
T3-NA-01 LoRaWAN Temperature & Humidity Sensor Manual

last modified by Xiaoling

on 2022/12/10 09:35

Table of Contents

1. Introduction	6
1.1 What is T3-NA-01 Temperature & Humidity Sensor	6
1.2 Features	6
1.3 Specification	6
2. Connect T3-NA-01 to IoT Server	7
2.1 How does T3-NA-01 work?	7
2.2 How to Activate T3-NA-01?	7
2.3 Example to join LoRaWAN network	8
2.3.1 Step 1: Create Device n TTN	9
2.3.2 Step 2: Activate T3-NA-01 by pressing the ACT button for more than 5 seconds.	13
2.4 Uplink Payload (Fport=2)	13
2.4.1 Decoder in TTN V3	14
2.4.2 BAT-Battery Info	14
2.4.3 Built-in Temperature	15
2.4.4 Built-in Humidity	15
2.4.5 Ext #	16
2.4.6 Ext value	16
2.5 Show data on Datacake	22
2.6 Datalog Feature	24
2.6.1 Ways to get datalog via LoRaWAN	25
2.6.2 Unix TimeStamp	25
2.6.3 Set Device Time	26
2.6.4 Poll sensor value	27
2.6.5 Datalog Uplink payload	27
2.7 Alarm Mode & Feature "Multi sampling, one uplink"	29
2.7.2 ALARM MODE (Before v1.3.1 firmware)	31
2.8 LED Indicator	32
2.9 installation	32
3. Sensors and Accessories	33
3.1 E2 Extension Cable	33
3.2 E3 Temperature Probe	33
4. Configure T3-NA-01 via AT command or LoRaWAN downlink	34
4.1 Set Transmit Interval Time	34
4.2 Set External Sensor Mode	35
4.3 Enable/Disable uplink Temperature probe ID	35
4.4 Set Password	36
4.5 Quit AT Command	36
4.6 Set to sleep mode	37
4.7 Set system time	37
4.8 Set Time Sync Mode	38
4.9 Set Time Sync Interval	38
4.10 Print data entries base on page.	38
4.11 Print last few data entries.	39
4.12 Clear Flash Record	40
4.13 Auto Send None-ACK messages	40
4.14 Modified WMOD command for external sensor TMP117 or DS18B20 temperature alarm (Since firmware 1.3.0)	41
5. Battery & How to replace	42
5.1 Battery Type	42
5.2 Replace Battery	42
5.3 Battery Life Analyze	43
6. FAQ	43
6.1 How to use AT Command?	43

6.2 Where to use AT commands and Downlink commands	47
6.3 How to change the uplink <code>interval</code> ?	51
6.4 How to use TTL-USB to connect a PC to input AT commands?	52
6.5 How to use TTL-USB to connect PC to upgrade firmware?	53
6.6 Using USB-TYPE-C to connect to the computer using the AT command	58
6.7 How to use USB-TYPE-C to connect PC to upgrade firmware?	59
6.8 Why can't I see the datalog information	63
7. Order Info	64
8. Packing Info	64
9. Reference material	64
10. FCC Warning	64



Table of Contents:

- [1. Introduction](#)
 - [1.1 What is T3-NA-01 Temperature & Humidity Sensor](#)
 - [1.2 Features](#)
 - [1.3 Specification](#)

- [2. Connect T3-NA-01 to IoT Server](#)
 - [2.1 How does T3-NA-01 work?](#)
 - [2.2 How to Activate T3-NA-01?](#)
 - [2.3 Example to join LoRaWAN network](#)
 - [2.3.1 Step 1: Create Device n TTN](#)
 - [2.3.2 Step 2: Activate T3-NA-01 by pressing the ACT button for more than 5 seconds.](#)
 - [2.4 Uplink Payload \(Fport=2\)](#)
 - [2.4.1 Decoder in TTN V3](#)
 - [2.4.2 BAT-Battery Info](#)
 - [2.4.3 Built-in Temperature](#)
 - [2.4.4 Built-in Humidity](#)
 - [2.4.5 Ext #](#)
 - [2.4.6 Ext value](#)
 - [2.4.6.1 Ext=1, E3 Temperature Sensor](#)
 - [2.4.6.2 Ext=9, E3 sensor with Unix Timestamp](#)
 - [2.4.6.3 Ext=6, ADC Sensor \(use with E2 Cable\)](#)
 - [2.4.6.4 Ext=2 TMP117 Sensor \(Since Firmware v1.3\)](#)
 - [2.4.6.5 Ext=4 Interrupt Mode \(Since Firmware v1.3\)](#)
 - [2.4.6.6 Ext=8 Counting Mode \(Since Firmware v1.3\)](#)
 - [2.5 Show data on Datacake](#)
 - [2.6 Datalog Feature](#)
 - [2.6.1 Ways to get datalog via LoRaWAN](#)
 - [2.6.2 Unix TimeStamp](#)
 - [2.6.3 Set Device Time](#)
 - [2.6.4 Poll sensor value](#)
 - [2.6.5 Datalog Uplink payload](#)
 - [2.7 Alarm Mode & Feature "Multi sampling, one uplink"](#)
 - [2.7.1 ALARM MODE \(Since v1.3.1 firmware\)](#)
 - [Sampling multiple times and uplink together](#)
 - [2.7.2 ALARM MODE \(Before v1.3.1 firmware\)](#)
 - [2.8 LED Indicator](#)
 - [2.9 installation](#)
- [3. Sensors and Accessories](#)
 - [3.1 E2 Extension Cable](#)
 - [3.2 E3 Temperature Probe](#)
- [4. Configure T3-NA-01 via AT command or LoRaWAN downlink](#)
 - [4.1 Set Transmit Interval Time](#)
 - [4.2 Set External Sensor Mode](#)
 - [4.3 Enable/Disable uplink Temperature probe ID](#)
 - [4.4 Set Password](#)
 - [4.5 Quit AT Command](#)
 - [4.6 Set to sleep mode](#)
 - [4.7 Set system time](#)
 - [4.8 Set Time Sync Mode](#)
 - [4.9 Set Time Sync Interval](#)
 - [4.10 Print data entries base on page.](#)
 - [4.11 Print last few data entries.](#)
 - [4.12 Clear Flash Record](#)
 - [4.13 Auto Send None-ACK messages](#)
 - [4.14 Modified WMOD command for external sensor TMP117 or DS18B20 temperature alarm \(Since firmware 1.3.0\)](#)
- [5. Battery & How to replace](#)
 - [5.1 Battery Type](#)
 - [5.2 Replace Battery](#)
 - [5.3 Battery Life Analyze](#)
- [6. FAQ](#)
 - [6.1 How to use AT Command?](#)
 - [6.2 Where to use AT commands and Downlink commands](#)
 - [6.3 How to change the uplink interval?](#)
 - [6.4 How to use TTL-USB to connect a PC to input AT commands?](#)

- [6.5 How to use TTL-USB to connect PC to upgrade firmware?](#)
- [6.6 Using USB-TYPE-C to connect to the computer using the AT command](#)
- [6.7 How to use USB-TYPE-C to connect PC to upgrade firmware?](#)
- [6.8 Why can't I see the datalog information](#)
- [7. Order Info](#)
- [8. Packing Info](#)
- [9. Reference material](#)
- [10. FCC Warning](#)

1. Introduction

1.1 What is T3-NA-01 Temperature & Humidity Sensor

The Dragino T3-NA-01 Temperature & Humidity sensor is a Long Range LoRaWAN Sensor. It includes a **built-in Temperature & Humidity sensor** and has an external sensor connector to connect to an external **Temperature Sensor**.

The T3-NA-01 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.

T3-NA-01 has a built-in 2400mAh non-chargeable battery which can be used for up to 10 years*.

T3-NA-01 is full compatible with LoRaWAN v1.0.3 Class A protocol, it can work with a standard LoRaWAN gateway.

T3-NA-01 supports **Datalog Feature**. It will record the data when there is no network coverage and users can retrieve the sensor value later to ensure no miss for every sensor reading.

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

1.2 Features

- Wall mountable
- 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
- Optional External Sensors
- Tri-color LED to indicate working status
- Datalog feature (Max 3328 records)

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: < 0.02 °C/yr
- Operating Range: 0 ~ 96 %RH

External Temperature Sensor:

- Resolution: 0.0625 °C
- $\pm 0.5^{\circ}\text{C}$ accuracy from -10°C to $+85^{\circ}\text{C}$
- $\pm 2^{\circ}\text{C}$ accuracy from -55°C to $+125^{\circ}\text{C}$
- Operating Range: -55°C ~ 125°C

2. Connect T3-NA-01 to IoT Server

2.1 How does T3-NA-01 work?

T3-NA-01 is configured as LoRaWAN OTAA Class A mode by default. Each T3-NA-01 is shipped with a worldwide unique set of OTAA keys. To use T3-NA-01 in a LoRaWAN network, first, we need to put the OTAA keys in LoRaWAN Network Server and then activate .

If T3-NA-01 is under the coverage of this LoRaWAN network, T3-NA-01 can join the LoRaWAN network automatically. After successfully joining, T3-NA-01 will start to measure environment temperature and humidity, and start to transmit sensor data to the LoRaWAN server. The default period for each uplink is 20 minutes.

2.2 How to Activate T3-NA-01?

The T3-NA-01 has two working modes:

- **Deep Sleep Mode:** T3-NA-01 doesn't have any LoRaWAN activation. This mode is used for storage and shipping to save battery life.
- **Working Mode:** In this mode, T3-NA-01 works as LoRaWAN Sensor mode to Join LoRaWAN network and send out the sensor data to the server. Between each sampling/tx/rx periodically, T3-NA-01 will be in STOP mode (IDLE mode), in STOP mode, LHT65N has the same power consumption as Deep Sleep mode.

The T3-NA-01 is set in deep sleep mode by default; The ACT button on the front is to switch to different modes:

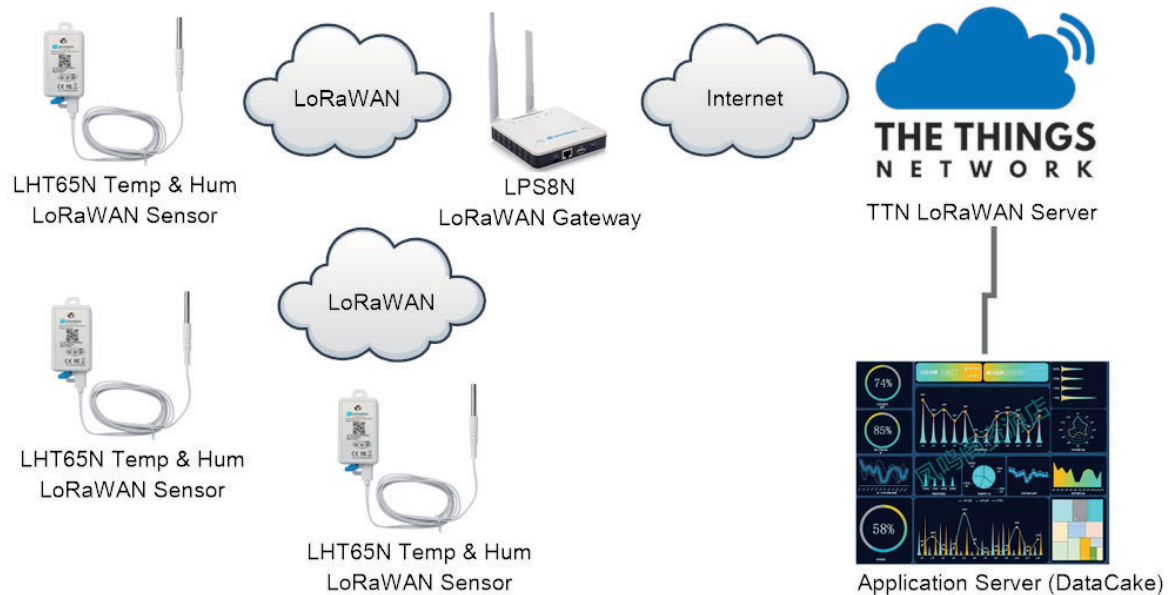


Behavior on ACT	Function	Action
Pressing ACT between 1s < time < 3s	Test uplink status	If LHT65N is already Joined to the LoRaWAN network, LHT65N will send an uplink packet, if LHT65N has an external sensor connected, blue led will blink once. If LHT65N has no external sensor, red led will blink once.
Pressing ACT for more than 3s	Active Device	green led will fast blink 5 times, LHT65N will enter working mode and start to JOIN LoRaWAN network. green led will solid turn on for 5 seconds after join in network.
Fast press ACT 5 times	Deactivate Device	red led will solid on for 5 seconds. This means LHT65N 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.

LHT65N in a LoRaWAN Network



Assume the LPS8N is already set to connect to [TTN V3 network](#), So it provides network coverage for T3-NA-01. Next we need to add the T3-NA-01 device in TTN V3:

2.3.1 Step 1: Create Device in TTN

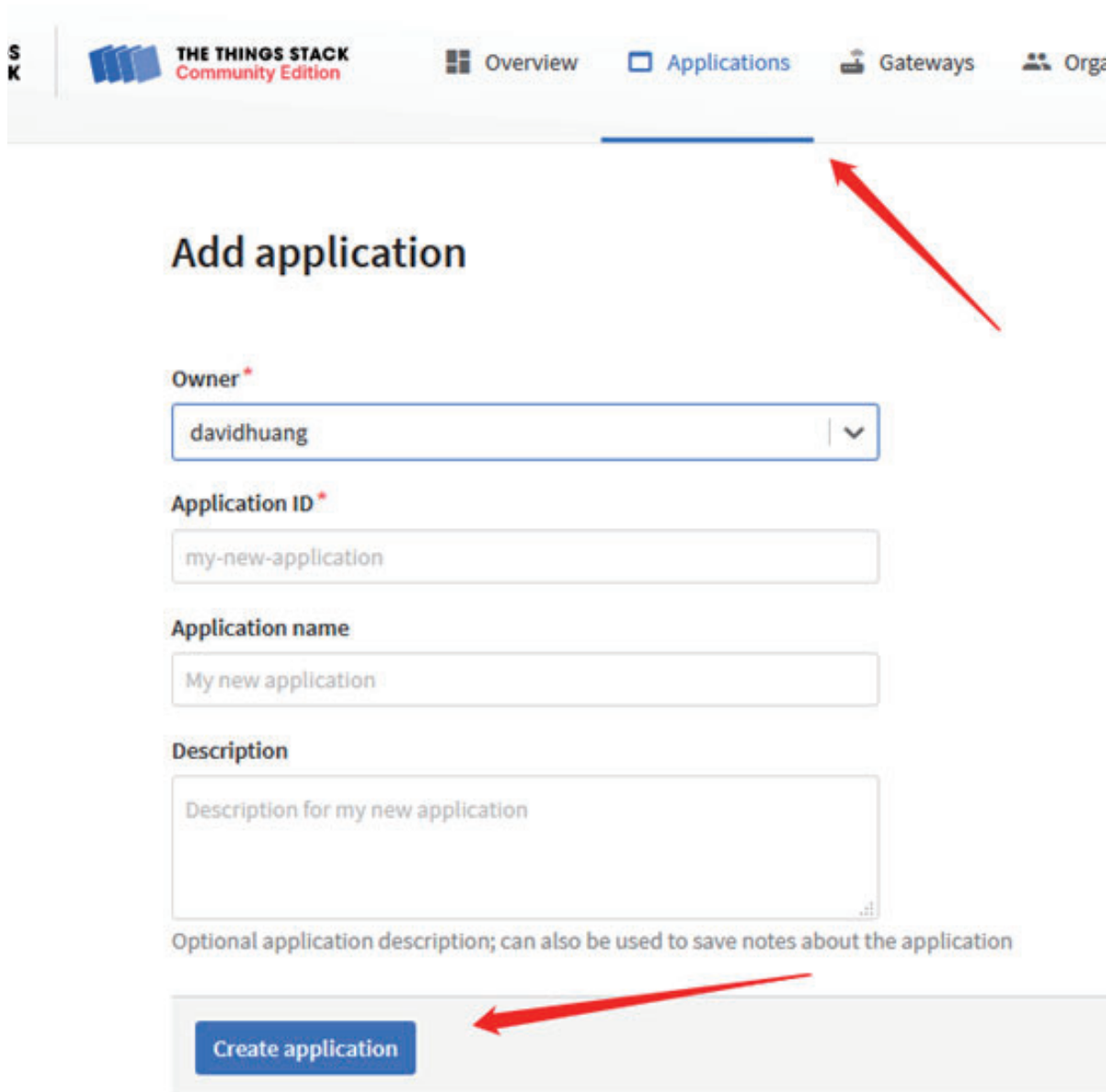
Create a device in TTN V3 with the OTAA keys from LHT65N.

