



LW004-PB User Manual

Version 1.1



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1 About this Manual

The purpose of this manual is to outline how to apply LW004-PB in suitable scenarios, as well as how to configure and join into LoRa network.

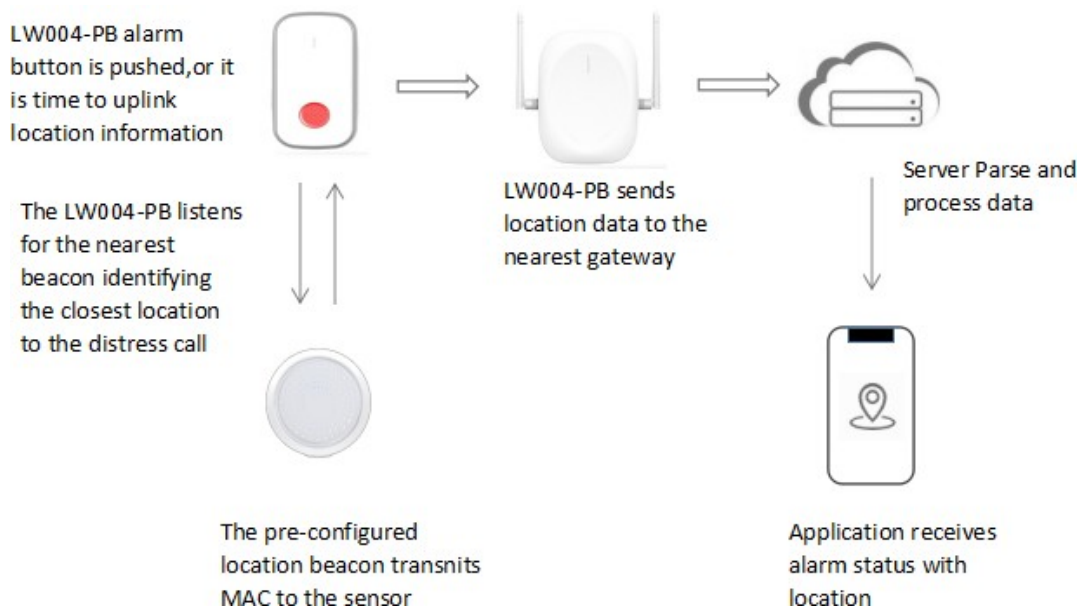
2 Product Introduction

2.1 Overview

The LW00-PB is a long-range panic button device for Class A type devices based on the LoRaWAN open protocol and is compatible with the LoRaWAN protocol. It is small, compact, and easy to use. The LW004-PB has Bluetooth and GPS for positioning and can be used for both indoor and outdoor tracker objects.

2.2 Application

2.2.1 Working Principle



2.2.2 BLE Scan

Regardless of the standby mode or the alarm mode, BLE will scan for 10 seconds at the end of each reporting interval and select the closest MAC beacon before sending the data to the server. LW004-PB can scan all V4.2 Bluetooth beacons, but it only uploads the nearest MAC beacon, based on your filter conditions.

2.2.3 GPS location

The GPS function of LW004-PB is default on, but can be configured to off through the Moka LoRa APP or downlink command.

In standby mode, if GPS is turned on, you can configure GPS search satellite time and sleep time according to actual application scenarios. The stronger the GPS signal, the recommended GPS search time can be shortened appropriately to extend the working time. Incorrect GPS search satellite time will not be able to obtain GPS data. It is recommended to configure GPS search time according to actual test conditions. By the way, in this working mode, the position information reporting interval is equal to the GPS search satellite time plus the sleep time.

In alarm mode, GPS is always in search satellite status if the GPS is on. And the location reporting interval depend on the alarm reporting interval.

