WTSTemperature Sensor UserManual

Document Version: 0.1

Image Version: v1.0

Version	Description	Date

0.1	Draft	2021-Aug-9
1.0	Fix typo.	

1. Introduction

1.1 What is WTS Temperature & Humidity Sensor

The WTS Temperature sensor isa Long Range LoRaWANSensor. It includes a **built-in Temperature sensor**.

The WTS 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 smart cities, building automation, and so on.

WTS supports Data-log feature, it will store the data when there is no LoRaWAN network and upload them to LoRaWAN server when there is LoRaWAN network coverage again

WTS has a built-in 3.8Ah non-chargeable battery which can be used for long term.

WTS is full compatible with LoRaWAN v1.0.3Class A protocol, it can work with standard LoRaWAN gateway.

1.2 Features

- ✓ Wall mountable, in place / out of place detection
- ✓ LoRaWAN v1.0.3 Class A Protocol
- ✓ Built-in 3.8Ah battery for more than 10 years use. (Base on configure)
- ✓ Built-in high accuracy Temperature sensor
- ✓ Remote configure via LoRaWAN downlink.
- ✓ Frequency Bands: KR920/US915/EU868/AS923/AU915
- ✓ Built-in data-log feature
- ✓ Tri-color LED to indicate status

1.3 Specifications

Built-in Temperature Sensor:

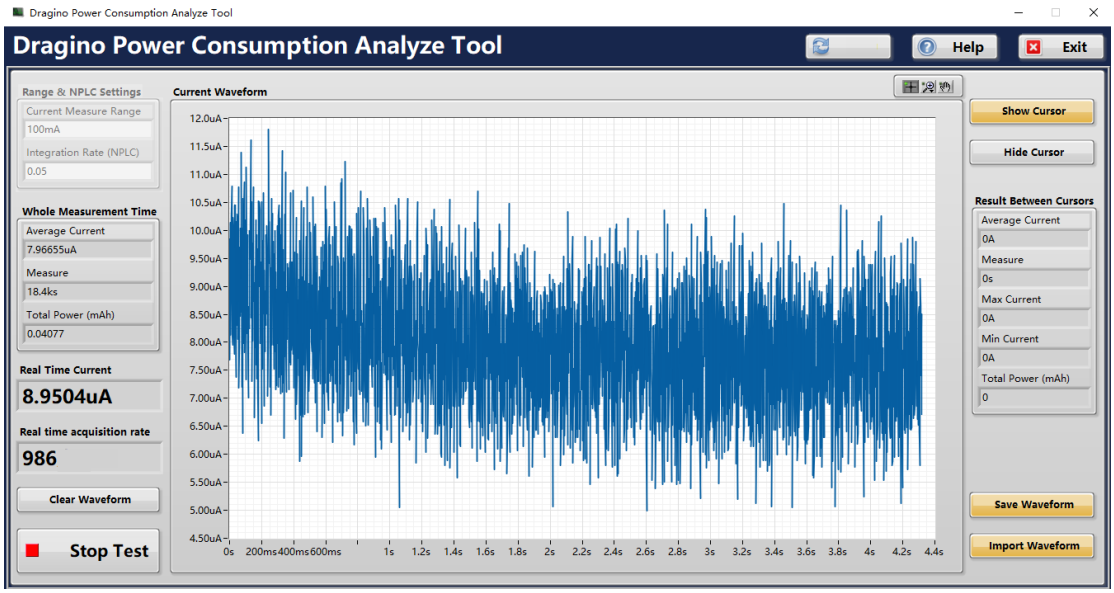
- Operating Range: -40 °C ~ 70 °C
- Accuracy:
  - ✓ Max: ±0.10°C (-20°C to 50°C)
  - ✓ Max: ±0.15°C (-40°C to 70C)
  - ✓ Typ: +/-0,05°C (-40°C to 70°C)
- Resolution: 0.01°C
- Long term stability and drift: +/-0,03°C (300h at 150°C)

External Temperature Sensor: (for RPL-2 only)

