

LS100 User Manual

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Revision History

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1. Introduction

The LS100 is a LoRaWAN end device.

The LS100 has a built-in magnetic switch and a Sensirion SHT40 temperature and humidity sensor. After joining the network, it reports a group of data every 15 minutes by default. The reporting interval can be changed via LoRaWAN downlink or NFC.

It will immediately send a group of data when the magnet approaches or leaves the magnetic switch.

You need to install the battery and ensure the device is within the LoRaWAN network range. Additionally, the device must be registered on the LoRaWAN server. Once these conditions are met, the device will automatically send a join request to join the network.

2. Key Features

- STM32WLE5CCU6 LoRa MCUs
- LoRaWAN 1.0.3 CLASS A fully compliant
- Standby current less than 4 uA
- Offline detection
- Equipped with an NFC tag for upgrading firmware and changing configurations
- Change configurations by LoRaWAN downlink or NFC
- Battery life of more than 1 year (14dBm, SF7@125KHz data rate, and 15-minute data transmission interval)
- Power by 2 x AAA/LR03 batteries
- Small size
- Easy install

3. Application

- Home and Building Automation

4. Sensor Characteristics

4.1 Built-in SHT40 temperature and humidity sensor Performance Graphs

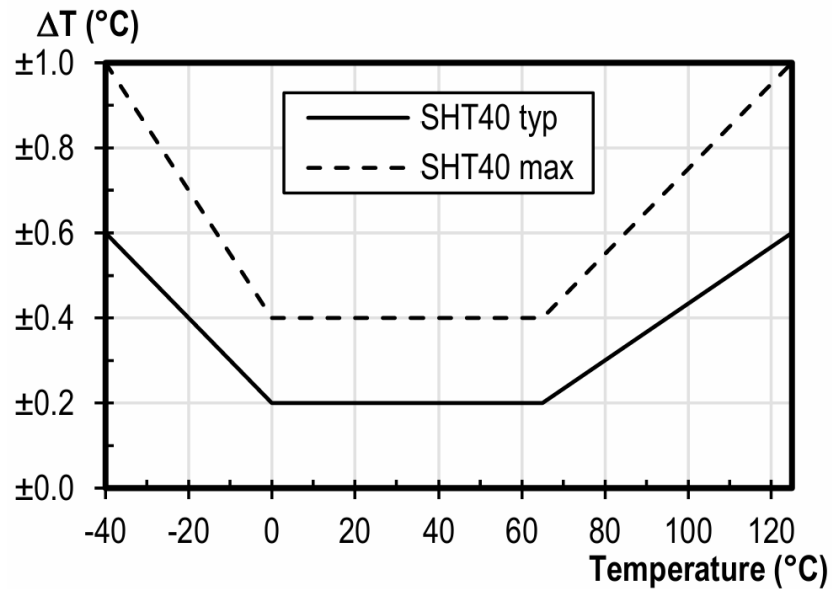


Figure 6: SHT40 typical and maximal temperature accuracy.