Each T3-NA-01 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 Orga

Add application

Owner *

davidhuang | v

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

The screenshot displays the LoRaWAN device management interface. At the top, there's a header with the CCC logo and user information. Below this, a navigation bar shows '4 End devices', '2 Collaborators', and '2 API keys'. The main content area is divided into two sections: 'General Information' and 'Live data'. The 'General Information' section shows the Application ID as '123', created at 'Feb 2, 2021 11:12:30', and last updated at 'Apr 30, 2021 11:00:33'. The 'Live data' section shows a list of events with timestamps and descriptions. Below these sections, there's a table for 'End devices (4)' with columns for ID, Name, DevEUI, JoinEUI, and Created. To the right of the table, there are buttons for 'Search by ID', 'Import end devices', and 'Add end device'. A red arrow points to the 'Add end device' button. Below the table, there's a 'Register end device' section with two tabs: 'From The LoRaWAN Device Repository' (selected) and 'Manually'. Under the 'From The LoRaWAN Device Repository' tab, there's a section titled '1. Select the end device' with a 'Brand' dropdown (set to 'Dragino Technology Co.,...') and a 'Model' dropdown (set to 'Type to search...'). A red arrow points to the 'Model' dropdown. Below this, there's a section titled '2. Enter registration data' with a 'Please choose an end device first to' message and a 'Register end device' button. A red arrow points to the 'Register end device' button. The 'Model' dropdown menu is open, showing a list of models: LBT1, LDDS20, LDDS75, LDS01, LGT92, LHT65, LSE01, and LSN50-V2. A red arrow points to the 'LHT65' model in the dropdown menu.

Register end device

From The LoRaWAN Device Repository | Manually

1. Select the end device

Brand *
Dragino Technology Co.,...

Model *
Type to search...

Cannot find your exact end device?

2. Enter registration data

Please choose an end device first to

Register end device

LBT1
LDDS20
LDDS75
LDS01
LGT92
LHT65
LSE01
LSN50-V2

Note: LHT65N use same payload as LHT65.



2. Enter registration data

Frequency plan ⓘ *

The frequency plan used by the end device

AppEUI ⓘ *

The AppEUI uniquely identifies the owner of the end device. If no AppEUI is provided by the device manufacturer (usually for development), it can be filled with zeros.

DevEUI ⓘ *

The DevEUI is the unique identifier for this end device

AppKey ⓘ *

Input APP EUI, APP KEY and DEV EUI:

2. Enter registration data

Frequency plan ⓘ *

Europe 863-870 MHz (SF12 for RX2)

The frequency plan used by the end device

AppEUI ⓘ *

.. .. . 00

The AppEUI uniquely identifies the owner of the end device. If no AppEUI is provided by the device manufacturer (usually for dev

DevEUI ⓘ *

.. .. .

The DevEUI is the unique identifier for this end device

AppKey ⓘ *

.. .. .

The root key to derive session keys to secure communication between the end device and the application

End device ID *

my-new-device

After registration

2.3.2 Step 2: Activate T3-NA-01 by pressing the ACT button for more than 5 seconds.

Use ACT button to activate T3-NA-01 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.

• Last seen 3 seconds ago ↑ 573 ↓ 34 Created 8 days ago

Overview **Live data** Messaging Location Payload formatters Claiming General settings

Time	Type	Data preview
↑ 10:09:42	Forward data message to Applic...	DevAddr: 26 08 B5 9A MAC payload: 79 41 62 C5 18 2A B9 99 5A E2 A7 FPort: 2 SNR: -6.2 RSSI: -126 Bandwidth: 125000
ⓘ 10:09:42	Store upstream data message	DevAddr: 26 08 B5 9A
↑ 10:09:42	Forward uplink data message	Temperature Sensor", Hum_SHT: 56.1, Temp_DS: 327.67, TempC_SHT: 38.28 CB F4 08 D4 02 31 01 7F FF 7F FF FPort: 2 SNR: -6.2 RSSI: -126 Ban
↑ 10:09:42	Receive uplink data message	DevAddr: 26 08 B5 9A
↑ 10:09:42	Successfully processed data me...	DevAddr: 26 08 B5 9A FCnt: 573 FPort: 2 MAC payload: 79 41 62 C5 18 2A B9 99 5A E2 A7 Bandwidth: 125000 SNR: -6.2 RSSI: -126 Raw pay
↑ 10:09:42	Drop data message	Uplink is a duplicate
↑ 10:09:42	Receive data message	DevAddr: 26 08 B5 9A FCnt: 573 FPort: 2 MAC payload: 79 41 62 C5 18 2A B9 99 5A E2 A7 Bandwidth: 125000 SNR: 7.5 RSSI: -46 Raw paylo

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.

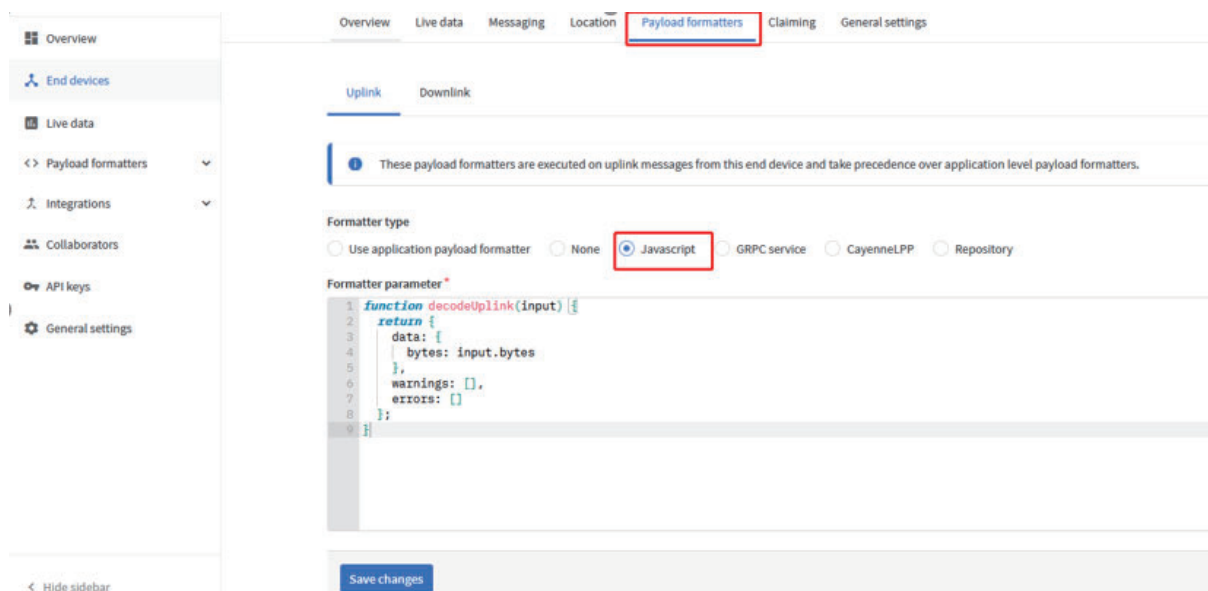
Size(bytes)	2	2	2	1	4
Value	BAT	Built-In Temperature	Built-in Humidity	Ext #	Ext value

- The First 6 bytes: has fix meanings for every T3-NA-01
- The 7th byte (EXT #): defines the external sensor model.
- The 8th ~ 11th byte: the value for external sensor value. The definition is based on external sensor type. (If EXT=0, there won't be these four bytes.)

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 decoder in TTNv3 for friendly reading.

Below is the position to put the decoder and T3-NA-01 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

AC payload: 5F 6B FD 0B 99 51 A3 A8 84 40 37 FPort: 2 SNR: 10.8 RSSI: -41 Bandwidth: 12.5kHz
 SHT: 60.4, TempC_DS: 327.67, TempC_SHT: 27.47 } CB A4 0A BB 02 5C 01 7F FF 7F FF FPort: 2

Check the battery voltage for T3-NA-01

- BAT status=(0xcba4>>14)&0xFF=11(B), very good
- Battery Voltage =0xCB F6&0x3FFF=0x0BA4=2980mV

2.4.3 Built-in Temperature

AC payload: 5F 6B FD 0B 99 51 A3 A8 84 40 37 FPort: 2 SNR: 10.8 RSSI: -41 Bandwidth: 12.5kHz
 SHT: 60.4, TempC_DS: 327.67, TempC_SHT: 27.47 } CB A4 0A BB 02 5C 01 7F FF 7F FF FPort: 2

- Temperature: 0x0ABB/100=27.47°C

10:02:54 1559 2 payload: CBBDF5 C6 02 2E 01 F5 4F 7F FF

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

2.4.4 Built-in Humidity

AC payload: 5F 6B FD 0B 99 51 A3 A8 84 40 37 FPort: 2 SNR: 10.8 RSSI: -41 Bandwidth: 12.5kHz
 SHT: 69.4, TempC_DS: 327.67, TempC_SHT: 27.47 } CB A4 0A BB 02 5C 01 7F FF 7F FF FPort: 2

- Humidity: $0x025C/10=60.4\%$

2.4.5 Ext

Bytes for External Sensor:

EXT # Value	External Sensor Type
0x01	Sensor E3, Temperature Sensor
0x09	Sensor E3, Temperature Sensor, Datalog Mod

2.4.6 Ext value

2.4.6.1 Ext=1, E3 Temperature Sensor

APPLICATION DATA

Filters: uplink downlink activation ack error

time	counter	port	payload
08:38:57	375	2	CB F6 0B 0D 03 76 01 0A DD 7F FF

- DS18B20 temp= $0x0ADD/100=27.81^{\circ}\text{C}$

The last 2 bytes of data are meaningless

10:02:54	1559	2	payload: CB BD F5 C6 02 2E 01 F5 4F 7F FF
----------	------	---	---

- External temperature= $(0xF54F-65536)/100=-27.37^{\circ}\text{C}$

The last 2 bytes of data are meaningless

If the external sensor is 0x01, and there is no external temperature connected. The temperature will be set to 7FFF which is 327.67°C

2.4.6.2 Ext=9, E3 sensor with Unix Timestamp

Timestamp mode is designed for T3-NA-01 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 & Built-in Humidity	Status & Ext	Unix Time Stamp

• Battery status & Built-in Humidity

Bit(bit)	[15:14]	[11:0]
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)	Built-in Humidity

• 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 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 will set this bit to 1 every 10 days to request a time SYNC. (AT+SYNCMOD to set this)

2.4.6.3 Ext=6, ADC Sensor (use with E2 Cable)

In this mode, user can connect external ADC sensor to check ADC value. The 3V3_OUT can be used to power the external ADC sensor; user can control the power on time for this

sensor by setting:

AT+EXT=6,timeout Time to power this sensor, from 0 ~ 65535ms

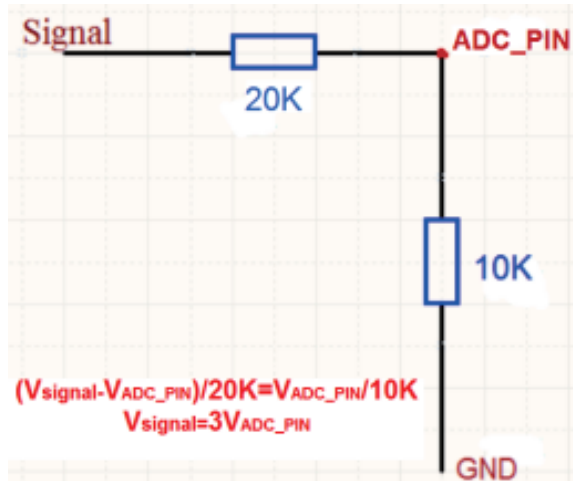
For example:

AT+EXT=6,1000 will power this sensor for 1000ms before sampling the ADC value.

Or use **downlink command A2** to set the same.

The measuring range of the node is only about 0.1V to 1.1V The voltage resolution is about 0.24mv.

When the measured output voltage of the sensor is not within the range of 0.1V and 1.1V, the output voltage terminal of the sensor shall be divided The example in the following figure is to reduce the output voltage of the sensor by three times If it is necessary to reduce more times, calculate according to the formula in the figure and connect the corresponding resistance in series.



When ADC_IN1 pin is connected to GND or suspended, ADC value is 0

```
Payload: { ADC_V: 0, BatV: 3.106, Bat_status: 3, Hum_SHT: 45.2, TempC_SHT: 28.11, Work_mode: "ADC Sensor" }
```

When the voltage collected by ADC_IN1 is less than the minimum range, the minimum range will be used as the output; Similarly, when the collected voltage is greater than the maximum range, the maximum range will be used as the output.

