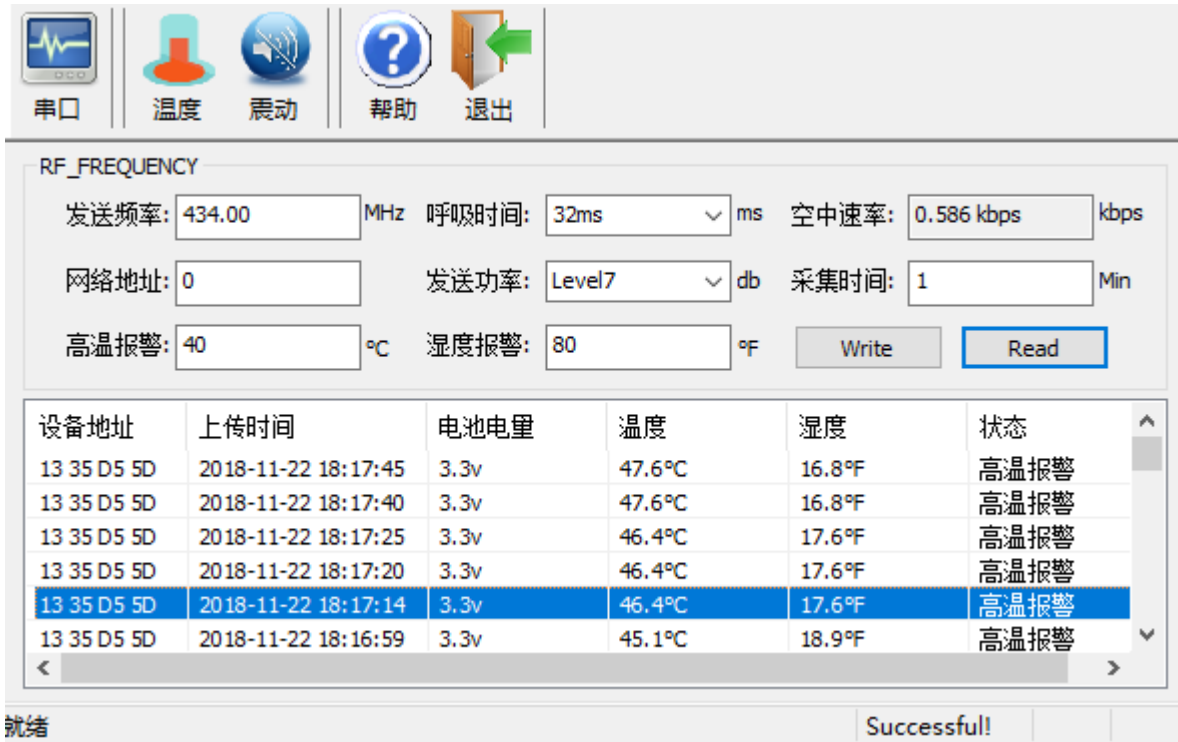| Parameter	Clarification						
Frequency	433MHz、490MHz, 868MHz, 915MHz						
Breath	2,4,8,16,32,64ms (2Ms-5Kbps,4Ms-3Kbps,8Ms-1.7Kbps,16Ms-1Kbps, 32Ms-0.5Kbps,64Ms-0.3Kbps)						
Node ID	0-65535						
Net ID	0-255						
Output power	Level	7	6	5	4	3	2	1
	dBm	19.5-20	17.5-18	14.5-15.5	11.5-12.5	8.5-9.5	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 LS820 is closed.						
Sensor type	Any RS485 sensor						
Awake time	This parameter indicates the waiting time for receiving after sending data. The unit is calculated in seconds. Within this time, instructions issued by the server can be received, ranging from 0 to 30 seconds						
Period of powering sensor	It indicates how long time LS820 starts collecting data after supplying power to the sensor. The range is 0 ~ 30 seconds, which can be set						
Sensor Command	Command sent when getting the sensor data						
Collection interval	Indicates the period of sensor data upload to master. It is designed as minutes, the range is 0~65535, and the setting is 0, which means that LS820 does not enable the function.						
Device ID	the unique ID of LS820, the range can be set from 0~4294967295.						
Write	Write the parameter.						
Read	Read the parameter.						
Version	Read the version number of LS820						
Longitude and Latitude	This parameter is the positioning data of the equipment. It is 0 when used for the first time. You can set it manually; The collector updates the positioning information once every 24 hours and starts the positioning once 2 minutes after the first power on						