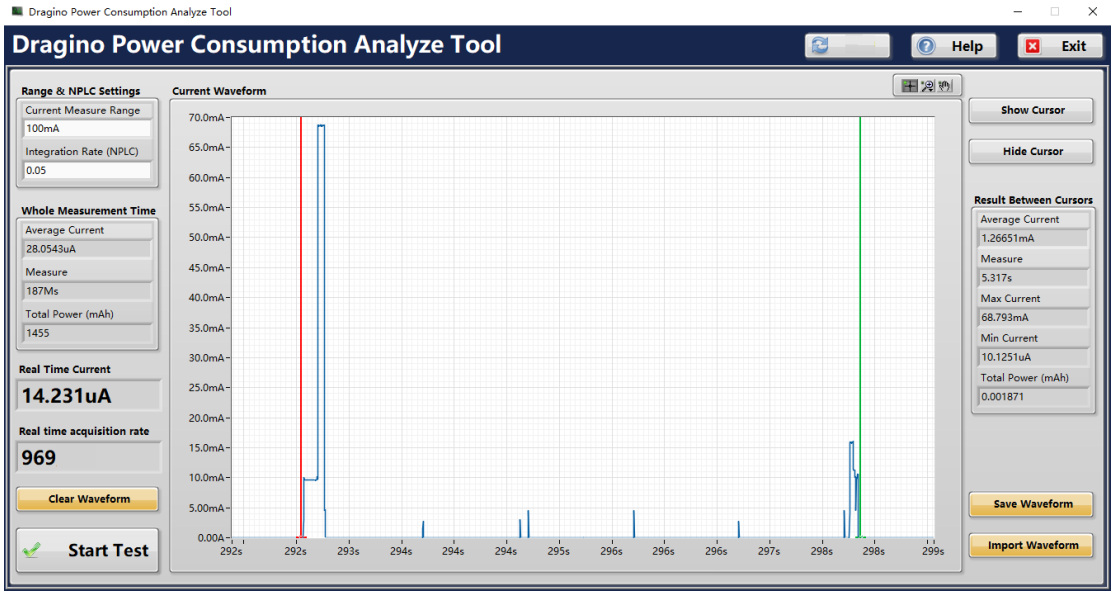
- Operating range -50° to + 200°C
- Accuracy of +/- 0,4°C Long Term Drift: < 0.02 °C/y
- Cable length of 1.5 m
- Metal probe dimension: ϕ 4 x 100mm

1.4 Power Consumption

Idle: 8uA, Wireless Transmit: max 130mA.
Idle:



MAX:



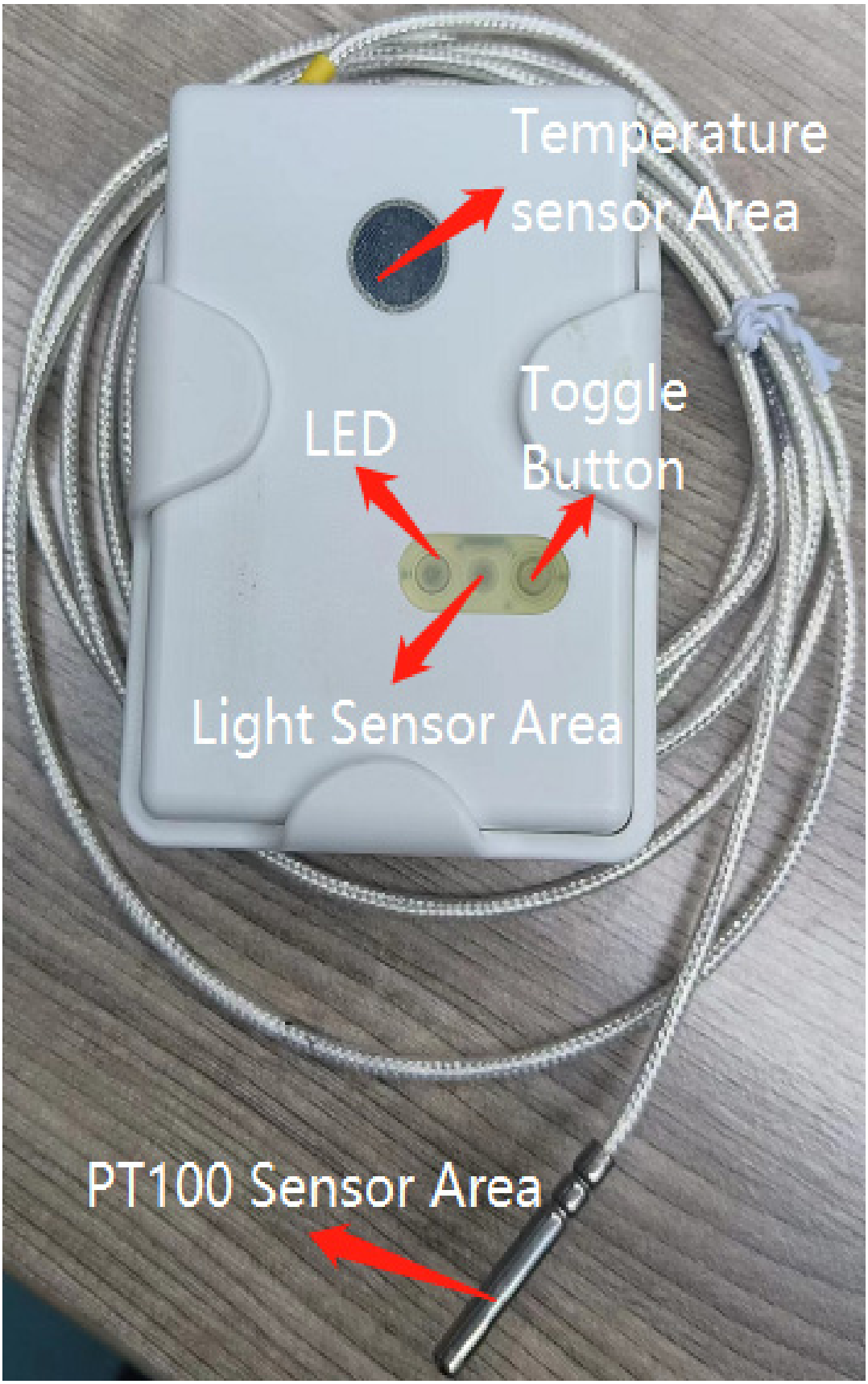
1.5 Storage & Operation Temperature

-40°C to 65°C

1.6 Applications

- ✓ Food Chain
- ✓ Smart Buildings & Home Automation
- ✓ Logistics and Supply Chain Management
- ✓ Smart Cities
- ✓ Smart Factory

1.7 Functions Block


Temperature
sensor Area
LED
Toggle
Button
Light Sensor Area
PT100 Sensor Area

2. Operation Mode

2.1 How to activateWTS?

The WTS has two working modes:

- ✓ Deep Sleep Mode: WTSdoesn't have any LoRaWAN activate. This mode is used for storage and shipping to save battery life.
- ✓ Working Mode: In this mode, WTS will work as LoRaWAN Sensor to Join LoRaWAN network and send out sensor data to server. Between each sampling/transmit periodically, WTS will be in STOP mode (IDLE mode), in STOP mode, WTS has the same power consumption as Deep Sleep mode.

The WTS is set in deep sleep mode by default; The ACT button on the top of device is used to switch to different modes:

Behavior on ACT	Function	Action
Pressing ACT between 1s < time < 3s	Test uplink status	If WTS is already Joined to LoRaWAN network, WTS will send an uplink packet.
Pressing ACT for more than 3s	Active Device	green led will fast blink 5 times, device will enter working mode and start to JOIN LoRaWAN network. green led will solidly turn on for 5 seconds after joined in network.
Fast press ACT 5 times.	Deactivate Device	red led will solid on for 5 seconds. Means WTS are in Deep Sleep Mode.

2.2 How it works?

The WTS is configured as LoRaWAN OTAA Class A mode by default. Each WTS is shipped with a worldwide unique set of OTAA and ABP keys. To use WTS in a LoRaWAN network, user needs to input the OTAA keys in the network server. So WTS can join the LoRaWAN network and start to transmit sensor data. The default period for each uplink is 20 minutes.