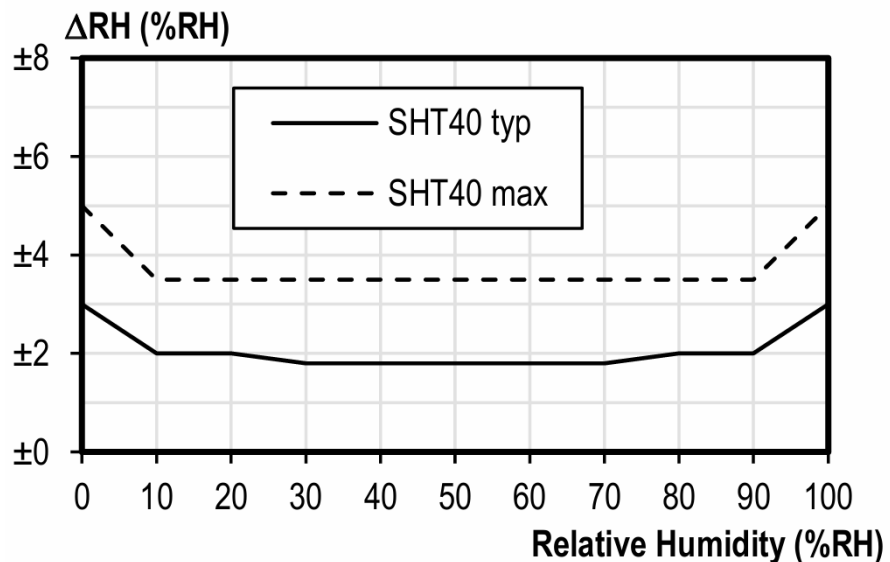
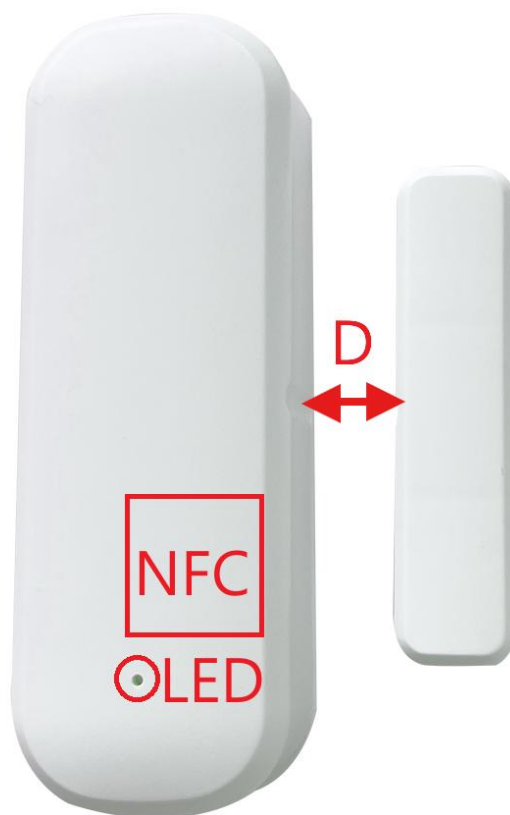


Figure 2: SHT40 typical and maximal relative humidity accuracy at 25 °C.

4.2 Magnetic switch



Note that during installation, the distance between the magnet and the magnetic switch needs to be less than 15 mm for accurate triggering.

WARNING

Recommended device operating temperature is -20 to 60°C, and humidity is 20 to 80%.

5. LED status

The green LED blinks once every time a packet is sent.

Successfully connected to the LoRaWAN network, the green LED is always on for 3s.

The green LED blinks 3 times to indicate that the device has been reset successfully.

6. Uplink payload formats

Size(bytes)	1	2	1	1	3
Payload	Battery voltage	Temperature	Humidity	Door open/close status	Door opened times since the last power on

An example uplink payload is 9D 0C 5E 85 01 00 00 00 (HEX), uplink fport is 10.

```
"decoded_payload": {  
  "BAT_Voltage": 3.07,  
  "Door_Opened_Times": 0,  
  "Door_Status": "open",  
  "Humidity": 66.5,  
  "Temperature": 31.66  
}
```

7. How to connect The Things Network v3

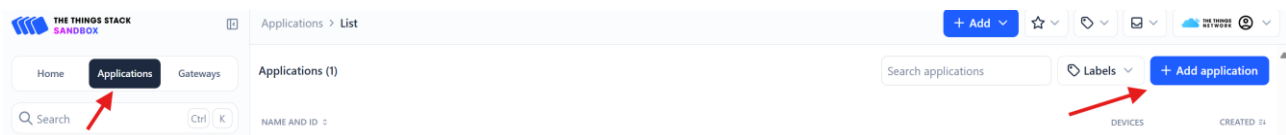
7.1 What do you need to prepare?

- ✓ 1 x LS100
- ✓ 2 x AAA/LR03 batteries
- ✓ LoRaWAN gateway in range and connect to TTN v3
- ✓ Register the end device

7.2 Adding Device

First, please contact us to get LoRaWAN keys.