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 LS820 should be the same as the wake-timer of RF1276T. The Frequency and the Net ID should be the same for both LS820 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 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 master device has dedicated parameter configuration software, and the wireless parameters (sending frequency, breathing time, network address) need to be set to be consistent with the RS485 sensor.
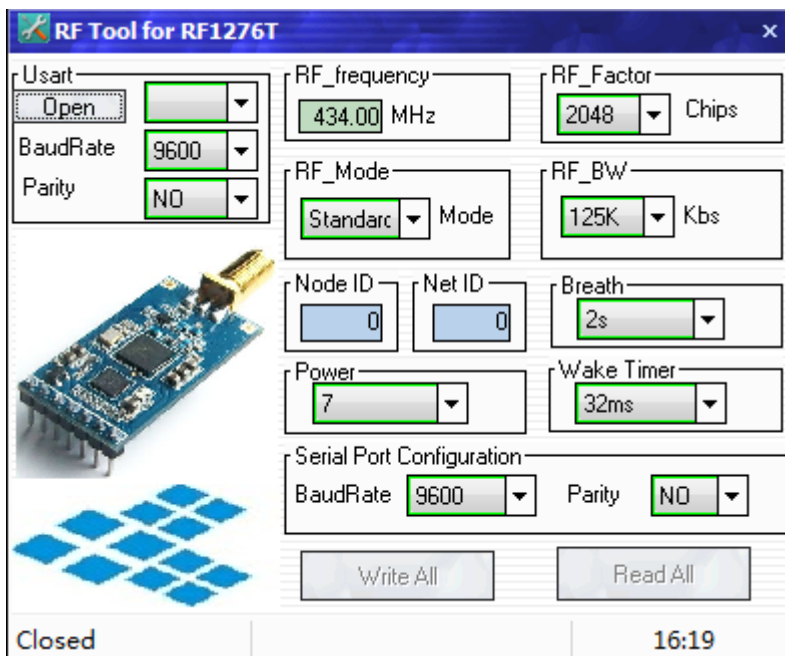
When the sensor is in the working state, the sensor data will be reported regularly according to the set collection time including device ID, upload time, battery power, pressure, level, status, etc.

The sensor will perform a temperature and humidity check every 20 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、The protocol of LS820.

LS820 has the uplink and downlink protocol that are suitable for all RS485 sensing devices. The data packets are also divided into uplink data and downlink data. Uplink data indicates that the data collected by LS820 is sent to the master device. LS820 actively upload the data to the master device. Downlink data means that the master device sends data to LS820. LS820 opens the receiving window after sending sensor data to the master, and there is a limited time (the time set by the rf tool, the maximum is 30S), During this period, the master device can send data to LS820.

work flow of YL-220
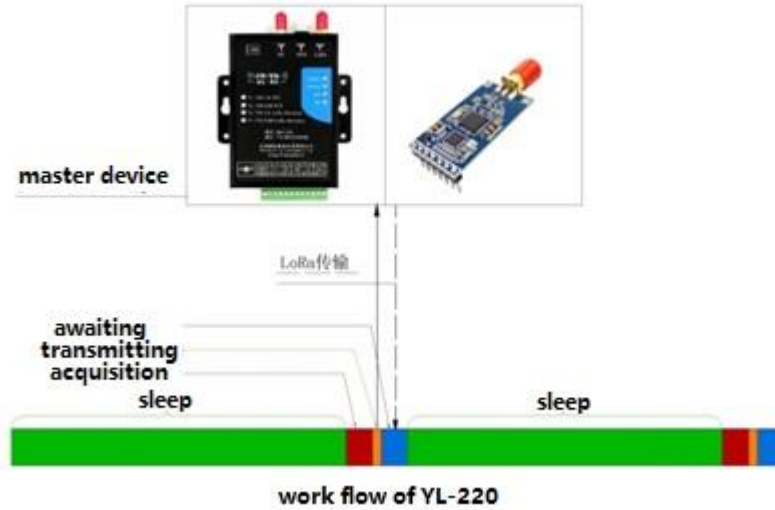
8, Data packet format of LS820.