1) The minimum range is about 0.1V. Each chip has internal calibration, so this value is close to 0.1V

```
Payload: { ADC_V: 0.084, BatV: 3.106, Bat_status: 3, Hum_SHT: 44.9, TempC_SHT: 28.13, Work_mode: "ADC Sensor" }
```

2) The maximum range is about 1.1V. Each chip has internal calibration, so this value is close to 1.1v

```
Payload: { ADC_V: 1.085, BatV: 3.108, Bat_status: 3, Hum_SHT: 46.5, TempC_SHT: 28.16, Work_mode: "ADC Sensor" }
```

3) Within range

```
Payload: { ADC_V: 0.427, BatV: 3.099, Bat_status: 3, Hum_SHT: 45.1, TempC_SHT: 27.47, Work_mode: "ADC Sensor" }
```

2.4.6.4 Ext=2 TMP117 Sensor (Since Firmware v1.3)



Ext=2, Temperature Sensor (TMP117):

```
Payload: { BatV: 3.054, Bat_status: 3, Ext_sensor: "Temperature Sensor", Hum_SHT: 59.9, TempC_SHT: 29.16, TempC_TMP117: 27.55 }
```

Interrupt Mode and Counting Mode:

The external cable NE2 can be use for MOD4 and MOD8

2.4.6.5 Ext=4 Interrupt Mode (Since **Firmware v1.3**)

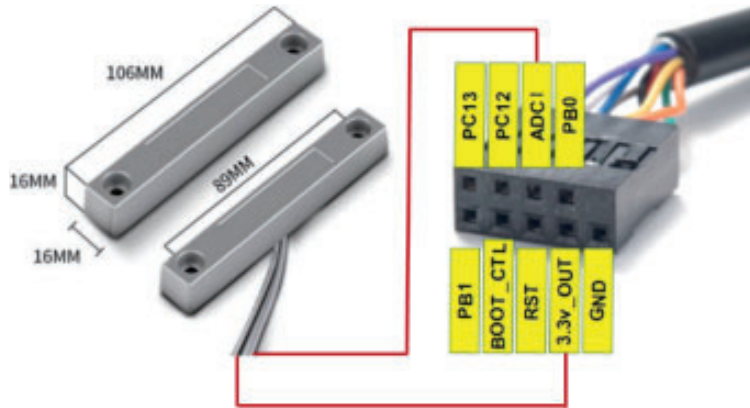
Note: In this mode, 3.3v output will be always ON. LHT65N will send an uplink when there is a trigger.

Interrupt Mode can be used to connect to external interrupt sensors such as:

Case 1: Door Sensor. 3.3v Out for such sensor is just to detect Open/Close.

In Open State, the power consumption is the same as if there is no probe

In Close state, the power consumption will be 3uA higher than normal.



Ext=4, Interrupt Sensor:

AT+EXT=4,1	Sent uplink packet in both rising and falling interrupt
AT+EXT=4,2	Sent uplink packet only in falling interrupt
AT+EXT=4,3	Sent uplink packet only in rising interrupt

Trigger by falling edge:

```
Payload: { BatV: 3.078, Bat_status: 3, Exti_pin_level: "Low", Exti_status: "True", Hum_SHT: 48.4, TempC_SHT: 28.3, Work_mode: "Interrupt Sensor send" }
```

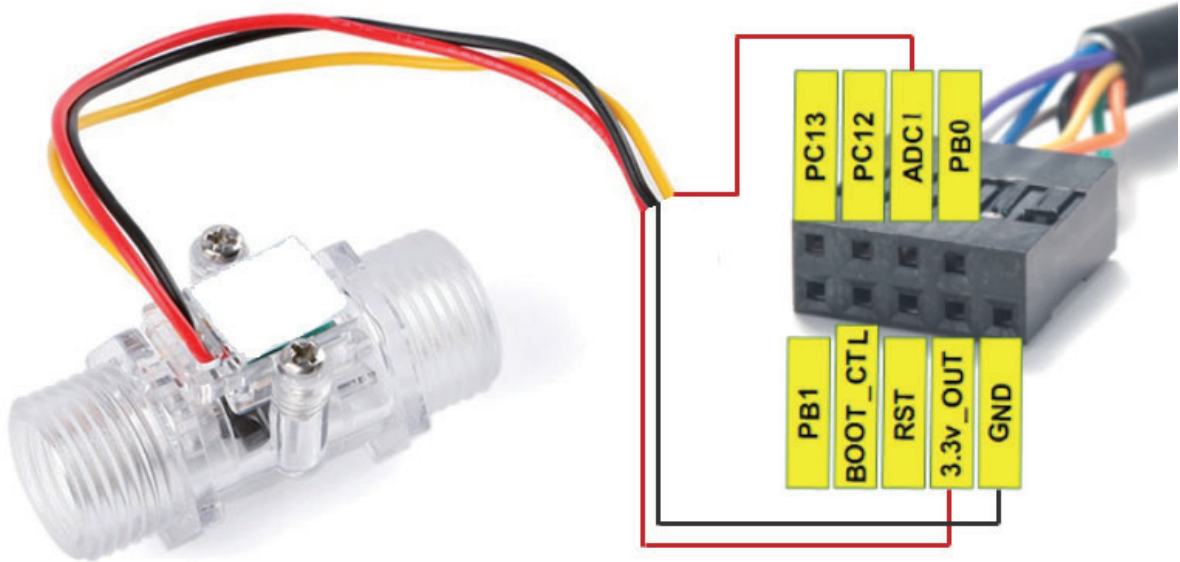
Trigger by raising edge:

```
Payload: { BatV: 3.079, Bat_status: 3, Exti_pin_level: "High", Exti_status: "True", Hum_SHT: 48.6, TempC_SHT: 28.3, Work_mode: "Interrupt Sensor send" }
```

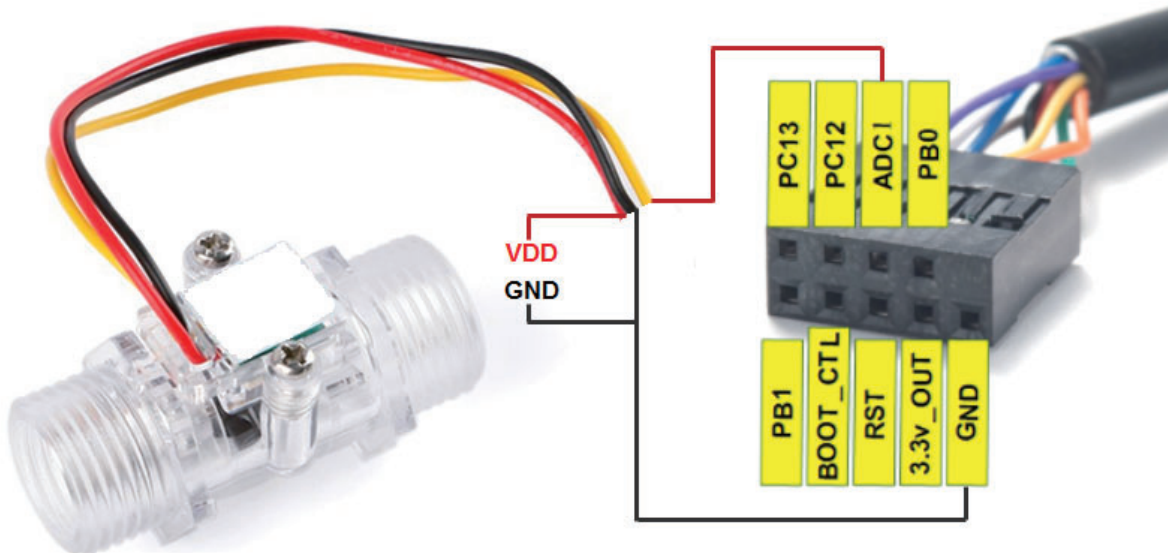
2.4.6.6 Ext=8 Counting Mode (Since Firmware v1.3)

Note: In this mode, 3.3v output will be always ON. LHT65N will count for every interrupt and uplink periodically.

Case 1: Low power consumption Flow Sensor, such flow sensor has pulse output and the power consumption in uA level and can be powered by .



Case 2: Normal Flow Sensor: Such flow sensor has higher power consumption and is not suitable to be powered by T3-NA-01. It is powered by external power and output <3.3v pulse



Ext=8, Counting Sensor (4 bytes):

AT+EXT=8,0

Count at falling interrupt

AT+EXT=8,1	Count at rising interrupt
AT+SETCNT=60	Sent current count to 60

```
Payload: { BatV: 3.072, Bat_status: 3, Exit_count: 25, Hum_SHT: 48.6, TempC_SHT: 28.41, Work_mode: "Interrupt Sensor count" }
```

A2 downlink Command:

A2 02: Same as AT+EXT=2 (AT+EXT= second byte)

A2 06 01 F4: Same as AT+EXT=6,500 (AT+EXT= second byte, third and fourth bytes)

A2 04 02: Same as AT+EXT=4,2 (AT+EXT= second byte, third byte)

A2 08 01 00: Same as AT+EXT=8,0 (AT+EXT= second byte, fourth byte)

A2 08 02 00 00 00 3C: Same as AT+ SETCNT=60 (AT+ SETCNT = 4th byte and 5th byte and 6th byte and 7th byte)

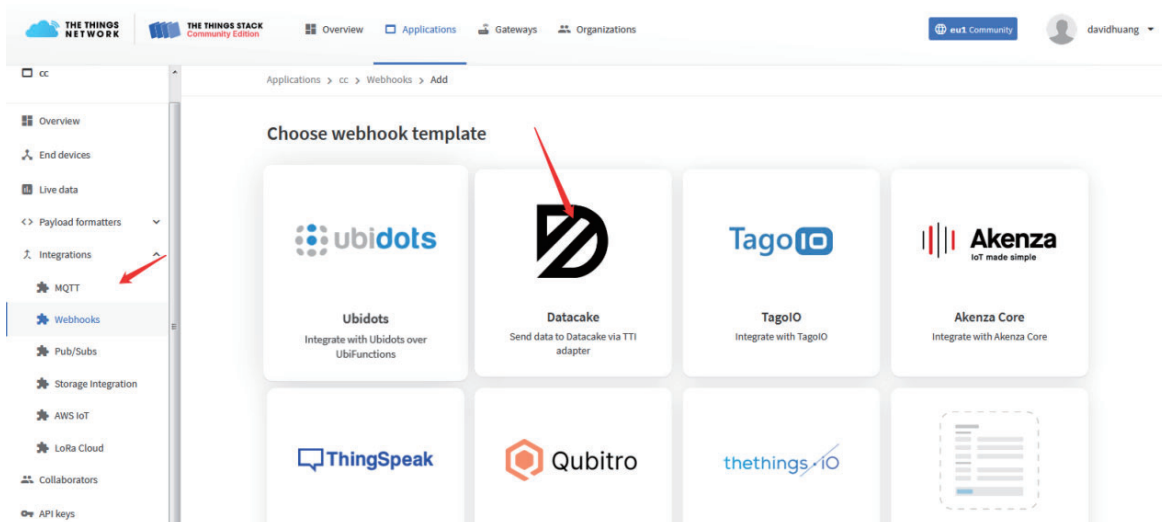
2.5 Show data on Datacake

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:

Applications > lgt92test > Webhooks > Add > Datacake

Add custom webhook

Template information



Datacake

Send data to Datacake via TTI adapter

[About Datacake](#) | [Documentation](#)

Template settings

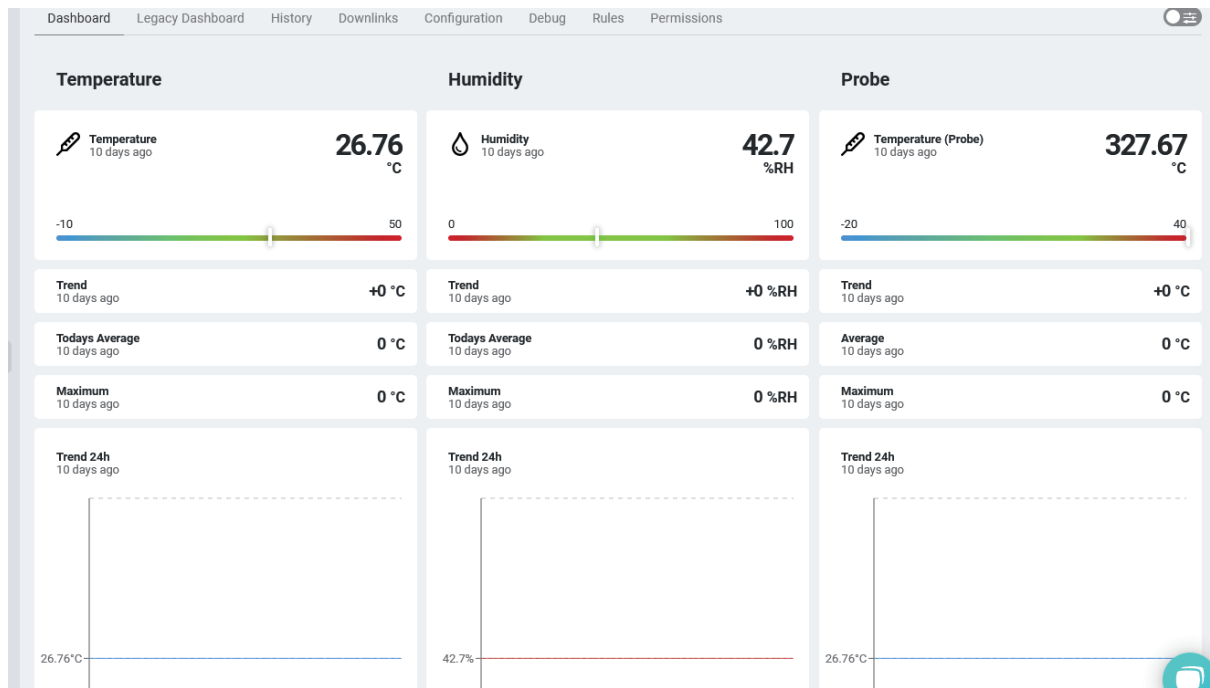
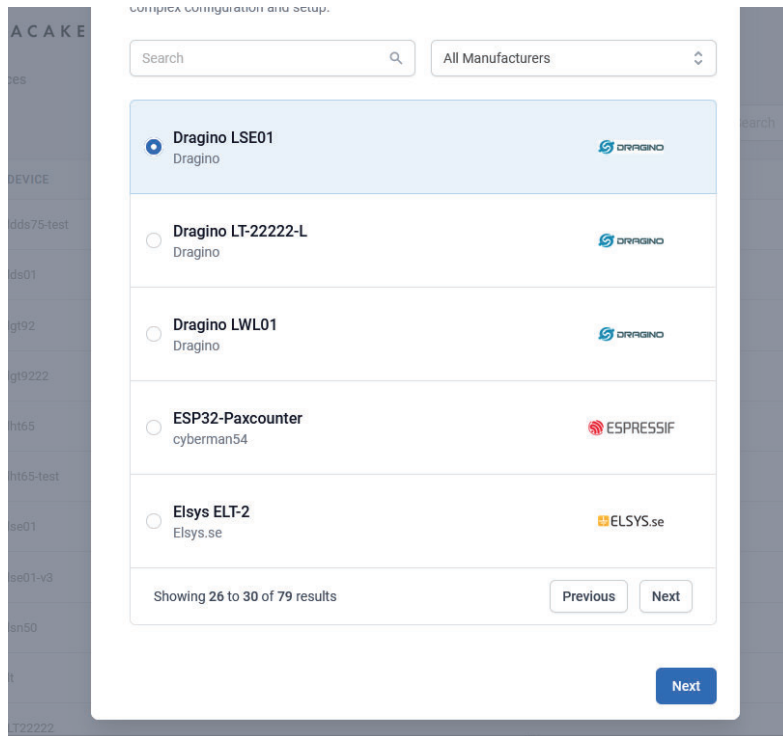
Webhook ID *

Token *

Datacake API Token

Create datacake webhook

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



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, T3-NA-01 will store the reading for future retrieving purposes. There are two ways for IoT servers to get datalog from T3-NA-01.

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.

