LHT65N-E5 -- LoRaWAN Temperature_Humidity & Illuminance Sensor User Manual

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on 2024/04/07 10:15

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1. Introduction

1.1 What is LHT65N-E5 Temperature,Humidity&Illuminance Sensor

The Dragino **LHT65N-E5 Temperature, Humidity & Illuminance sensor** is a Long Range LoRaWAN Sensor.It includes a **built-in Temperature & Humidity sensor** and has an **external Illuminance sensor.**

The LHT65N-E5 allows users to send data and reach extremely long ranges. It provides ultra-long range spread spectrum communication and high interference immunity whilst minimizing current consumption. It targets professional wireless sensor network applications such as irrigation systems, smart metering, smart cities, building automation, and so on.

LHT65N-E5 has a **built-in 2400mAh non-chargeable battery** which can be used for more than 10 years*.

LHT65N-E5 is fully compatible with **LoRaWAN v1.0.3 Class A protocol**, it can work with a standard LoRaWAN gateway.

* The actual battery life depends on how often to send data, please see battery analyzer chapter.

1.2 Features

- LoRaWAN v1.0.3 Class A protocol
- Frequency Bands: CN470/EU433/KR920/US915/EU868/AS923/AU915
- AT Commands to change parameters
- Remote configure parameters via LoRaWAN Downlink
- Firmware upgradeable via program port
- Built-in 2400mAh battery for up to 10 years of use.
- Built-in Temperature & Humidity sensor
- External Illuminance Sensor
- Tri-color LED to indicate working status
- Datalog feature to save sensor data when no LoRaWAN network

1.3 Specification

Built-in Temperature Sensor:

- Resolution: 0.01 °C
- Accuracy Tolerance : Typ ±0.3 °C
- Long Term Drift: < 0.02 °C/yr
- Operating Range: -40 ~ 85 °C

Built-in Humidity Sensor:

- Resolution: 0.04 %RH
- Accuracy Tolerance : Typ ±3 %RH
- Long Term Drift: < 0.25 RH/yr
- Operating Range: 0 ~ 96 %RH

External Illuminace Sensor:

- Base on BH1750 Illumination Sensor
- Cable Length : 50cm
- Resolution: 1 lx
- Range: 0-65535 lx
- Operating Range: -40 °C ~ 85 °C

2. Connect LHT65N-E5 to IoT Server

2.1 How does LHT65N-E5 work?

LHT65N-E5 is configured as LoRaWAN OTAA Class A sensor by default. Each LHT65N-E5 is shipped with a worldwide unique set of OTAA keys. To use LHT65N-E5 in a LoRaWAN network, first, we need to put the OTAA keys in LoRaWAN Network Server and then activate LHT65N-E5.

If LHT65N-E5 is within the coverage of this LoRaWAN network. LHT65N-E5 can join the LoRaWAN network automatically. After successfully joining, LHT65N-E5 will start to measure environment temperature, humidity & illumination, and start to transmit sensor data to the LoRaWAN server. The default period for each uplink is 20 minutes.

2.2 How to Activate LHT65N-E5?

The LHT65N-E5 has two working modes:

- **Deep Sleep Mode**: LHT65N-E5 doesn't have any LoRaWAN activation. This mode is used for storage and shipping to save battery life.
- **Working Mode**: In this mode, LHT65N-E5 works as LoRaWAN Sensor mode to Join LoRaWAN network and send out the sensor data to the server. Between each sampling/tx/rx periodically, LHT65N-E5 will be in STOP mode (IDLE mode), in STOP mode, LHT65N-E5 has the same power consumption as Deep Sleep mode.

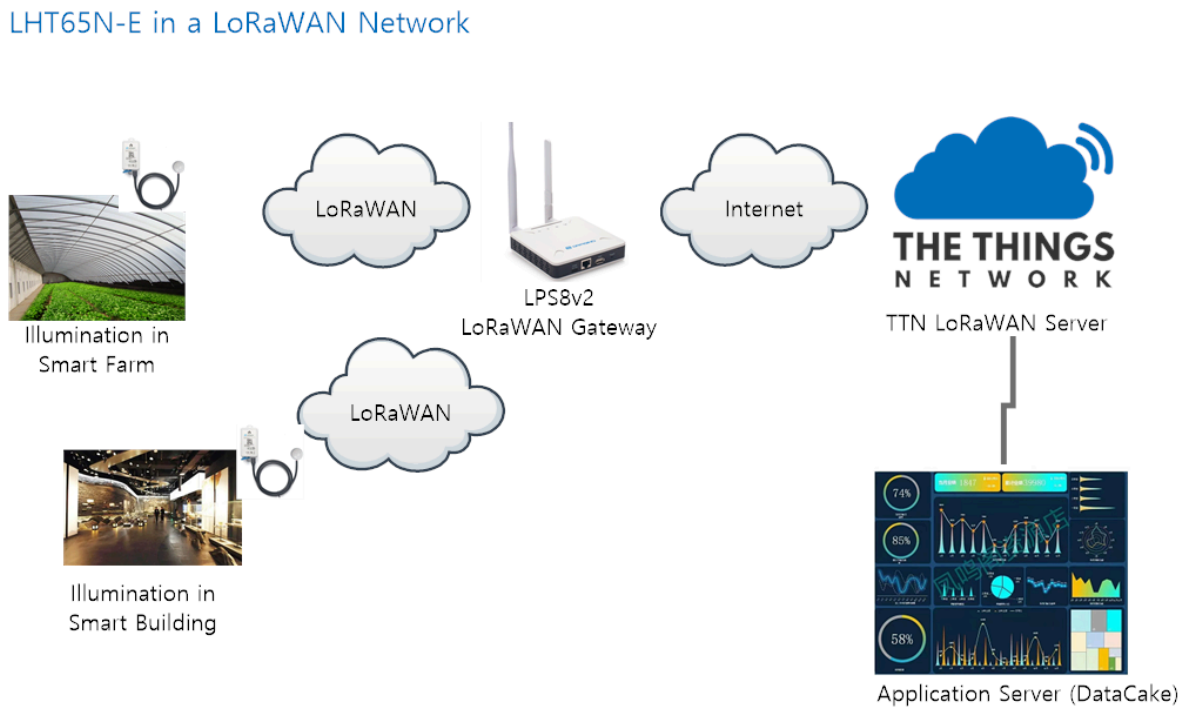
The LHT65N-E5 is set in deep sleep mode by default; The ACT button on the front is to switch to different modes:

Behavior on ACT	Function	Action
Pressing ACT between 1s < time < 3s	Test uplink status	If LHT65N-E5 is already Joined to rhe LoRaWAN network, LHT65N-E5 will send an uplink packet, if LHT65N-E5 has external sensor connected,**Blue led** will blink once. If LHT65N-E5 has not external sensor, **Red led** will blink once.
Pressing ACT for more than 3s	Active Device	**Green led** will fast blink 5 times, LHT65N-E5 will enter working mode and start to JOIN LoRaWAN network. **Green led** will solidly turn on for 5 seconds after join in network.

Fast press ACT 5 times.	Deactivate Device	**Red led** will solid on for 5 seconds. Means LHT65N-E5 is in Deep Sleep Mode.

2.3 Example to join LoRaWAN network

This section shows an example of how to join the TTN V3 LoRaWAN IoT server. Use with other LoRaWAN IoT servers is of a similar procedure.

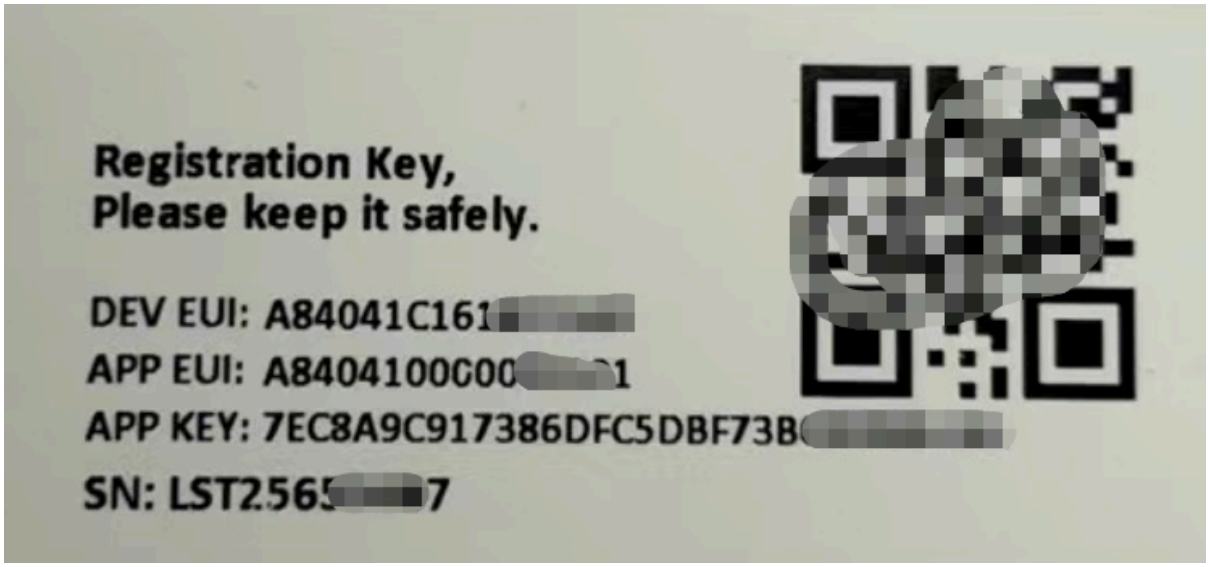


Assume the LPS8v2 is already set to connect to TTN V3 network, So it provides network coverage for LHT65N-E5. Next we need to add the LHT65N-E5 device in TTN V3:

2.3.1 Step 1: Create Device n TTN

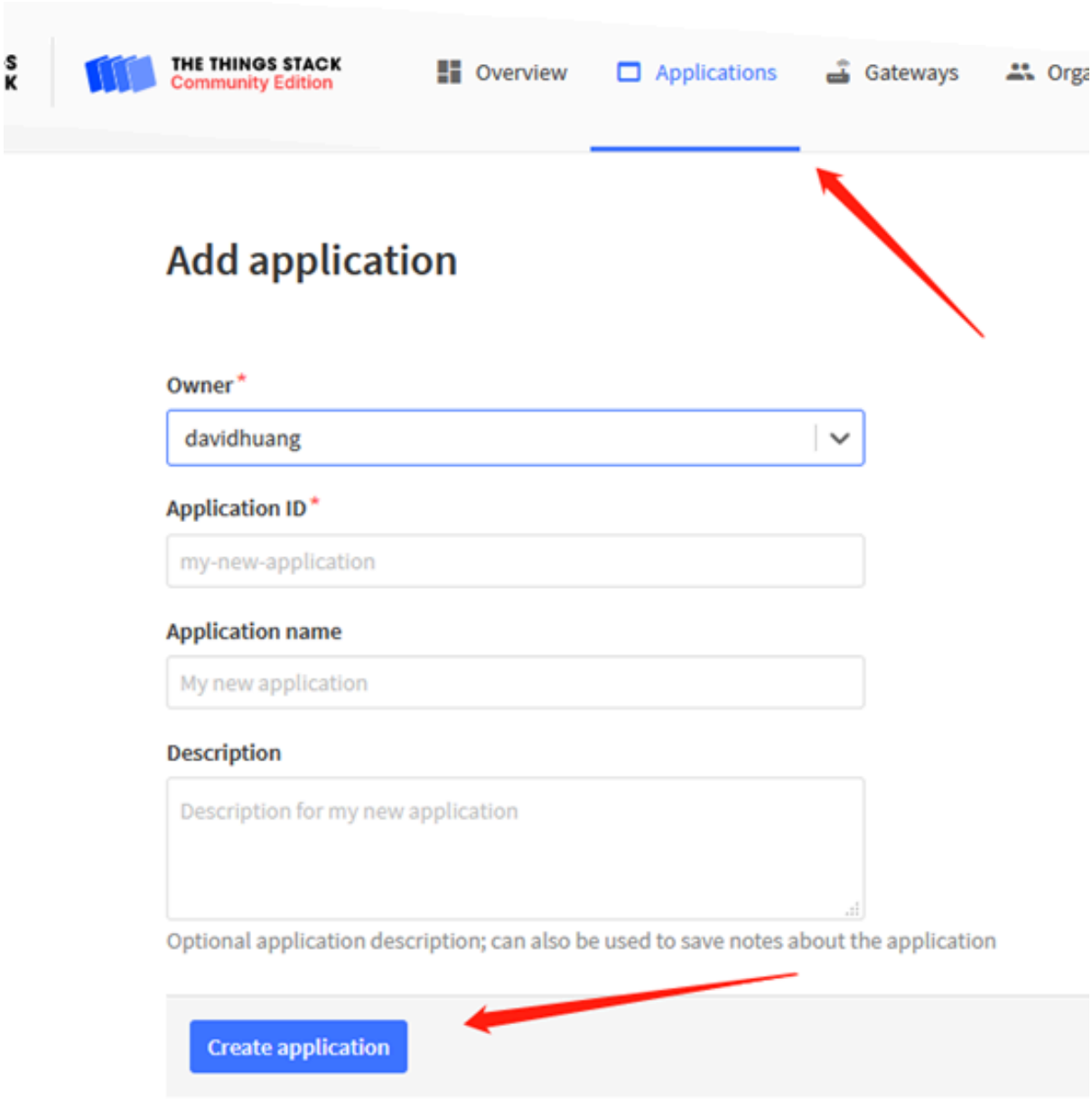
Create a device in TTN V3 with the OTAA keys from LHT65N-E5.