8.1 Uplink data packet format

Chart 1, the format of uplink data packet

head	Device ID	Sensor type	Function code	length	payload	CRC	End byte
1byte	4byte	1byte	1byte	1byte	Nbyte	1byte	1byte
5E	05 E8 25 61	C3	00	Nn	Check chart 2	Sum Check	16

Chart 2, Payload format

Voltage of battery	GPS_E	GPS_N	Sensor data	Period of sensing	Awake time	Version number	Packet No.
VCC_ADC	East	North	DATA	Period	timing	Version	No.
2byte	8byte	8byte	4byte	2byte	2byte	1byte	2byte

"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.

8.2 Downlink data packet format

Set the sampling period of LS820

head	**Device ID**	Sensor type	Function code	Length indication	Data payload	CRC	End code
1byte	4byte	1byte	1byte	1byte	Sampling period	2byte	1byte
5E	**05 E8 25 61**	C3	A4	Nn	2byte	Sum check	16

Read the history sensor data

head	Device ID	Sensor type	Function code	Length indication	Data payload	CRC	End code
1byte	4byte	1byte	1byte	1byte	Packet No.	2byte	1byte
5E	05 E8 25 61	C2	A6	Nn	2byte	Sum check	16

9, Connect the LS820 with LoRa gateway GW711.

GW711 is lora gateway that can upload the LS820 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.
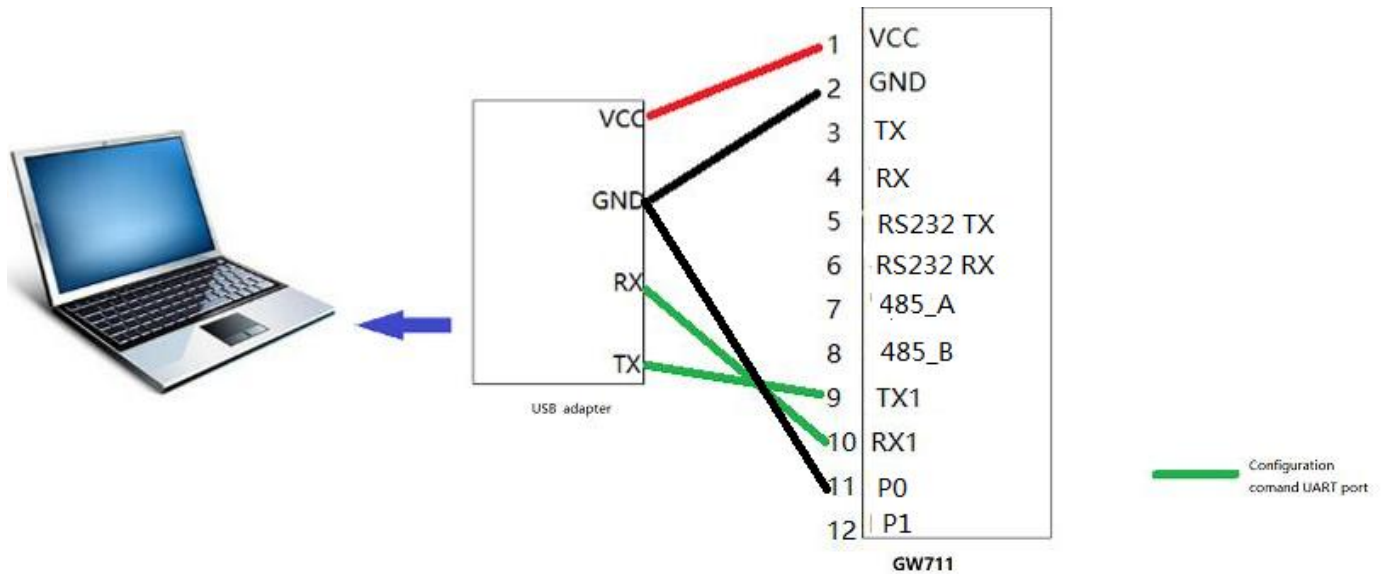
After finish the hardware connection, users can insert the SIM card into the gateway and power it on.

