



<b>Product Name</b>	<b>GAOTek GPS Tester Healthcare</b>
<b>Product SKU</b>	<b>GAOTek-HI-132</b>
<b>Product URL</b>	<a href="https://gaotek.com/product/gaotek-gps-tester-healthcare/">https://gaotek.com/product/gaotek-gps-tester-healthcare/</a>

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Based in New York City & Toronto, GAO Tek Inc. is ranked as one of the top 10 global B2B technology suppliers. GAO ships overnight within the U.S. & Canada & provides top-notch support thanks to its 4 decades of experience.



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## GAOTek GPS Tester Healthcare

### 1. INTRODUCTION:

With the development of low power range RF technology, especially LoRa technology launched by Semtech becoming more and more mature, Winext Technology has launched LoRa tester AN-106 based on the LoRa module. AN-106 LoRa tester has with LCD screen and connects with the gateway via OTAA network joining. It can test the UPLINK and DOWNLINK packet loss rate and meanwhile, users can get RSSI and SNR of gateway transmission. Users can also turn on the GPS to display the latitude and longitude coordinates of the device and check the LoRoWAN CLASS type and the firmware version number of the LoRa tester.

### 2. TECHNICAL SPECIFICATIONS:

<b>Technical parameter</b>	CPU	ARM 32bit-Cortex-M3 kernel; Main frequency: 32MHz
	Memory	128KB Flash 16KB RAM 4KB EEPROM
<b>Hardware parameter</b>	Sensor	built-in GPS
	Buzzer	Built-in
	LED indicator	1x power indicator, red 1x charging indicator, green
	Antenna	External LoRa antenna, Built-in GPS ceramic antenna
	Data rate	300bps~5.4Kbps
	Frequency optional	EU868 US915 AS923 AU915

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<b>Wireless parameter</b>	Protocol	LoRaWAN
	Maximum transmitted power	17dbm
	Rx sensitivity	-140dBm
<b>Electrical specification</b>	Overall power consumption	110mW
	Battery capacity	3.7V/3500mAh

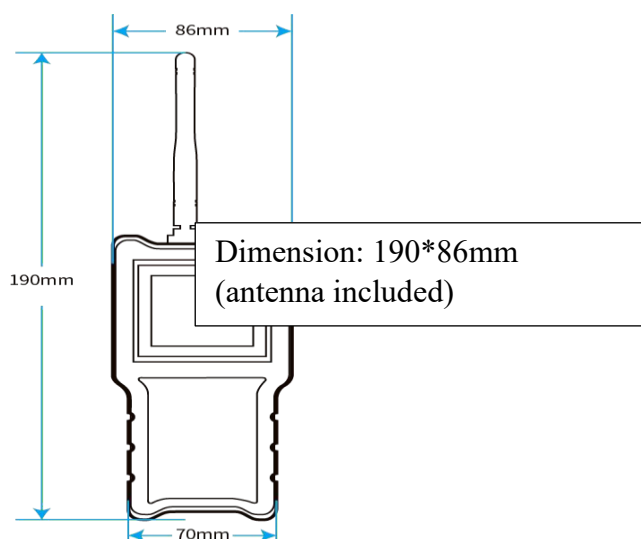
	Working temperature	-20°C ~ 70°C
	Working humidity	10% ~ 90%
<b>DC specification</b>	Power supply	built-in rechargeable lithium battery
	Input voltage	DC3.7V
	Transmit status	150mA
<b>Physical parameter</b>	IP grade	IP65
	Dimension	190*86*30mm(antenna included)

**Accessory:**

<b>Item</b>	<b>Qty(pc)</b>	<b>Remark</b>
AN-106 LoRa Tester	1	/
Antenna	1	/
USB cable	1	/
User manual	1	Please contact the sales person or technician for the latest docs.

### 3. FEATURES:

- Support standard LoRaWAN protocol
- Support GPS locating with the accuracy of within 5M;
- With built-in lithium battery can support the system for 36 hours;
- With LCD screen, which can support text interface display;
- Full plastic shell structure design;
- Wide working temperature range, to achieve industrial  $-20^{\circ}\text{C}\sim+70^{\circ}\text{C}$ ;
- Support real-time communication with gateway can get RSSI and SNR of gateway transmission;
- Support statistics of packet loss rate of communication between gateway and nodes.



#### Application:

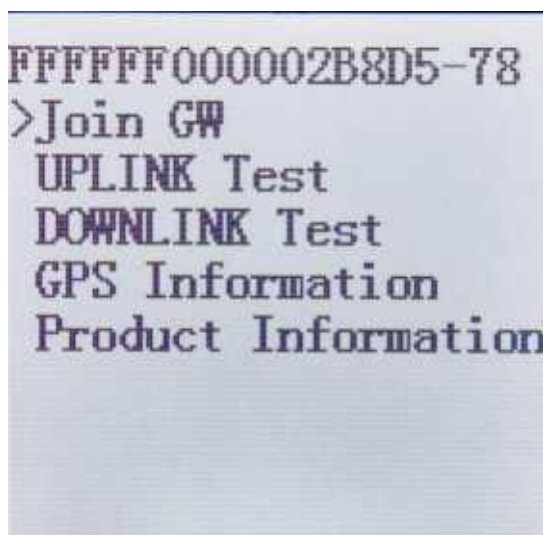
- Smart City communication management system
- Smart community communication management system
- Smart Agriculture communication system
- Smart transportation communication system