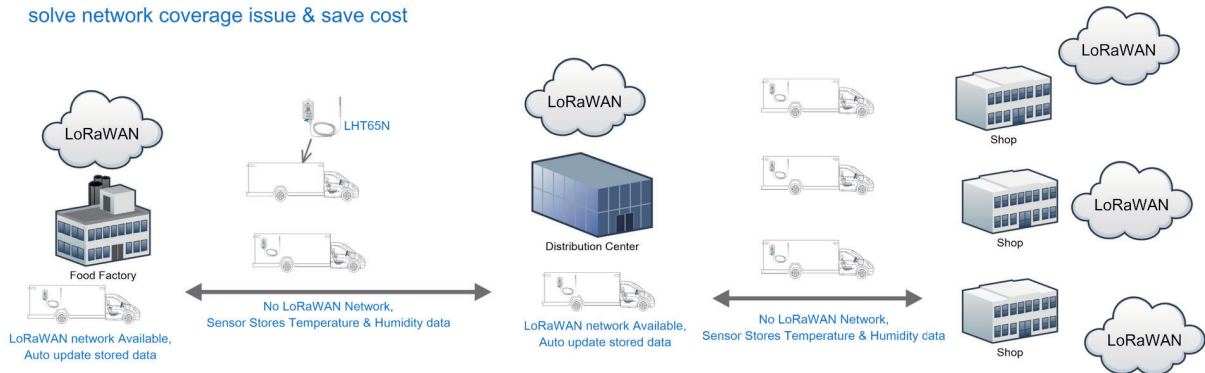
Method 2: Set [PNACKMD=1](#), T3-NA-01 will wait for ACK for every uplink, when there is no LoRaWAN network, T3-NA-01 will mark these records with non-ack messages and store the sensor data, and it will send all messages (10s interval) after the network recovery.

Note for method 2:

- a) T3-NA-01 will do an ACK check for data records sending to make sure every data arrive server.
- b) T3-NA-01 will send data in **CONFIRMED Mode** when PNACKMD=1, but T3-NA-01 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 T3-NA-01 gets a ACK, T3-NA-01 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)

New Feature for ColdChain
solve network coverage issue & save cost



2.6.2 Unix TimeStamp

T3-NA-01 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 $\frac{1}{2}^8$ second steps

Figure 10 : DeviceTimeAns payload format

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

Below is the converter example

The screenshot shows two web interfaces. On the left, the EpochConverter website displays the current Unix epoch time as 1611889418. Below this, it shows the conversion of 1611889090 to a human-readable date: GMT: 2021年1月29日 Friday 02:58:10, and a relative time of 3 minutes ago. On the right, the Code Beautify website shows the 'Decimal to Hex' converter. A red arrow points from the EpochConverter timestamp (1611889418) to the input field of the Code Beautify converter, which contains 1611889405. The output of the conversion is shown as 60137afd.

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 T3-NA-01 Joined LoRaWAN network, it will send the MAC command (DeviceTimeReq) and the server will reply with (DeviceTimeAns) to send the current time to T3-NA-01. If T3-NA-01 fails to get the time from the server, LHT65N 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 Interval = 5s, means T3-NA-01 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	No ACK Message	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:

- DR0:** max is 11 bytes so one entry of data
- DR1:** max is 53 bytes so devices will upload 4 entries of data (total 44 bytes)
- DR2:** total payload includes 11 entries of data
- 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 T3-NA-01 has below data inside Flash:

Flash Addr	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
8019700	21/1/19 04:30:30	1	3145	sht_temp=21.81 sht_hum=33.4 ds_temp=327.67
8019710	21/1/19 04:40:30	1	3145	sht_temp=21.65 sht_hum=33.7 ds_temp=327.67
8019720	21/1/19 04:50:30	1	3147	sht_temp=21.55 sht_hum=34.1 ds_temp=327.67
8019730	21/1/19 05:00:30	1	3149	sht_temp=21.50 sht_hum=34.1 ds_temp=327.67
8019740	21/1/19 05:10:30	1	3149	sht_temp=21.43 sht_hum=34.6 ds_temp=327.67
8019750	21/1/19 05:20:30	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

T3-NA-01 will uplink this payload.

09:57:27 102 2 payload: 7F FF 08 98 01 46 41 60 06 5F 97 7F FF 08 8E 01 4B 41 60 06 60 09 7F FF

Uplink

Payload

7F FF 08 98 01 46 41 60 06 5F 97 7F FF 08 8E 01 4B 41 60 06 60 09 7F FF 08 85 01 4E 41 60 06 60 66 7F FF 08 75 01 51 41 60 06

Fields

no fields

Metadata

```
{
  "time": "2021-01-20T01:57:27.690185935Z",
  "frequency": 904.5,
  "modulation": "LORA",
  "data_rate": "SF7BW125",
  "coding_rate": "4/5",
  "gateways": [
    {
      "gtw_id": "eui-a840411cfe60415c",
      "timestamp": 3270993355,
      "time": "2021-01-20T01:57:27.544057Z",
      "channel": 3,
      "rssi": -55,
      "snr": 10
    }
  ]
}
```

7FFF089801464160065F97 7FFF 088E 014B 41 60066009
 7FFF0885014E41600660667FFF0875015141600662BE7FFF086B015541600665167FFF08660155416006676E7FFF085F015A41

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 & Feature "Multi sampling, one uplink"

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 (Since v1.3.1 firmware)

Internal GXHT30 temperature alarm (Acquisition time: fixed at one minute)

AT+WMOD=3: 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.

AT+LEDALARM=1 : Enable LED visual Alarm.

Downlink Command:

AT+WMOD=1: A501 , AT+WMOD=0 : A600

AT+CITEMP=1 : A60001

AT+ARTEMP=1,60 : A70001003C

AT+ARTEMP=-16,60 : A7FFF0003C

AT+LEDALARM=1 : 3601

Downlink Command: AAXXXXXXXXXXXXXX

Total bytes: 8 bytes

Example: AA0100010001003C

WMOD=01

CITEMP=0001

TEMPlow=0001

TEMPhigh=003C

DS18B20 and TMP117 Threshold Alarm

AT+WMOD=1,60,-10,20

Downlink Command:

Example: A5013CFC180014

MOD=01

CITEMP=3C(S)

TEMPlow=FC18

TEMPhigh=0014

Fluctuation alarm for DS18B20 and TMP117 (Acquisition time: minimum 1s)

AT+WMOD=2,60,5

Downlink Command:

Example: A5023C05

MOD=02

CITEMP=3C(S)

temperature fluctuation=05

Sampling multiple times and uplink together

AT+WMOD=3,1,60,20,-16,32,1

Explain:

- Set Working Mode to **Mode 3**
- Sampling Interval is **60s**.
- When there is **20** sampling data, Device will send these data via one uplink. (max value is 60, means max 60 sampling in one uplink)
- Temperature alarm range is **-16 to 32 °C**,
- **1** to enable temperature alarm, **0** to disable the temperature alarm. If alarm is enabled, a data will be sent immediately if temperature exceeds the Alarm range.

Downlink Command:

Example: A50301003C14FFF0002001

MOD=03

EXT=01

CITEMP=003C(S)

Total number of acquisitions=14

TEMPlow=FFF0

TEMPhigh=0020

ARTEMP=01

Uplink payload(Fport=3)

Example: CBEA0109920A4109C4

BatV=CBEA

EXT=01

Temp1=0992 // 24.50°C

Temp2=0A41 // 26.25°C

Temp3=09C4 // 25.00°C

Note: This uplink will automatically select the appropriate DR according to the data length

In this mode, the temperature resolution of ds18b20 is 0.25°C to save power consumption

2.7.2 ALARM MODE (Before v1.3.1 firmware)

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

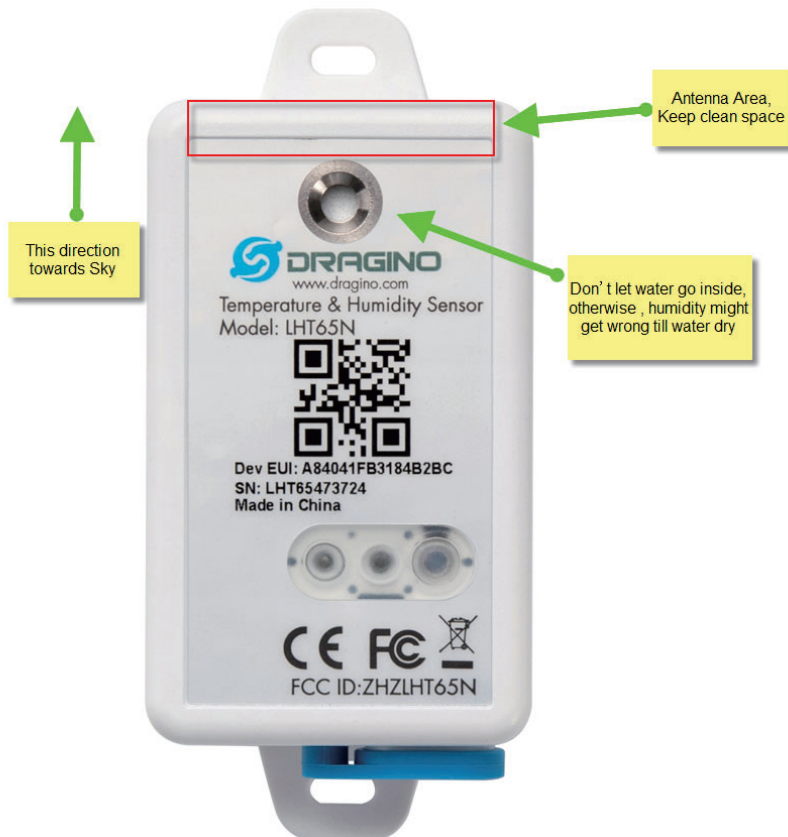
The T3-NA-01 has a triple color LED which for easy showing different stage .

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

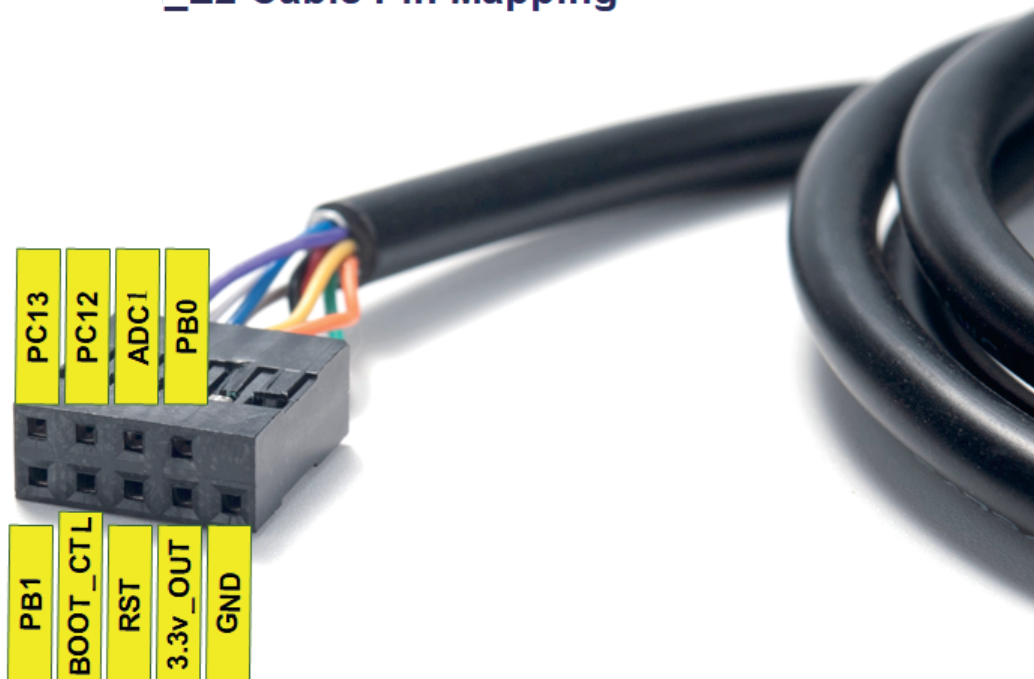
3.1 E2 Extension Cable



1m long breakout cable for T3-NA-01. Features:

- Use for AT Command, works for both LHT52/T3-NA-01
- Update firmware for T3-NA-01, works for both LHT52/T3-NA-01
- Supports ADC mode to monitor external ADC
- Supports Interrupt mode
- Exposed All pins from the T3-NA-01 Type-C connector.

E2 Cable Pin Mapping



3.2 E3 Temperature Probe



Temperature sensor with 2 meters cable long

- Resolution: 0.0625 °C
- $\pm 0.5^{\circ}\text{C}$ accuracy from -10°C to $+85^{\circ}\text{C}$
- $\pm 2^{\circ}\text{C}$ accuracy from -55°C to $+125^{\circ}\text{C}$
- Operating Range: $-40 \sim 125^{\circ}\text{C}$
- Working voltage 2.35v ~ 5v

4. Configure T3-NA-01 via AT command or LoRaWAN downlink

Use can configure T3-NA-01 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 T3-NA-01, 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**

These commands are only valid for T3-NA-01, 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 Set External Sensor Mode

Feature: Change External Sensor Mode.

AT Command: AT+EXT

Command Example	Function	Response
AT+EXT?	Get current external sensor mode	1 OK External Sensor mode =1
AT+EXT=1	Set external sensor mode to 1	
AT+EXT=9	Set to external DS18B20 with timestamp	

Downlink Command: 0xA2

Total bytes: 2 ~ 5 bytes

Example:

- 0xA201: Set external sensor type to E1
- 0xA209: Same as AT+EXT=9
- 0xA20702003c: Same as AT+SETCNT=60

4.3 Enable/Disable uplink Temperature probe ID

Feature: If PID is enabled, device will send the temperature probe ID on:

- First Packet after OTAA Join
- Every 24 hours since the first packet.

PID is default set to disable (0)

AT Command:

Command Example	Function	Response
AT+PID=1	Enable PID uplink	OK

Downlink Command:

- **0xA800** --> AT+PID=0
- **0xA801** --> AT+PID=1

4.4 Set Password

Feature: Set device password, max 9 digits

AT Command: AT+PWORD

Command Example	Function	Response
AT+PWORD=?	Show password	123456 OK
AT+PWORD=999999	Set password	OK

Downlink Command:

No downlink command for this feature.

4.5 Quit AT Command

Feature: Quit AT Command mode, so user needs to input password again before use AT Commands.

AT Command: AT+DISAT

Command Example	Function	Response
AT+DISAT	Quit AT Commands mode	OK

Downlink Command:

No downlink command for this feature.

4.6 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.

4.7 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

4.8 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
```

4.9 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
```

4.10 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	Response
AT+PDTA=1,3	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
Print page 1 to 3	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

4.11 Print last few data entries.

Feature: Print the last few data entries

AT Command: AT+PLDTA

Command Example	Response
AT+PLDTA=5	Stop Tx and RTP events when read sensor data
Print last 5 entries	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

4.12 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

4.13 Auto Send None-ACK messages

Feature: T3-NA-01 will wait for ACK for each uplink, If T3-NA-01 doesn't get ACK from the IoT server, it will consider the message doesn't arrive server and store it. T3-NA-01 keeps sending messages in normal periodically. Once T3-NA-01 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

4.14 Modified WMOD command for external sensor TMP117 or DS18B20 temperature alarm (Since firmware 1.3.0)

Feature: Set internal and external temperature sensor alarms.