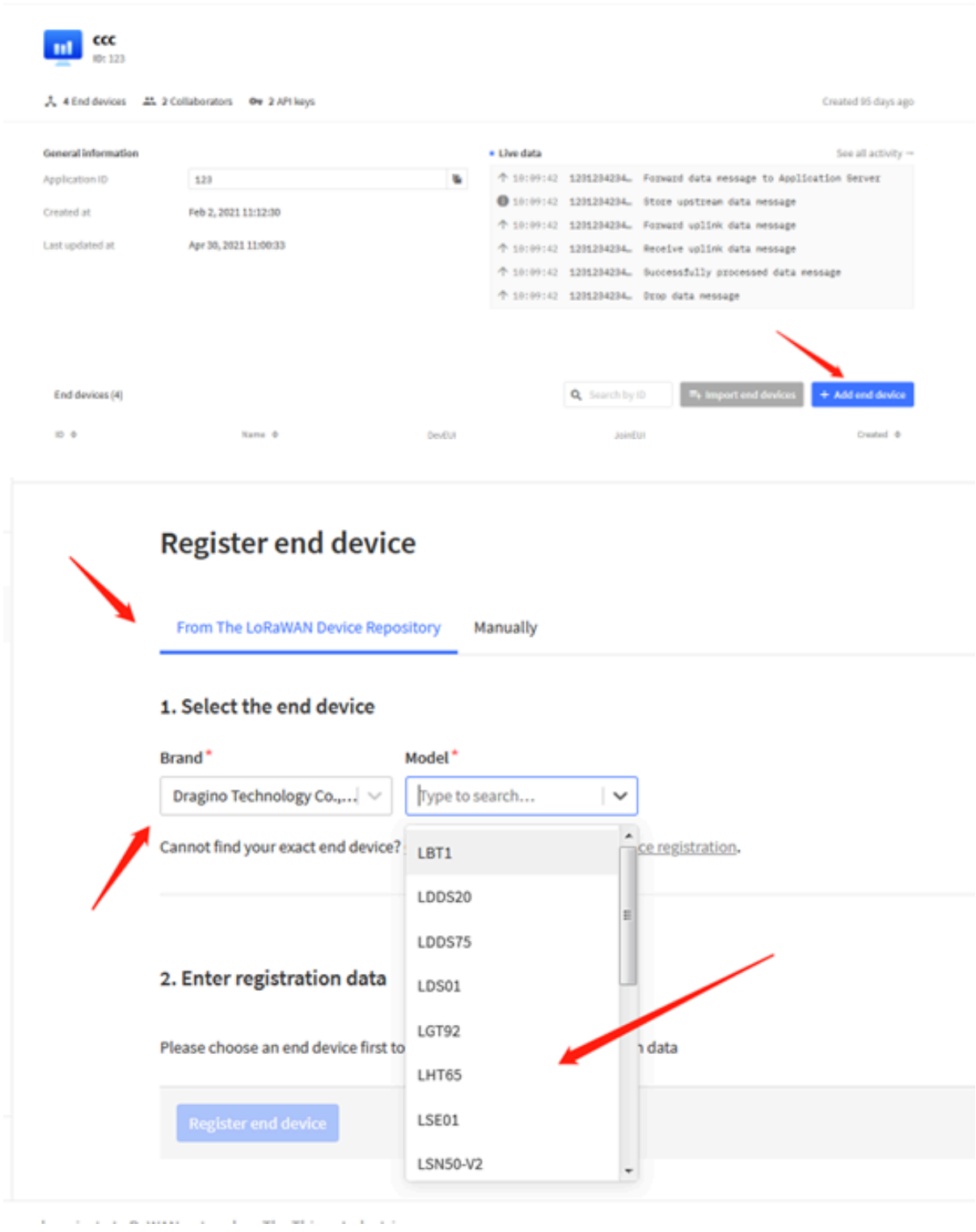
Each LHT65N-E5 is shipped with a sticker with its device EUI, APP Key and APP EUI as below:



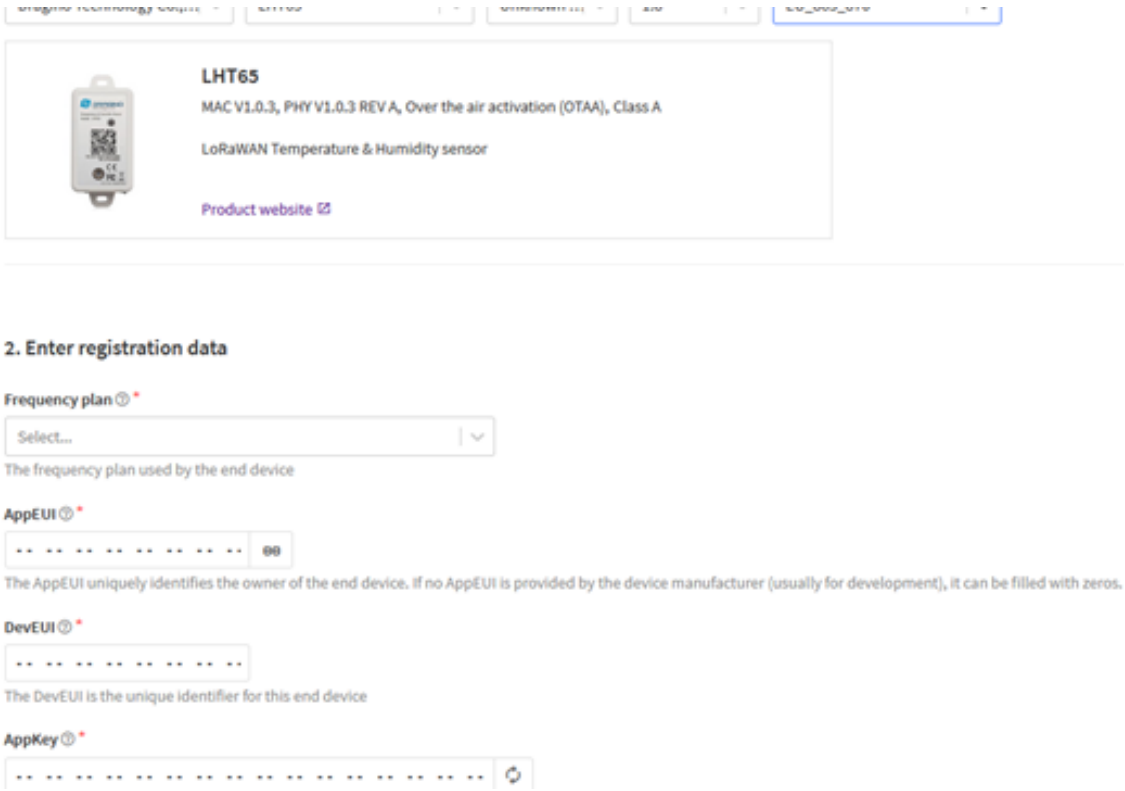
User can enter these keys in the LoRaWAN Server portal. Below is TTN V3 screenshot:

Add APP EUI in the application.


THE THINGS STACK
Community Edition
Overview
Applications
Gateways
Add application
Owner *
davidhuang
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
Create application



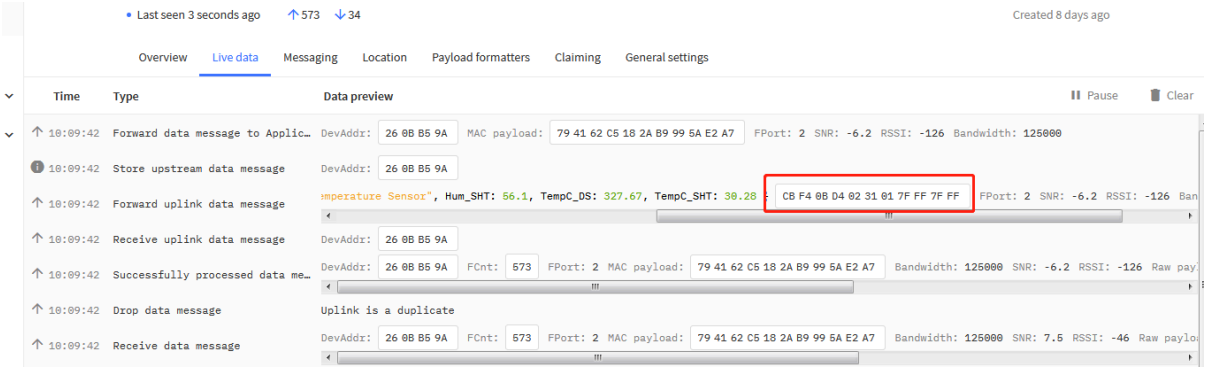
Note: LHT65N-E5 use same payload decoder as LHT65.



Input APP EUI, APP KEY and DEV EUI:

2.3.2 Step 2: Activate LHT65N-E5 by pressing the ACT button for more than 5 seconds.

Use ACT button to activate LHT65N-E5 and it will auto-join to the TTN V3 network. After join success, it will start to upload sensor data to TTN V3 and user can see in the panel.



2.4 Uplink Payload (Fport=2)

The uplink payload includes totally 11 bytes. Uplink packets use FPORT=2 and **every 20 minutes** send one uplink by default.

After each uplink, the **BLUE LED** will blink once.

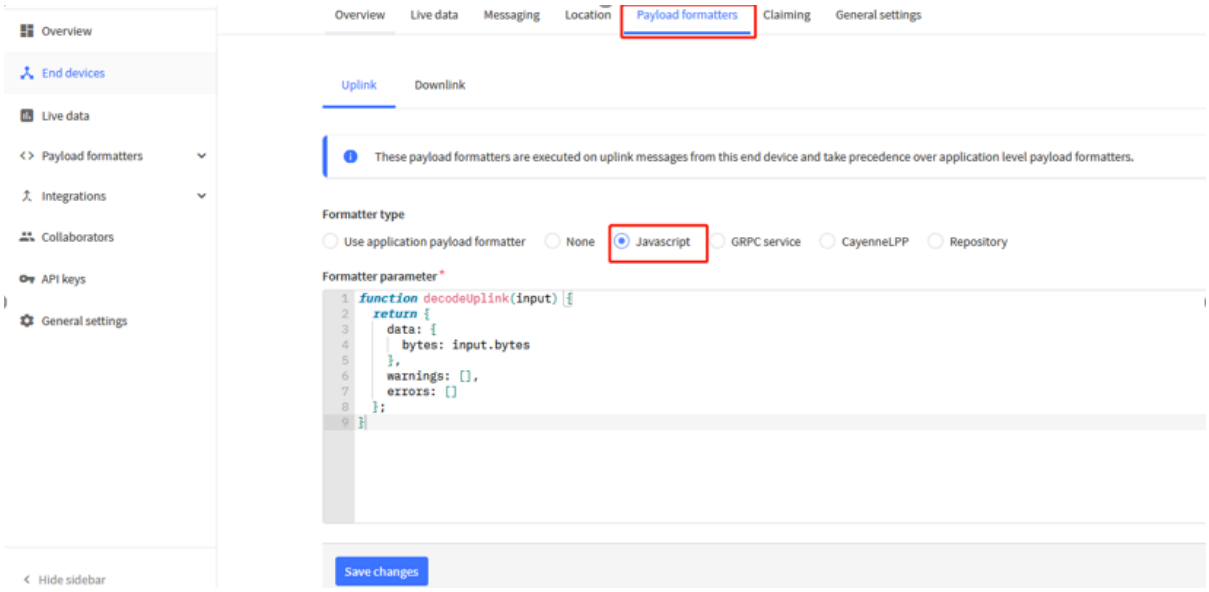
Size(bytes)	2	2	2	1	4
Value	BAT	Built-In Temperature	Built-in Humidity	Ext #	Ext value

- The First 6 bytes: has fix meanings for every LHT65N-E5.
- The 7th byte (EXT #): defines the external sensor model. It can be 0x05 or 0x09 for LHT65N-E5
- The 8th ~ 9th byte: Illuminance. Range: 0-65535 lx.
- The 10th ~ 11th byte: Reserve, always 0xFFFF

2.4.1 Decoder in TTN V3

When the uplink payload arrives TTNv3, it shows HEX format and not friendly to read. We can add LHT65N-E5 decoder in TTNv3 for friendly reading.