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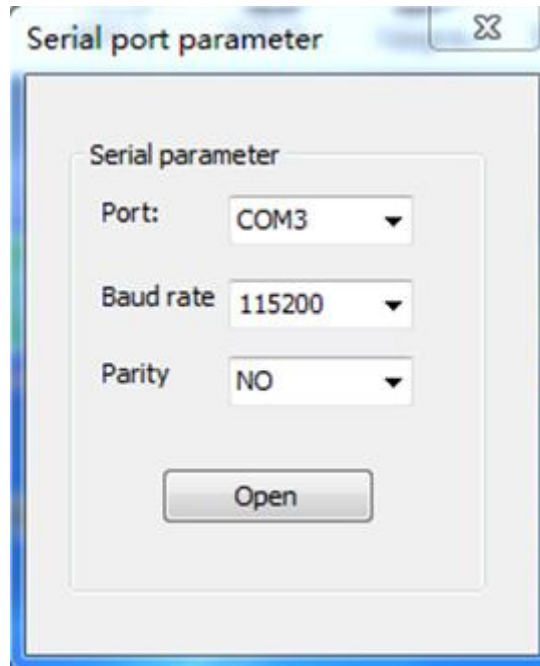
Commonly used setting function parameters include: TCP server management, carrier management, serial port