Command Example	Function	Response
AT+WMOD=parameter1,parameter2,parameter3,parameter4	Set internal and external temperature sensor alarms	OK

AT+WMOD=parameter1,parameter2,parameter3,parameter4

Parameter 1: Alarm mode:

- 0): Cancel
- 1): Threshold alarm
- 2): Fluctuation alarm

Parameter 2: Sampling time. Unit: seconds, up to 255 seconds.

Note: When the collection time is less than 60 seconds and always exceeds the set alarm threshold, the sending interval will not be the collection time, but will be sent every 60 seconds.

Parameter 3 and parameter 4:

1): If Alarm Mode is set to 1: Parameter 3 and parameter 4 are valid, as before, they represent low temperature and high temperature.

Such as AT+WMOD=1,60,45,105, it means high and low temperature alarm.

2): If Alarm Mode is set to 2: Parameter 3 is valid, which represents the difference between the currently collected temperature and the last uploaded temperature.

Such as AT+WMOD=2,10,2,it means that it is a fluctuation alarm.

If the difference between the current collected temperature and the last Uplink is ± 2 degrees, the alarm will be issued.

Downlink Command: 0xA5

0xA5 00 -- AT+WMOD=0.

0xA5 01 0A 11 94 29 04 -- AT+WMOD=1,10,45,105 (AT+WMOD = second byte, third byte, fourth and fifth bytes divided by 100, sixth and seventh bytes divided by 100)

0xA5 01 0A F9 C0 29 04 --AT+WMOD=1,10,-16,105(Need to convert -16 to -1600 for calculation, $-1600(\text{DEC}) = \text{FFFFFFFFFFFF9C0}(\text{HEX})$ $\text{FFFFFFFFFFFF9C0}(\text{HEX}) + 10000(\text{HEX}) = \text{F9C0}(\text{HEX})$)

0xA5 02 0A 02 -- AT+WMOD=2,10,2 (AT+WMOD = second byte, third byte, fourth byte)

0xA5 FF -- After the device receives it, upload the current alarm configuration (FPORT=8). Such as 01 0A 11 94 29 04 or 02 0A 02.

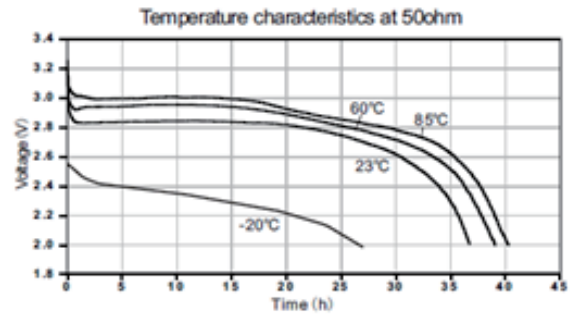
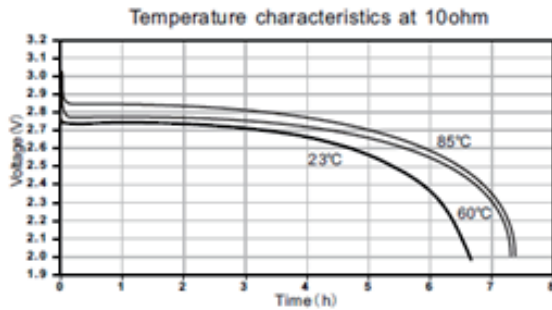
5. Battery & How to replace

5.1 Battery Type

T3-NA-01 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.

Performance



The minimum Working Voltage for the T3-NA-01 is ~2.5v. When battery is lower than 2.6v, it is time to change the battery.

5.2 Replace Battery

T3-NA-01 has two screws on the back, Unscrew them, and changing the battery inside is ok. The battery is a general CR17450 battery. 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 T3-NA-01 on different frequency can be found at : <https://www.dropbox.com/sh/r2i3zlhsrypavla/AAB1sZw3mdT0K7XjpHCITt13a?dl=0>

6. FAQ

6.1 How to use AT Command?

T3-NA-01 supports AT Command set. User can use a USB to TTL adapter plus the Program Cable to connect to T3-NA-01 for using AT command, as below.



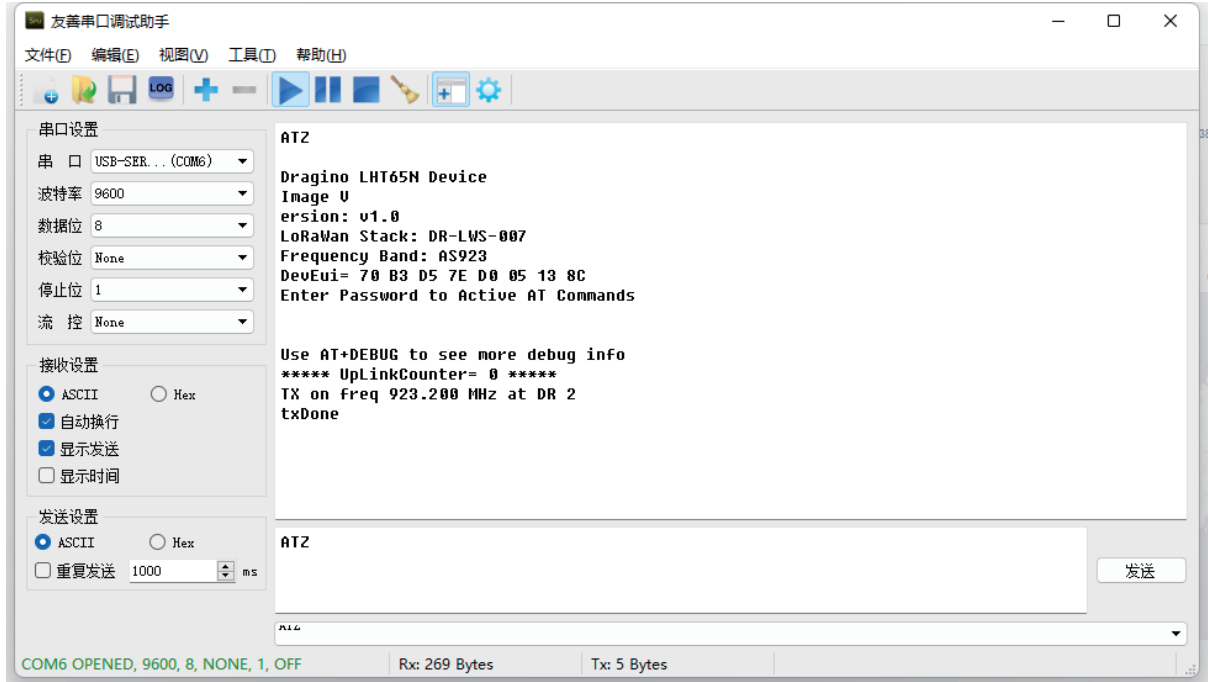
TYPE-C Beta (Male)

Connection:

- **USB to TTL GND <--> GND**
- **USB to TTL RXD <--> D+**
- **USB to TTL TXD <--> A11**

In PC, User needs to set serial tool (such as [putty](#), SecureCRT) baud rate to **9600** to access to access serial console for T3-NA-01. The AT commands are disabled by default and need to enter password (default: **123456**) to activate 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.

Input password and ATZ to activate T3-NA-01, As shown below:



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+PASSWORD: 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

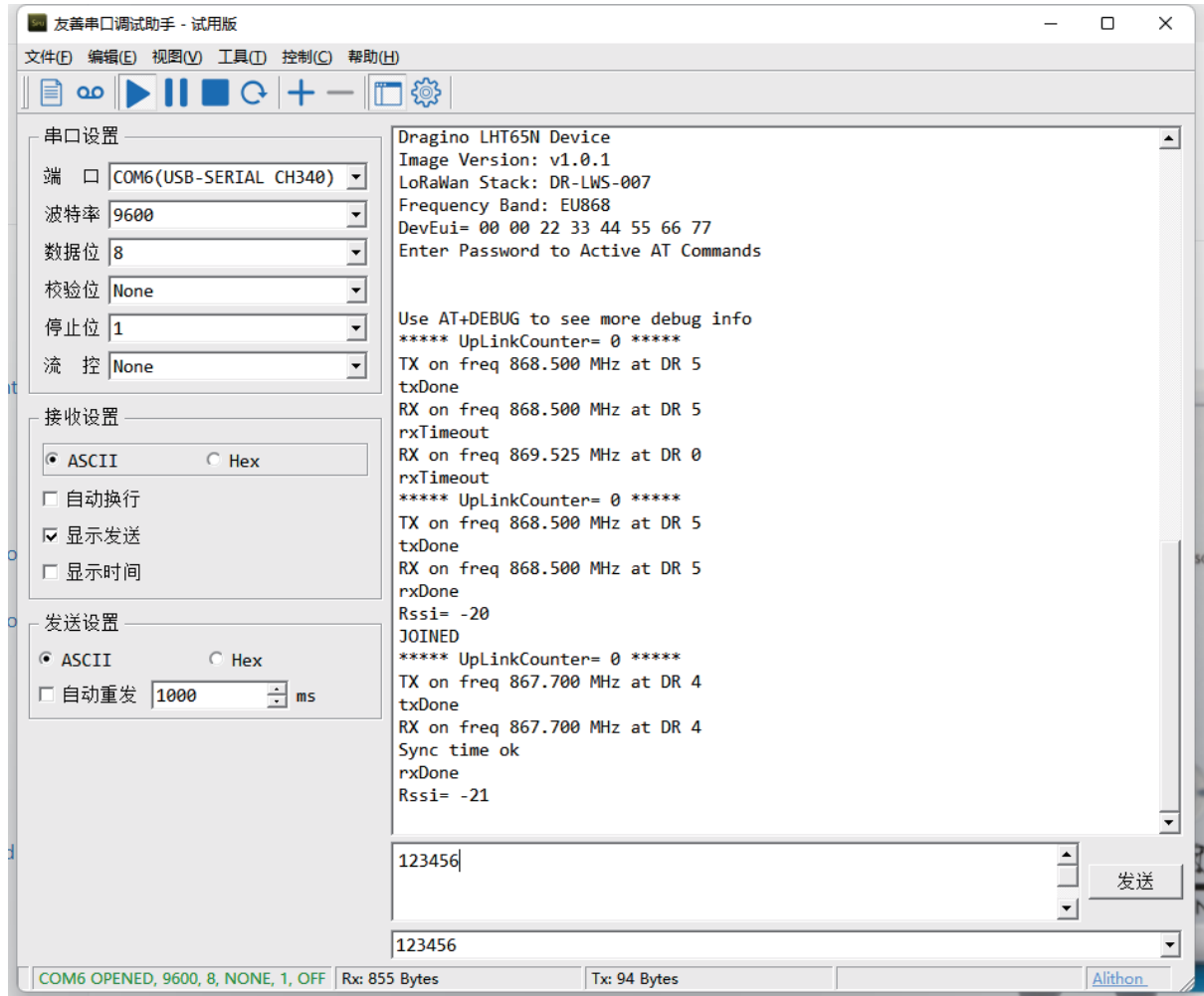
AT+ARTEMP: Get or set the internal Temperature sensor alarm range

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

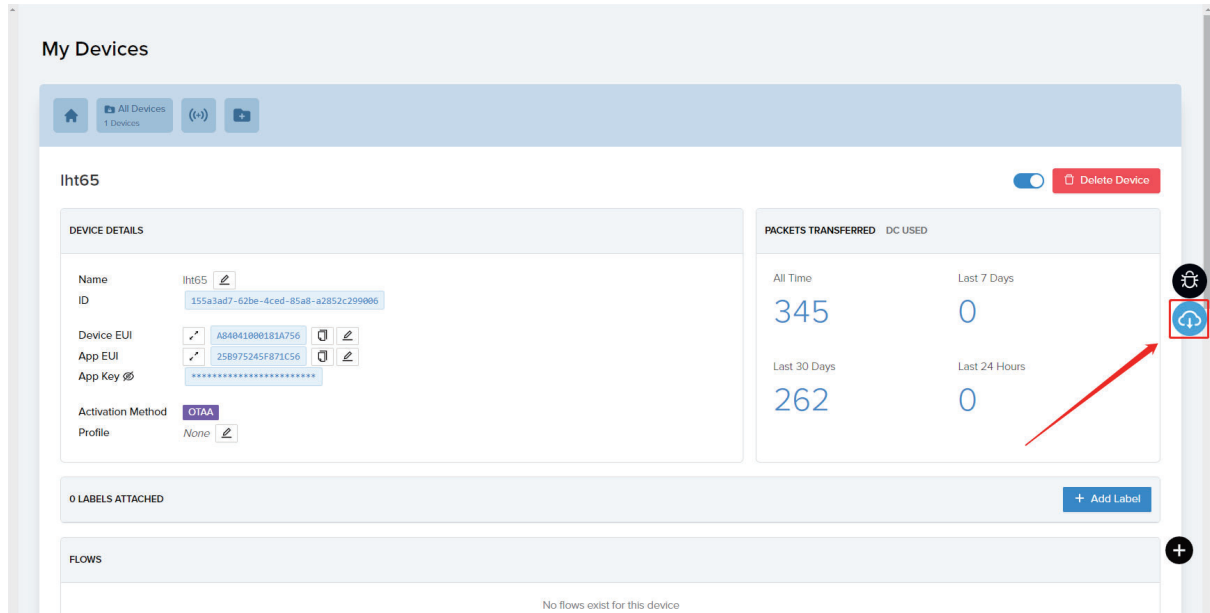
Payload

The desired payload bytes of the downlink message

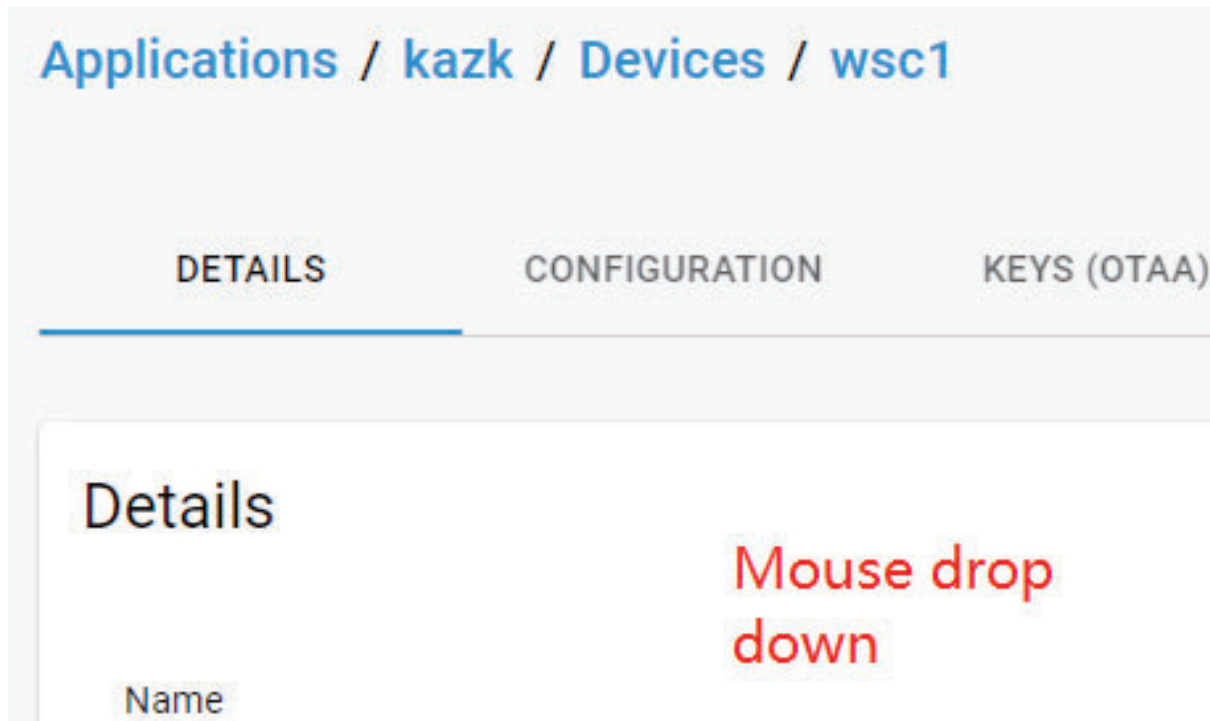
- ☐ Confirmed downlink

Schedule downlink

Helium:



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



▼

Enqueue downlink payload

Port *

Please note that the fPort value must be > 0.