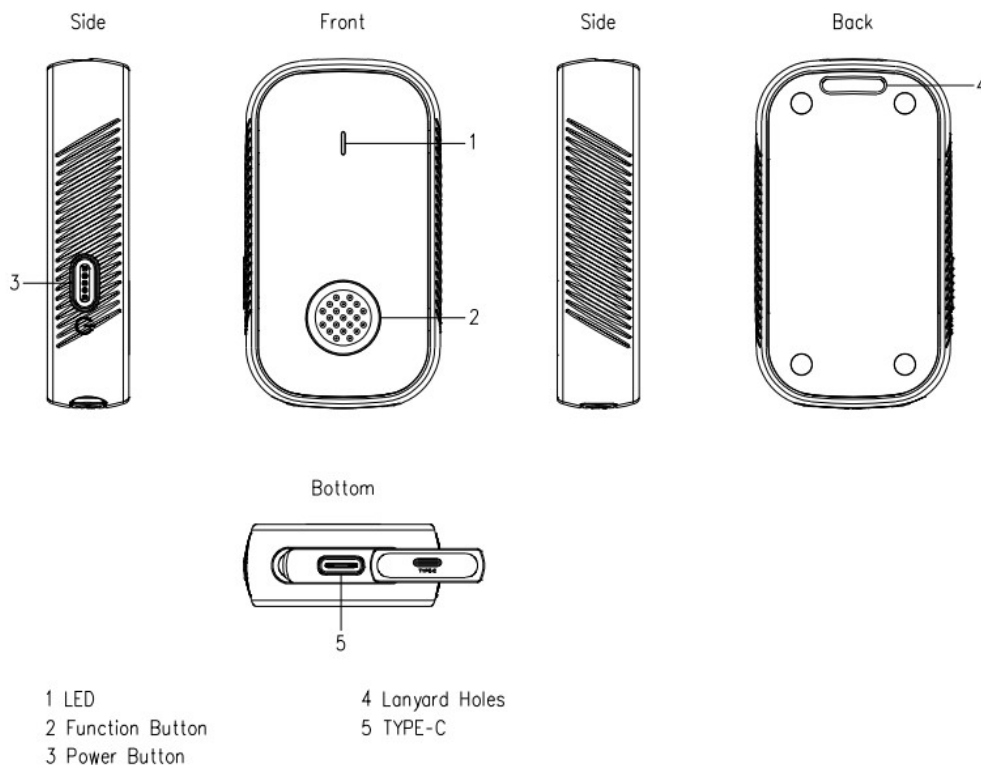
Note: GPS data is only available outdoors.

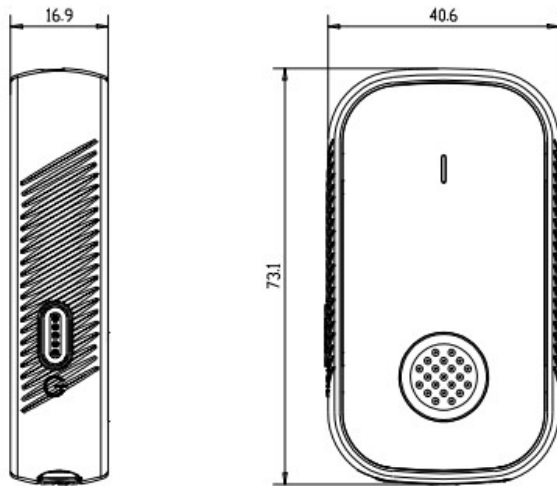
2.2.4 3-Axis Sensor Motion Detect

There is 3-Axis sensor data in every uplink payload. It includes the acceleration value of X,Y,Z axis and the angle of relative to the X-axis and the Y-axis . Based on the value can judge the motion status and relative direction.

2.3 Product Specifications

2.3.1 Appearance





2.2.2 LED Indicators and Button

Items	Indicator	Operation	Remark
Turn ON	Solid blue and keep 3S	Press and hold the power button for 5 seconds till the LED indicate blue and release. The LED will indicate blue for 3 seconds to show the LW004-PB is turned on.	
Turn OFF	Red LED Blink 3S	Press and hold the power button for 5 seconds till the red indicator flashes quickly and release. The indicator will flash red for 3 seconds to show the LW004-PB is turned off.	
Join LoRa Network	Solid green and keep 3S	If the device had never Joined any network, after turning on, the device automatically sends join request	It will send join request automatic after power on the device or send "connect" request in APP
Trigger Alarm	Yellow LED Blink	Double click the alarm button	Either enters the alarm mode or send alarm message to server, there will also have vibration reminder
Exit Alarm	Alarm indicator LED turn off	Press alarm button and hold on 15S or send downlink command to exit alarm	
Charging	Blue LED blink	Plug in type-c charger	
Full Charged	Solid blue	Plug in type-c charger	
Low Battery Reminder	Red LED blink	Battery level lower than 10%	

2.2.3 Product Datasheet

Please refer to the [LW004-PB Datasheet](#) for more details.



3 Set up Instruction

3.1 Turn on /off

Items	Operation
Turn ON	Press and hold the power button for 5 seconds till the LED indicate blue and release. The LED will indicate blue for 3 seconds to show the LW004-PB is turned on.
Turn OFF	Press and hold the power button for 5 seconds till the red indicator flashes quickly and release. The indicator will flash red quickly for 3 seconds to show the LW004-PB is turned off.

3.2 Join Into Lora Network

To join LW004-PB into LoRa network to communicate with LoRa gateway. The network operation is as following:

1) If LW004-PB had never joined any network:

First, turn on the device.

Second, use Mokolara APP to connect the device then get required ID and Keys.

Default join ID and Keys as following:

```
DevEUI: BLE MAC+ FFFF,example:MAC:112233445566 DevEUI:112233FFFF445566
AppEUI: 70B3D57ED0026B78
AppKey: 2b7e151628aed2a6abf7158809cf4f3c
DevAddr: The last four bytes of BLE MAC address
AppSKey: 2b7e151628aed2a6abf7158809cf4f3c
NwkSkey: 2b7e151628aed2a6abf7158809cf4f3c
```

Third, register the device on Lora server

Forth, click connect on Mokolara APP to send a join request to Lora server, it will search an available LoRa network to join. The green indicator will stay on for 5 seconds to show it joins into the network, otherwise, the indicator will be off.

