LMPS-X User Manual

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Revision History

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Apr 2023	v1.0	First Release

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1. Introduction

The LMPS-X is a LoRaWAN end node. According to the connected sensor, it can be configured as a temperature, humidity, and door open or close detection sensor.

The LMPS-1 has a built-in SHT30 temperature and humidity sensor, which will report a group of data every 15 minutes after joining the network. The reporting interval can be changed via downlink or AT commands.

The LMPS-2 is connected to a waterproof temperature sensor DS18B20. After joining the network, a group of data is reported every 15 minutes, and the reporting interval can be changed via downlink or AT commands.

The LMPS-3 has a built-in magnetic switch, which reports a group of heartbeat data every other day after joining the network. When the magnet approaches or leaves the magnetic switch, it will immediately send a group of data.

2. Key Features

- ASR6601CB LoRa SoC
- LoRaWAN 1.0.3 CLASS A fully compliant
- Standby current less than 6 uA
- Offline detection
- Battery life of more than 1 year (14dBm, SF7@125KHz data rate, and 15-minute data transmission interval)
- Change configuration via AT command or server downlink
- Upgrade firmware via the USB to TTL (CH340, CP210x)
- Power by 2 x AAA/LR03 batteries
- Small size
- Easy install

3. Application

- Home and Building Automation

4. Product model

Model	Built-in Temperature and Humidity sensor	External DS18B20 Temperature sensor	Built-in Door open or close detection
LMPS-1	√	x	x
LMPS-2	x	√	x
LMPS-3	x	x	√

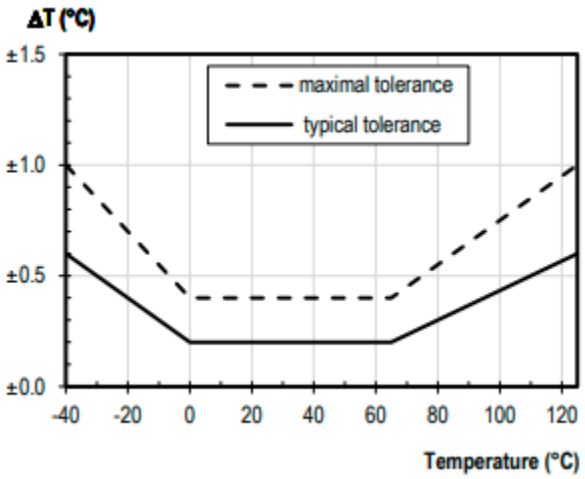
The product pictures are as follows
LMPS-1

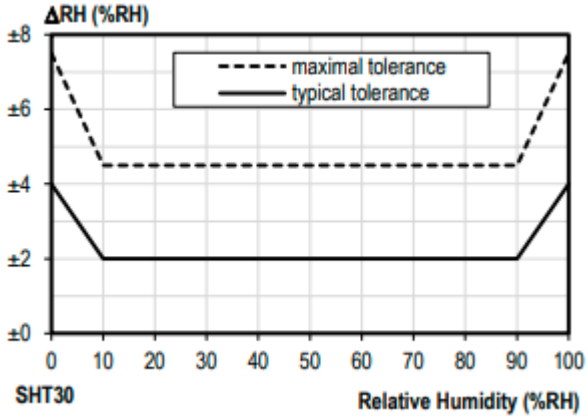
LMPS-2

LMPS-3

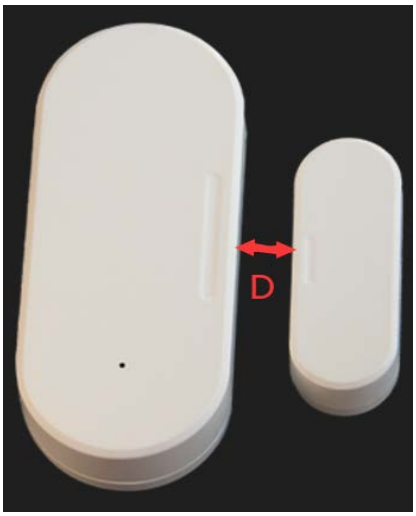
5. Sensor Characteristics

5.1 Built-in SHT30 temperature and humidity sensor Performance Graphs





5.2 Magnetic switch



Note that during installation, the distance between the magnet and the magnetic switch needs to be less than 5 mm for accurate triggering.

5.3 DS18B20 temperature sensor

Measures Temperatures from -55°C to +125°C
±0.5°C Accuracy from -10°C to +85°C
±2°C Accuracy from -55°C to +125°C
WARNING
Recommended device operating temperature is -20 to 60°C and humidity is 20 to 80%.