☐ Confirmed downlink

BASE64 ENCODED

JSON OBJECT

Base64 encoded string *

ENQUEUE PAYLOAD

Aws:

Test

Device Advisor

MQTT test client

manage

All devices

goods

Item groups

Item type

Queue metrics

Greengrass devices

LPWAN appliances

Network Analyzer

gateway

equipment

Multicast groups

FUOTA tasks

Configuration file

destination

Remote operation

Message routing

Reserved messages

security

Queue Hub

Device software

Billing groups

Set up

Device traffic

Clicking the "Refresh" button will incur a charge

The gateway to which it was last connected	DevEUI	RSSI (dBm)	SNR (dB)	frequency	Data rate
a840411e96744159	003586ec8db99ebb	-79	13.25	916800000	3

Configuration file

Device profiles

Service configuration file

8287665f-9338-415c-ad8c-57f3f2d71ee2	fdb906f1-f524-4f14-ac20-2a22a17e0933
--------------------------------------	--------------------------------------

Downlink message queue (0)

information

Refresh

Clear the downlink queue

Delete

Downlink messages are queued

The message ID	timestamp	fPort	TransmitMode
No downlink message No downlink messages are queued. Downlink messages are queued			

label

Manage tags

key	value
No labels You don't have any tags attached to this resource.	

feedback

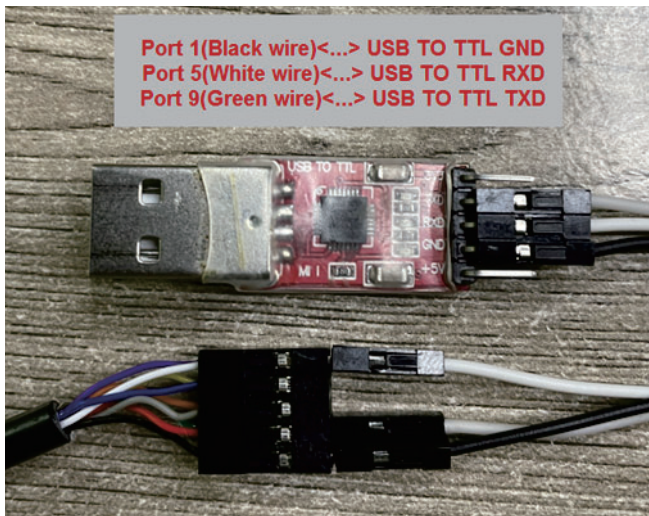
In looking for "Language Selection"? You can do so in the new Unified Settings. Find it

© 2022, Amazon Web Services, Inc. or its affiliates. privacy article Cookie preferences

6.3 How to change the uplink interval?

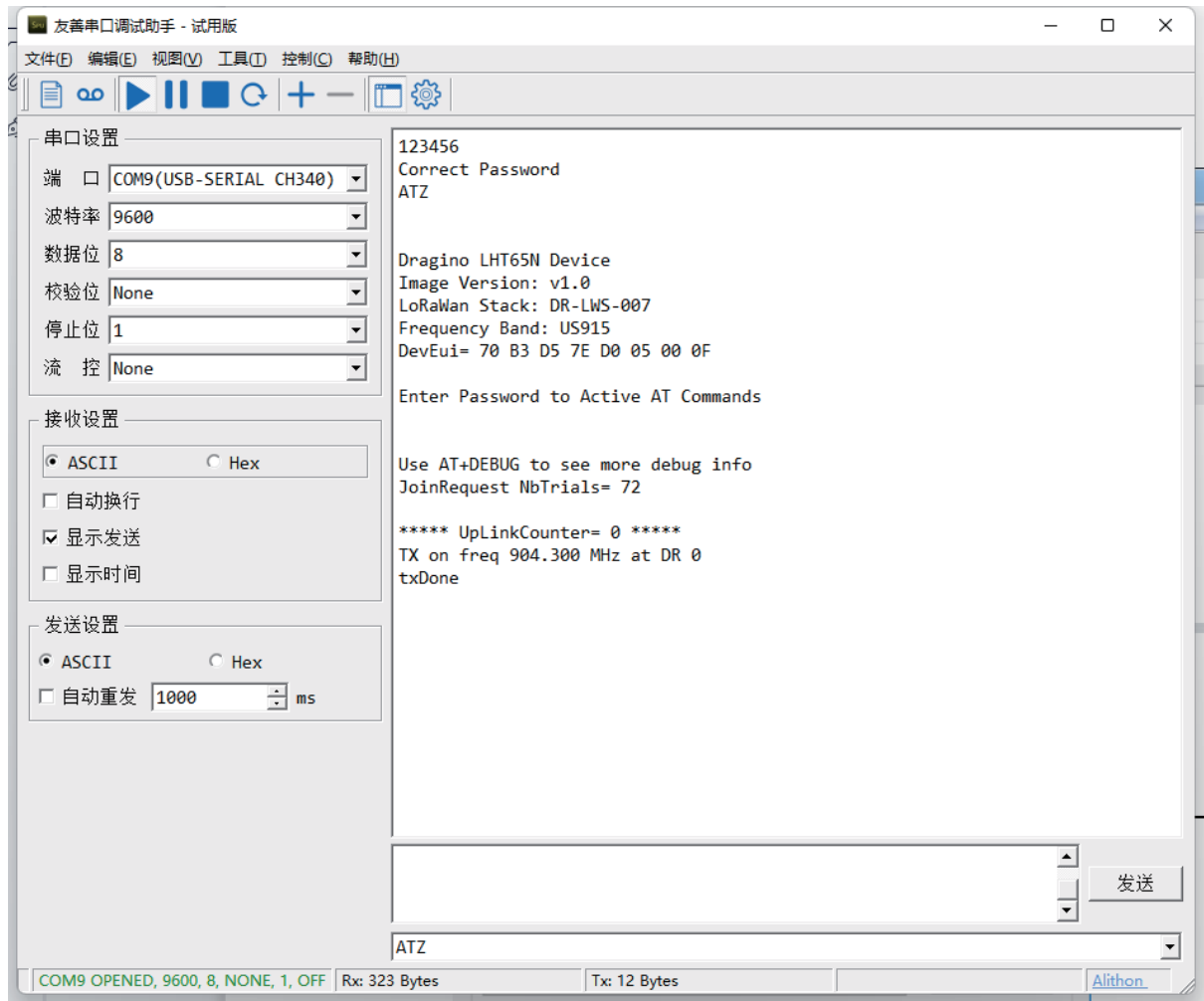
Please see this link: <http://wiki.dragino.com/xwiki/bin/view/Main/How%20to%20set%20the%20transmit%20time%20interval/>

6.4 How to use TTL-USB to connect a PC to input AT commands?

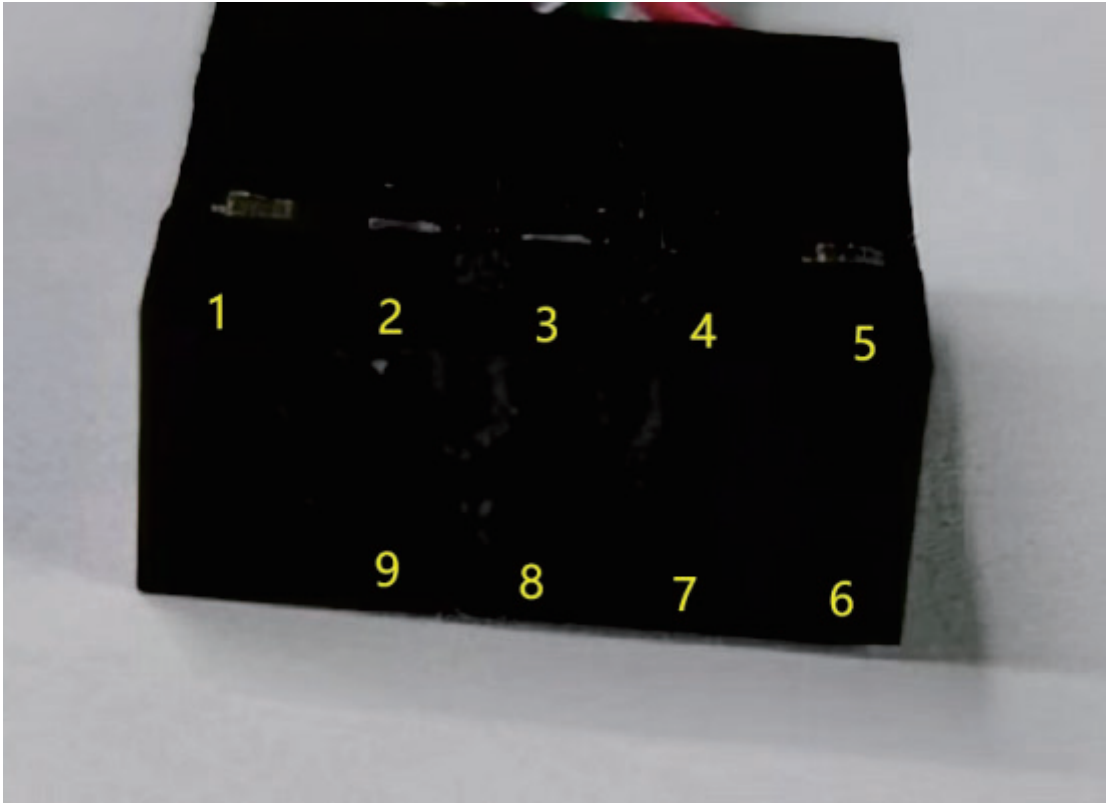


In PC, User needs to set serial tool (such as [putty](#), SecureCRT) baud rate to **9600** to access to access serial console for T3-NA-01. The AT commands are disable by default and need to enter password (default: **123456**) to active it. Timeout to input AT Command is 5 min, after 5-minute, user need to input password again. User can use AT+DISAT command to disable AT command before timeout.

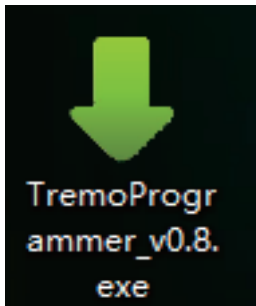
Input password and ATZ to activate T3-NA-01, As shown below:



6.5 How to use TTL-USB to connect PC to upgrade firmware?

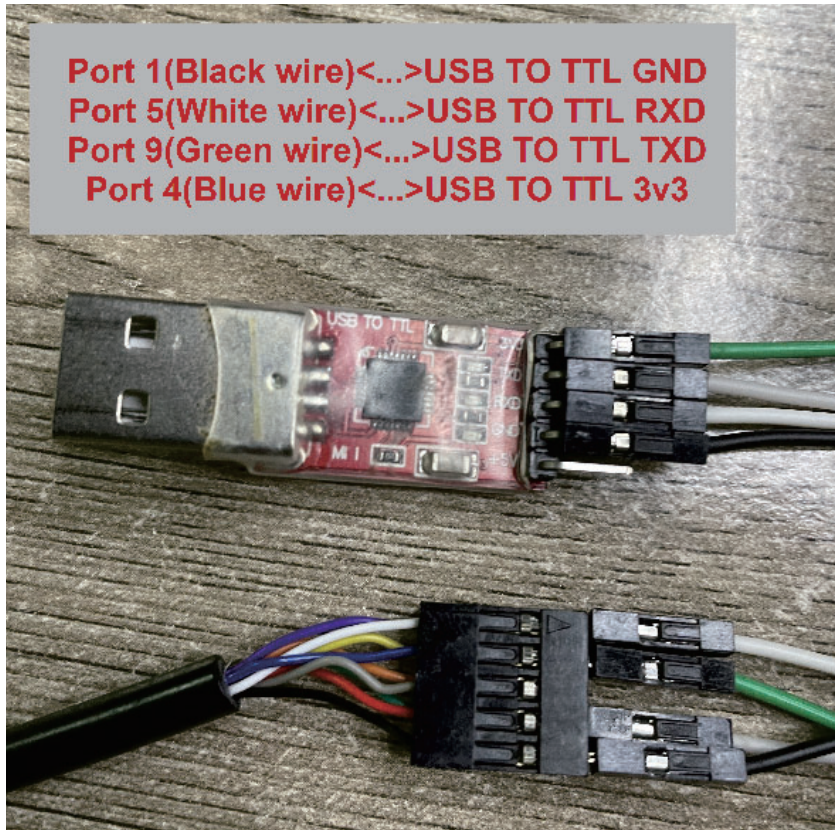


Step1: Install TremoProgrammer first.

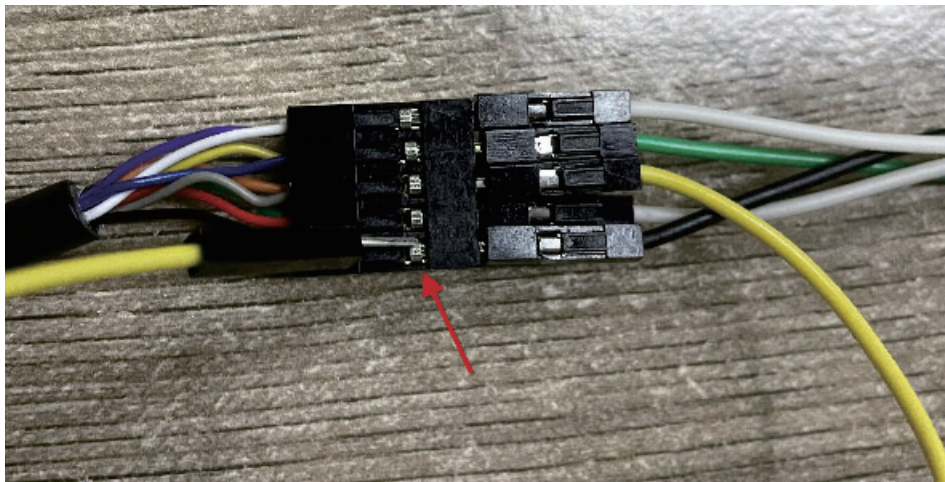


Step2: wiring method.