Open [The Things Network](https://www.thethingsnetwork.org/) and login, write device information.



Create application

Within applications, you can register and manage end devices and their network data. After setting up you external services.

Learn more in our guide on [Adding Applications](#).

Application ID*

my-new-application

Application name

My new application

Description

Description for my new application

Optional application description; can also be used to save notes about the application

Application properties

Labels

Select...

Add a label or [create one](#) to categorize your applications

Create application

Search Ctrl K

← Is100

- Application overview
- End devices**
- Live data
- Webhooks
- Message storage
- Payload formatters
- Collaborators
- API keys
- Other integrations
- General settings

End devices (0)

Search

Labels

Import end devices

+ Register end device

NAME AND ID

DEVEUI

JOINEUI

LAST ACTIVITY

No items found

Home Applications Gateways

Search Ctrl K

← Is100

- Application overview
- End devices**
- Live data
- Webhooks
- Message storage
- Payload formatters
- Collaborators
- API keys
- Other integrations
- General settings

No top end devices yet

Resources eu1 • v3.34.1.dd390f6960

Register end device

Does your end device have a LoRaWAN® Device Identification QR Code? Scan it to speed up onboarding.

[Scan end device QR code](#) [Device registration help](#)

End device type

Input method

- ☐ Select the end device in the LoRaWAN Device Repository
- ☒ Enter end device specifics manually

Frequency plan

Europe 863-870 MHz (SF9 for RX2 - recommended)

LoRaWAN version

LoRaWAN Specification 1.0.3

Regional Parameters version

RP001 Regional Parameters 1.0.3 revision A

[Show advanced activation, LoRaWAN class and cluster settings](#)

Provisioning information

JoinEUI

..... Confirm

To continue, please enter the JoinEUI of the end device so we can determine onboarding options

Make sure that the gateway and end devices use the same frequency plan.

JoinEUI is the same as APPEUI.

DevEUI

..... Generate 0/50 used

AppKey

..... Generate

End device ID

my-new-device

Device properties

Labels

Select...

Add a label or [create one](#) to categorize your devices

After registration

- ☒ View registered end device
- ☐ Register another end device of this type

Register end device

7.3 Add uplink payload decoder

The uplink payload decoder download link is as follows:

[LoRaWAN/LS100/LS100 uplink payload](#)

[decoder/LS100 uplink payload decoder for The Things Network.js at main · huangdove/LoRaWAN · GitHub](#)

Copy the source to the formatter code and save changes.

Default uplink payload formatter

Setup

Formatter type*

Custom Javascript formatter

Formatter code*

```

1 function decodeUplink(input) {
2   var payload = {};
3
4   switch (input.fPort) {
5
6     case 10:
7
8       payload.BAT_Voltage = (input.bytes[0] * 10 + 1500) / 1000;
9       payload.Temperature = (((input.bytes[1] & 0x80 ? input.bytes[1] - 0x100 : input.bytes[1] << 8) + input.bytes[2]) / 100;
10      payload.Humidity = input.bytes[3]/2;
11      payload.Door_Status = input.bytes[4] & 0x01 ? "open" : "close";
12      payload.Door_Opened_Times = ((input.bytes[5] << 16) + (input.bytes[6] << 8) + input.bytes[7]);
13
14      break;
15
16      default:
17        throw Error("unknown FPort");
18    }
19
20    return {
21      data: payload,
22    };
23  }

```

Save changes

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

8. Change configuration via LoRaWAN server downlink

8.1 Reset the device

Size(bytes)	1	1
data	0x00	0x16

The command identifier is 0x00

Example:

Downlink 0016(HEX) to reset the device

The screenshot shows the 'Messaging' tab in the LoRaWAN server interface. The 'Schedule downlink' option is selected. The 'Insert Mode' is set to 'Replace downlink queue'. The 'FPort' is set to 1. The 'Payload type' is set to 'Bytes'. The 'Payload' field contains the hexadecimal value '00 16'. The 'Confirmed downlink' checkbox is checked. The 'Schedule downlink' button is at the bottom.