## 4. OPERATING INSTRUCTIONS:

### 4.1 Key Instruction:

- There are total 5 function keys and an ON/OFF key;
- Function keys are: left key, right key, up key, down key, OK key, ON/OFF key
- Right key/left key: return the function menu to the previous level Up key/Down key: choose up and down;
- The ">" at the beginning, displays the chosen function menu
- OK key: to enter the function menu, perform the function of the function menu

### 4.2 Main menu page



- The 1st line: display DevEui & battery capacity;
- The 2nd line: OTAA network joining;
- The 3rd line: UPLINK Test;
- The 4th line: DOWNLINK Test;
- The 5th line: GPS information;
- The 6<sup>th</sup> line: Product information

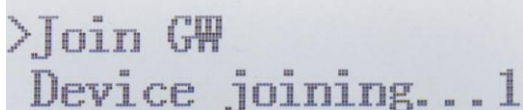
### 4.2.1 Display DevEui & battery capacity



FFFFFFFF0000002B8D5-79

### 4.3 OTAA network joining:

#### 4.3.1 Apply to join network



```
>Join GW  
Device joining...1
```

- The 2nd line: displays device joining, and the number shows the times of this request;
- Only in this menu can you send an OTAA network joining request; It will stop the sending of the network joining request after exiting the function menu
- After sending the OTAA network joining request, in the time of Join accept delay 2, if you exit the function menu, you can still get the incoming confirmation message from the gateway.
- The device will always send the request to the network until it is successful.

### 4.3.2 Network Joining Success

```
>Join GW  
Device has joined  
DevAddr:C39DB507
```

- The 2nd line: display “device has joined”
- The 3<sup>rd</sup> line: displays the IP address assigned by the gateway

## 4.4 UPLINK test

### 4.4.1 Interface description

- The 1st line: press Enter to start the UPLINK Test;
- The 2nd line: press Enter to get UPLINK packet loss rate;
- The 3rd line: press Enter to adjust the communication frequency when doing the UPLINK test;
- The 4th line: press Enter to adjust the spreading factor when doing the UPLINK test;
- The 5th line: press Enter to adjust the Tx power when doing the UPLINK test;
- The 6th line: press Enter to adjust the package size when doing the UPLINK test;
- The 7th line: press Enter to adjust the testing number when doing the UPLINK test;
- The 8th line: press Enter to adjust the sending interval when doing the UPLINK test.



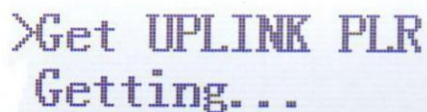
#### 4.4.2 Do UPLINK Test

```
>UPLINK Testing...  
Repeat Number:50  
Send Count:050->OK
```

Note: When the Send Count and Repeat Number are the same, that means the testing is finished.

- The 2<sup>nd</sup> line: displays the repeat number of the testing;
- The 3<sup>rd</sup> line: displays the send count of the current testing, and “OK” shows the sending succeeds; “Failure” shows the sending fails.

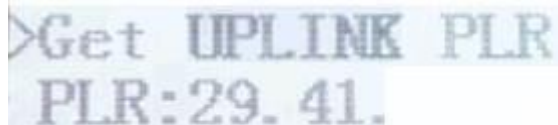
#### 4.4.3 Get UPLINK packet loss rate



```
>Get UPLINK PLR
Getting...
```

Note: the above picture shows UPLINK packet loss rate getting

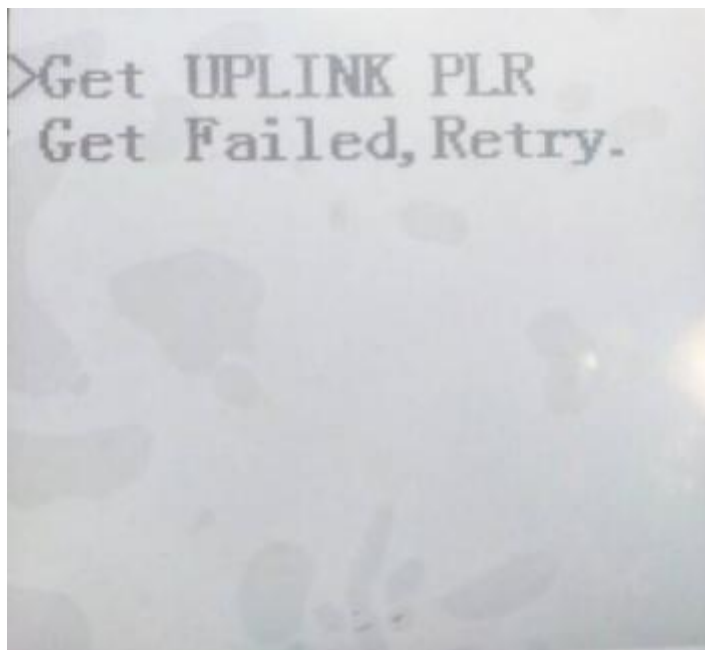
#### 4.4.4 Get UPLINK packet loss rate success



```
>Get UPLINK PLR
PLR:29.41.
```

Note: the value of packet loss is shown after successfully obtaining UPLINK packet loss rate. In above picture, the value 29.41 of PLR, which is the packet loss rate.