(2) If LW004-PB had been joined into a LoRa network, turn off and turn on the device, the green indicator will stay on for 5 seconds to show it joins into the network.

Note: About MokoLora APP details, please check the instructions in [Chapter 10 Moke Lora APP](#)

3.3 Gateway Setup

Before the gateway communicate with the LW004-PB Panic Button, please refer to your gateway's user manual. If you use Moko LoRaWAN gateway MKGW2-LW, please refer to the [MOKO LoRaWAN Gateway MKGW2-LW Configuration Guide](#)

3.4 Parameters Configuration

Before you start configuring, prepare MokoLora APP.

1. To configure parameters through MokoLora APP, follow the instructions in [Chapter 10 Moke Lora](#)

APP

2. To configure parameters through downlink command, follow the instructions in [Chapter 9 Downlink Command](#)

4 Standby Mode

After joining the network, the device will upload the device location information to the server within three minutes. The device will then be placed in standby mode or non-alarm mode, and the device location information can be uploaded according to the configured reporting interval.

In each cycle, the device will upload a blank message to check the network connection. If the LoRa network detects that it is disconnected, the device will first join the LoRa network and then send the device location information.

The longest battery life is more than one month in standby mode when the reporting interval is 720min and GPS search satellite time 1min.

5 Alarm Mode

After the device is turned on and the alarm is triggered, the alarm mode will remain until the "stop alarm" command is received, or the user presses and hold the alarm button for 15 seconds to exit the alarm mode.

In the alarm mode, the device uploads location information to the server every 10 seconds, and the user can configure the reporting interval through the APP and downlink commands.

The shortest battery life is about 14hours in alarm mode when reporting interval is 10s, GPS and vibration are turn on.

7 Advertising Packet



LW004-PB-85C5

E0:80:EC:C0:85:C5

NOT BONDED ▲ -51 dBm ↔ 890 ms

CONNECT ⋮

Device type: LE only

Advertising type: Legacy

Flags: GeneralDiscoverable,
BrEdrNotSupported

Manufacturer data (Bluetooth Core 4.1):

Company: Reserved ID <0x80E0>
0xECC085C56303

Complete Local Name: LW004-PB-85C5

Complete list of 16-bit Service UUIDs:
0xFFC3

Raw data:

```
0x02010609FFE080ECC085C5630
30E094C573030342D50422D3835
43350303C3FF
```

Details:

LEN.	TYPE	VALUE
2	0x01	0x06
9	0xFF	0xE080ECC085C56303
14	0x09	0x4C573030342D50422D38354335
3	0x03	0xC3FF

LEN. - length of EIR packet (Type + Data) in bytes,

TYPE - the data type as in <https://www.bluetooth.org/en-us/specification/assigned-numbers/generic-access-profile>



- MAC address-0XE0 80 EC C0 85 C5
- Battery level-0X63 (99%)
- Device type-0x03
- Device advertising name-0x4C 57 30 30 34 2D 50 42 2D 38 35 43 35(LW004-PB-85C5)
- server UUID-FFC3

8 Uplink Payload

There are two different uplink payloads. One is an empty packet for the network link check notification. The other packet is the location information notifications.

The uplink data packet includes battery levels, alarm status, GPS data, and the nearest MAC beacon, 3- axis data. 3-axis data can be used to judge the status of the device.

Byte Index	Type	Data Type	Value	Description
1	Battery Level	Uint	0X00-0X64	
2	Alarm Status	Uint	0X00,0X01	00: alarm off, 01:alarm on
3-6	GPS Latitude	Int	0X000000-0XFFFFFF	The data format is little-endian. After the hex data converts to decimals, the calculation formula is (decimal value) $\times 90/8388607$ degree. Positive Value indicates northern latitude, Negative Value shows southern latitude
7-10	GPS Longitude	Int	0X000000-0XFFFFFF	The data format is little-endian, after the hex data converts to decimals, the calculation formula is (decimal value) $\times 180/8388607$ degree. Positive Value indicates eastern longitude, Negative Value shows western longitude
11-16	MAC Beacon Address	Uint	0X000000000000-0XFFFFFFFFFFFFFF	
17-18	X-axis acceleration	Int	0X0000-0XFFFF	The data format is big- endian. After the hex data converts to decimals, the calculation formula is (decimal value) $\times 2/32768$,unit:g
19-20	Y-axis acceleration	Int	0X0000-0XFFFF	The data format is big- endian. After the hex data converts to decimals, the calculation formula is (decimal value) $\times 2/32768$,unit:g
21-22	Z-axis acceleration	Int	0X0000-0XFFFF	The data format is big- endian. After the hex data converts to decimals, the calculation formula is (decimal value) $\times 2/32768$,unit:g
23-24	Angular	Uint	0X0000-0XFFFF	The angular is relative to the X-axis and the Y-axis. The data format is a big-endian unit: degree