2.3 Example to join LoRaWAN network

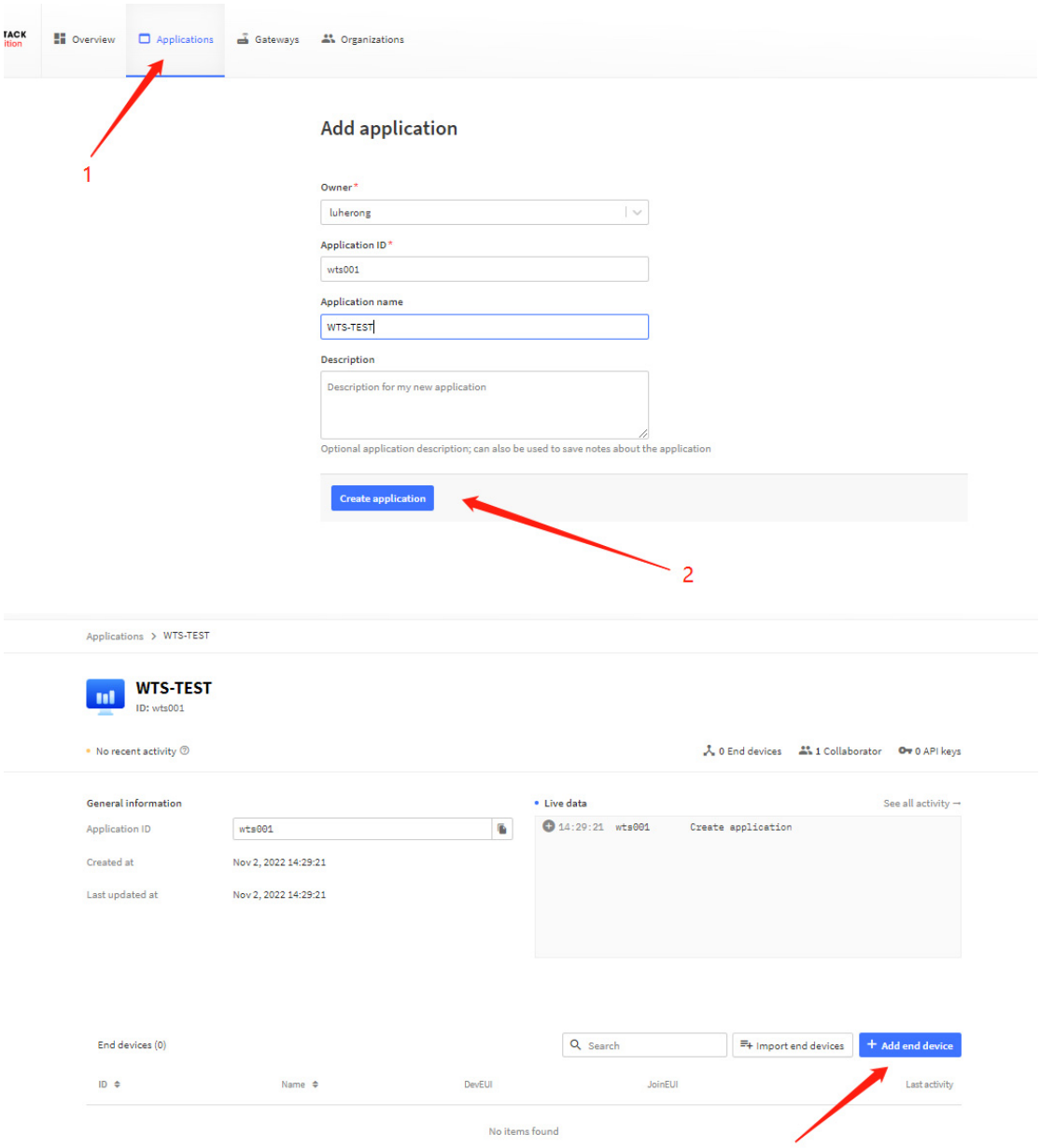
This section shows an example for how to join the TTN V3 LoRaWAN IoT server. Use with other LoRaWAN IoT server is of similar procedure.