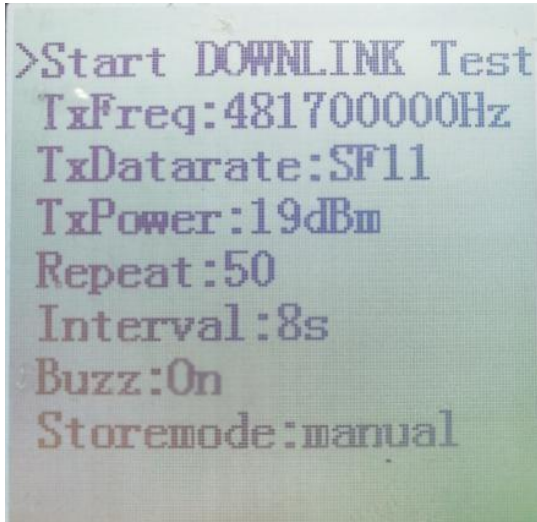
#### 4.4.5 Get the UPLINK packet loss rate failed



Note: If the UPLINK packet loss rate fails, you can retry.

## 4.5 DOWNLINK test

### 4.5.1 Interface description



```
>Start DOWNLINK Test
TxFreq:481700000Hz
TxDataRate:SF11
TxPower:19dBm
Repeat:50
Interval:8s
Buzz:On
Storemode:manual
```

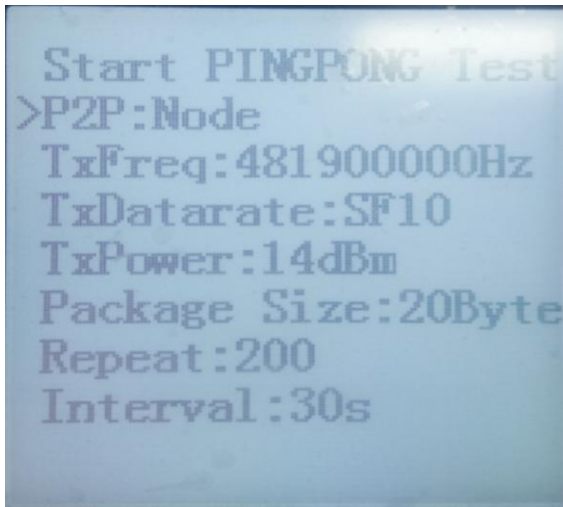
- The 1st line: start DOWNLINK Test menu, press “Enter” to this interface;
- The 2nd line: display the communication frequency in the DOWNLINK test, press the Enter key to adjust;
- The 3rd line: display the spread factor in the DOWNLINK test, press the Enter key to adjust;
- The 4th line: display the transmit power in the DOWNLINK test, press the Enter key to adjust;
- The 5th line: display the testing repetition during the DOWNLINK test, press the Enter key to adjust;
- The 6th line: display the delivery interval in the DOWNLINK test, press the Enter key to adjust;
- The 7th line: display the buzzer to remind when receiving a DOWN package in the DOWNLINK test, press the Enter key to adjust.
- The 8th line: display the storage mode, press the Enter key to adjust. In manual mode: it works when receiving downlink ACK;
- In automatic mode: it works when its displacement or moving height is up to 50m.

```
DOWNLINK Testing...
Record State:29/50
>IsStore:No
Repeat Number:50
Send Count:003->OK
Recv Count:003
PLR:0.000
RSSI:-72 SNR:036
```

#### 4.5.2 Start DOWNLINK test

- The 2<sup>nd</sup> line: display the 29<sup>th</sup> record with storage capacity up to 50 records.
- The 3<sup>rd</sup> line: options to store this record or not, press Enter key to adjust.
- The 4<sup>th</sup> line: display the testing numbers of current test.
- The 5<sup>th</sup> line: display the sending repetition of current test, the “OK” indicates that the sending succeed, “FAIL” indicates the sending failed;
- The 6<sup>th</sup> line: display the receiving repetition of DOWNLINK packet from server;
- The 7<sup>th</sup> line: PLR is for Packet Loss Rate, here 0.000 is the current packet loss rate of DOWNLINK test, the packet loss rate will be refreshed after each test;
- The 8<sup>th</sup> line: display the RSSI and SNR value of DOWNLINK packet from gateway; Notes:
- The RSSI and SNR value will be cleaned each time when sending packet during DOWNLINK test;
- When Send Count is the same as Repeat Number, it means that you’ve completed the testing.
- In manual mode, it is fine to make options to store the record or not before receiving downlink packet. Once you get the downlink packet, you can make storage options for the next test.

## 4.6 PINGPONG test



- The 1<sup>st</sup> line: shows PINGPONG Test, press Enter key to start;
- The 2<sup>rd</sup> line: shows modes. Press Enter key to make a choice between “Node” and “GW”;
- The 3<sup>rd</sup> line: shows PINGPONG Test frequency. Press Enter key to make adjustment;
- The 4<sup>th</sup> line: shows PINGPONG Test SF. Press Enter key to make adjustment;
- The 5<sup>th</sup> line: shows PINGPONG Test Tx. Press Enter key to make adjustment;
- The 6<sup>th</sup> line: shows PINGPONG Test payload capacity. Press Enter key to make adjustment;
- The 7<sup>th</sup> line: shows testing numbers of PINGPONG Test. Press Enter key to make adjustment;
- The 8<sup>th</sup> line: shows time interval of PINGPONG Test. Press Enter key to make adjustment.