Example:2F 01 79 51 2B 00 77 66 51 00 D9 19 4D 75 0B 33 00 D0 00 6C 03 A2 00 0E

2F: battery level 47%

01: alarm status on

79 51 2B 00: GPS Latitude, the normal byte order is 00 2B 51 79, the first byte 00 is sign bit, it is the convert to decimal is 2838905, the actual latitude is $2838905 * 90 / 8388607 = 30.45814996458888$ degree

77 66 51 00: GPS Longitude, the normal byte order 00 51 66 77, the first byte 00 is sign bit, it is the convert to decimal is 5334647, the actual longitude is $5334647 * 180 / 8388607 = 114.4691198431396$ degree

D9 19 4D 75 0B 33: the nearest Beacon MAC

00 D0: X-axis acceleration, it is the convert to decimal is 208, the actual value is $208 * 2 / 32768 = 0.0126953125$ g

00 6C: Y-axis acceleration, it is the convert to decimal is 108, the actual value is $108 * 2 / 32768 = 0.006591796875$ g

03 A2: Z-axis acceleration, it is the convert to decimal is 930, the actual value is $41475 * 2 / 32768 = 0.05511474609375$ g

00 0E: The angular relative to the X-axis and the Y-axis, the actual value is 14 degree.

9 Downlink Command

For the commands used to configure and read device information, please refer to the following details.

Note: LW004-PB supports downlink getting and configuring the device parameter in CLASS A.

9.1 Get Device Information

9.1.1 Format

The response will be received after sending the message on LoRa server to get the device information. The response message has two types: get information success or failure. The message is sent in the downlink window, and the response information is displayed through the uplink window.



Message type	Direction	Header code	Command code	Data length	Data	End code
The message for getting device information	Downlink	0xED	See below 'Get device information code list'	none	none	0XEE
Response for getting device information success	Uplink	0XED	See below 'Get device information code list'	Read data length	Data value	None
Response for getting device information failure	Uplink	0XED	See below 'Get device information code list'	None	None	0XFF

Note: The wrong command code sent or the system is busy may cause to get device information fails. If the device RX window is not opened, or the message sends failed, it will no response.

9.1.2 Get Device Information Command Code List

Command code	Description	Data type	Data length	Example	Remark
0x05	Get BLE firmware version	String (ASCII)	max 17 bytes	Send:ED05EE Response:ED050656312E302E34 (Get BLE version V1.0.4)	
0x06	Get LORA firmware version	Uint	max 17 bytes	Send:ED06EE Response:ED060401000300 (Get LoRa version 1.0.3)	
0x07	Get DevAddr	Uint	4 bytes	Send:ED07EE Response:ED0704ECC085C5 (Get DevAddr ECC085C5)	
0x08	Get NwkSKey	Uint	16 bytes	Send:ED08EE Response:ED08102B7E151628AED2A6ABF7158809CF4F3C (Get DevAddr 2B7E151628AED2A6ABF7158809CF4F3C)	
0x09	Get AppSKey	Uint	16 bytes	Send:ED09EE Response:ED09102B7E151628AED2A6ABF7158809CF4F3C (Get AppSKey 2B7E151628AED2A6ABF7158809CF4F3C)	
0x0A	Get DevEUI	Uint	8 bytes	Send:ED0AEE Response:ED0A08112233FFFF445566 (Get DevEUI 112233FFFF445566)	
0x0B	Get AppEUI	Uint	8 bytes	Send:ED0BEE Response:ED0B0870B3D57ED0026BE6 (Get AppEUI 70B3D57ED0026BE6)	
0x0C	Get AppKey	Uint	16 bytes	Send:ED0CEE Response:ED0C102B7E151628AED2A6ABF7158809CF4F3C (Get AppKey 2B7E151628AED2A6ABF7158809CF4F3C)	
0x0D	Get Region/Subnet	Uint	1 byte	Send:ED0DEE Response:ED0D0100	00:EU868 01:US915