6. LED status

The red light blinks once every 2s, indicating that the battery voltage is less than 2.5v.
The green light blinks every time a packet is sent.
Successfully connected to the network, the green light is always on for 4s.

7. Uplink payload formats

7.1 Get device configuration, uplink fport is 8

An example uplink payload is 0A010F010384190701


```
"decoded_payload": {
  "confirm_retransmission_fcntup_increment": 0,
  "confirm_status": 0,
```

```
    "firmware_version": 10,
    "linkadr_retransmission_fcntup_increment": 0,
    "max_confirm_uplink_retries": 7,
    "max_linkadr_nbtrans": 1,
    "rejoin_interval": 25,
    "report_interval": 900,
    "sample_intrval": 1,
    "sample_total_times": 15,
    "work_mode": 1
}
```


7.2 Reply with an answer, uplink fport is 9

Reply with an answer when the device needs to reset or the current uplink payload size is exceeded, uplink fport is 9.

7.3 LMPS-1 payload formats, work mode is 1

Bytes	2	2	1	2
Payload	Work mode & BAT voltage	SHT30 temperature	SHT30 humidity	RFU

LMPS-1 payload formats, work mode is 1

An example uplink payload is 11110AE68D0000(HEX), uplink fport is 10


```
    "decoded_payload": {
        "battery_voltage": 2.73,
        "relative_humidity_sht30": 70.5,
        "temperature_sht30": 27.9,
        "work_mode": 1
}
```


7.4 LMPS-2 payload formats, work mode is 2

Bytes	2	3	2
Payload	Work mode & BAT voltage	RFU	DS18B20 temperature

LMPS-2 payload formats, work mode is 2

An example uplink payload is 21100000000A7F (HEX), uplink fport is 11


```
    "decoded_payload": {
        "battery_voltage": 2.72,
```

```
        "temperature_ds18b20": 26.87,
        "work_mode": 2
    }
```


7.5 LMPS-3 payload formats, work mode is 3

Bytes	2	3	2
Payload	Door status & Work mode & BAT voltage	Door open times Since the last hardware reset	RFU

LMPS-3 payload formats, work mode is 3

An example uplink payload is 39110000020000 (HEX), uplink fport is 12


```
        "decoded_payload": {
            "battery_voltage": 2.73,
            "door_open_times": 2,
            "door_status": "open",
            "work_mode": 3
    }
```


7.6 LMPS-1 payload formats, work mode is 4

Bytes	2	2	1	2	1	…
Payload	Work mode & BAT voltage	SHT30 Temp1	SHT30 Hum1	SHT30 Temp2	SHT30 Hum2	…

LMPS-1 payload formats, work mode is 4

An example uplink payload is 41120A9B920A96920A99950A9D930AA2940AA2940A99930A9C950A9F960AA3960AA2930A9F930AA5950AA9970AAE97(HEX), uplink fport is 13


```
"decoded_payload": {
        "battery_voltage": 2.74,
        "collection": {
            "humidity": [
                73,
                73,
                74.5,
                73.5,
                74,
                74,
                73.5,
                74.5,
                75,
                75,
```

```
            73.5,
            73.5,
            74.5,
            75.5,
            75.5
          ],
          "temperature": [
            27.15,
            27.1,
            27.13,
            27.17,
            27.22,
            27.22,
            27.13,
            27.16,
            27.19,
            27.23,
            27.22,
            27.19,
            27.25,
            27.29,
            27.34
          ]
        },
        "work_mode": 4
}
```


7.7 LMPS-2 payload formats, work mode is 5

Bytes	2	2	2	…
Payload	Work mode & BAT voltage	DS18B20 Temp1	DS18B20 Temp2	…

LMPS-2 payload formats, work mode is 5

An example uplink payload is 51120A8C0A980A980A980A980A980A980A8C0A8C0A980A8C0A8C0A8C0A980A98(HEX), uplink fport is 14


```
      "decoded_payload": {
        "battery_voltage": 2.74,
        "collection": {
          "temperature": [
            27,
            27.12,
```

```
            27.12,
            27.12,
            27.12,
            27.12,
            27.12,
            27,
            27,
            27.12,
            27,
            27,
            27,
            27.12,
            27.12
          ]
        },
        "work_mode": 5
}
```


Bits	15	[14:12]	[11:0]
Door status & Work mode & BAT voltage	Door open status	Work mode	BAT voltage(mV)

LMPS-1 can work on either mode 1 or mode 4, and the default shipping configuration is 1. For work mode 1, LMPS-1 will report a group of data every reporting interval after joining the network, the default report interval is 15 mins.

For work mode 4, LMPS-1 wakes up the MCU every sample interval to read and record temperature and humidity data, until the number of samples exceeds the total sample times, and then report a group of data.