8.2 Sent once again

Size(bytes)	1	1
data	0x01	0x00

The command identifier is 0x01

Example:

The device will send data once again when it receives 0100(HEX).

8.3 Change data report interval

Size(bytes)	1	3
data	0x02	Interval in seconds

The command identifier is 0x02

Example:

Downlink 02000384(HEX) to change data report interval to 0x000384=900s.

8.4 Change ADR and DataRate

Size(bytes)	1	1	1
data	0x03	ADR	DataRate

The command identifier is 0x03

Example:

Downlink 030100(HEX) to enable ADR.

Downlink 030004 (HEX) to disable ADR, and set data rate to 4.

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

For more information, see the details of LoRaWAN 1.0.3 Regional Parameters.

8.5 Change the uplink confirmed params

Size(bytes)	1	1	1
data	0x04	Uplink confirm mode	Max retries

The command identifier is 0x04

Example:

Downlink 040106 (HEX) to enable uplink confirm mode, max retries set to 6.

Downlink 040005 (HEX) to disable uplink confirm mode, max retries set to 5.

8.6 Change the offline detection params

Size(bytes)	1	1	1	
data	0x05	switch	Min threshold	Max threshold

The command identifier is 0x05

Example:

Downlink 05016496 (HEX) to enable offline detection, min threshold set to 100, and max threshold set to 100.

Downlink 05006496 (HEX) to disable offline detection, min threshold set to 100, and max threshold set to 100.

8.7 Change channel mask for US915, AU915, and CN470

Size(bytes)	1	1
data	0x06	value

The command identifier is 0x06

Example:

Downlink 0600(HEX) to enable all uplink channels.

Downlink 0601(HEX) to enable channels 0 to 7 and channel 64.

Downlink 0602(HEX) to enable channels 8 to 15 and channel 65.

Downlink 0608(HEX) to enable channels 56 to 63 and channel 71.

9. How to use the NFC Reader 3911 to communicate with the LS100

9.1 What do you need to prepare?

- √ Power on the LS100
- √ Connect the NFC Reader 3911 to your PC via Micro USB
- √ Download and install [STSW-ST25PC001 - Windows® PC software for ISO15693, ISO14443-A/B, NFC and industrial readers - STMicroelectronics](#)

The recommended version is 2.6.2

Get Software

Part Number	General Description	Download	All versions
+ STSW-ST25PC001	PC software for ISO15693 & ISO14443-A/B readers (Executable)	Get latest	Select version ▼
+ STSW-ST25PC002	PC software for ISO15693 & ISO14443-A/B readers (Source)	Get latest	3.0.0
			2.6.2