				(Get Region/Subnet 00:EU868)	03:CN779 04:EU433 05:AU915 07:CN470 08:AS923 0A:IN865
0x0E	Get LoRaWAN Class	Uint	1 byte	Send:ED0EEE Response:ED0E0101 (Get LoRaWAN Class 01:CLASS A)	
0x0F	Get activation mode	Uint	1 byte	Send:ED0FEE Response:ED0F0101 (Get activation mode 02:OTAA)	01:ABP 02:OTAA
0x10	Get GPS sleep time	Uint	4 bytes	Send:ED10EE Response:ED1004D0020000 (The data format is little-endian. Get GPS sleep time 02D0 convert to decimal is 720min)	Unit:min
0x11	Get network connection status	Uint	1 byte	Send:ED11EE Response:ED110101 (Get network connection status 01:connected)	00:disconnected 01:connected 02:connecting
0x32	Get uplink message type	Uint	1 byte	Send:ED32EE Response:ED320100 (Get uplink message type 00:unconfirmed message)	00:unconfirmed 01:confirmed
0x2B	Get BLE scan filter name	String (ASCII)	Max 11 bytes	Send:ED2BEE Response:ED2B00 (Get scan filter name empty)	
0x2C	Get BLE scan filter RSSI	Uint	1 byte	Send:ED2CEE Response:ED2C0164 (Get scan filter RSSI 64 convert to decimal is 100)	unit:-dBm
0xC0	Get alarm status	Uint	1 bytes	Send:EDC0EE Response:EDC00100 (Get alarm status 00:alarm off)	alarm on: 01 alarm off: 00,
0xC1	Get alarm report interval	Uint	2 byte	Send:EDC1EE Response:EDC1020A00 (Get alarm report interval 000A convert to decimal is 10)	unit:s
0xC2	Get alarm trigger mode	Uint	1 bytes	Send:EDC2EE Response:EDC20102 (Get alarm trigger mode 02:double click)	01:single click 02:double click 03:long press
0xC3	Get vibration sensor switch status	Uint	1 bytes	Send:EDC3EE Response:EDC30100 (Get vibration sensor switch status 00:off)	00:vibration off 01:vibration on
0xC4	Get GPS switch status	Uint	1 bytes	Send:EDC4EE Response:EDC40101 (Get GPS switch status 01:on)	00:GPS off 01:GPS on
0xC5	GPS search satellite time	Uint	1 bytes	Send:EDC5EE Response:EDC50103 (Get GPS search satellite time 03)	



9.2 Configure Device Information

9.2.1 Format

The response will be received after sending the message on LoRa server to get the device information. The response message has two types: configure device parameter success or failure. But the format is same. The message is sent in the downlink window, and the response information is displayed through the uplink window.

Message type	Direction	Header code	Command code	Data Length	Data
The message for configuring device information	Downlink	0xED	See below configure command code list	The total length of the configure data	Data value
Response	Uplink	0xED	See below configure command code list	0X01	0XAA: configure success 0XFF: configure failed

Note: The wrong command code sent or the system is busy may cause to configure device information fails. If the device RX window is not opened, or the message sends failed, it will no response.

9.2.2 Configure Device Information Command Code List

Command code	Description	Data type	Data length	Example	Remark
0x37	Configure DevAddr	Uint	4 bytes	Send:ED370401959CF3 Response:ED3701AA	
0x38	Configure NwkSKey	Uint	16 bytes	Send:ED38102B7E15162 8AED2A6ABF7158809CF4 F3C Response:ED3801AA	
0x39	Configure AppSKey	Uint	16 bytes	Send:ED39102B7E15162 8AED2A6ABF7158809CF4 F3C Response:ED3901AA	
0x3A	Configure DevEUI	Uint	8 bytes	Send:ED3A08526973696 E674846 Response:ED3A01AA	
0x3B	Configure AppEUI	Uint	8 bytes	Send:ED3B08526973696 E674846 Response:ED3B01AA	
0x3C	Configure AppKey	Uint	16 bytes	Send:ED3C102B7E15162 8AED2A6ABF7158809CF4 F3C Response:ED3C01AA	



0x3D	Configure Frequency plan	Uint	1 byte	Send:ED3D0101 Response:ED3D01AA	00:EU868 01:US915 03:CN779 04:EU433 05:AU915 07:CN470 08:AS923 0A:IN865
0x3F	Configure activation mode	Uint	1 byte	Send:ED3D0101 Response:ED3D01AA	01:ABP mode; 02:OTAA mode
0x40	Configure GPS sleep time	Uint	4 bytes	Send:ED40043C000000 Response:ED3D01AA	The data format is little-endian,unit: min
0x6A	Configure scan filter name	String(ASCII)	Max. 11 bytes	Send:ED6A044D4F4B4F Response:ED6A01AA	If no need filter name,send data ED6A00
0x6B	Configure scan filter RSSI	Uint	1 byte	Send:ED6B013C Response:ED6B01AA	Unit:-dBm
0x6F	Configure uplink message type	Uint	1 byte	Send:ED6F0101 Response:ED6F01AA	00: Unconfirmed 01: Confirmed
0x75	Configure alarm report interval	Uint	2 bytes	Send:ED75023C00 Response:ED7501AA	unit:s
0x76	Configure alarm trigger mode	Uint	1 byte	Send:ED760101 Response:ED7601AA	01:single click 02:double click 03:long press
0x77	Configure vibration status	Uint	1 byte	Send:ED770100 Response:ED7701AA	00:vibration off 01: vibration on
0x78	Configure GPS status	Uint	1 byte	Send:ED780100 Response:ED7801AA	00:GPS off 01: GPS on
0x79	Configure GPS search satellite time	Uint	1 byte	Send:ED790101 Response:ED7901AA	Range:1-10 Unit:min

10 Moko Lora APP

For the detailed operation of the Moko Lora app to configure and read device information, please refer to the following instructions:

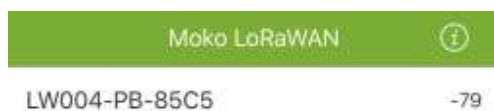
10.1 Install MokoLora APP

User can get the APP download link from below QR code, or search “MokoLora” in your phone APP store: Please allow bluetooth to be enabled during the installation process. This APP communicates with the device through bluetooth, and it only supports above android 4.4 and IOS 9.0 system.