### 4.6.1 Node mode and GW mode

1. In GW mode, it forwards data and record the numbers of receiving packet and sending packet. It displays RSSI and SNR of receiving packet;
2. In Node mode, it starts testing and records PLR;
3. During testing in GW mode, it can adjust parameters of frequency point, SF and Tx only;
4. During PINGPONG test, please ensure the two devices have same frequency point and SF as one in GW mode, the other one in Node mode.

## 4.6.2 Start PINGPONG test

### Node mode display

```
>PINGPONG Testing...
P2P:Node
Repeat Number:200
Send Count:003
Recv Count:003
RSSI:-28 SNR:026
PLR:0.000
```

- The 3<sup>rd</sup> line: shows numbers of current test;
- The 4<sup>th</sup> line: shows numbers of sending packet;
- The 5<sup>th</sup> line: shows numbers of receiving packet;
- The 6<sup>th</sup> line: shows the RSSI and SNR of the latest receiving packet;
- The 7<sup>th</sup> line: shows packet loss rate;

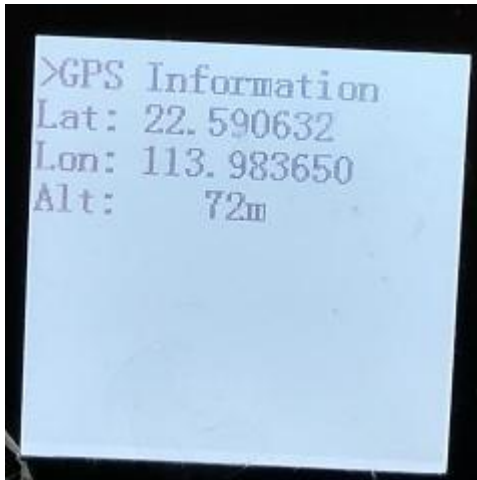
### GW mode display

```
>PINGPONG Testing...
P2P:GW
Recv Count:006
RSSI:-31 SNR:001
Send Count:006
```

- The 3<sup>rd</sup> line: shows numbers of sending packet;
- The 4<sup>th</sup> line: shows the RSSI and SNR of the receiving packet;
- The 5<sup>th</sup> line: shows numbers of sending packet;

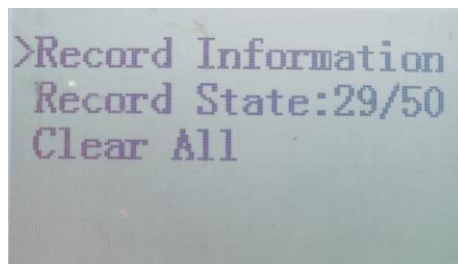
Note: When the device exits PINGPONG test and goes to communicate with a gateway, it needs to re-join the LoRa network.

### 4.7 GPS Information

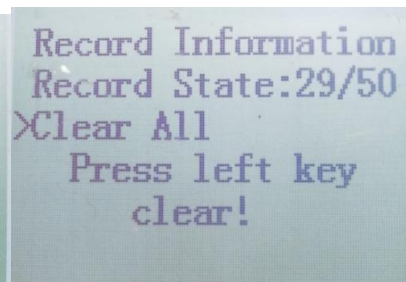
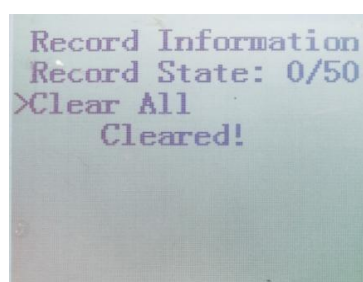


- Note: After starting the GPS power switch by pressing Enter key, it takes about a few minutes of searching time.
- The 2<sup>rd</sup> line: shows latitude;
- The 3<sup>th</sup> line: shows longitude;
- The 4<sup>th</sup> line: shows altitude.

### 4.8 Record information



- The 2<sup>nd</sup> line: shows the 29<sup>th</sup> record as its capacity up to 50 records;
- The 3<sup>rd</sup> line: shows the option to clear all the records. Press Enter key and press the left button to confirm.





## 4.9 Product information

```
>Product Information
LoRaWAN :1.0.2
Type: Class A
Band: CN470
HW :3.0
SW :0.3.7
```

- The 2nd line: shows LoRaWAN protocol version;
- The 3rd line: shows the type (Class A, B,C) of LoRaWAN;
- The 4<sup>th</sup> line: shows the frequency;
- The 5<sup>th</sup> line: shows the hardware version;
- The 6<sup>th</sup> line: shows the software version.

## 5. CONFIGURATION METHODS AND STEPS

1st step: Install the driver of the device on the computer.