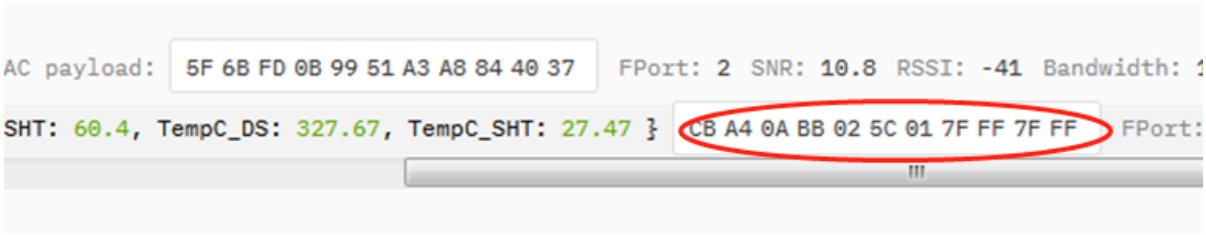
Below is the position to put the decoder and LHT65N-E5 decoder can be download from here: https://github.com/dragino/dragino-end-node-decoder



2.4.2 BAT-Battery Info

These two bytes of BAT include the battery state and the actually voltage

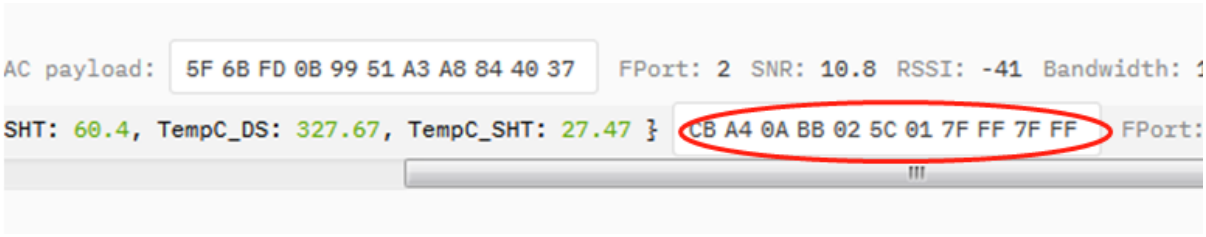
Bit(bit)	[15:14]	[13:0]
Value	BAT Status 00(b): Ultra Low (BAT <= 2.50v) 01(b): Low (2.50v <=BAT <= 2.55v) 10(b): OK (2.55v <= BAT <=2.65v) 11(b): Good (BAT >= 2.65v)	Actually BAT voltage



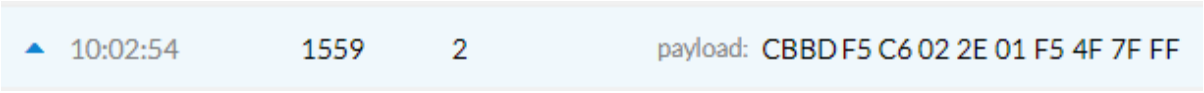
Check the battery voltage for LHT65N-E5.

- BAT status=(0Xcba4>>14)&0xFF=11(B), very good
- Battery Voltage =0xCBF6&0x3FFF=0x0BA4=2980mV

2.4.3 Built-in Temperature

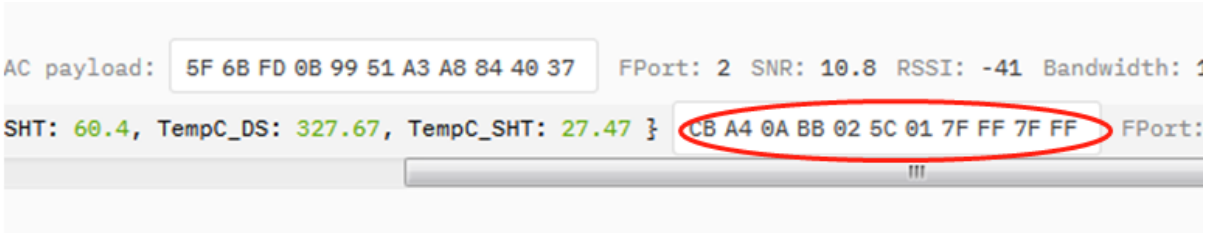


- Temperature: 0x0ABB/100=27.47℃



- Temperature: (0xF5C6-65536)/100=-26.18℃

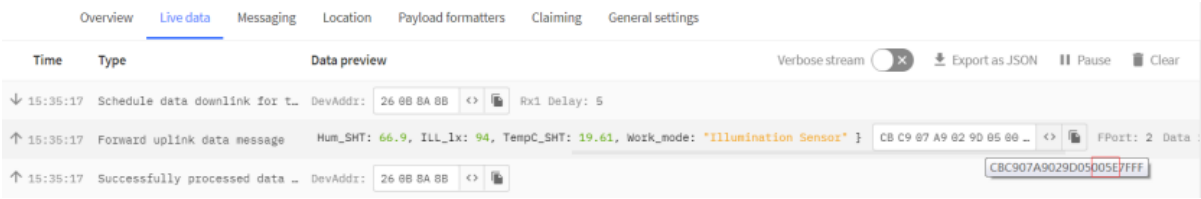
2.4.4 Built-in Humidity



- Humidity: 0x025C/10=60.4%

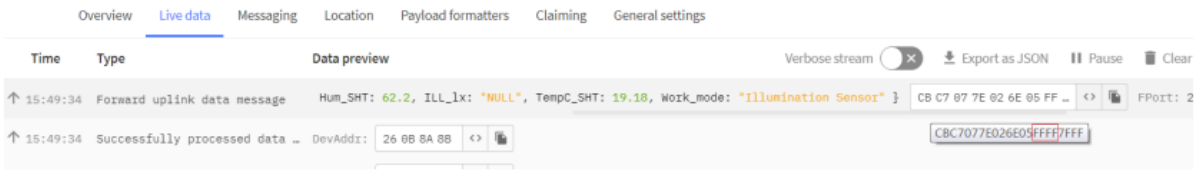
2.4.5 Ext value

2.4.5.1 Ext=0x05, Illuminance Sensor



- Illumination=0x005E=94 lux

The last 2 bytes of data are meaningless



- When the sensor is not connected or not connected properly, will show "NULL"

  The last 2 bytes of data are meaningless

2.4.5.2 Ext=0x85, E5 sensor with Unix Timestamp

Timestamp mode is designed for LHT65N-E5 with E3 probe, it will send the uplink payload with Unix timestamp. With the limitation of 11 bytes (max distance of AU915/US915/AS923 band), the time stamp mode will be lack of BAT voltage field, instead, it shows the battery status. The payload is as below:

Size(bytes)	2	2	2	1	4
Value	External temperature	Built-In Temperature	BAT Status & Illumination	Status & Ext	Unix Time Stamp

- **Battery status & Built-in Humidity**

Bit(bit)	[15:14]	[13:0]
Value	BAT Status 00(b): Ultra Low (BAT <= 2.50v) 01(b): Low (2.50v <=BAT <= 2.55v) 10(b): OK (2.55v <= BAT <=2.65v) 11(b): Good (BAT >= 2.65v)	Illumination

- **Status & Ext Byte**

Bits	7	6	5	4	[3:0]
Status&Ext	None-ACK Flag	Poll Message FLAG	Sync time OK	Unix Time Request	Ext: 0b(1001)

- **Poll Message Flag**: 1: This message is a poll message reply, 0: means this is a normal uplink.
- **Sync time OK**: 1: Set time ok, 0: N/A. After time SYNC request is sent, LHT65N-E5 will set this bit to 0 until got the time stamp from the application server.
- **Unix Time Request**: 1: Request server downlink Unix time, 0 : N/A. In this mode, LHT65N-E5 will set this bit to 1 every 10 days to request a time SYNC. (AT+SYNCMOD to set this)

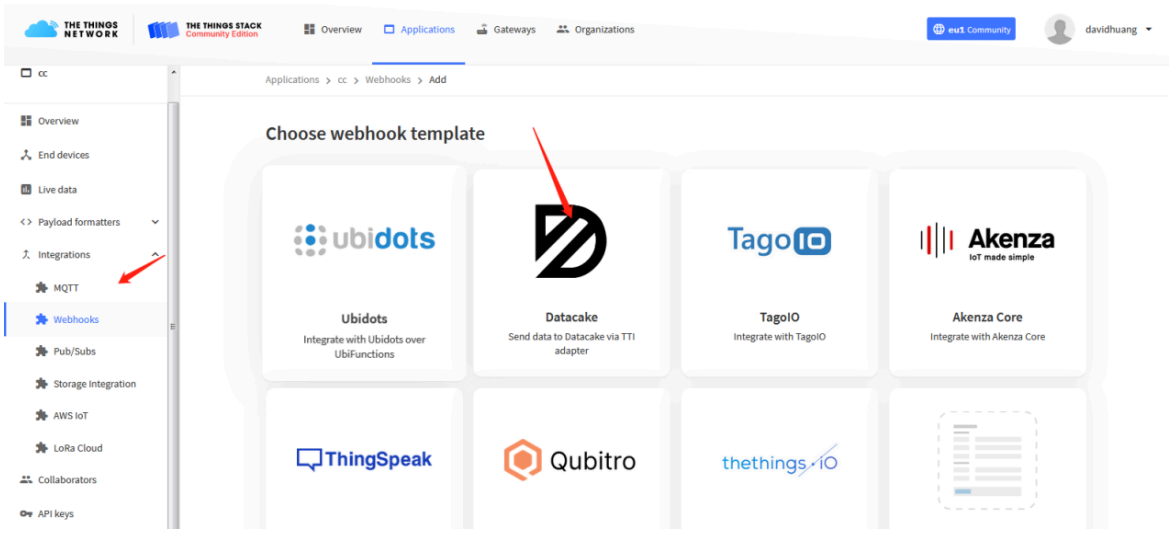
2.5 Show data on Datacake

Datacake IoT platform provides a human-friendly interface to show the sensor data, once we have sensor data in TTN V3, we can use Datacake to connect to TTN V3 and see the data in Datacake. Below are the steps:

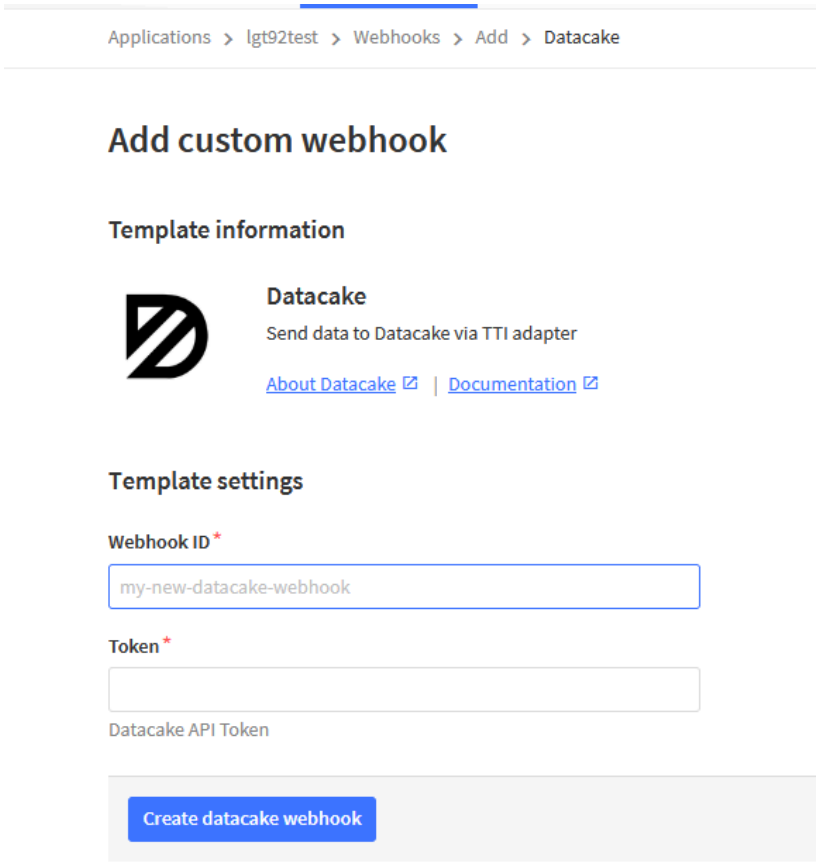
Step 1: Be sure that your device is programmed and properly connected to the LoRaWAN network.

Step 2: Configure your Application to forward data to Datacake you will need to add integration. Go to TTN V3 Console --> Applications --> Integrations --> Add Integrations.