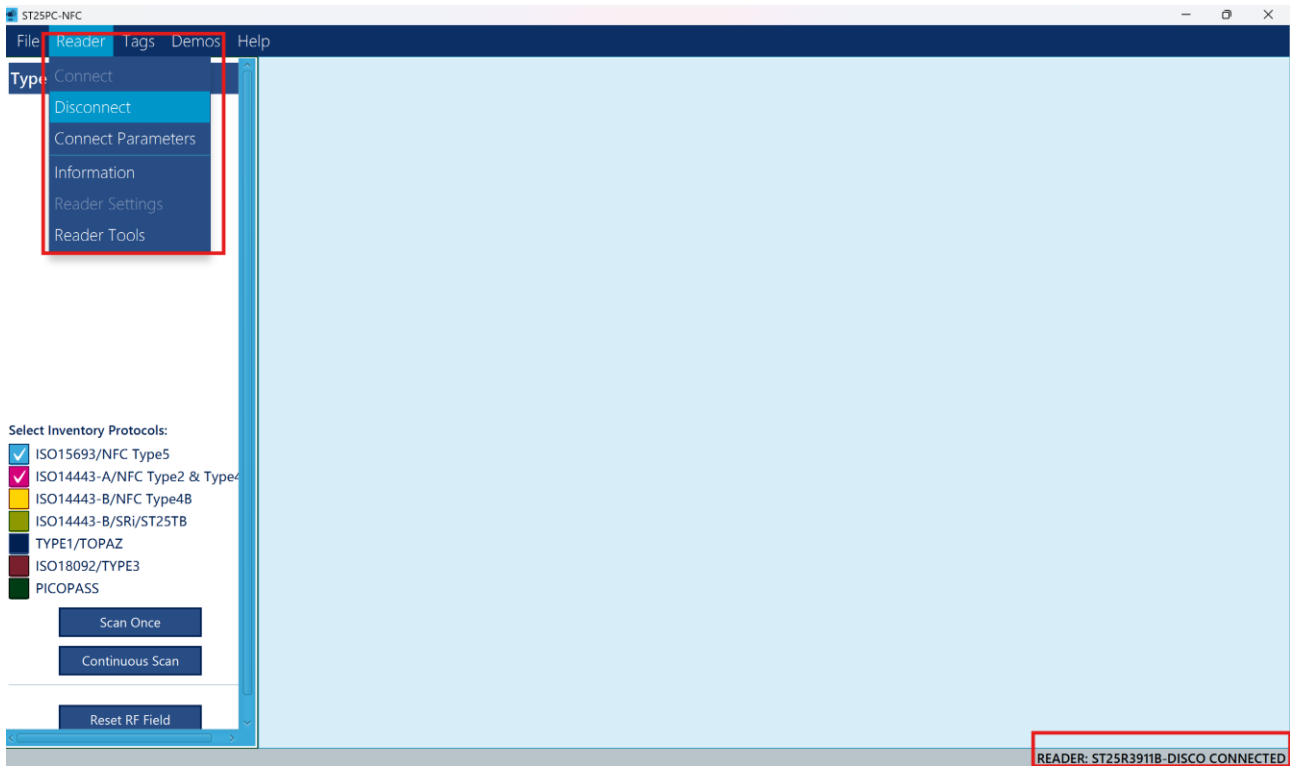
9.2 Scan the NFC tags



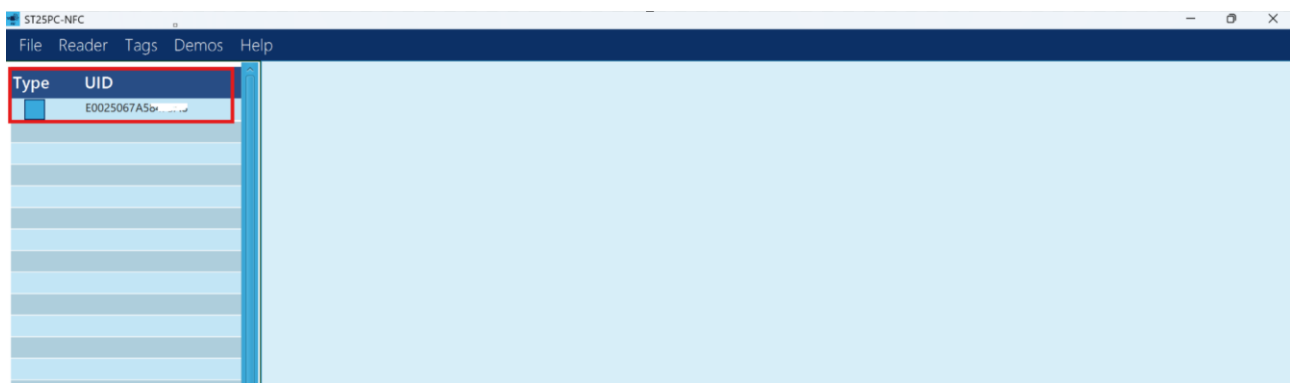
Step 1: Open the ST25PC-NFC software

Step 2: Press the NFC Reader 3911 S1 button once to reset the device. The 6 LEDs are fully lit to indicate that the reset is successful.

Step 3: Click Reader → Disconnect → Connect. When ST25R3911B-DISCO CONNECTED is displayed, it means that the NFC reader 3911 is connected to the PC successfully.