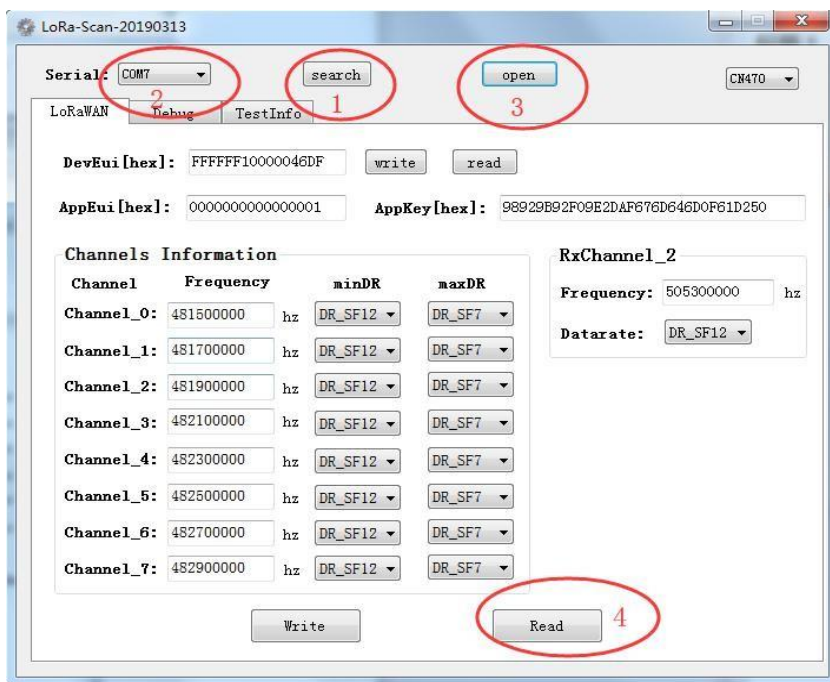
PL2303\_Prolific\_DriverInstaller\_v1.10.0.exe 2014/9/25 10:28 应用程序 3,144 KB

2nd step: Connecting the device and computer with the micro USB cable and check out.

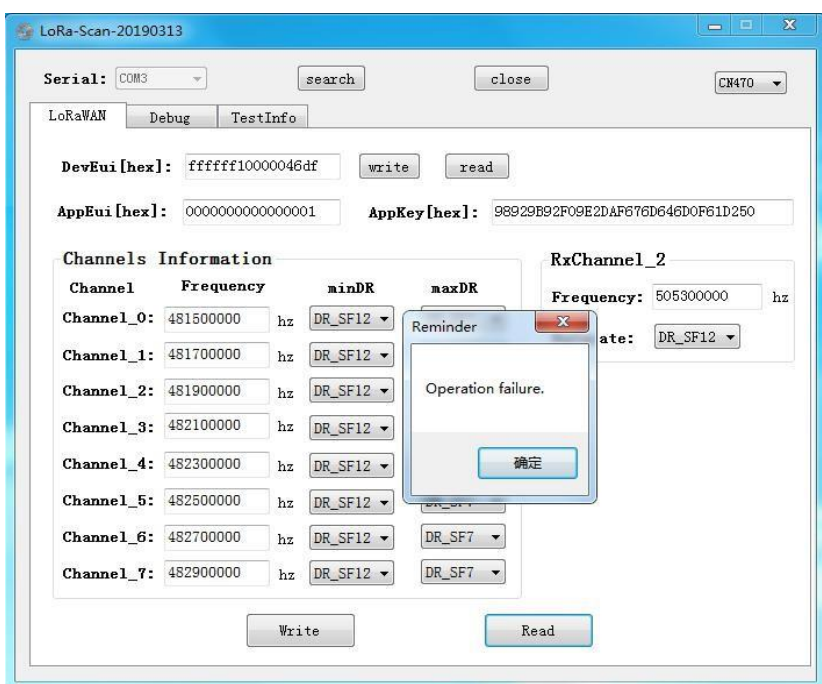


3rd step: Open configuration software ( LoRa -Scan- Config ) , show as below:

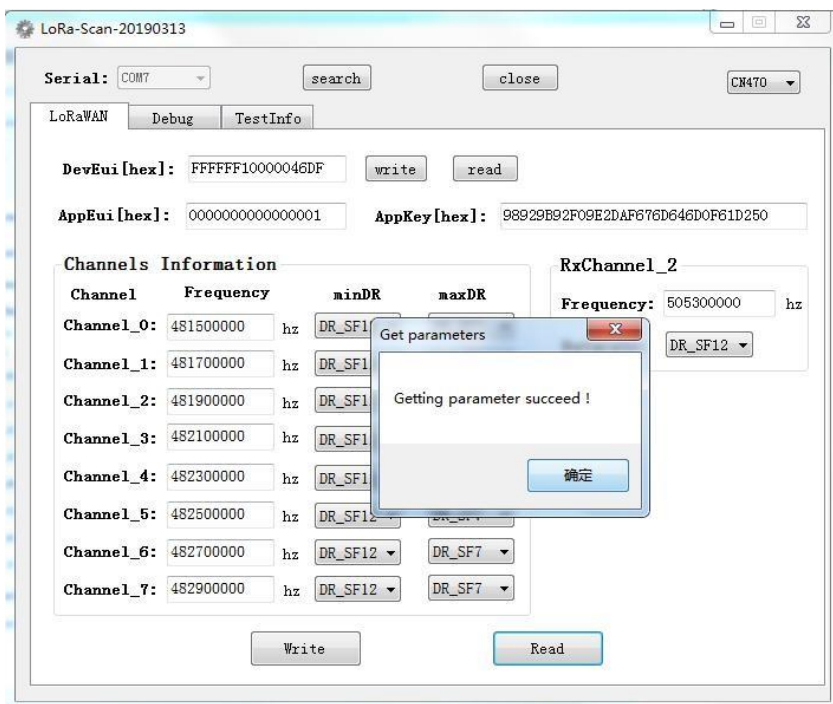
4th step: in the main interface of the configuration tool, click “search” button, select the corresponding port number of “Serial”, then click “OPEN” button, finally click “Read” button, show as below:



5th step: The prompt window will pop up if the read is successful. If unsuccessful, the prompt window prompts “operation failure”.