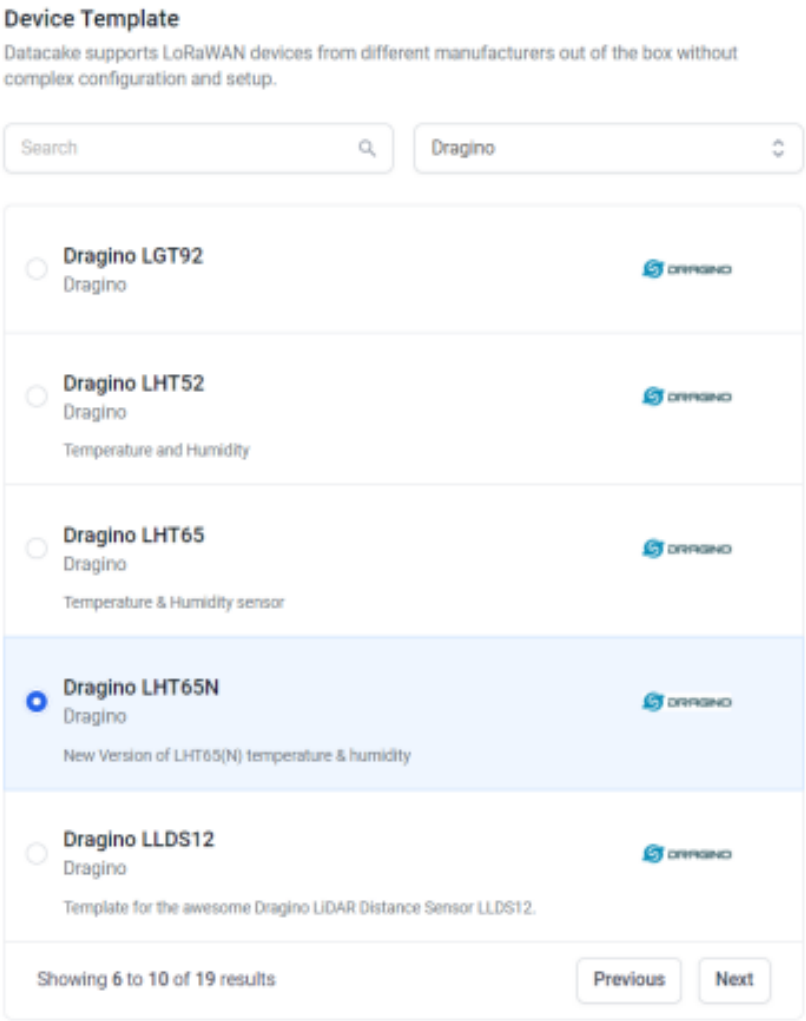
Add Datacake:

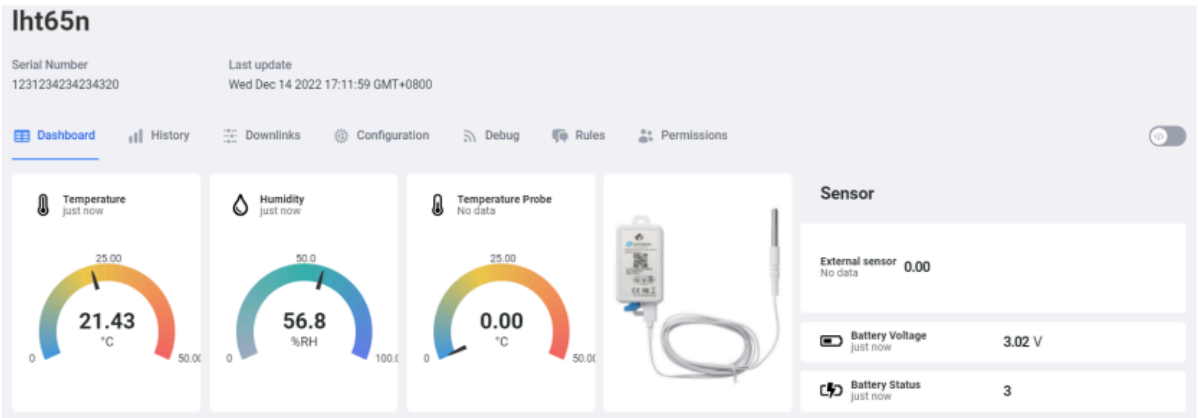


Select default key as Access Key:



In Datacake console (https://datacake.co/) , add LHT65 device.


Device Template
Datacake supports LoRaWAN devices from different manufacturers out of the box without complex configuration and setup.
Search
Dragino
Dragino LGT92
Dragino
Dragino LHT52
Dragino
Temperature and Humidity
Dragino LHT65
Dragino
Temperature & Humidity sensor
Dragino LHT65N
Dragino
New Version of LHT65(N) temperature & humidity
Dragino LLDS12
Dragino
Template for the awesome Dragino LiDAR Distance Sensor LLDS12.
Showing 6 to 10 of 19 results
Previous
Next


lht65n
Serial Number
1231234234234320
Last update
Wed Dec 14 2022 17:11:59 GMT+0800
Dashboard
History
Downlinks
Configuration
Debug
Rules
Permissions
Temperature
just now
25.00
21.43
°C
Humidity
just now
50.0
56.8
%RH
Temperature Probe
No data
25.00
0.00
°C
Sensor
External sensor
No data
0.00
Battery Voltage
just now
3.02 V
Battery Status
just now
3

2.6 Datalog Feature

Datalog Feature is to ensure IoT Server can get all sampling data from Sensor even if the LoRaWAN network is down. For each sampling, LHT65N-E5 will store the reading for future retrieving purposes. There are two ways for IoT servers to get datalog from LHT65N-E5.

2.6.1 Ways to get datalog via LoRaWAN

There are two methods:

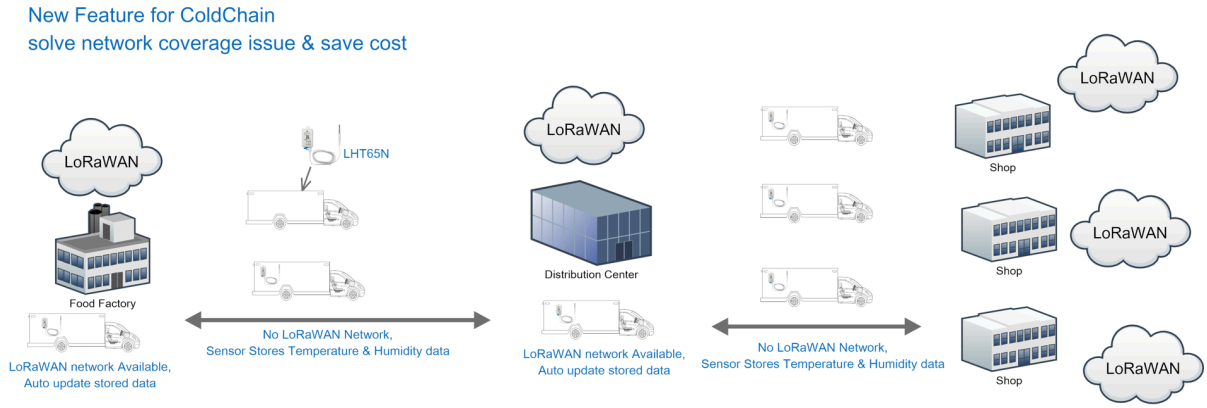
Method 1: IoT Server sends a downlink LoRaWAN command to poll the value for specified time range.

Method 2: Set PNACKMD=1, LHT65N-E5 will wait for ACK for every uplink, when there is no LoRaWAN network, LHT65N-E5 will mark these records with non-ack messages and store the sensor data, and it will send all messages (10s interval) after the network recovery.

Note for method 2:

- a) LHT65N-E5 will do an ACK check for data records sending to make sure every data arrive server.
- b) LHT65N-E5 will send data in **CONFIRMED Mode** when PNACKMD=1, but LHT65N-E5 won't re-transmit the packet if it doesn't get ACK, it will just mark it as a NONE-ACK message. In a future uplink if LHT65N-E5 gets a ACK, LHT65N-E5 will consider there is a network connection and resend all NONE-ACK Message.

Below is the typical case for the auto-update datalog feature (Set PNACKMD=1)



2.6.2 Unix TimeStamp

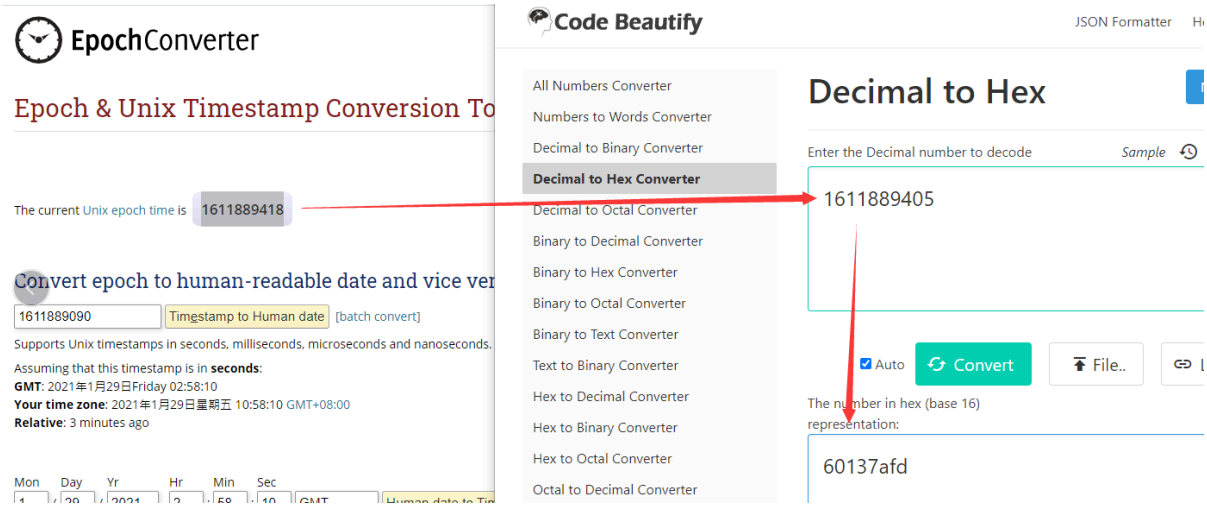
LHT65N-E5 uses Unix TimeStamp format based on

Size (bytes)	4	1
DeviceTimeAns Payload	32-bit unsigned integer : Seconds since epoch*	8bits unsigned integer: fractional-second in ½^8 second steps

Figure 10 : DeviceTimeAns payload format

User can get this time from link: https://www.epochconverter.com/ :

Below is the converter example



So, we can use AT+TIMESTAMP=1611889405 or downlink 3060137afd00 to set the current time 2021 – Jan -- 29 Friday 03:03:25

2.6.3 Set Device Time

There are two ways to set device's time:

1. Through LoRaWAN MAC Command (Default settings)

User need to set SYNCMOD=1 to enable sync time via MAC command.

Once LHT65N-E5 Joined LoRaWAN network, it will send the MAC command (DeviceTimeReq) and the server will reply with (DeviceTimeAns) to send the current time to LHT65N-E5. If LHT65N-E5 fails to get the time from the server, LHT65N-E5 will use the internal time and wait for next time request (AT+SYNCTDC to set the time request period, default is 10 days).

Note: LoRaWAN Server need to support LoRaWAN v1.0.3(MAC v1.0.3) or higher to support this MAC command feature, Chirpstack,TTN V3 v3 and loriot support but TTN V3 v2 doesn't support. If server doesn't support this command, it will through away uplink packet with this command, so user will lose the packet with time request for TTN V3 v2 if SYNCMOD=1.

2. Manually Set Time

User needs to set SYNCMOD=0 to manual time, otherwise, the user set time will be overwritten by the time set by the server.

2.6.4 Poll sensor value

User can poll sensor value based on timestamps from the server. Below is the downlink command.

1byte	4bytes	4bytes	1byte
31	Timestamp start	Timestamp end	Uplink Interval

Timestamp start and Timestamp end use Unix TimeStamp format as mentioned above. Devices will reply with all data log during this time period, use the uplink interval.

For example, downlink command **31 5FC5F350 5FC6 0160 05**

Is to check 2020/12/1 07:40:00 to 2020/12/1 08:40:00's data

Uplink Internal =5s, means LHT65N-E5 will send one packet every 5s. range 5~255s.

2.6.5 Datalog Uplink payload

The Datalog poll reply uplink will use below payload format.

Retrieval data payload:

Size(bytes)	2	2	2	1	4
Value	External sensor data	Built In Temperature	Built-in Humidity	Poll message flag & Ext	Unix Time Stamp

Poll message flag & Ext:

Bits	7	6	5	4	[3:0]
Status&Ext	None-ACK Flag	Poll Message FLAG	Sync time OK	Unix Time Request	Ext: 0b(1001)

No ACK Message: 1: This message means this payload is fromn Uplink Message which doesn't get ACK from the server before (for PNACKMD=1 feature)

Poll Message Flag: 1: This message is a poll message reply.

- Poll Message Flag is set to 1.
- Each data entry is 11 bytes, to save airtime and battery, devices will send max bytes according to the current DR and Frequency bands.