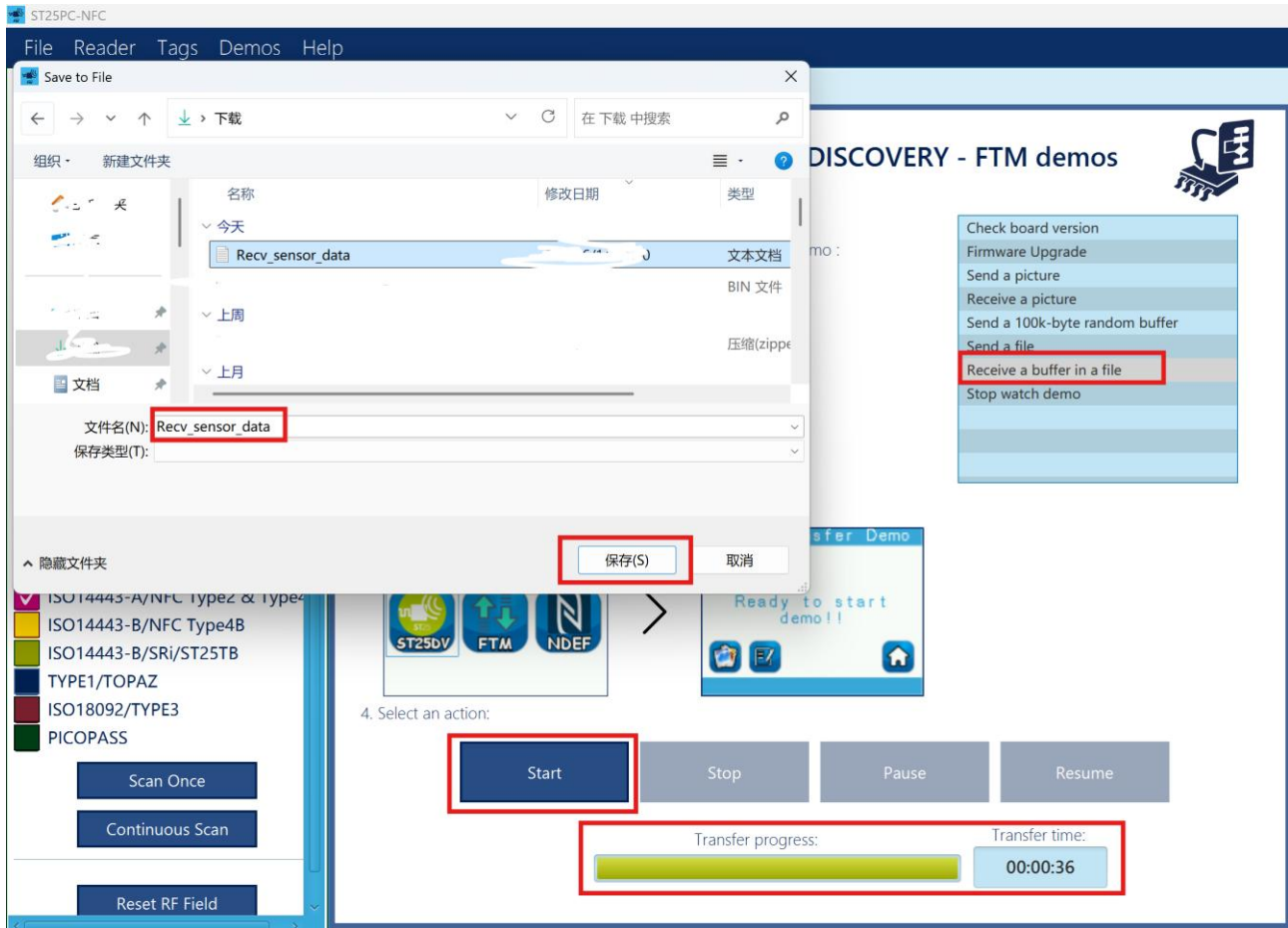
Step 4: Hold the NFC reader 3911 close to the NFC area of the LS100 and click Scan Once.