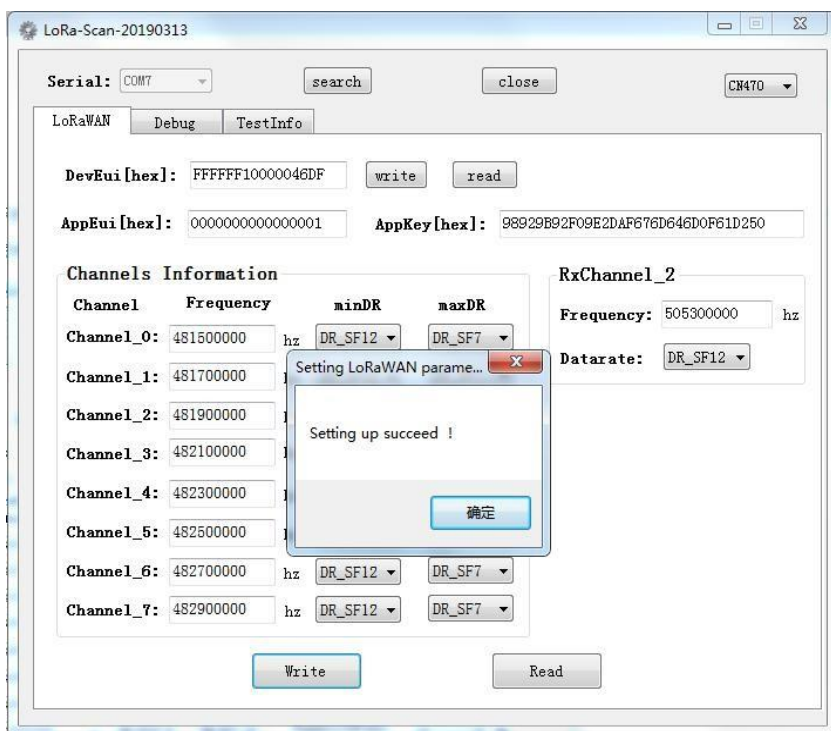


If read unsuccessful, you need to reconnect the USB Serial line and restart the operation of the 3rd step, and pay attention to the corresponding port number of "Serial". If the read succeeds, the prompt window prompts for "Getting parameter succeed", as below:



6th step: After clicking the "ok" button, modify the frequency point parameter of the "ChannelsInformation" in the main interface of the configuration tool, and the frequency point parameter must be modified to be consistent with the gateway frequency point parameter. As below:

After finishing modification of parameter, click "Write" to save.

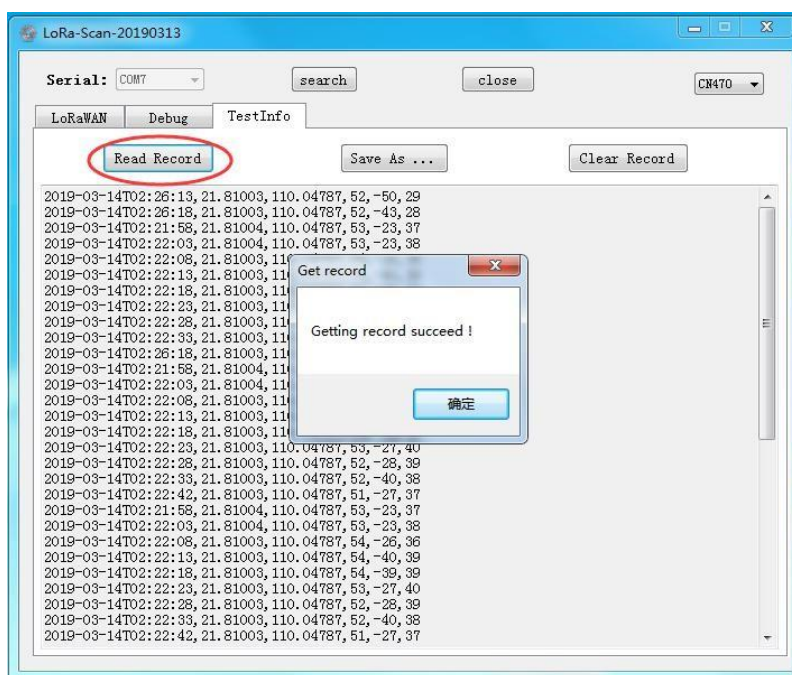


Note: Please make sure that the frequency parameters should be consistent with the gateway frequency parameters, otherwise, it can not join network and can not communicate with the gateway.