For example, in US915 band, the max payload for different DR is:

a) DR0: max is 11 bytes so one entry of data

b) DR1: max is 53 bytes so devices will upload 4 entries of data (total 44 bytes)

c) DR2: total payload includes 11 entries of data

d) DR3: total payload includes 22 entries of data.

If devise doesn't have any data in the polling time. Device will uplink 11 bytes of 0

Example:

If LHT65N-E5 has below data inside Flash:

Flash Add	Unix Time	Ext	BAT voltage	Value
80196E0	21/1/19 04:27:03	1	3145	sht temp=22.00 sht hum=32.6 ds temp=327.67
80196F0	21/1/19 04:28:57	1	3145	sht temp=21.90 sht hum=33.1 ds temp=327.67

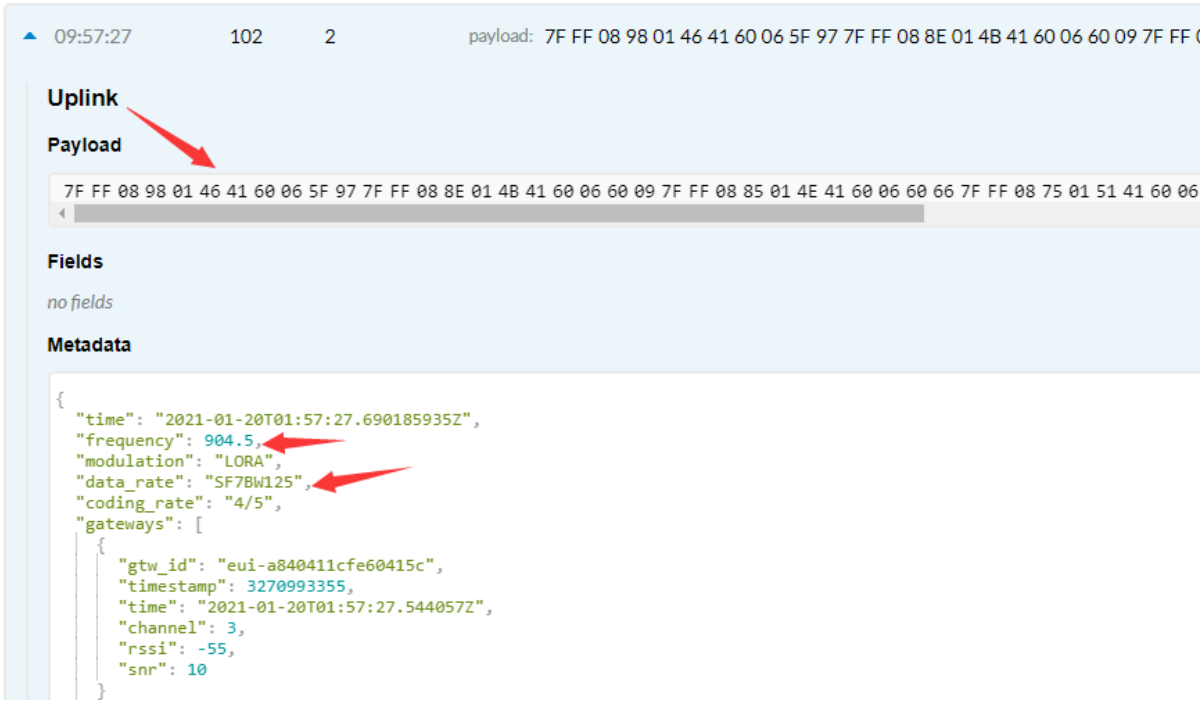
8019600	21/1/19 04:30:30	1	3145	sht temp=21.81 sht hum=33.4 ds temp=327.67
8019610	21/1/19 04:40:30	1	3145	sht temp=21.65 sht hum=33.7 ds temp=327.67
8019620	21/1/19 04:50:30	1	3147	sht temp=21.55 sht hum=34.1 ds temp=327.67
8019630	21/1/19 04:00:30	1	3149	sht temp=21.50 sht hum=34.1 ds temp=327.67
8019640	21/1/19 04:10:30	1	3149	sht temp=21.43 sht hum=34.6 ds temp=327.67
8019650	21/1/19 04:20:30	1	3151	sht temp=21.35 sht hum=34.9 ds temp=327.67

If user sends below downlink command: 3160065F9760066DA705

Where : Start time: 60065F97 = time 21/1/19 04:27:03

Stop time: 60066DA7= time 21/1/19 05:27:03

LHT65N-E5 will uplink this payload.



7FFF089801464160065F97 7FFF 088E 014B 41 60066009

7FFF0885014E41600660667FFF087501514160066 2BE7FFF086B015541600665167FFF086601554160066 76E7FFF085F015A41

Where the first 11 bytes is for the first entry:

7FFF089801464160065F97

Ext sensor data=0x7FFF/100=327.67

Temp=0x088E/100=22.00

Hum=0x014B/10=32.6

poll message flag & Ext=0x41,means reply data,Ext=1

Unix time is 0x60066009=1611030423s=21/1/19 04:27:03

2.7 Alarm Mode

when the device is in alarm mode, it checks the built-in sensor temperature for a short time. if the temperature exceeds the preconfigured range, it sends an uplink immediately.

Note: alarm mode adds a little power consumption, and we recommend extending the normal read time when this feature is enabled.

2.7.1 ALARM MODE

AT+WMOD=1: Enable/disable alarm mode. (0: Disabled, 1: Enabled Temperature Alarm for onboard temperature sensor)

AT+CITEMP=1: The interval between checking the alarm temperature. (In minutes)

AT+ARTEMP: Gets or sets the alarm range of the internal temperature sensor

AT+ARTEMP=? : Gets the alarm range of the internal temperature sensor

AT+ARTEMP=45,105: Set the internal temperature sensor alarm range from 45 to 105.

Downlink Command: AAXXXXXXXXXXXXXX

Total bytes: 8 bytes

Example:AA0100010001003C

WMOD=01

CITEMP=0001

TEMPlow=0001

TEMPhigh=003C

2.8 LED Indicator

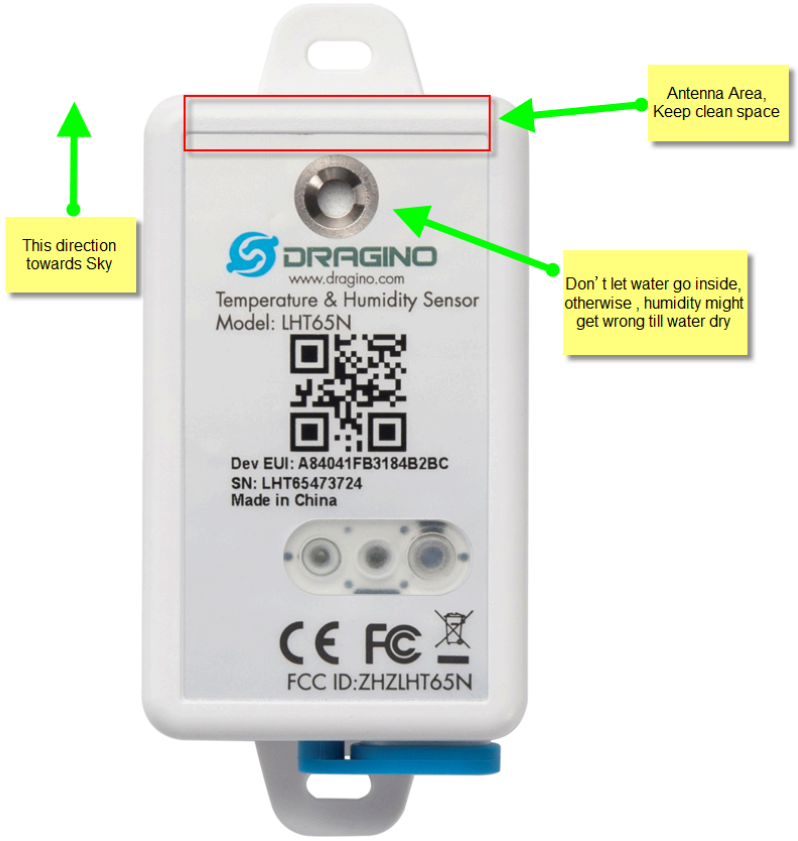
The LHT65 has a triple color LED which for easy showing different stage .

While user press ACT button, the LED will work as per LED status with ACT button.

In a normal working state:

- For each uplink, the BLUE LED or RED LED will blink once.
  BLUE LED when external sensor is connected.
- RED LED when external sensor is not connected
- For each success downlink, the PURPLE LED will blink once

2.9 installation

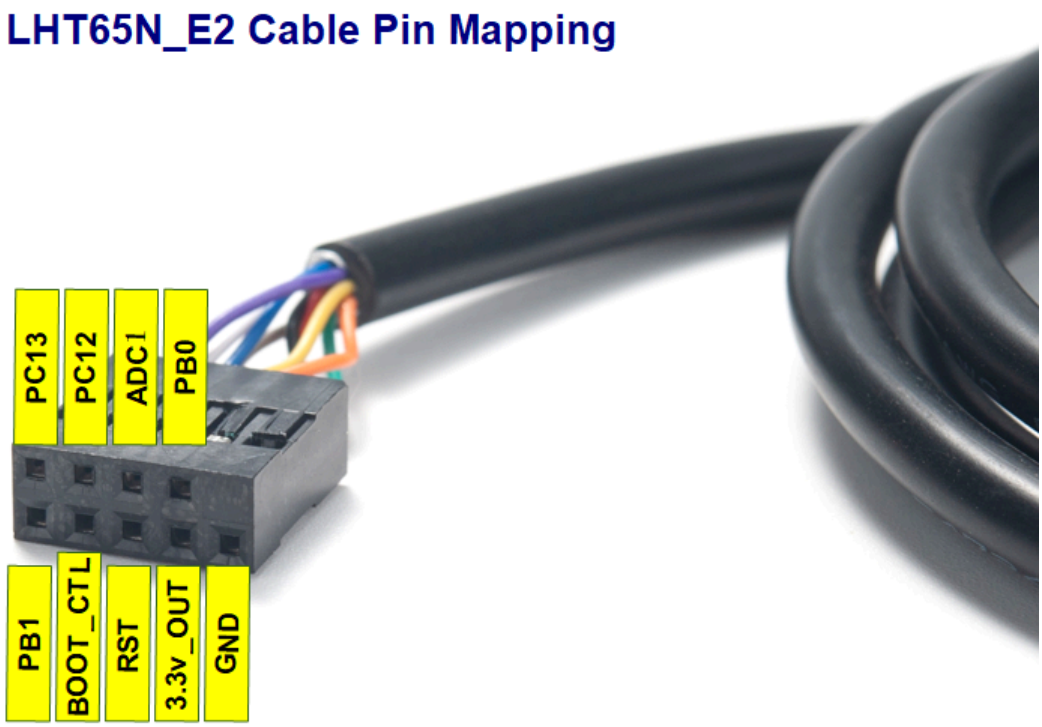


3. Sensors and Accessories

3.1 E2 Extension Cable

1m long breakout cable for LHT65N-E5. Features:

- Use for AT Command
- Update firmware for LHT65N-E5
- Exposed All pins from the LHT65N-E5 Type-C connector.



4. Configure LHT65N-E5 via AT command or LoRaWAN downlink

Use can configure LHT65N-E5 via AT Command or LoRaWAN Downlink.

- AT Command Connection: See FAQ.
- LoRaWAN Downlink instruction for different platforms: IoT LoRaWAN Server

There are two kinds of commands to configure LHT65N-E5, they are:

- **General Commands**.

These commands are to configure:

1. General system settings like: uplink interval.
2. LoRaWAN protocol & radio-related commands.

They are the same for all Dragino Devices which supports DLWS-005 LoRaWAN Stack(Note**). These commands can be found on the wiki: End Device Downlink Command

- **Commands special design for LHT65N-E5**

These commands are only valid for LHT65N-E5, as below:

4.1 Set Transmit Interval Time

Feature: Change LoRaWAN End Node Transmit Interval.

AT Command: AT+TDC

Command Example	Function	Response

AT+TDC?	Show current transmit Interval	30000 OK the interval is 30000ms = 30s
AT+TDC=60000	Set Transmit Interval	OK Set transmit interval to 60000ms = 60 seconds

Downlink Command: 0x01

Format: Command Code (0x01) followed by 3 bytes time value.

If the downlink payload=0100003C, it means set the END Node's Transmit Interval to 0x00003C=60(S), while type code is 01.

- **Example 1**: Downlink Payload: 0100001E // Set Transmit Interval (TDC) = 30 seconds
- **Example 2**: Downlink Payload: 0100003C // Set Transmit Interval (TDC) = 60 seconds

4.2 Currently only supports E5

Feature: Set device password, max 9 digits

AT Command: AT+EXT

Command Example	Function	Response
AT+EXT=?	Get or Set external sensor model	5 OK
AT+EXT=5	Set external sensor mode to 5	

Downlink Command:0xA2

Total bytes: 2 bytes

Example:

- 0xA205: Set external sensor type to E5

4.3 Set to sleep mode

Feature: Set device to sleep mode

- **AT+Sleep=0** : Normal working mode, device will sleep and use lower power when there is no LoRa message
- **AT+Sleep=1** : Device is in deep sleep mode, no LoRa activation happen, used for storage or shipping.