LMPS-2 can work on either mode 2 or mode 5, and the default shipping configuration is 2. For work mode 2, LMPS-2 will report a group of data every reporting interval after joining the network, the default report interval is 15 mins. For work mode 5, LMPS-2 wakes up the MCU every sample interval to read and record temperature data, until the number of samples exceeds the total sample times and then report a group of data.

For the work mode, 3 is used for LMPS-3.

8. How to connect The Things Network v3

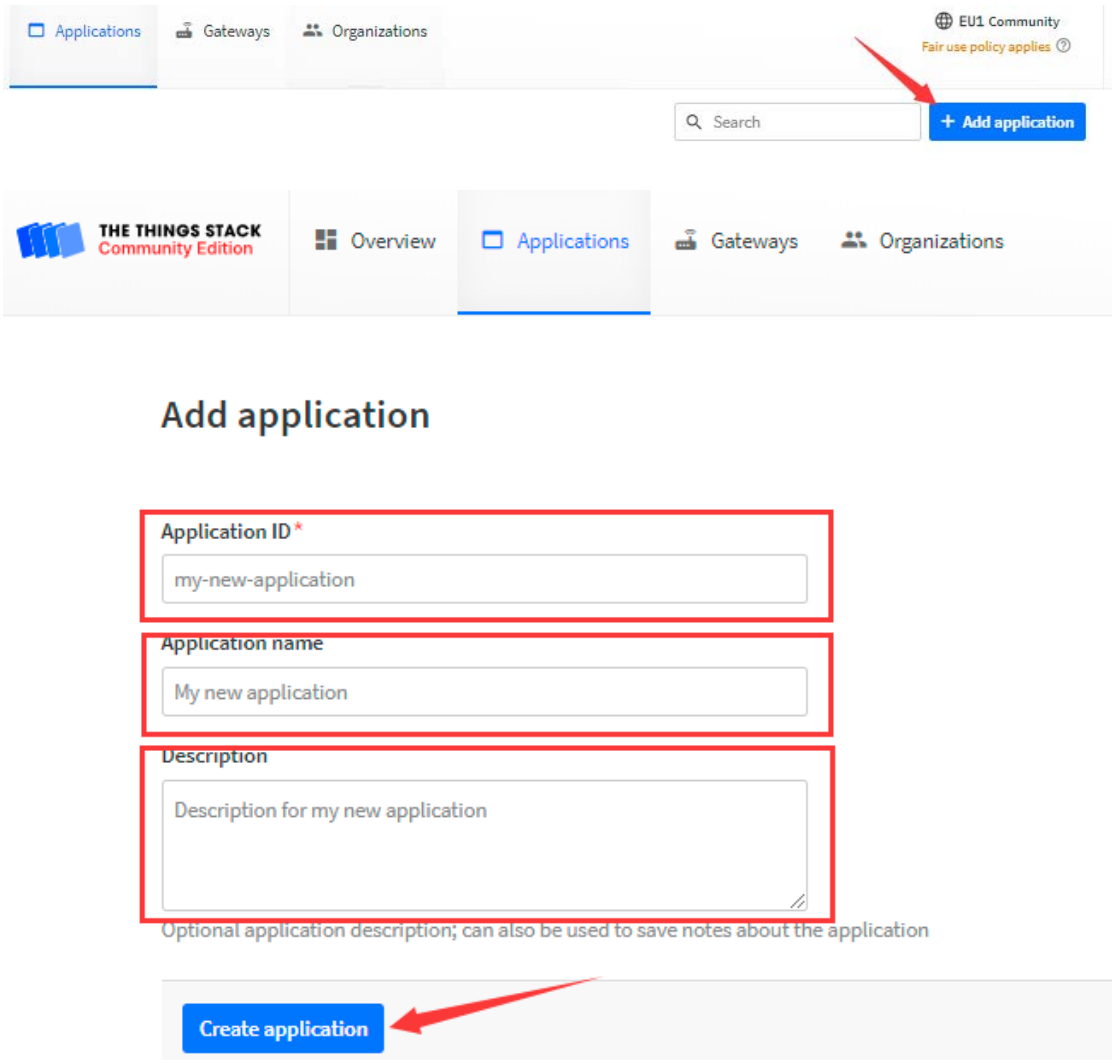
8.1 What do you need to prepare?