parameter management, LoRa wireless parameter configuration, and so on. As shown in the red box below.
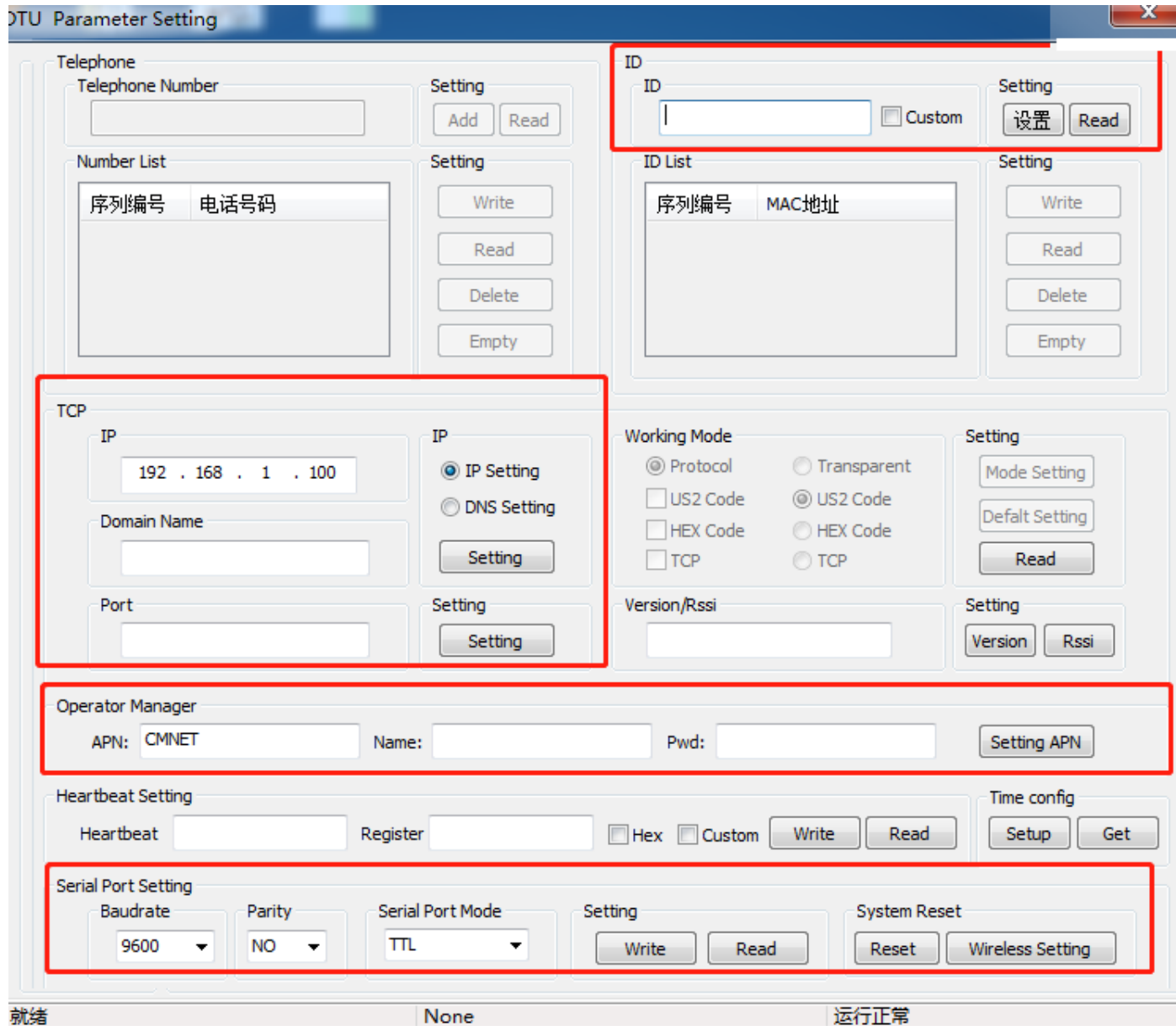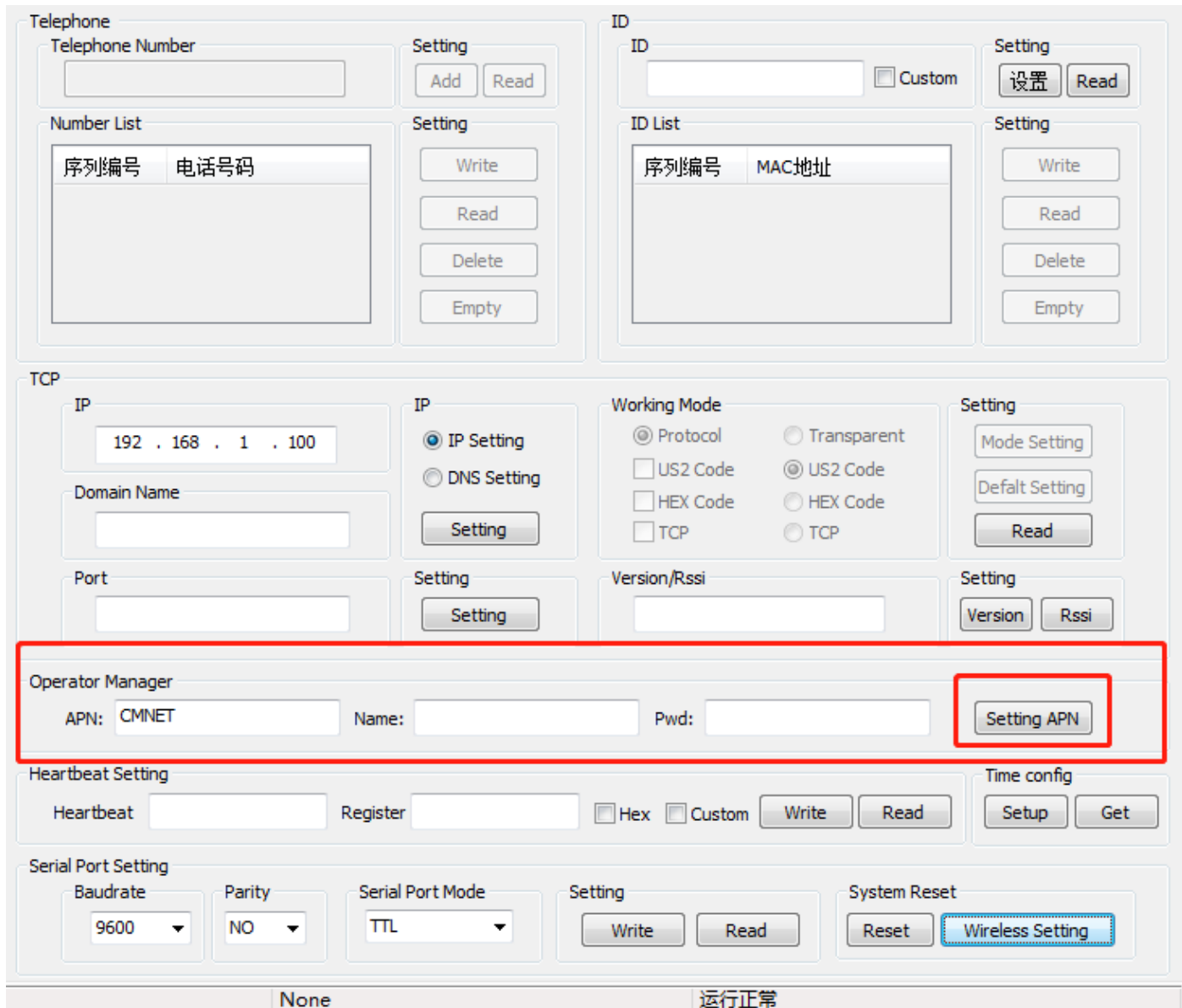
TCP server management:

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.

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 LS820.

3. The output power has 7 levels. The defaults is 7.

Wireless Setting
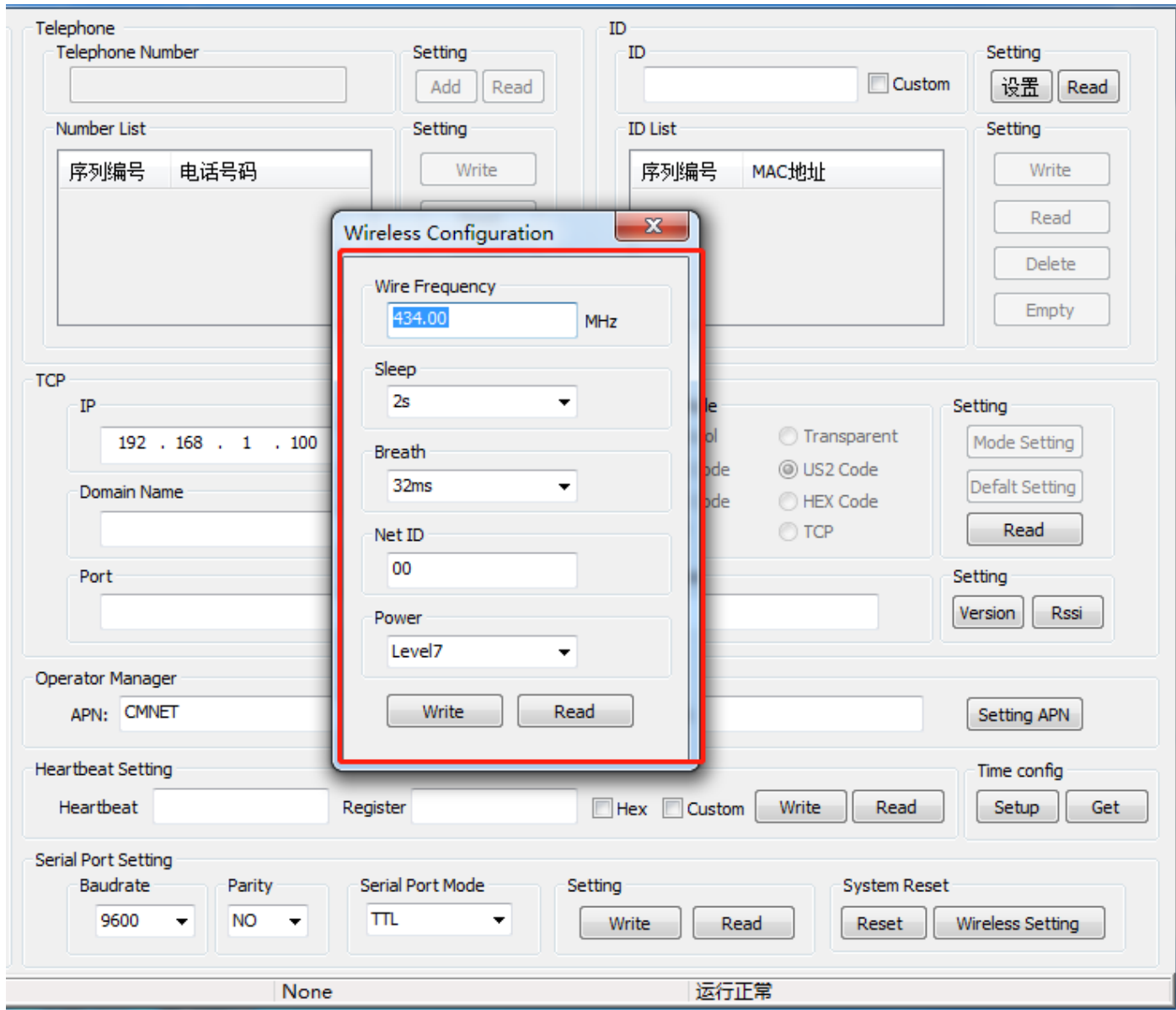
LoRa parameter configuration

10, The LoRa data format of LS820 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-120	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 MH ML: YL-120 voltage. e.g. Decimal 33，is the voltage 3.3V DH DL is the temperature E.g：Decimal 295，Temperture 29.5℃ CH CL humidity E.g：Decimal 153，Humidity 15.5%
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	
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	
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	
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	

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