Assume the LG308 is already set to connect to TTN V3 network . We need to add the WTS device in TTN V3:

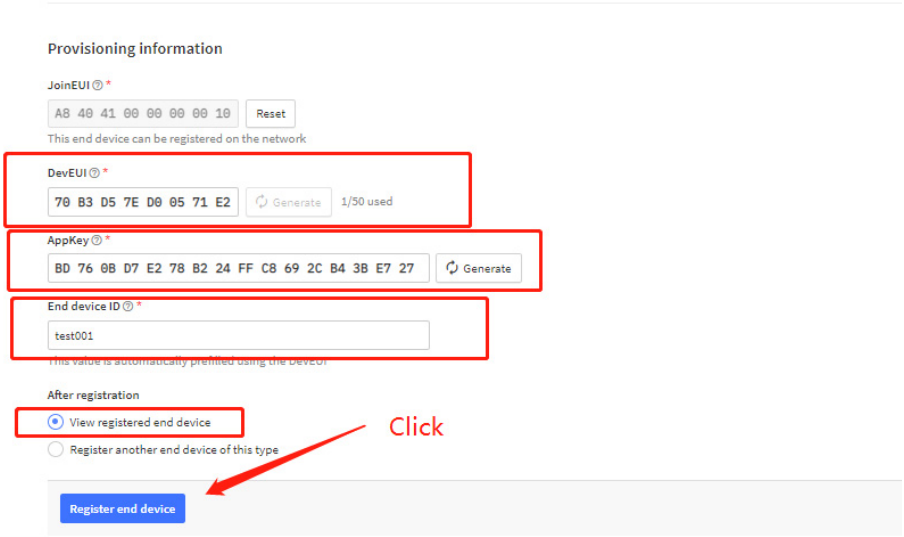
Step 1: Create a device in TTN V3 with the OTAA keys from WTS.
Each WTS is shipped with a sticker with the default device EUI as below:

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

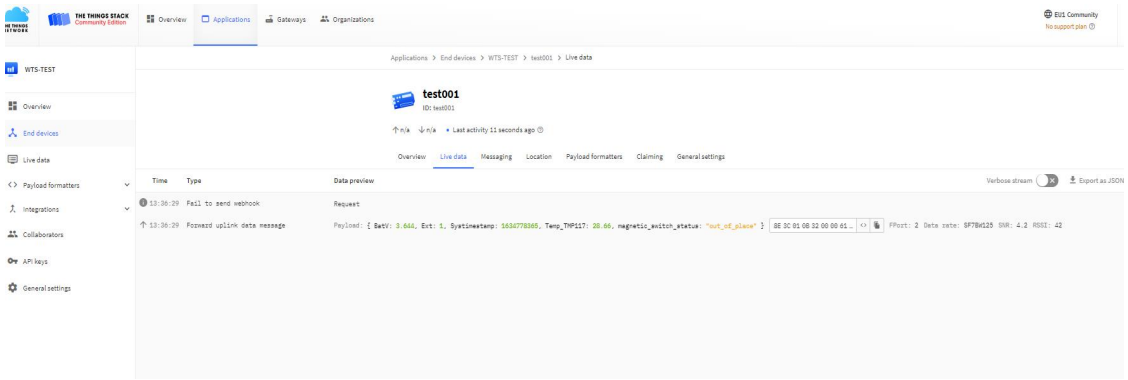
Add APP EUI in the application.



Add APP KEY and DEV EUI



Step 2: Use ACT button to activate WTS 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

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

After each uplink of WTS-10 and WTS-11, the blue LED will flash once

If the PT100 is not connected, the red LED will flash once every time the WTS-11 uplinks

Normal Uplink Payload. Total 11 Bytes.

Size(bytes)	2	1	2	2	4
Value	In-Place &Light &Battery	Status	Temp_ TMP117	Temp_PT100 or Open Duration Depends on Model	Unix TimeStamp (UTC)

In-Place & Light &Battery: Total 2 Bytes

Bits	15	14	[13:0]
Value	In Place 0: Device in place 1: Device out of place	Light Status; 0: Dark (Fridge is close) 1: Bright (Fridge is open)	BAT: Battery Voltage example: 0x0BA4=2980mV

Notice:

In Place detection and light status both are interrupt event, device from in-place to out-of-place or light from dark to bright will cause an uplink packet.