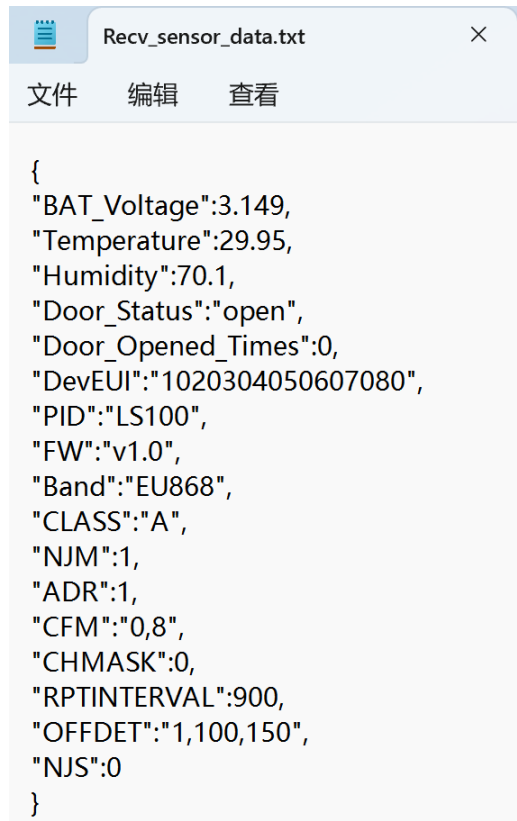
Step 5: View the UID of the scanned device.

9.3 Get the LS100 sensor data

Click on the Receive a buffer in a file option, click the start button, wait for the device to collect sensor data, and then save the content as a Recv_sensor_data.txt.



View the Recv_sensor_data.txt file content.



9.4 Set the LS100 configurations

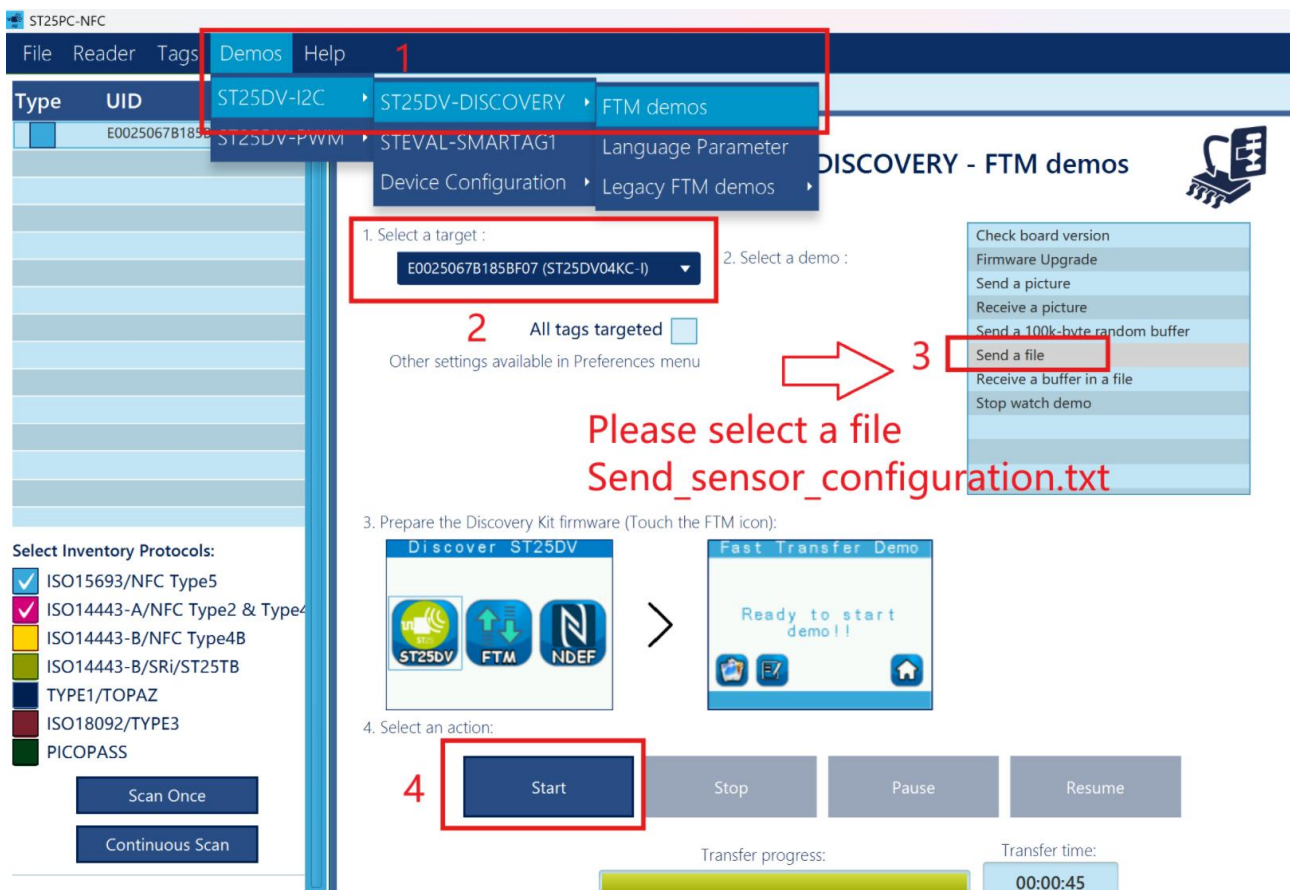
Suppose the following configurations need to be changed.

```

Send_sensor_configuration.txt
文件  编辑  查看

AT
AT+RPTINTERVAL=1200
AT+NMJ=1
AT+CFM=0,7
AT+OFFDET=1,101,151
AT+CS
AT
    
```