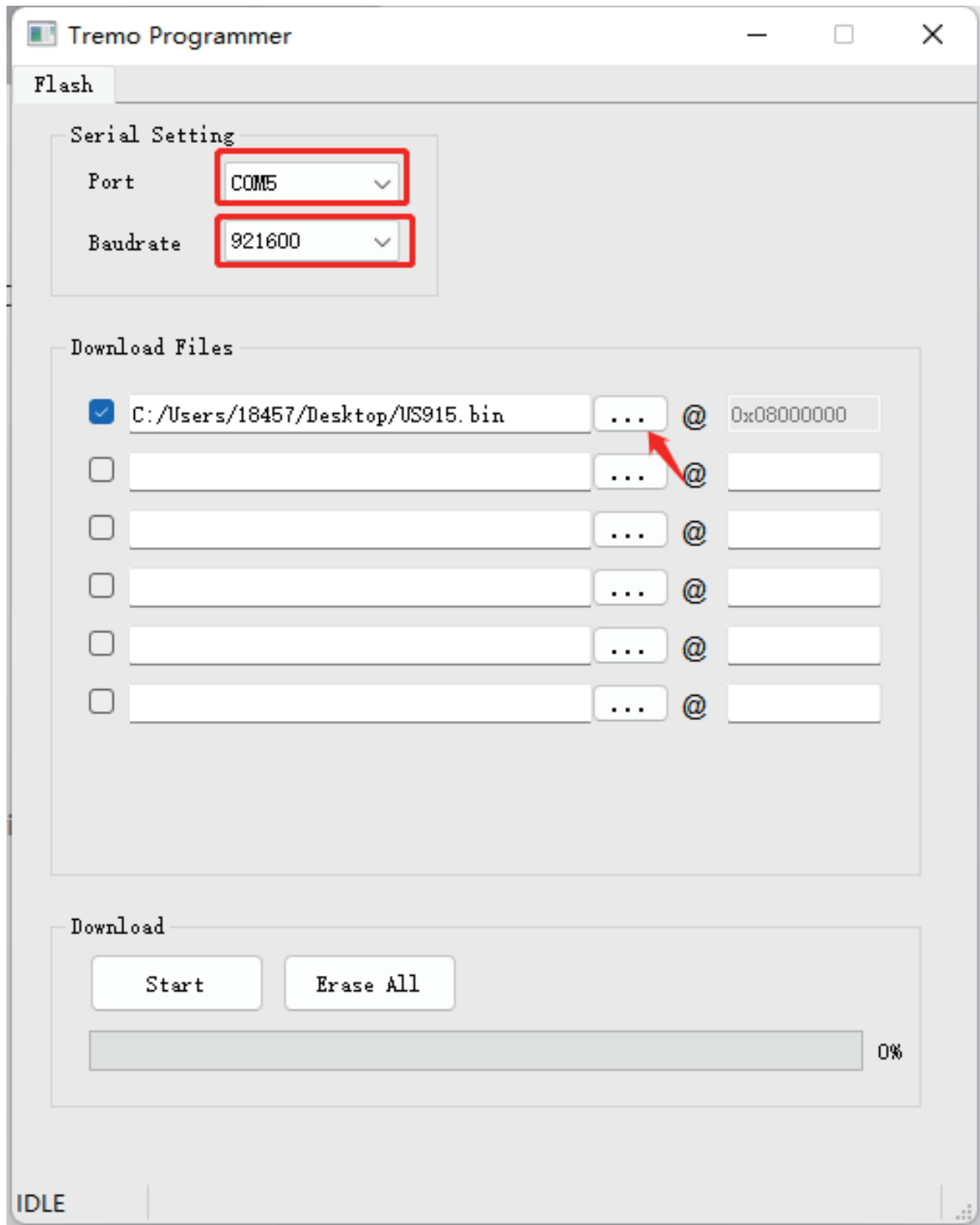
First connect the four lines;



Then use DuPont cable to short circuit port3 and port1, and then release them, so that the device enters bootload mode.

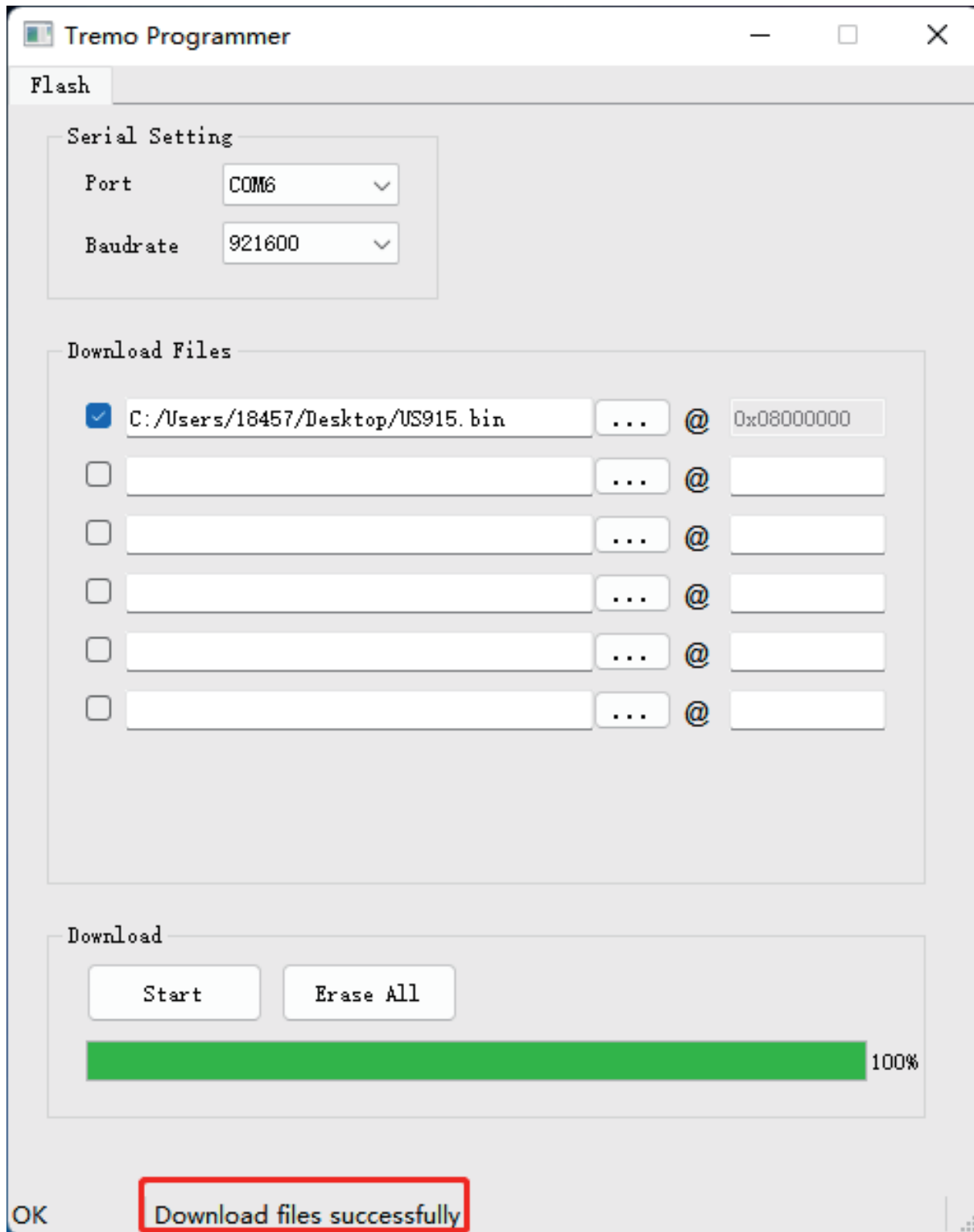


Step3: Select the device port to be connected, baud rate and bin file to be downloaded.



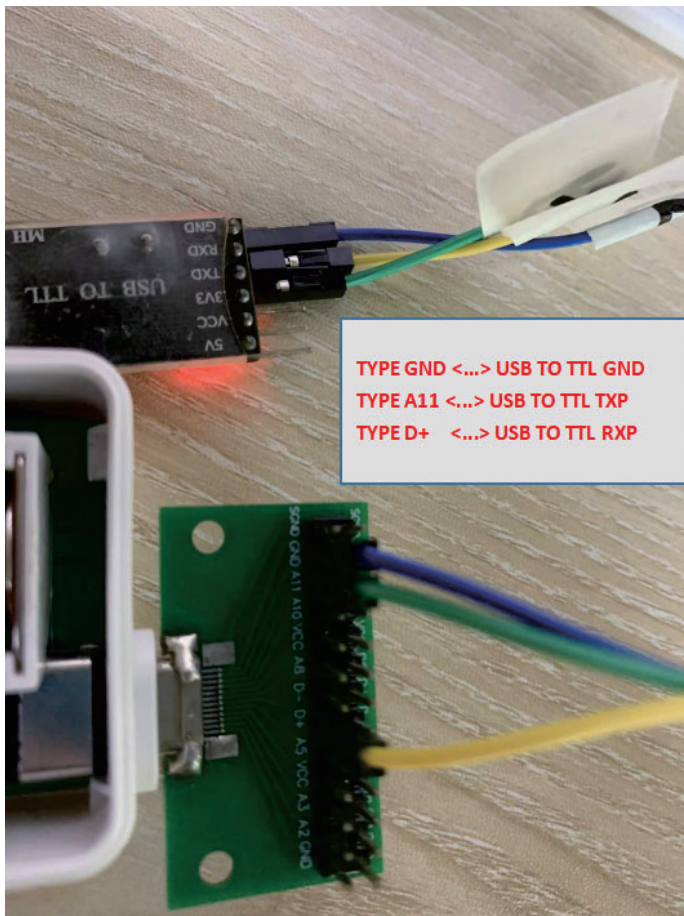
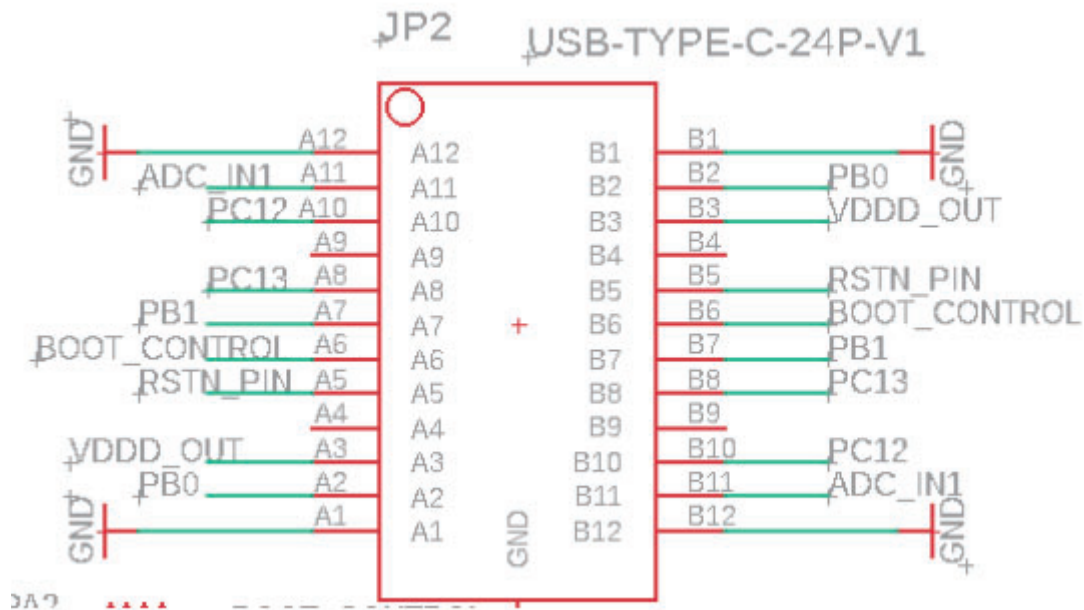
Click the [start](#) button to start the firmware upgrade.

When this interface appears, it indicates that the download has been completed.



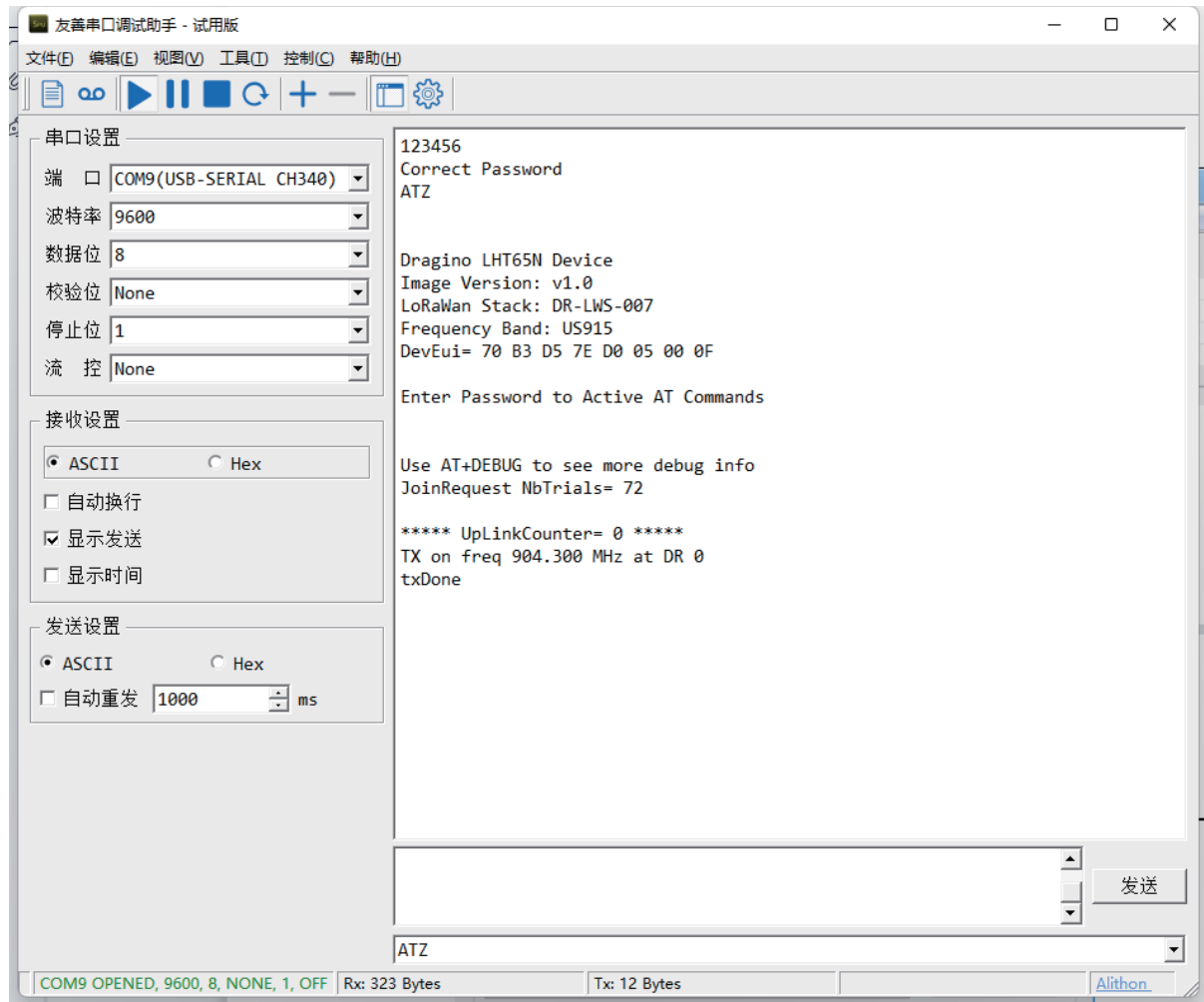
Finally, unplug the DuPont cable on port4, and then use the DuPont cable to short circuit port3 and port1 to reset the device.