AT Command: AT+SLEEP

Command Example	Function	Response
AT+SLEEP	Set to sleep mode	Clear all stored sensor data... OK

Downlink Command:

- There is no downlink command to set to Sleep mode.

4.4 Set system time

Feature: Set system time, unix format. See here for format detail.

AT Command:

Command Example	Function
AT+TIMESTAMP=1611104352	OK

Set System time to 2021-01-20 00:59:12

Downlink Command:

0x306007806000 // Set timestamp to 0x(6007806000),Same as AT+TIMESTAMP=1611104352

4.5 Set Time Sync Mode

Feature: Enable/Disable Sync system time via LoRaWAN MAC Command (DeviceTimeReq), LoRaWAN server must support v1.0.3 protocol to reply this command.

SYNCMOD is set to 1 by default. If user want to set a different time from LoRaWAN server, user need to set this to 0.

AT Command:

Command Example	Function
AT+SYNCMOD=1	Enable Sync system time via LoRaWAN MAC Command (DeviceTimeReq)

Downlink Command:

0x28 01 // Same As AT+SYNCMOD=1
0x28 00 // Same As AT+SYNCMOD=0

4.6 Set Time Sync Interval

Feature: Define System time sync interval. SYNCTDC default value: 10 days.

AT Command:

Command Example	Function
AT+SYNCTDC=0x0A	Set SYNCTDC to 10 (0x0A), so the sync time is 10 days.

Downlink Command:

0x29 0A // Same as AT+SYNCTDC=0x0A

4.7 Get data

Feature: Get the current sensor data.

AT Command:

- **AT+GETSENSORVALUE=0** // The serial port gets the reading of the current sensor
- **AT+GETSENSORVALUE=1** // The serial port gets the current sensor reading and uploads it.

4.8 Print data entries base on page

Feature: Print the sector data from start page to stop page (max is 416 pages).

AT Command: AT+PDTA

Command Example	Function
AT+PDTA=13 Print page 1 to 3	8019500 19/6/26 16:48 1 2992 sht temp=28.21 sht hum=71.5 ds temp=27.31 8019510 19/6/26 16:53 1 2994 sht temp=27.64 sht hum=69.3 ds temp=26.93 8019520 19/6/26 16:58 1 2996 sht temp=28.39 sht hum=72.0 ds temp=27.06 8019530 19/6/26 17:03 1 2996 sht temp=27.97 sht hum=70.4 ds temp=27.12 8019540 19/6/26 17:08 1 2996 sht temp=27.80 sht hum=72.9 ds temp=27.06 8019550 19/6/26 17:13 1 2998 sht temp=27.30 sht hum=72.4 ds temp=26.68

	8019560 19/6/26 17:22 1 2992 sht temp=26.27 sht hum=62.3 ds temp=26.56 8019570 8019580 8019590 80195A0 80195B0 80195C0 80195D0 80195E0 80195F0 OK

Downlink Command:

No downlink commands for feature

4.9 Print last few data entries

Feature: Print the last few data entries

AT Command: AT+PLDTA

Command Example	Function
AT+PLDTA=5 Print last 5 entries	Stop Tx and RTP events when read sensor data 1 19/6/26 13:59 1 3005 sht temp=27.09 sht hum=79.5 ds temp=26.75 2 19/6/26 14:04 1 3007 sht temp=26.65 sht hum=74.8 ds temp=26.43 3 19/6/26 14:09 1 3007 sht temp=26.91 sht hum=77.9 ds temp=26.56 4 19/6/26 14:15 1 3007 sht temp=26.93 sht hum=76.7 ds temp=26.75 5 19/6/26 14:20 1 3007 sht temp=26.78 sht hum=76.6 ds temp=26.43 Start Tx and RTP events OK

Downlink Command:

No downlink commands for feature

4.10 Clear Flash Record

Feature: Clear flash storage for data log feature.

AT Command: AT+CLRDTA

Command Example	Function	Response
AT+CLRDTA	Clear date record	Clear all stored sensor data... OK

Downlink Command: 0xA3

- Example: 0xA301 // Same as AT+CLRDTA

4.11 Auto Send None-ACK messages

Feature: LHT65N-E5 will wait for ACK for each uplink, If LHT65N-E5 doesn't get ACK from the IoT server, it will consider the message doesn't arrive server and store it. LHT65N-E5 keeps sending messages in normal periodically. Once LHT65N-E5 gets ACK from a server, it will consider the network is ok and start to send the not-arrive message.

AT Command: AT+PNACKMD

The default factory setting is 0

Command Example	Function	Response
AT+PNACKMD=1	Poll None-ACK message	OK

Downlink Command: 0x34

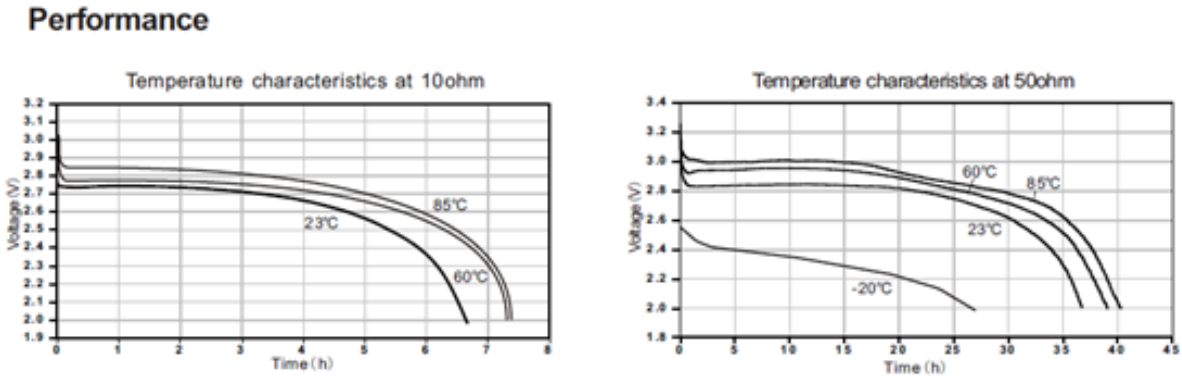
- Example: 0x3401 // Same as AT+PNACKMD=1

5. Battery & How to replace

5.1 Battery Type

LHT65N-E5 is equipped with a 2400mAH Li-MnO2 (CR17505) battery . The battery is an un-rechargeable battery with low discharge rate targeting for up to 8~10 years use. This type of battery is commonly used in IoT devices for long-term running, such as water meters.

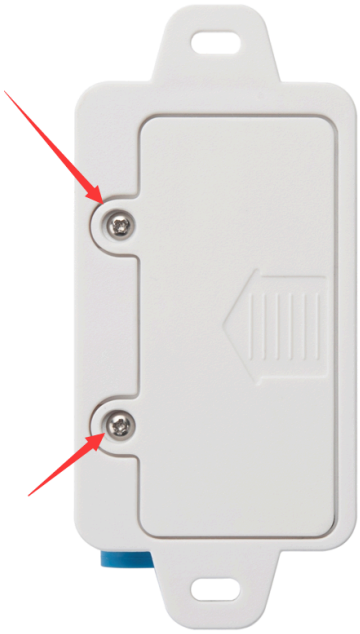
The discharge curve is not linear so can't simply use percentage to show the battery level. Below is the battery performance.



The minimum Working Voltage for the LHT65N-E5 is ~ 2.5v. When battery is lower than 2.6v, it is time to change the battery.

5.2 Replace Battery

LHT65N-E5 has two screws on the back, Unscrew them, and changing the battery inside is ok. The battery is a general CR17450 battery (3.0v). Any brand should be ok.



5.3 Battery Life Analyze

Dragino battery-powered products are all run in Low Power mode. User can check the guideline from this link to calculate the estimated battery life:
https://www.dragino.com/downloads/downloads/LoRa_End_Node/Battery_Analyze/DRAGINO_Battery_Life_Guide.pdf

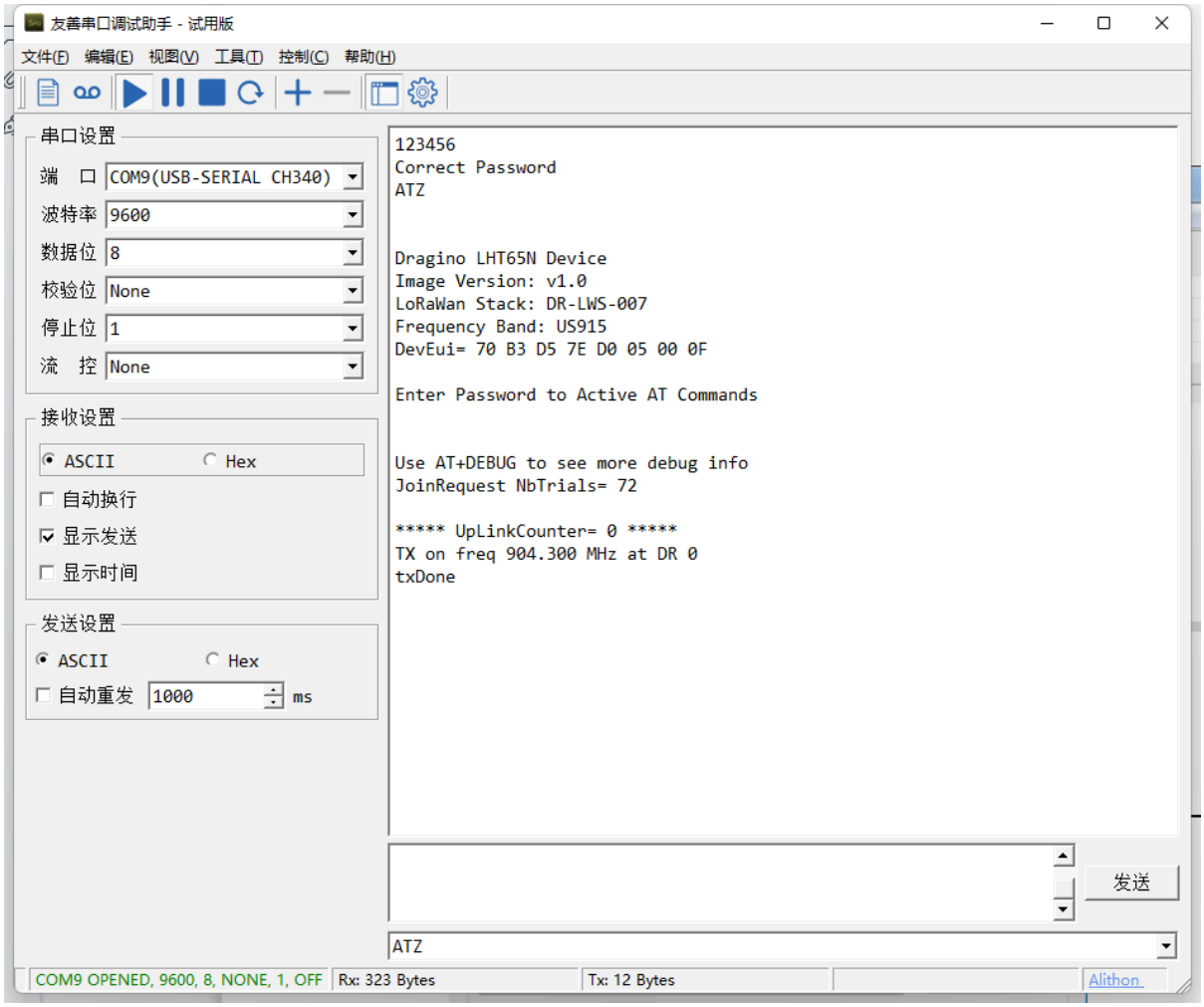
A full detail test report for LHT65N-E5 on different frequency can be found at : https://www.dropbox.com/sh/r2i3zlhsyrpavla/AAB1sZw3mdT0K7XjpHCITt13a?dl=0

6. FAQ

6.1 How to use AT Command?

Refer this link for UART Hardware Connection.

In PC, User needs to set serial tool(such as **putty**, SecureCRT) baud rate to **9600** to access to access serial console for LHT65N-E5. The AT commands are disable by default and need to enter password (default:**123456**) to active it. Timeout to input AT Command is 5 min, after 5-minute, user need to input password again. User can use AT+DISAT command to disable AT command before timeout.