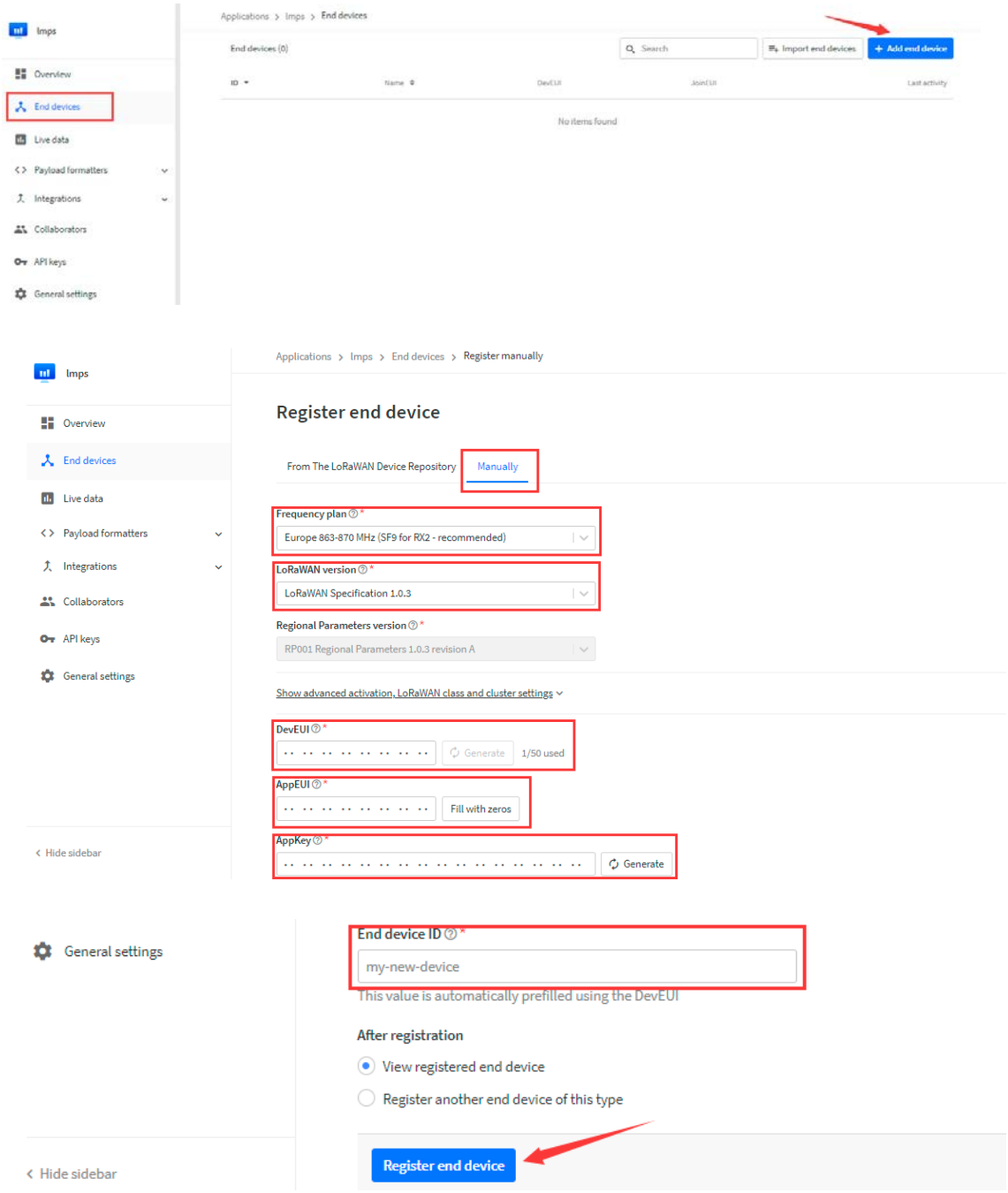
- √ LMPS-X
- √ 2 x AAA/LR03 batteries
- √ LoRaWAN gateway in range and connect to TTN v3
- √ Register TTN v3 account

8.2 Adding Device

First, please contact us to get LoRaWAN keys.