## 6. RECORD EXPORTING

**1<sup>st</sup> step:** Connecting the device and computer with the micro USB cable;

**2<sup>nd</sup> step:** Read record



**3<sup>rd</sup> step:** Save it as csv format and check with excel

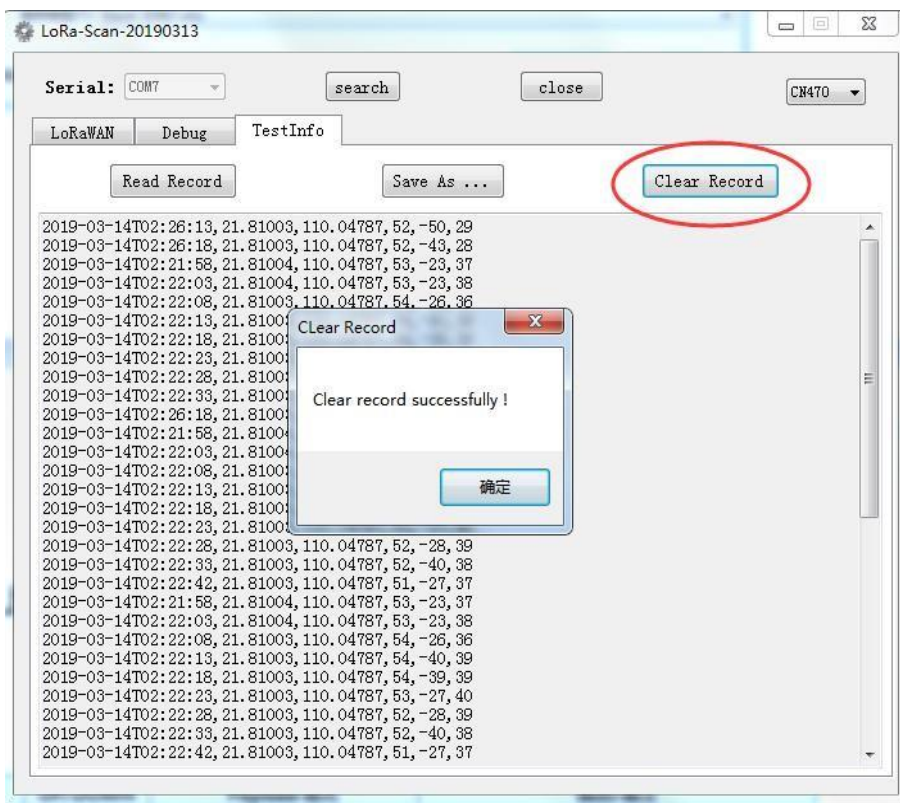




	A	B	C	D	E	F
1	time(utc)	latitude	longitude	altitude(m)	rss	snr
2	2019-03-14T02:26:13	21.81003	110.04787	52	-50	29
3	2019-03-14T02:26:18	21.81003	110.04787	52	-43	28
4	2019-03-14T02:21:58	21.81004	110.04787	53	-23	37
5	2019-03-14T02:22:03	21.81004	110.04787	53	-23	38
6	2019-03-14T02:22:08	21.81003	110.04787	54	-26	36
7	2019-03-14T02:22:13	21.81003	110.04787	54	-40	39
8	2019-03-14T02:22:18	21.81003	110.04787	54	-39	39
9	2019-03-14T02:22:23	21.81003	110.04787	53	-27	40
10	2019-03-14T02:22:28	21.81003	110.04787	52	-28	39
11	2019-03-14T02:22:33	21.81003	110.04787	52	-40	38
12	2019-03-14T02:26:18	21.81003	110.04787	52	-43	28
13	2019-03-14T02:21:58	21.81004	110.04787	53	-23	37
14	2019-03-14T02:22:03	21.81004	110.04787	53	-23	38
15	2019-03-14T02:22:08	21.81003	110.04787	54	-26	36
16	2019-03-14T02:22:13	21.81003	110.04787	54	-40	39
17	2019-03-14T02:22:18	21.81003	110.04787	54	-39	39
18	2019-03-14T02:22:23	21.81003	110.04787	53	-27	40
19	2019-03-14T02:22:28	21.81003	110.04787	52	-28	39
20	2019-03-14T02:22:33	21.81003	110.04787	52	-40	38
21	2019-03-14T02:22:42	21.81003	110.04787	51	-27	37
22	2019-03-14T02:21:58	21.81004	110.04787	53	-23	37
23	2019-03-14T02:22:03	21.81004	110.04787	53	-23	38
24	2019-03-14T02:22:08	21.81003	110.04787	54	-26	36
25	2019-03-14T02:22:13	21.81003	110.04787	54	-40	39
26	2019-03-14T02:22:18	21.81003	110.04787	54	-39	39
27	2019-03-14T02:22:23	21.81003	110.04787	53	-27	40
28	2019-03-14T02:22:28	21.81003	110.04787	52	-28	39
29	2019-03-14T02:22:33	21.81003	110.04787	52	-40	38
30	2019-03-14T02:22:42	21.81003	110.04787	51	-27	37
31	2019-03-14T02:22:43	21.81004	110.04787	51	-39	39
32	2019-03-14T02:22:03	21.81004	110.04787	53	-23	38
33	2019-03-14T02:22:08	21.81003	110.04787	54	-26	36
34	2019-03-14T02:22:13	21.81003	110.04787	54	-40	39
35	2019-03-14T02:22:18	21.81003	110.04787	54	-39	39