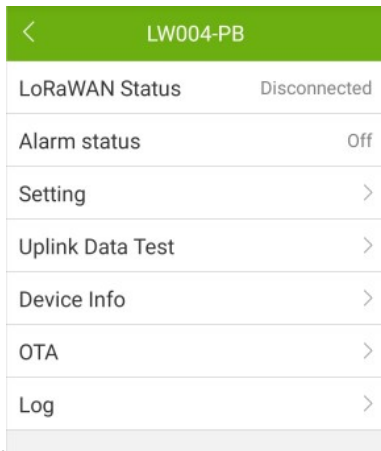
10.2 Scan and Connect LW004-PB

After the device is turned on, the device Bluetooth starts broadcasting. Open the APP, and you can search the LW004-PB device by pulling down the APP screen. The distance between the phone and the device should be kept within 10m without wall obstruction. Otherwise, the device will not be searched. After searching for the device, click the device name to connect the device. The default broadcast name of the device: LW004-PB-XXXX, XXXX is the last 4 bits of device MAC addresses.



10.3 Main Page

The APP main page will be displayed as below after the APP connects with the device successful .

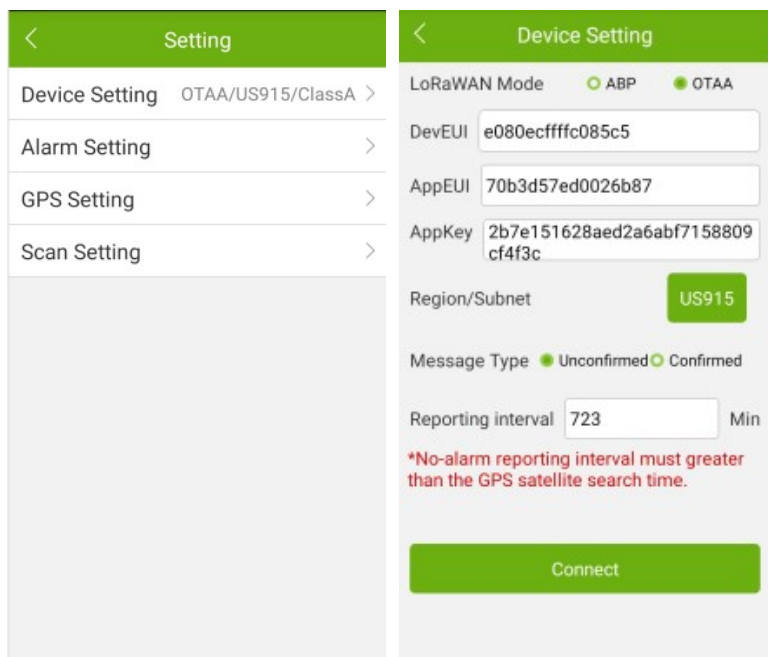


LoRaWAN Status: There are three different network status Disconnected,Connecting and Connected

Alarm status : On or Off

Function menu bar: Setting,Uplink Data Test,Device Info,OTA,Log

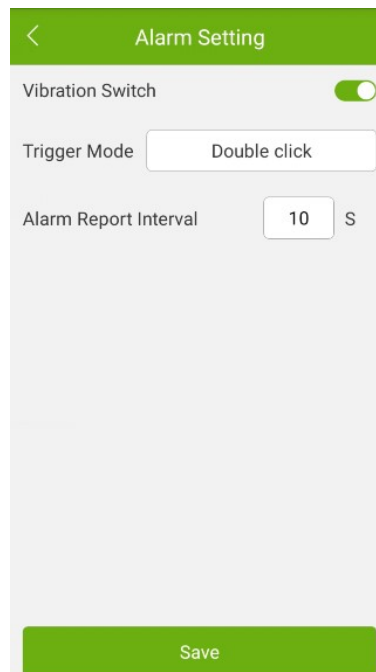
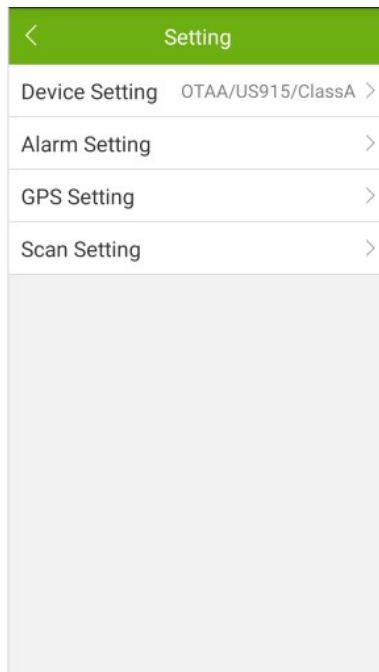
10.4 Get and Configure LoRaWAN Data



In the Device setting page we can get and configure the LoRaWAN Mode,DevEUI,AppEUI,AppKey,DevA ddr,AppSKey,NwkSKey,Region/Subnet,Message Type,Reporting interval.