Open The Things Network and login



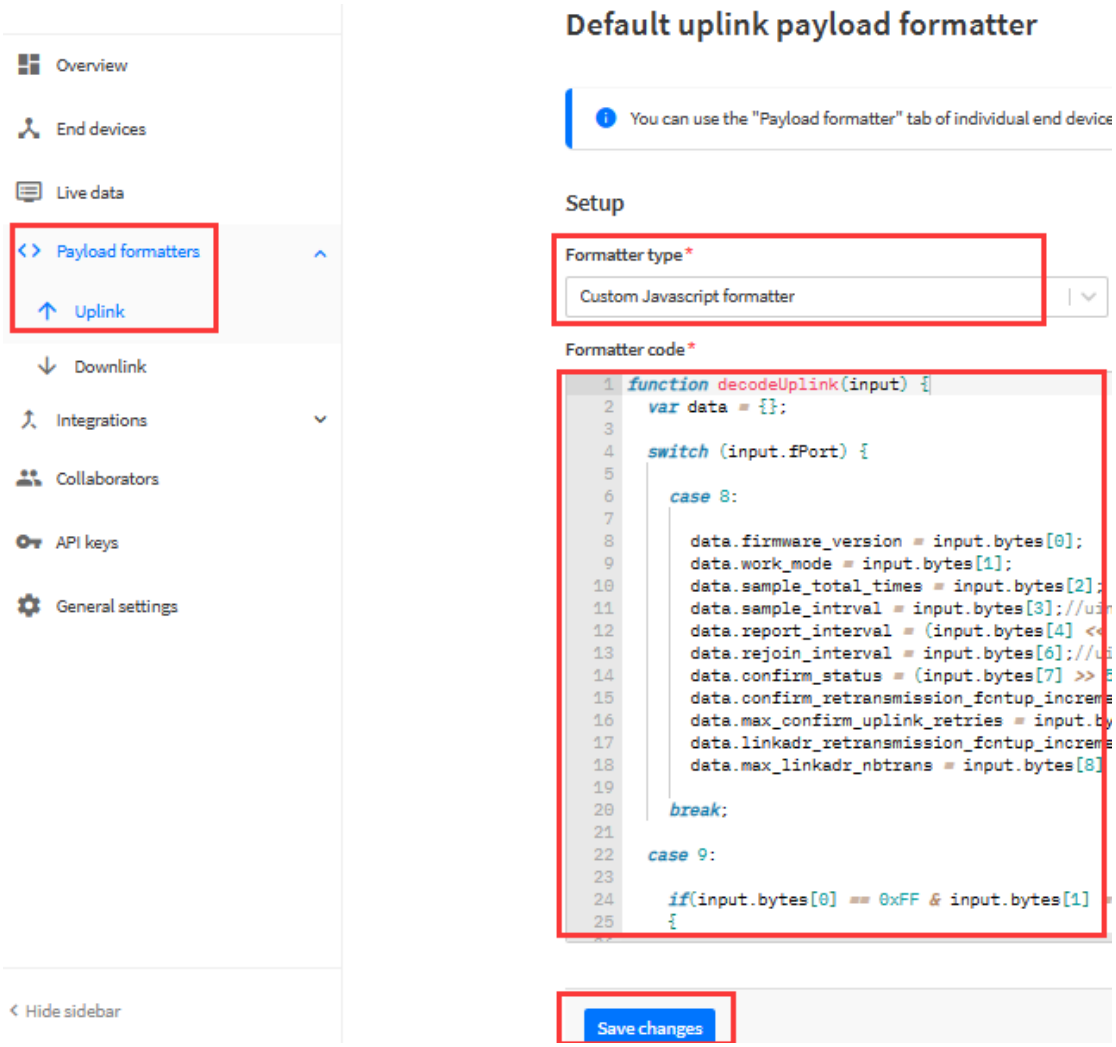


8.3 Add uplink payload decoder

The uplink payload decoder link is as follows:

[LoRa_End_Nodes/LMPS_uplink_payload_decoder_for_The_Things_Network.js at main · HiLinkThings/LoRa_End_Nodes (github.com)]

Copy the source to formatter code and save changes.



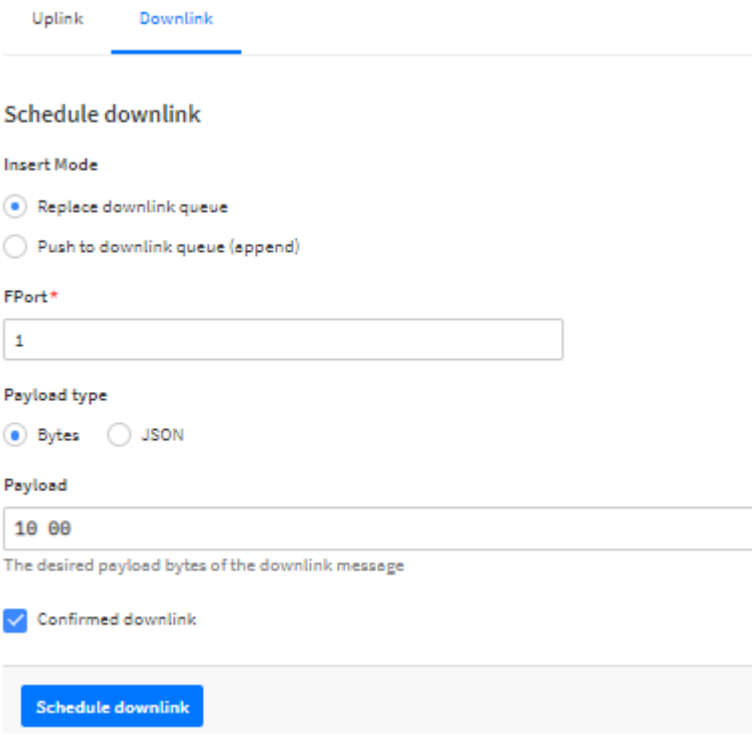
Finally, install the battery, and the device will automatically send a join request.