AT Command List is as below:

AT+<CMD>? : Help on <CMD>

AT+<CMD> : Run <CMD>

AT+<CMD>=<value> : Set the value

AT+<CMD>=? : Get the value

AT+DEBUG: Set more info output

ATZ: Trig a reset of the MCU

AT+FDR: Reset Parameters to Factory Default, Keys Reserve

AT+DEUI: Get or Set the Device EUI

AT+DADDR: Get or Set the Device Address

AT+APPKEY: Get or Set the Application Key

AT+NWKSKEY: Get or Set the Network Session Key

AT+APPSKEY: Get or Set the Application Session Key

AT+APPEUI: Get or Set the Application EUI

AT+ADR: Get or Set the Adaptive Data Rate setting. (0: off, 1: on)

AT+TXP: Get or Set the Transmit Power (0-5, MAX:0, MIN:5, according to LoRaWAN Spec)

AT+DR: Get or Set the Data Rate. (0-7 corresponding to DR_X)

AT+DCS: Get or Set the ETSI Duty Cycle setting - 0=disable, 1=enable - Only for testing

AT+PNM: Get or Set the public network mode. (0: off, 1: on)

AT+RX2FQ: Get or Set the Rx2 window frequency

AT+RX2DR: Get or Set the Rx2 window data rate (0-7 corresponding to DR_X)

AT+RX1DL: Get or Set the delay between the end of the Tx and the Rx Window 1 in ms

AT+RX2DL: Get or Set the delay between the end of the Tx and the Rx Window 2 in ms

AT+JN1DL: Get or Set the Join Accept Delay between the end of the Tx and the Join Rx Window 1 in ms

AT+JN2DL: Get or Set the Join Accept Delay between the end of the Tx and the Join Rx Window 2 in ms

AT+NJM: Get or Set the Network Join Mode. (0: ABP, 1: OTAA)

AT+NWKID: Get or Set the Network ID

AT+FCU: Get or Set the Frame Counter Uplink

AT+FCD: Get or Set the Frame Counter Downlink

AT+CLASS: Get or Set the Device Class

AT+JOIN: Join network

AT+NJS: Get the join status

AT+SENDB: Send hexadecimal data along with the application port

AT+SEND: Send text data along with the application port

AT+RECVB: Print last received data in binary format (with hexadecimal values)

AT+RECV: Print last received data in raw format

AT+VER: Get current image version and Frequency Band

AT+CFM: Get or Set the confirmation mode (0-1)

AT+CFS: Get confirmation status of the last AT+SEND (0-1)

AT+SNR: Get the SNR of the last received packet

AT+RSSI: Get the RSSI of the last received packet

AT+TDC: Get or set the application data transmission interval in ms

AT+PORT: Get or set the application port

AT+DISAT: Disable AT commands

AT+PWORD: Set password, max 9 digits

AT+CHS: Get or Set Frequency (Unit: Hz) for Single Channel Mode

AT+CHE: Get or Set eight channels mode,Only for US915,AU915,CN470

AT+PDTA: Print the sector data from start page to stop page

AT+PLDTA: Print the last few sets of data

AT+CLRDTA: Clear the storage, record position back to 1st

AT+SLEEP: Set sleep mode

AT+EXT: Get or Set external sensor model

AT+BAT: Get the current battery voltage in mV

AT+CFG: Print all configurations

AT+WMOD: Get or Set Work Mode

AT+ARTEMP: Get or set the internal Temperature sensor alarm range

AT+CITEMP: Get or set the internal Temperature sensor collection interval in min

AT+SETCNT: Set the count at present

AT+RJTDC: Get or set the ReJoin data transmission interval in min

AT+RPL: Get or set response level

AT+TIMESTAMP: Get or Set UNIX timestamp in second

AT+LEAPSEC: Get or Set Leap Second

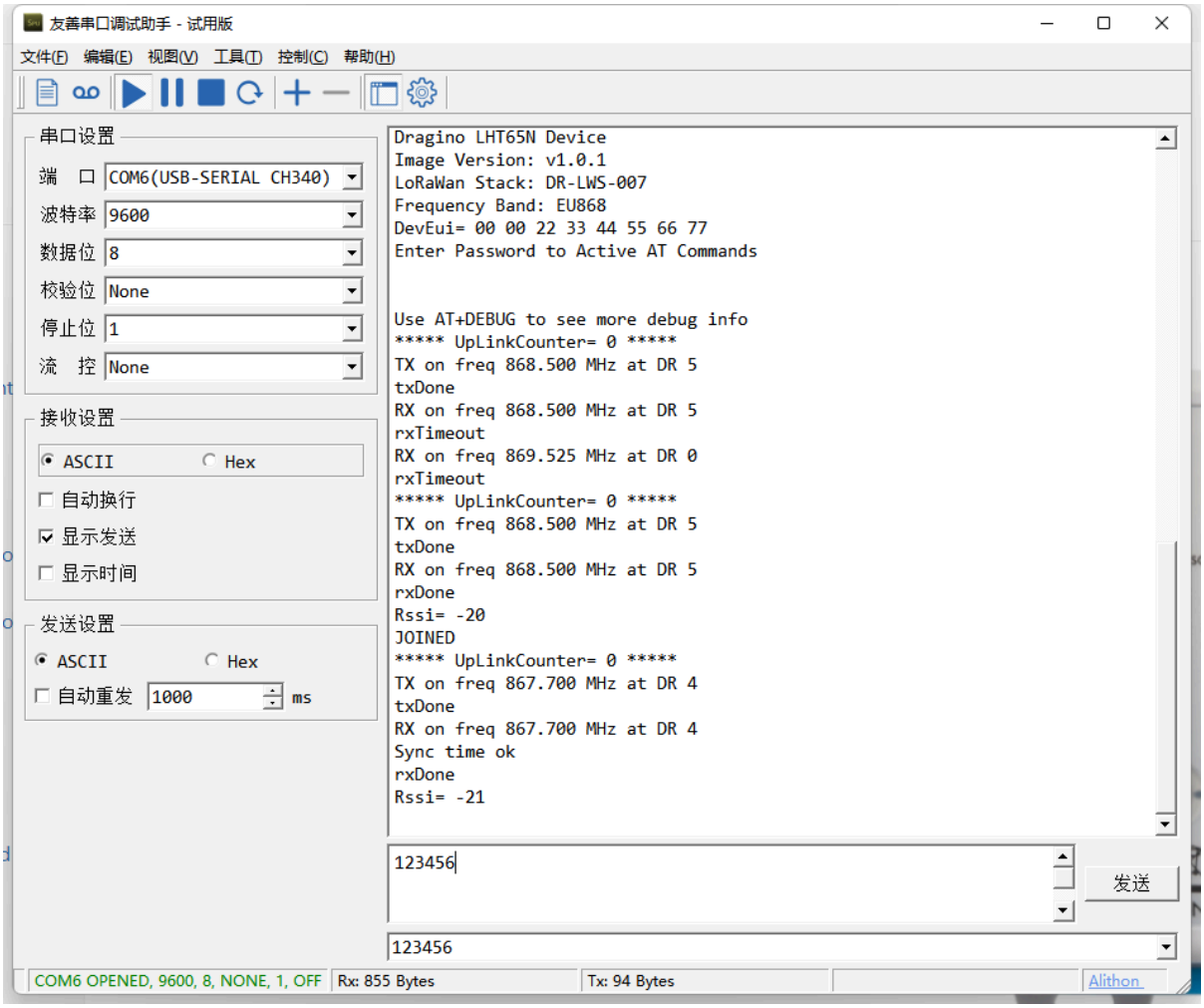
AT+SYNCMOD: Get or Set time synchronization method

AT+SYNCTDC: Get or set time synchronization interval in day

AT+PID: Get or set the PID

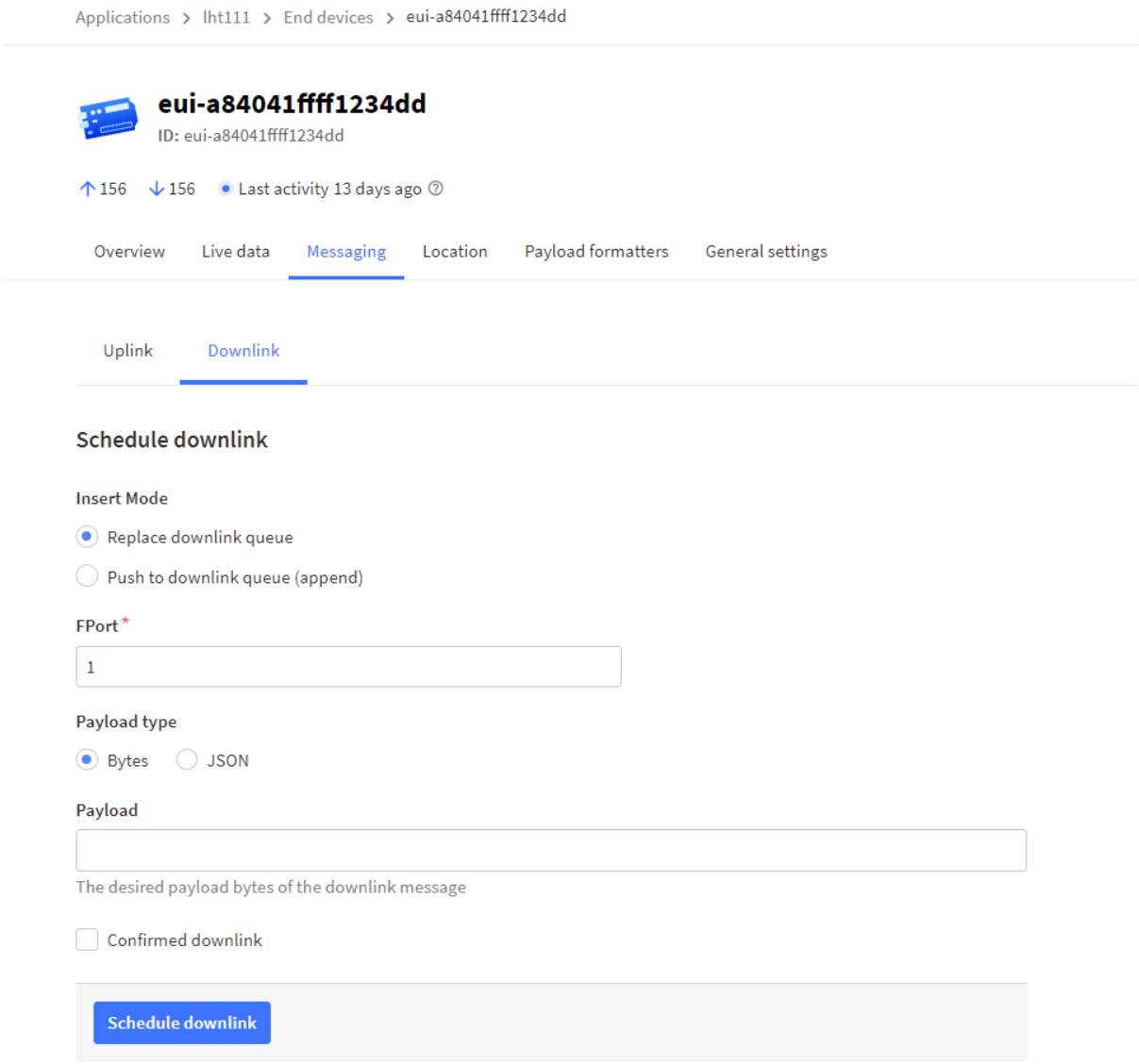
6.2 Where to use AT commands and Downlink commands

AT commands:

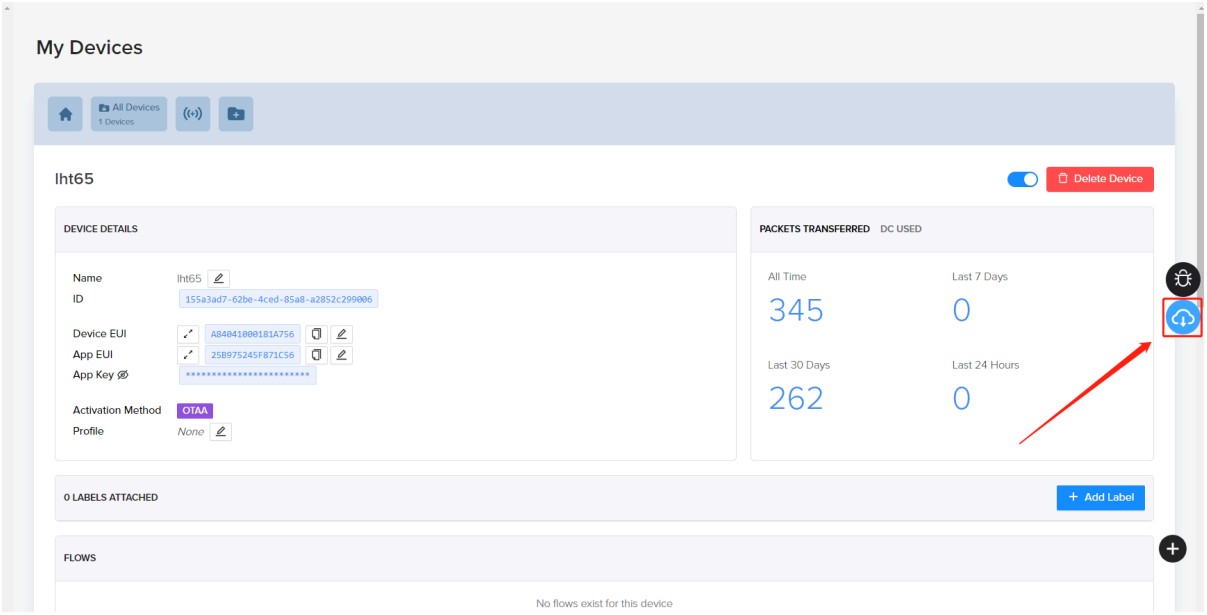


Downlink commands:

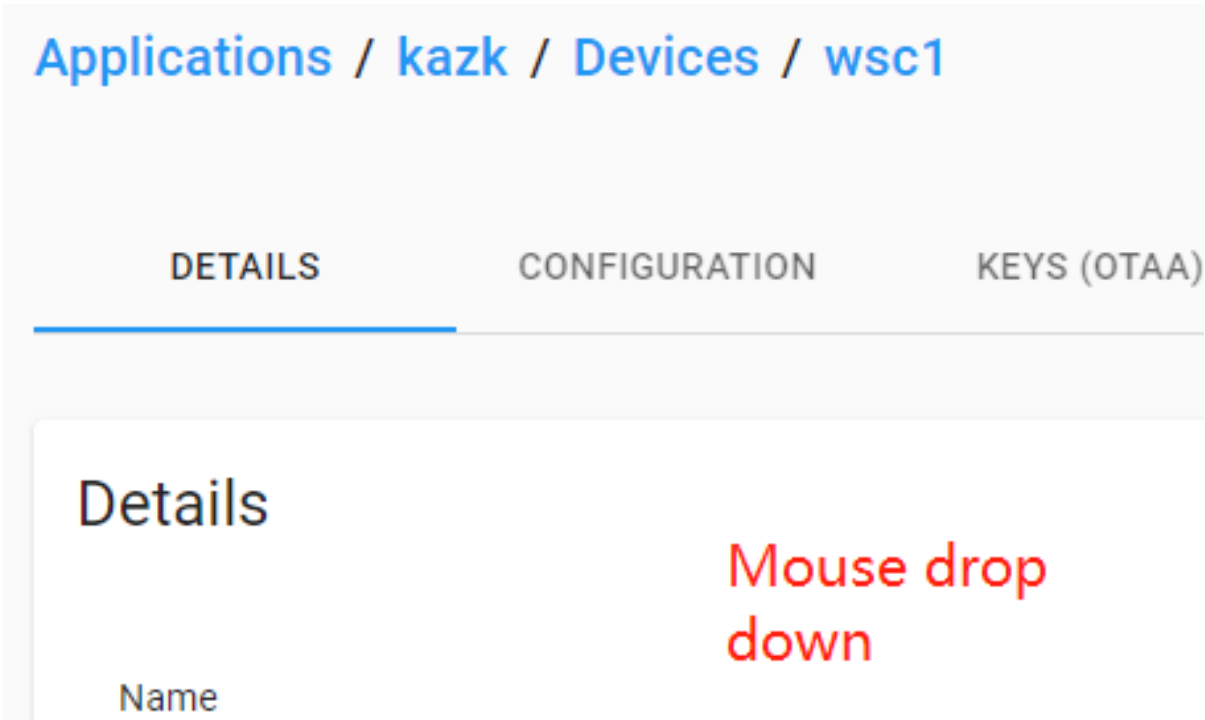
TTN:

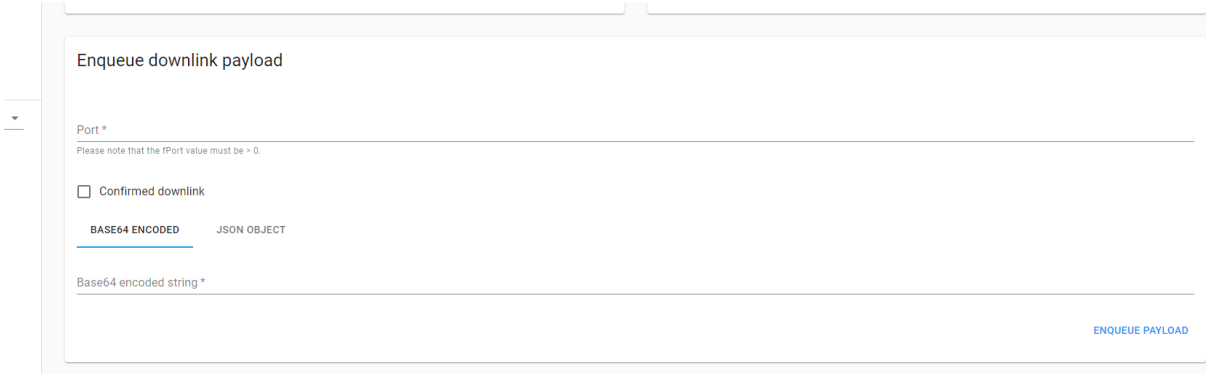

Applications > lht111 > End devices > eui-a84041ffff1234dd
eui-a84041ffff1234dd
ID: eui-a84041ffff1234dd
156 156 Last activity 13 days ago
Overview Live data Messaging Location Payload formatters General settings
Uplink Downlink
Schedule downlink
Insert Mode
Replace downlink queue
Push to downlink queue (append)
FPort *
1
Payload type
Bytes JSON
Payload
The desired payload bytes of the downlink message
Confirmed downlink
Schedule downlink

Helium:

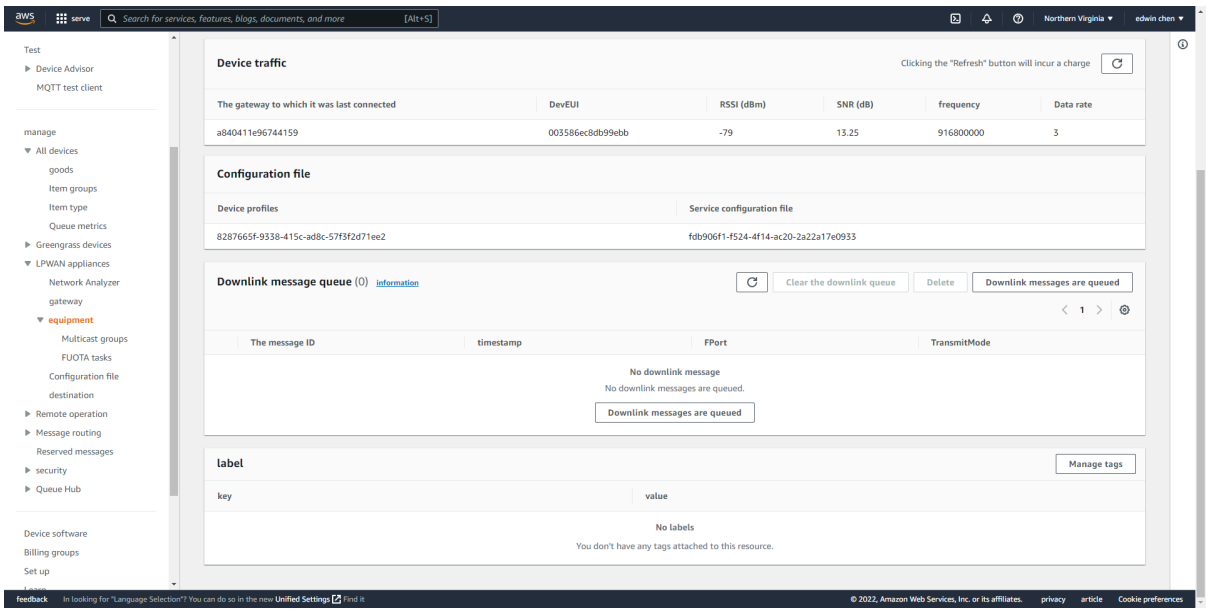


Chirpstack: The downlink window will not be displayed until the network is accessed



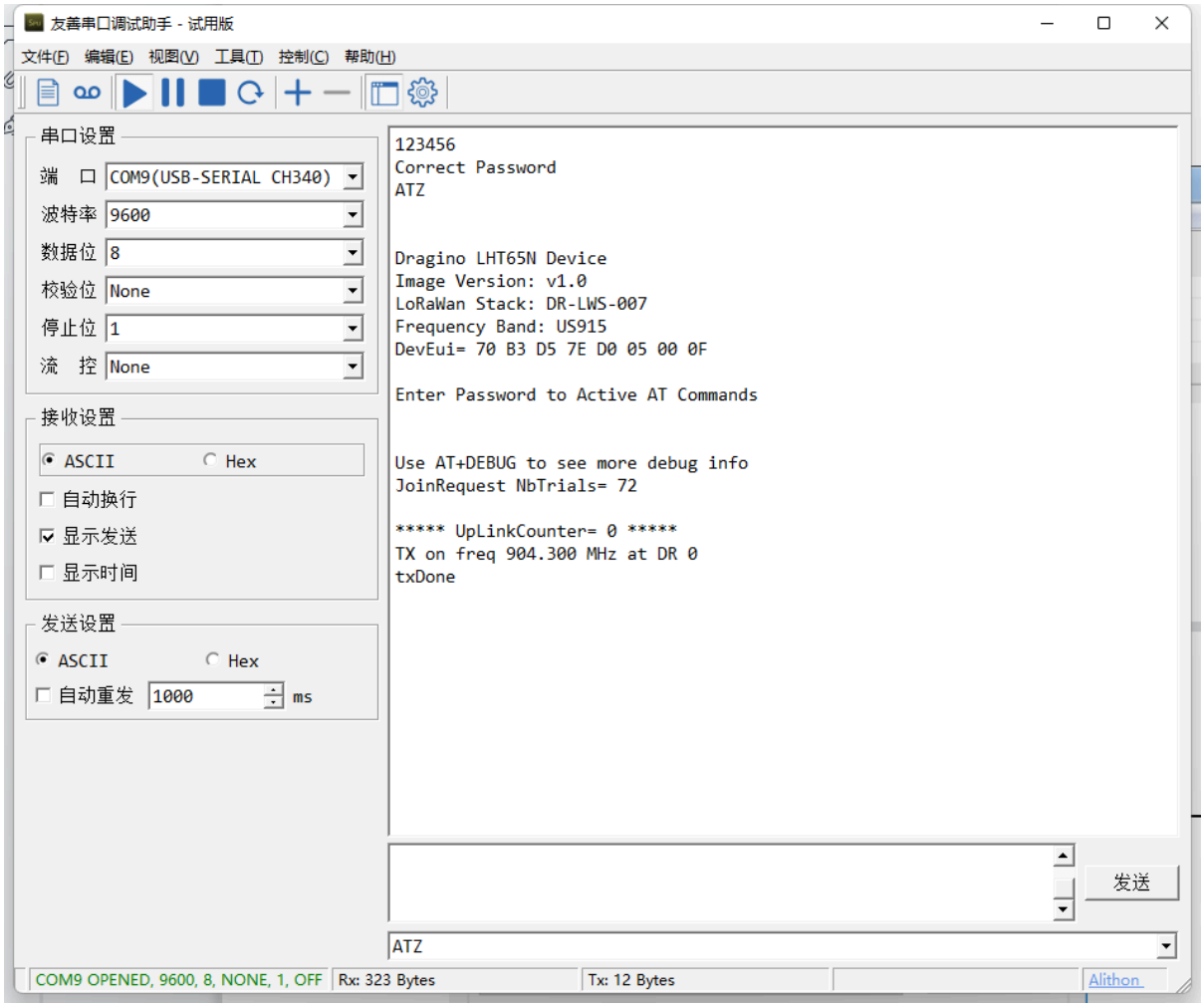


Aws:



6.3 How to change the uplink interval?

Please see this link: http://wiki.dragino.com/xwiki/bin/view/Main/How%20to%20set%20the%20transmit%20time%20interval/



6.4 How to upgrade firmware?

Please check update instruction.

7. Order Info

Part Number: **LHT65N-E5-XX**

XX : The default frequency band

- **AS923**: LoRaWAN AS923 band
- **AU915**: LoRaWAN AU915 band
- **EU433**: LoRaWAN EU433 band
- **EU868**: LoRaWAN EU868 band
- **KR920**: LoRaWAN KR920 band
- **US915**: LoRaWAN US915 band
- **IN865**: LoRaWAN IN865 band
- **CN470**: LoRaWAN CN470 band

8. Packing Info

Package Includes:

- LHT65N-E5 Temperature/Humidity/Illuminance Sensor x 1

9. Reference material

- Datasheet, photos, decoder, firmware

10. FCC Warning

This device complies with part 15 of the FCC Rules.Operation is subject to the following two conditions:

(1) This device may not cause harmful `interference;`

(2) this device must accept any interference received, including interference that may cause undesired operation.