Please notes the reporting interval in this page is standy mode or no-alarm mode reporting interval. And it must greater than the GPS satellite search time.

10.5 Get and Configure Alarm Parameters

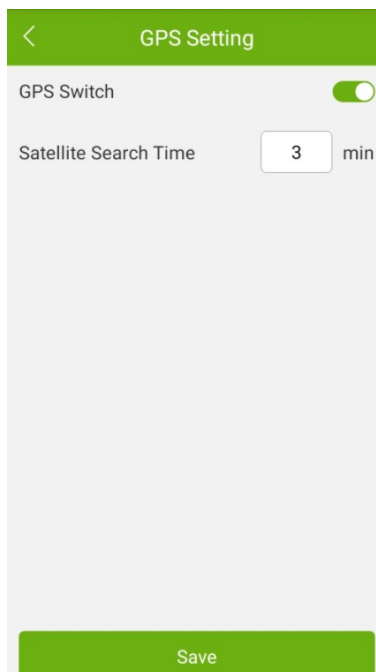
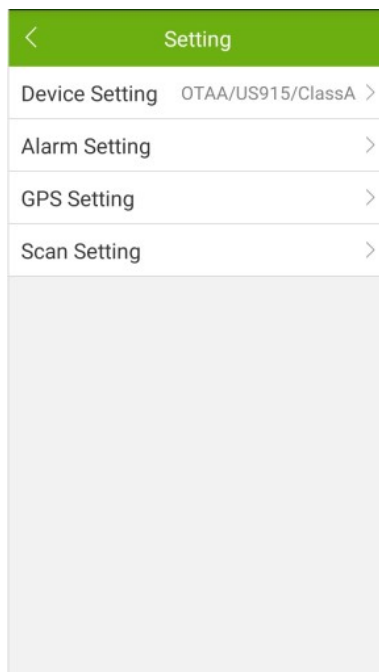


Vibration Switch: configure the vibration on or off in alarm mode. The default setting is on.

Trigger Mode:configure the alarm button trigger mode single click, double click or long press. The default setting is double click.

Alarm Report Interval: configure the report interval in alarm mode. The default setting is 10s, the range is 10-600s.

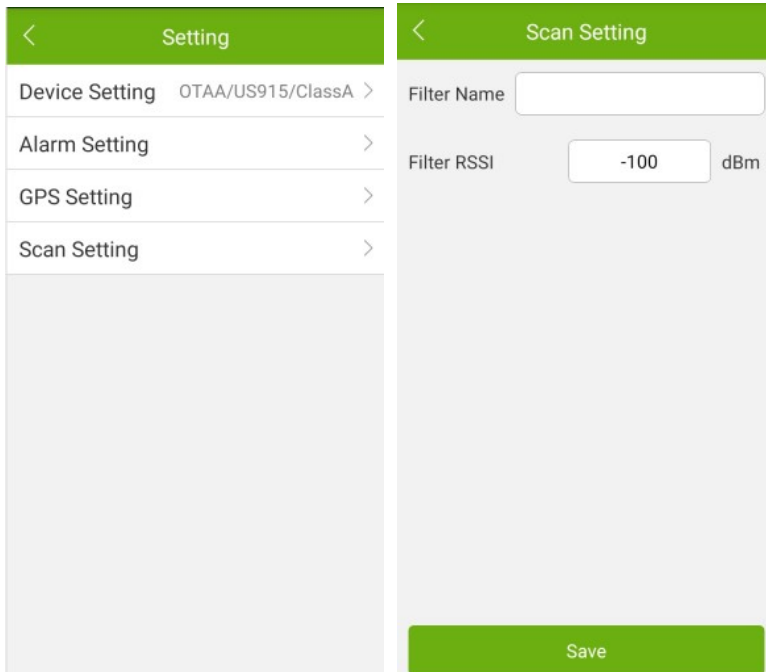
10.6 Get and Configure GPS Parameters



GPS Switch: configure the GPS function on or off . The default setting is on.

Satellite Search Time:configure the GPS search satellite time,it is also the time of GPS turn on in one no-alarm report interval. It is recommended to configure GPS search satellite time according to actual test conditions. And it is only valid in standby mode or no-alarm mode. The default setting is 3min. The range is 1-10min.