9. Change configuration via server downlink

9.1 Reset the device

Size(bytes)	1	1
data	0x10	0x00

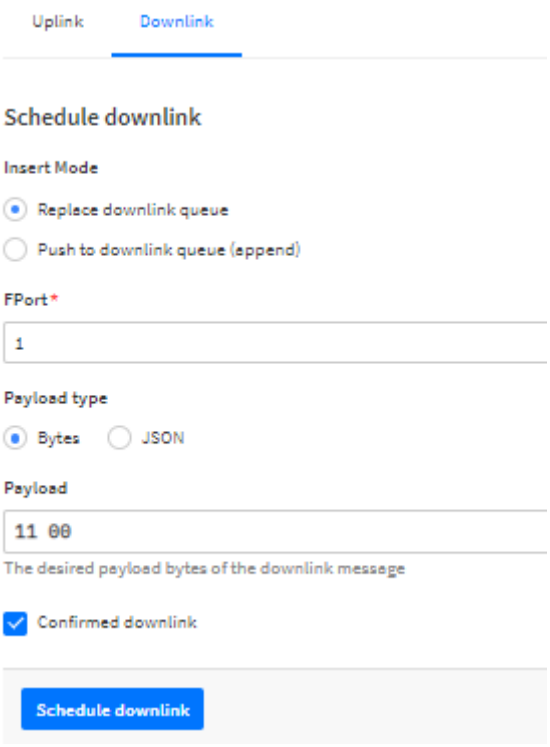
The command identifier is 0x10
Example:
downlink 1000(HEX) to reset the device



9.2 Report data immediately

Size(bytes)	1	1
data	0x11	0x00

The command identifier is 0x11
Example:
downlink 1100(HEX) to report data immediately



9.3 Get device configuration

Size(bytes)	1	1
data	0x12	0x00

The command identifier is 0x12
Example:
downlink 1200(HEX) to get device configuration

9.4 Change the uplink confirmed mode

Size(bytes)	1	1	1	1
data	0x13	Uplink confirm mode	Max retries	Whether to increase the uplink counter

The command identifier is 0x13
Example:
downlink 13010601(HEX) to enable confirm mode, max retries set to 6, and increase the uplink counter for the same payload.

downlink 13010500(HEX) to enable confirm mode, max retries set to 5, and do not increase the uplink counter for the same payload.

downlink 1300(HEX) to disable confirm mode.

9.5 Change ADR, Data Rate, and TX power

Size(bytes)	1	1	1	1
data	0x14	ADR	Data Rate	TX Power

The command identifier is 0x14
Example:
downlink 1401(HEX) to enable ADR.

downlink 14000400(HEX) to disable ADR, set data rate to 0, and TX power to 0.

DataRate	Configuration	Indicative physical bit rate [bit/s]
0	LoRa: SF12 / 125 kHz	250
1	LoRa: SF11 / 125 kHz	440
2	LoRa: SF10 / 125 kHz	980
3	LoRa: SF9 / 125 kHz	1760
4	LoRa: SF8 / 125 kHz	3125
5	LoRa: SF7 / 125 kHz	5470
6	LoRa: SF7 / 250 kHz	11000
7	FSK: 50 kbps	50000
8..15	RFU	

Table 5: EU863-870 TX Data rate table

TXPower	Configuration (EIRP)
0	Max EIRP
1	Max EIRP – 2dB
2	Max EIRP – 4dB
3	Max EIRP – 6dB
4	Max EIRP – 8dB
5	Max EIRP – 10dB
6	Max EIRP – 12dB
7	Max EIRP – 14dB
8..15	RFU

Table 6: EU863-870 TX power table

For more information, see details to LoRaWAN 1.0.3 Regional Parameters.

9.6 Change data report interval for LMPS-1 or LMPS-2

Size(bytes)	1	2
data	0x20	Interval in second

The command identifier is 0x20

Example:
downlink 200258(HEX) to change the data report interval is 600s
0x0258=600

9.7 Change work mode

Size(bytes)	1	1	1	1
data	0x21	Work mode	Total Sample times	Sample interval

The command identifier is 0x21
Example:
downlink 2101(HEX) to change the work mode to 1.

downlink 21040F01(HEX) to change the work mode to 4, total sample times to 15, and sample interval to 1 min.

downlink 2102(HEX) to change the work mode to 2.

downlink 21050E01(HEX) to change the work mode to 5, total sample times to 15, and sample interval to 1 min.

downlink 2103(HEX) to change the work mode to 3.