Status Byte:

Bits	7	6	5	4	[3:0]
Value:	None-ACK Flag	Reserve	Sync time OK	UTC Time Request	Model

- None-ACK Flag:
  - ✓ 0: If this uplink payload is a new sampling payload, this flag is set to 0.
  - ✓ 1: If this uplink is an old uplink payload which generated while there is none-LoRaWAN coverage, this flag is set to 1.
- Sync time OK: 1: Set time ok，0: N/A. After time SYNC request is send, device will set this bit to 0 until got the time stamp from application server.
- Unix Time Request:1: Request server downlink Unix time, 0 : N/A. In this mode, WTS will set this bit to 1 every 10 days to request a time SYNC. (AT+SYNCMOD to set this)
- Model:
  - ✓ 0x01: WTS-10
  - ✓ 0x02: WTS-11
  - ✓ 0x03: WTS-12

Built-in Temperature (TMP1117): 2 bytes

- Temperature: 0x0ABB/100=27.47℃
- Temperature: (0xF5C6-65536)/100=-26.18℃

External Temperature (Temp_PT100): 2 bytes (For model WTS-11 only)

- Temperature: 0x0ABB/100=27.47℃
- Temperature: (0xF5C6-65536)/100=-26.18℃

In WTS-10, WTS-12, these 2 bytes are always 00 00

Open Duration & Open Timeout Alarm: 2 bytes (For model WTS-12 only)

Bits	**15**	**14**	**[13:0]**
Value:	Reserve	Timeout Alarm	Bright Duration

- Timeout Alarm: This bit indicates if the bright detection exceeds certain time. The default timeout is 5 minutes. If bright duration exceed timeout, WTS-12 will set this bit to 1 and immediately send an uplink packet as an Alarm.

  0: Bright detection duration within timeout

  1: Bright detection duration exceed timeout

  This feature can be used to monitor if the fridge has been open for long time and provide an alarm.

- Bright Duration: total 14 bits Shows the current / last bright duration.

  Unit: second. range: 0 ~ 16383 Seconds (max ~ 4.5 hours)

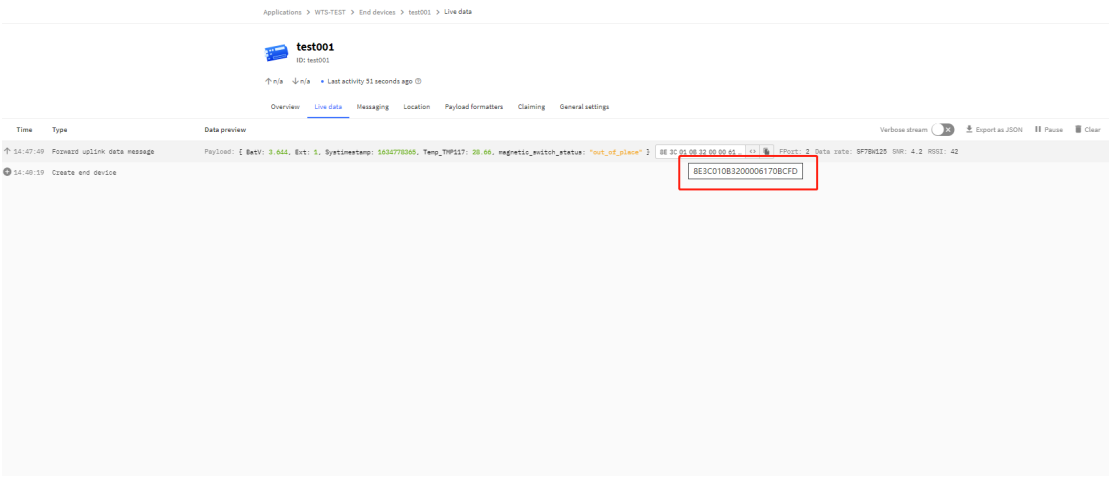
  ✓ If current light detection state is dark, the bright duration shows last bright duration.

  ✓ If current light detection state is bright, the bright duration shows current bright duration.