4<sup>th</sup> step: Clear record



## 7. COMMUNICATION FORMAT

### 7.1 GPS information

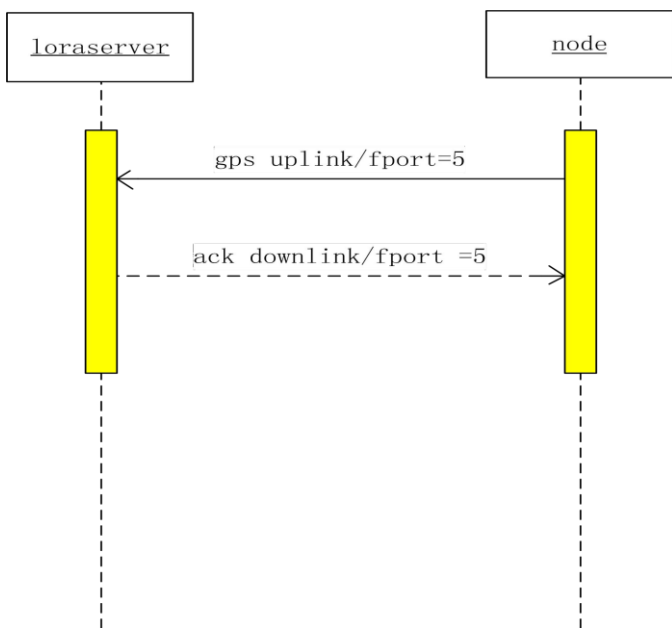
#### 7.1.1 GPS information format

Fport	UP/DOWN	Payload	Description
-------	---------	---------	-------------



5	UP/DOWN	<p>GPS information :</p> <p>Latitude ( 3 Bytes )</p> <p>Longitude ( 3 Bytes )</p> <p>Altitude ( 2 Bytes )</p>	<p>We use signed 24 bits for longitude, when the value is -223, it's accordingly west longitude 180°; When the value is 223-1, it's accordingly east longitude 180°; when the value is 0, it's accordingly Greenwich meridian.</p> <p>For example, when the rest 6 bytes is: 2020e8510e16(hex), here 2020e8 is for latitude, and we convert it to decimal, that's 2105576, then the latitude is: <math>2105576 \times 90 \div (2^{23} - 1) = 22.59</math> north latitude; Here 510e16(hex), we convert it to decimal, that's 5312022, the longitude is: East longitude <math>113.98 ( 5312022 \times 180 \div (2^{23} - 1) = 113.98)</math></p>
---	---------	---	---

### 7.1.2 The interaction sequence diagram



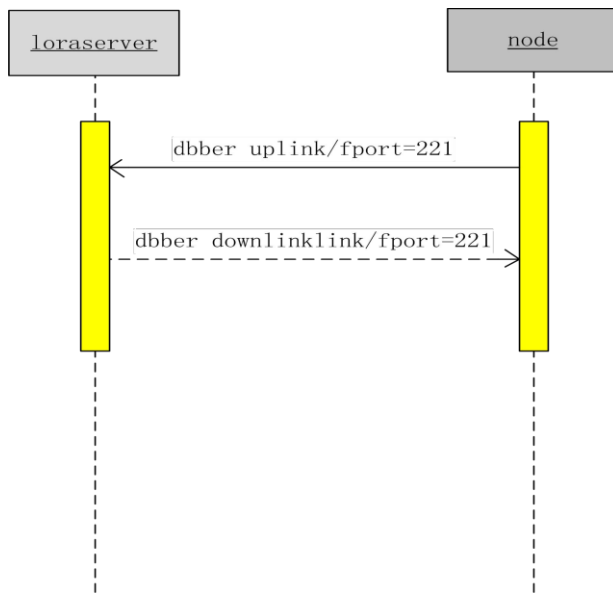


## 7.2 Uplink packet loss rate

Fport	UP/DOWN	Payload	Description
221	UP/DOWN	Uplink packet loss rate	2 bytes with the high byte is an integer and the low byte is of decimal place.  It needs to divide 100 for the real value.

### 7.2.1 Uplink packet loss rate format

### 7.2.2 The interaction sequence diagram

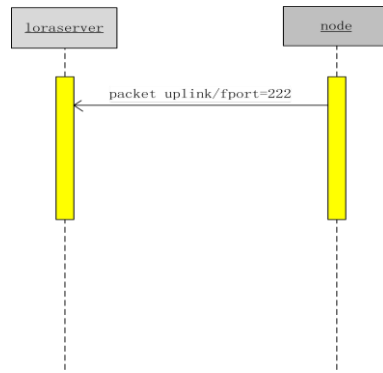


## 7.3 Uplink packet

### 7.3.1 Uplink packet format

Fport	UP/DOWN	Payload	Description
222	UP	Uplink counting packet for packet loss rate	2 significant bytes It uses to count.

### 7.3.2 Uplink packet interaction sequence diagram



## 8 Q&A

- How to check the device's charging status?
- ✓ During charging, the led indicator is in red; charging completion, the led indicator is in green.
- ✓ When the device can not join the network, how to solve it?
- ✓ Please make sure that the frequency parameters should be consistent with the gateway frequency parameters by setting up; you can check if the distance between the device and the gateway is the range.