10. Offline detection

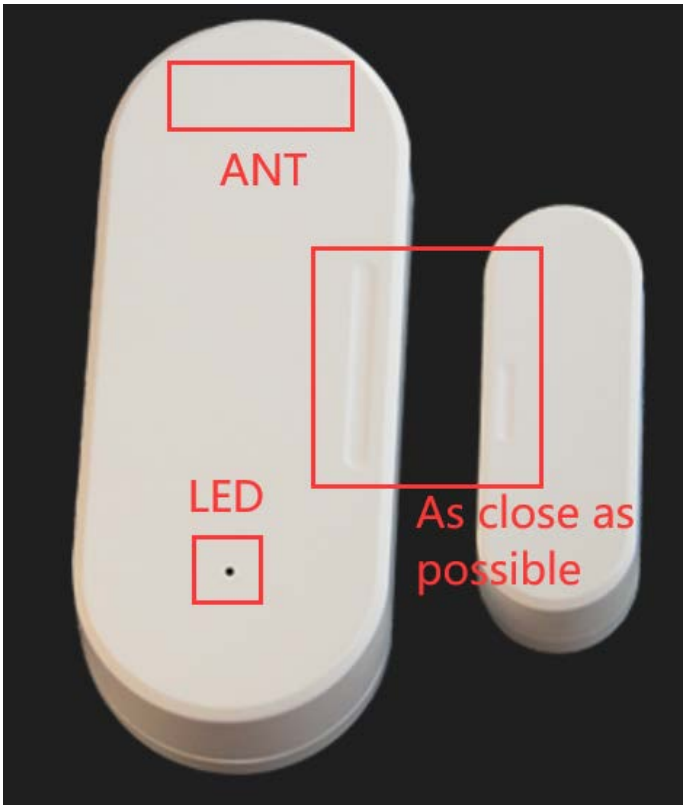
For LMPS-1 and LMPS-2, after joining the network, for every packet sent by the node, the offline_ detection counter will add 1, if the counter exceeds 140 and has not yet received a downlink, it will begin to rejoin. After receiving any downlink during listening, the counter will automatically clear to 0.

For LMPS-3, the upper limit of the counter is 30.

11. Sleep current

Sleep current is less than 6uA.

12. How to install LMPS-X

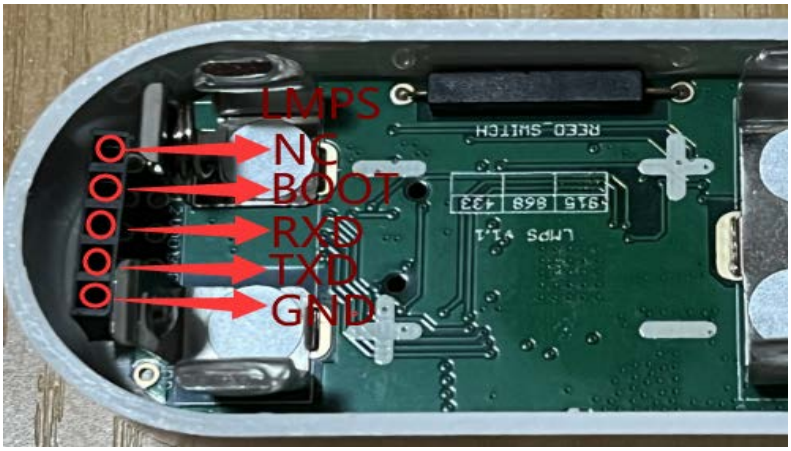


Please use double-sided adhesive tape to attach the device to the specified installation position.

13. How to upgrade firmware

First, you need to remove the battery, then connect LMPS and USB to TTL as follows