In WTS-10, WTS-11, these 2 bytes are always 00 00

TTNV3 payload example

EXT=1



Example:8E3C010B3200006170BCFD

Batv:0x8E3C=1000 1110 0011 1100

00 1110 0011 1100/1000=3.644 V

EXT:0x01=0001=1(3:0th bit)

Systimestamp:0x6170BCFD=1634778365=2021-10-21 09:06:05(GMT+8)

Temp_TMP117:0x0B32/100=28.66℃

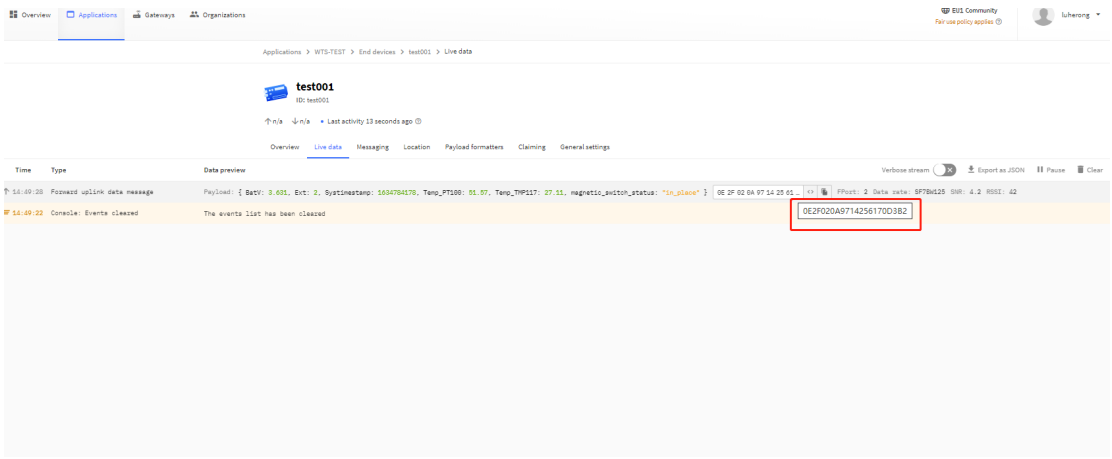
Magnetic_switch_status:0x8E3C=1000 1110 0011 1100

1(15th bit)

1:out_of_place

0:in_place

EXT=2



Example:0E2F020A9714256170D3B2

Batv:0x0E2F=0000 1110 0010 1111

00 1110 0010 1111/1000=3.631 V

EXT:0x02=0002=2 (3:0th bit)

Systimestamp:0x6170D3B2=1634784178=2021-10-21 10:42:58(GMT+8)

Temp_TMP117:0x0A97/100=27.11℃

Temp_PT100:0x1425/100=51.57℃

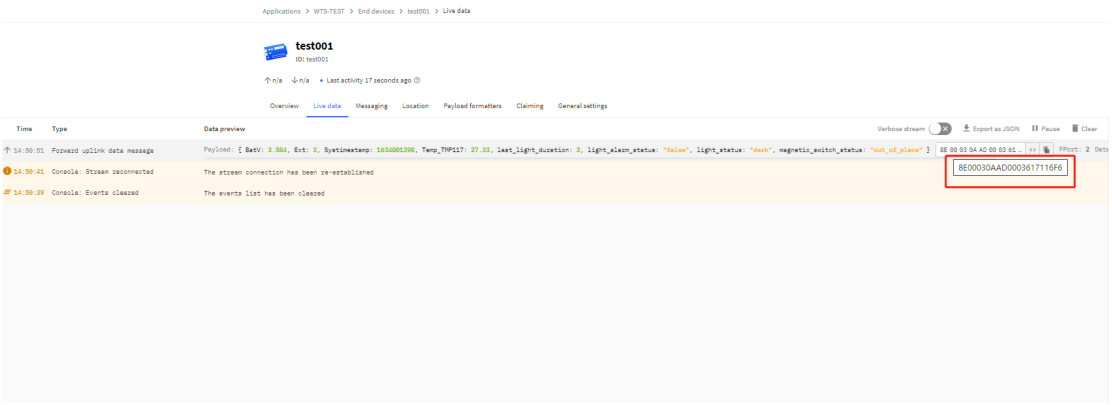
Magnetic_switch_status:0x0E2F=0000 1110 0010 1111

0(15th bit)

1:out_of_place

0:in_place

Ext=3



Example:8E00030AAD0003617116F6

Batv:0x8E00=1000 1110 0000 0000

00 1110 0000 0000/1000=3.584 V

EXT:0x03=0003=3(3:0th bit)