10.7 Get and Configure Scan Parameters

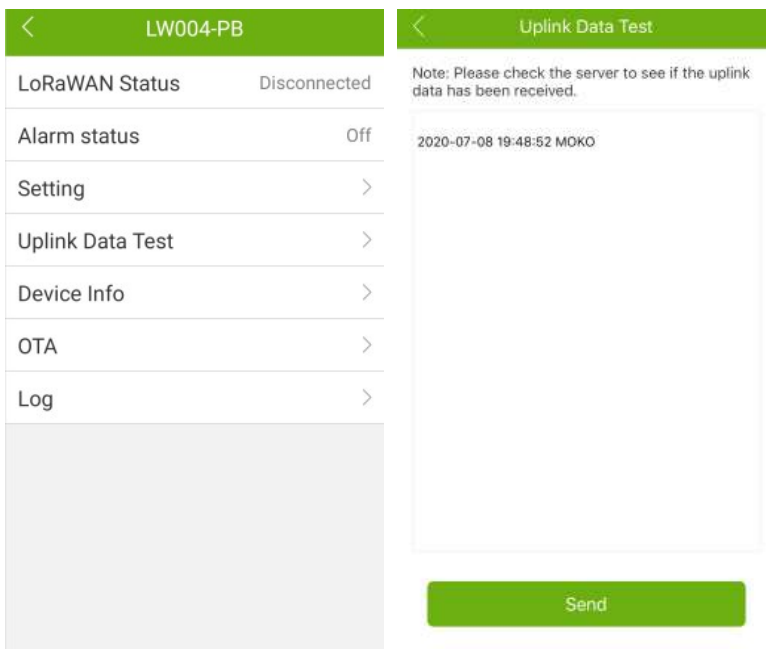


Filter Name: configure the BLE scan filter name .

The default setting is null, no filter name that means scan all standard above BLE4.0 device .

Filter RSSI: Range -100 to 0dBm, the default setting is -100dBm, it means device will scan the nearby BLE device RSSI between -100 to 0.

10.8 Uplink Data Test




Uplink data test: When LoRaWAN Status on the main page shows connected, but no Data has been transmitted, a real-time message (the default is the current date and time) can be sent to the server through the Uplink Data Test interface of the APP. If the server fails to receive the message, it indicates that the network connection is abnormal.

10.9 Device Info

LW004-PB		Device Info	
LoRaWAN Status	Disconnected	Company Name	MOKO
Alarm status	Off	Model Name	LW004-PB
Setting	>	BLE Firmware Version	V1.0.9
Uplink Data Test	>	Lora Firmware Version	1.0.3
Device Info	>		
OTA	>		
Log	>		

Device Info: get device information and firmware version

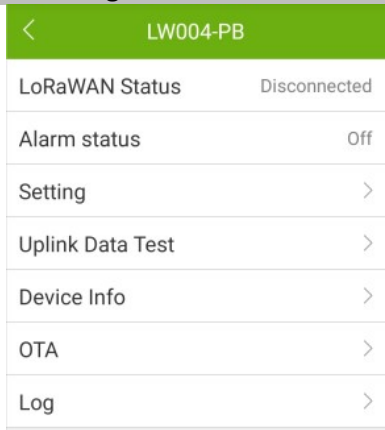
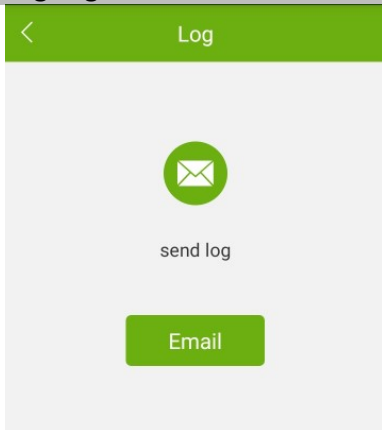
10.10 OTA

LW004-PB	OTA
LoRaWAN Status	Disconnected
Alarm status	Off
Setting	>
Uplink Data Test	>
Device Info	>
OTA	>
Log	>
	
	Firmware <input type="text"/> ...
	Upgrade Module <input type="button" value="BLE"/>
	<input type="button" value="Upgrade"/>

OTA: over the air to upgrade the firmware.
It only supports to upgrade the ZIP upgrade firmware file that provide by MOKO.

Upgrade module is BLE chip.

10.11 Log

Main Page	Log Page	Remark
 <p>The screenshot shows the 'Main Page' for device LW004-PB. It features a green header with a back arrow and the device ID. Below the header is a list of status and settings items: LoRaWAN Status (Disconnected), Alarm status (Off), Setting, Uplink Data Test, Device Info, OTA, and Log. Each item has a right-pointing arrow.</p>	 <p>The screenshot shows the 'Log Page' with a green header and a back arrow. The main content area is light gray and contains a green circular icon with a white envelope, the text 'send log', and a green 'Email' button.</p>	<p>Through the log page, user can send the last time join request information of the device to our RD engineer by email in case user need help when there is join network issues.</p>

11 Revision

Version	Description	Editor	Date
1.0	Initial version create	iris	2020-07-08
1.1	Adjust document structure	iris	2020-08-24