Use the NFC reader 3911 to approach the NFC area of the LS100.



Finally, move the NFC Reader 3911 away from the NFC area.

9.5 Upgrade the firmware of the LS100

The firmware download link is as follows:

[LoRaWAN/LS100/Firmware at main · huangdove/LoRaWAN · GitHub](#)

Use the NFC reader 3911 to approach the NFC area of the LS100.

Click on the Firmware Upgrade option and select a firmware.



FTM demo : Password for Firmware Upgrade



When the firmware download is complete, the device will reboot, and the green LED will blink 3 times.

Finally, move the NFC Reader 3911 away from the NFC area.

10. Offline detection

For the YOGEJAY LoRaWAN end device, after joining the network, for every packet sent by the node, the offline detection counter will add 1.

The uplink data automatically carries the LinkCheckReq when the counter is between `offline_detection_counter_min_threshold` and `offline_detection_counter_max_threshold`.

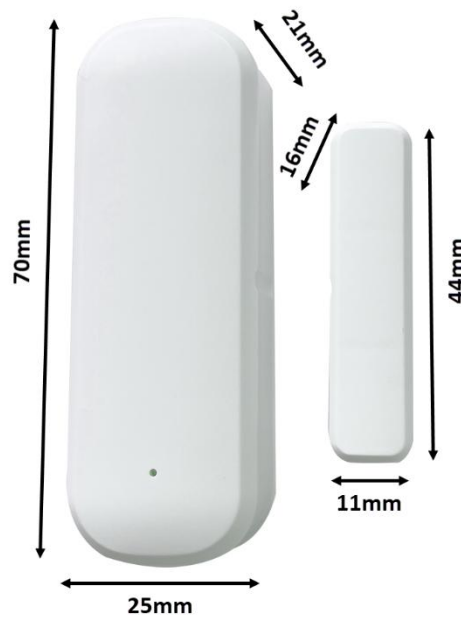
If the counter exceeds `offline_detection_counter_max_threshold` and has not yet received a downlink, it will begin to rejoin the network.

After receiving any downlink during listening, the counter will automatically clear to 0.

11. How to upgrade the LS100 firmware

Please refer to Section 4.5.

12. Dimension



13. Sleep current

After the device sends uplink data or processes a task, it will enter sleep mode.

The sleep current is about 3uA.

14. Package information

1 x LS100(Without battery)

1 x Double-sided tape

15. Support

Please send an email to dove.huang@aliyun.com.