6.6 Using USB-TYPE-C to connect to the computer using the AT command

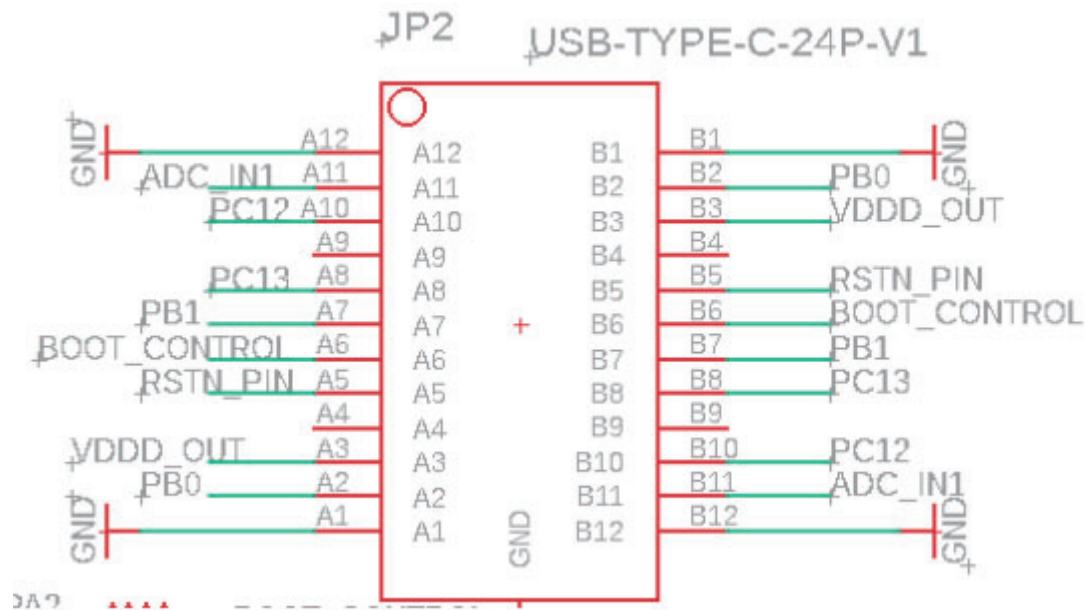


In PC, User needs to set serial tool(such as [putty](#), SecureCRT) baud rate to **9600** to access to access serial console for T3-NA-01. The AT commands are disable by default and need to enter password (default:**123456**) to active it. Timeout to input AT Command is 5 min, after 5-minute, user need to input password again. User can use AT+DISAT command to disable AT command before timeout.

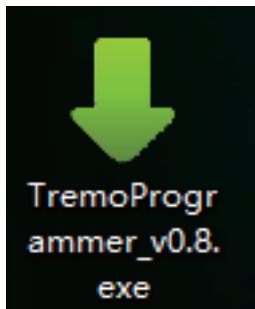
Input password and ATZ to activate T3-NA-01,As shown below:



6.7 How to use USB-TYPE-C to connect PC to upgrade firmware?

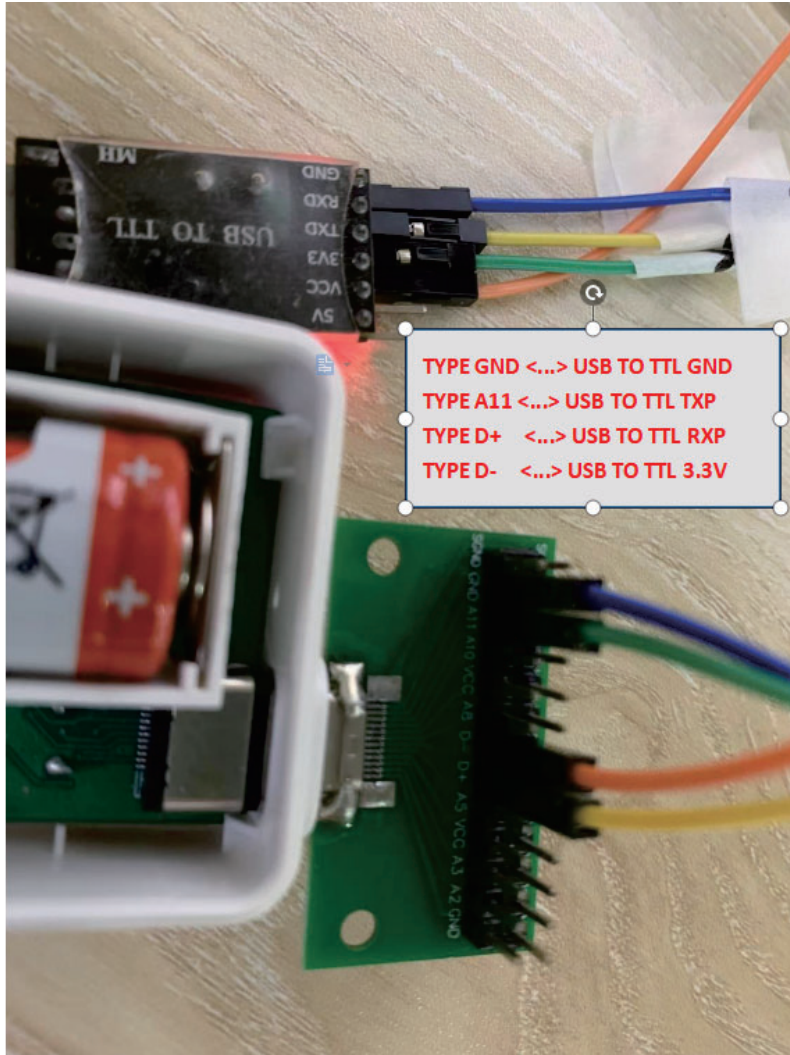


Step1: Install TremoProgrammer first.



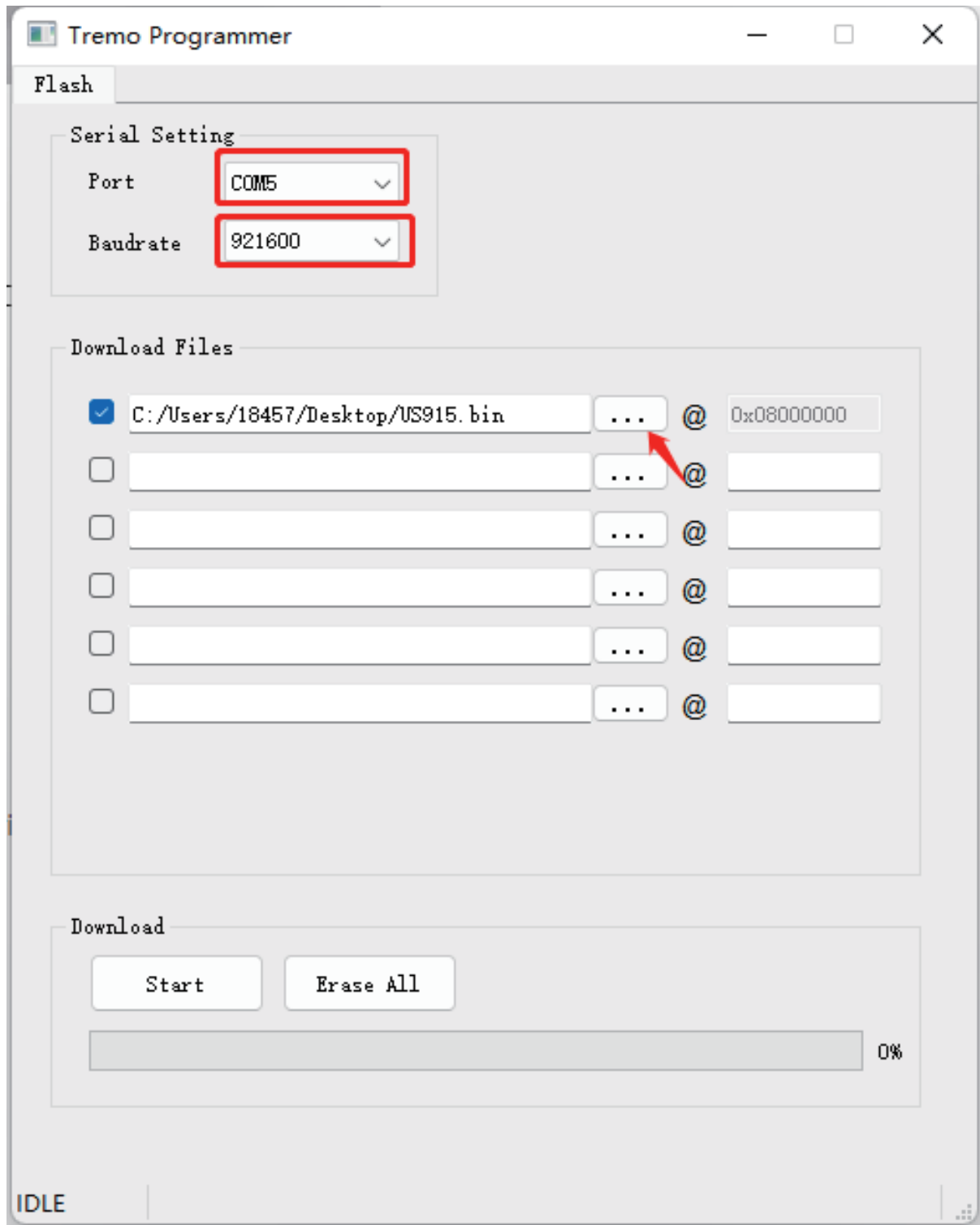
Step2: wiring method.

First connect the four lines;



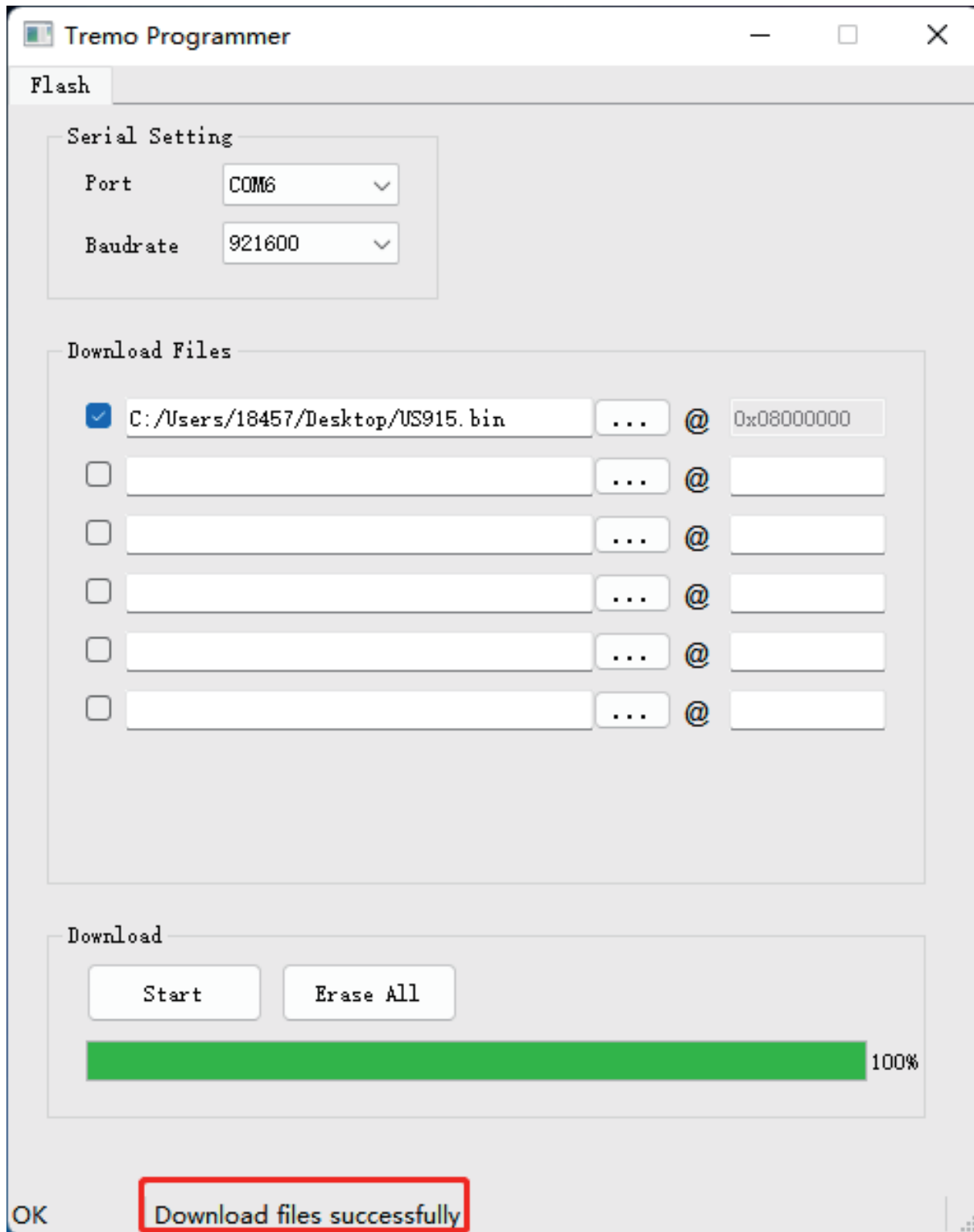
Connect A8 and GND with Dupont wire for a while and then separate, enter reset mode

Step3: Select the device port to be connected, baud rate and bin file to be downloaded.



Click the [start](#) button to start the firmware upgrade.

When this interface appears, it indicates that the download has been completed.



Finally, Disconnect 3.3v, Connect A8 and GND with Dupont wire for a while and then separate, exit reset mode

6.8 Why can't I see the datalog information

1. The time is not aligned, and the correct query command is not used.
2. Decoder error, did not parse the datalog data, the data was filtered.

7. Order Info

Part Number: **T3 I-XX-YY**

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

YY: Sensor Accessories

- **E3**: External Temperature Probe

8. Packing Info

Package Includes:

- **T3-NA-01** Temperature & Humidity Sensor x 1
- Optional external sensor

Dimension and weight:

- Device Size: 10 x 10 x 3.5 mm
- Device Weight: 120.5g

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

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

To maintain compliance with FCC's RF Exposure guidelines, This equipment should be installed and operated with minimum distance between 20cm the radiator your body: Use only the supplied antenna.

11. IC Caution:

RSS-Gen Issue 5 2021"&"CNR-Gen 5 2021:

- English:

This device complies with Industry Canada licence-exempt RSS standard(s).

Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

The device should be installed and used within a distance of at least 20 cm between the radiator and the body.

- French:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Déclaration d'exposition aux radiations Cet équipement est conforme Canada limites d'exposition aux radiations dans un environnement non contrôlé.

Cet équipement doit être installé et utilisé à distance minimum de 20cm entre le radiateur et votre corps.