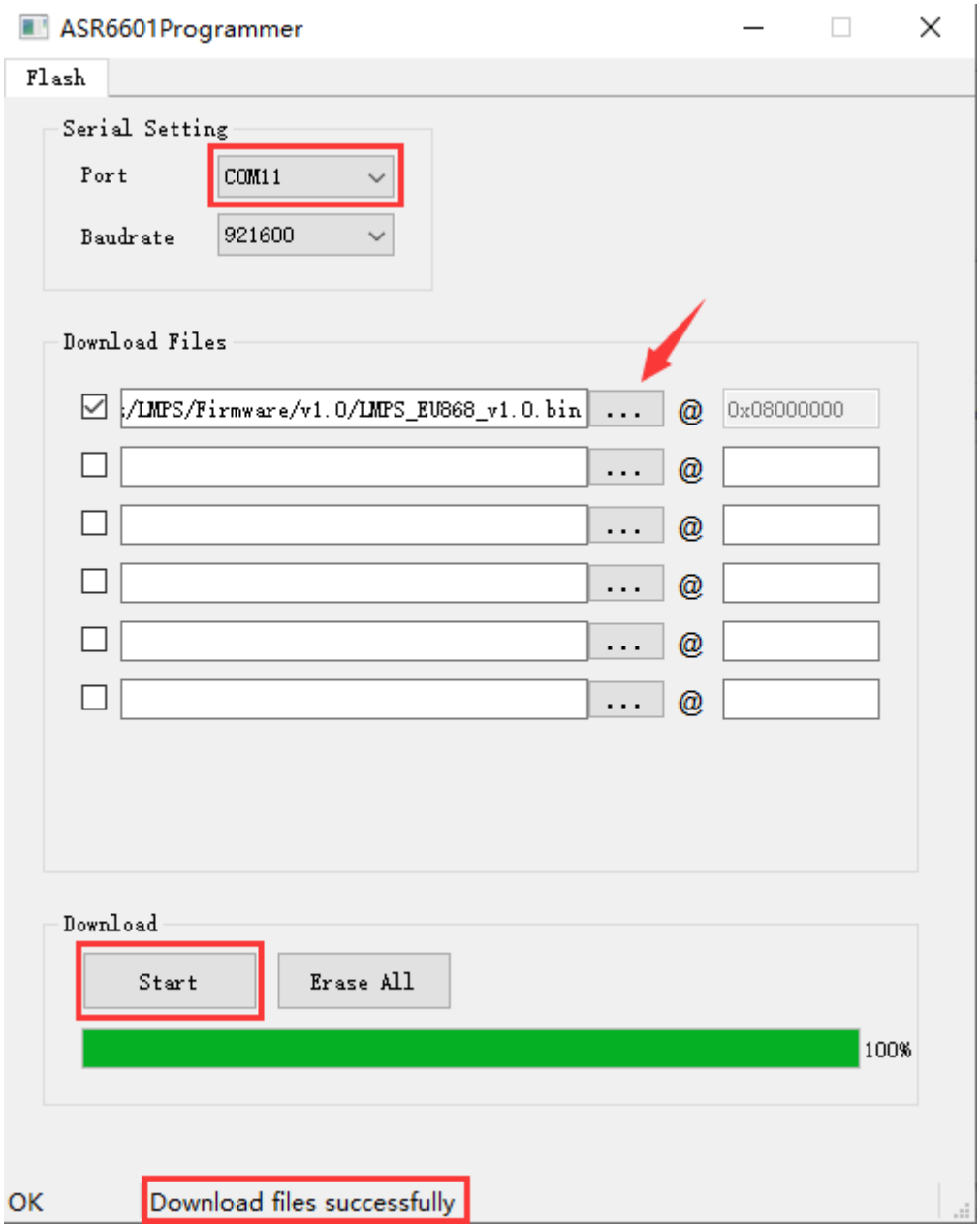
```
USB to TTL(CP210x, CH340 or FT232)  <>  LMPS board
GND     <>     GND
TXD     <>     RXD
RXD     <>     TXD
3.3v    <>     BOOT
```



Download firmware and ASR6601Programmer, the link is as follows:
LoRa_End_Nodes/LMPS/Firmware/v1.0 at main · HiLinkThings/LoRa_End_Nodes (github.com)

LoRa_End_Nodes/Tools at main · HiLinkThings/LoRa_End_Nodes (github.com)

Insert USB to TTL into the PC, open ASR6601Programmer, and select the serial port and software path. Click Start and wait for the download to complete.



If it fails to connect, please plug and unplug the USB to TTL.
Finally, disconnect the LMPS and USB to TTL.
install the battery, and the device will automatically send a join request.

14. Order information

Part Name	Description
LMPS-1-EU868	LoRaWAN temperature and humidity sensor, the frequency band is EU868
LMPS-2-EU868	LoRaWAN temperature sensor, the frequency band is EU868
LMPS-3-EU868	LoRaWAN door status detects sensor, the frequency band is EU868

The size of LMPS-1 is 7 X 3cm.
The size of LMPS-1 is 7 X 3cm, and the temperature sensor wire length is approximately 1m.
The size of LMPS-3 motherboard is 7 X 3cm, the magnet is 4 x 1.5cm.

15. Package information

1 x LMPS-x-x(Without battery)
1 x Double-sided tape

16. Support

Please send an email to gardenhuang@aliyun.com.