Systimestamp:0x6170D3B2=1634784178=2021-10-21 10:42:58(GMT+8)

Temp_TMP117:0x0A97/100=27.11℃

light_alarm_status:0x0003=000000000000011

0(14th bit)

0:false

1:true

last_light_duration:0x0003=000000000000011

0011=3(13:0th bit)

light_status:0x8E00=1000 1110 0000 0000

0(14th bit)

1:bright

0:dark

Magnetic_switch_status:0x8E00=1000 1110 0000 0000

1(15th bit)

1:out_of_place

0:in_place

2.5 Decoder

2.5.1 Example

Uplink payload=8E3C010B3200006170BCFD

"BatV": 3.644,

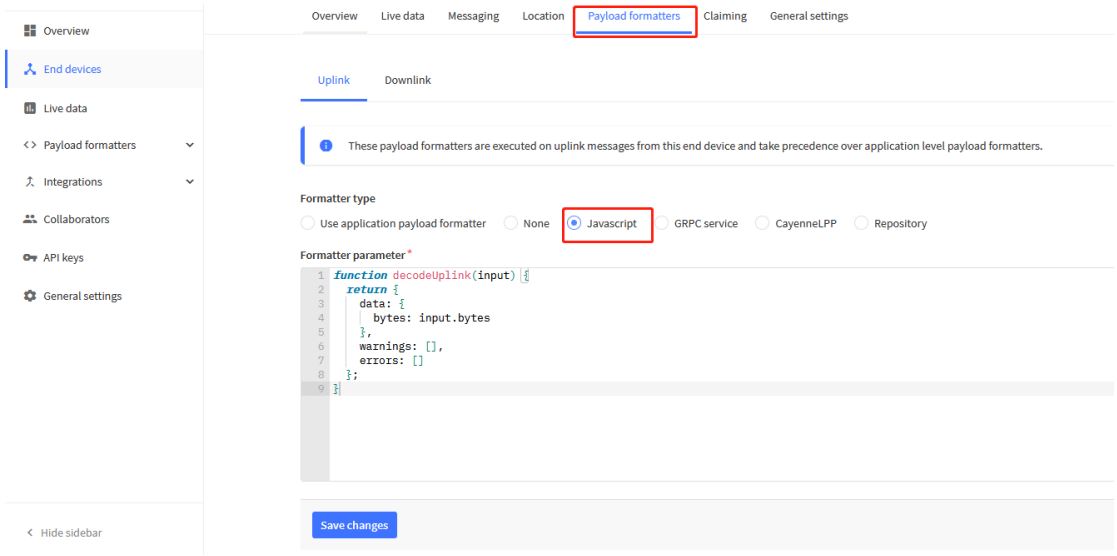
"Ext": 1,

"Systimestamp": 1634778365,

"Temp_TMP117": 28.66

"magnetic_switch_status": "out of place"

2.5.2 Decode in TTN V3




```
function Decoder(bytes, port) {
var poll_message_status=(bytes[2]&0x40)>>6;
var decode = {};
decode.Ext= bytes[2]&0x0F;
decode.BatV= ((bytes[0]<<8 | bytes[1]) & 0x3FFF)/1000;
decode.magnetic_switch_status=bytes[0]&0x80?"out_of_place":"in_place"
if(decode.Ext==0x01)
{
  decode.Temp_TMP117=parseFloat(((bytes[3]<<24>>16 | bytes[4])/100).toFixed(2));
}
else if(decode.Ext==0x02)
{
  decode.Temp_TMP117=parseFloat(((bytes[3]<<24>>16 | bytes[4])/100).toFixed(2));
  decode.Temp_PT100=parseFloat(((bytes[5]<<24>>16 | bytes[6])/100).toFixed(2));
}
else if(decode.Ext==0x03)
{
  decode.light_status=bytes[0]&0x40?"bright":"dark";
  decode.Temp_TMP117=parseFloat(((bytes[3]<<24>>16 | bytes[4])/100).toFixed(2));
  decode.last_light_duration=(bytes[5]<<8 | bytes[6])&0x3fff;
```

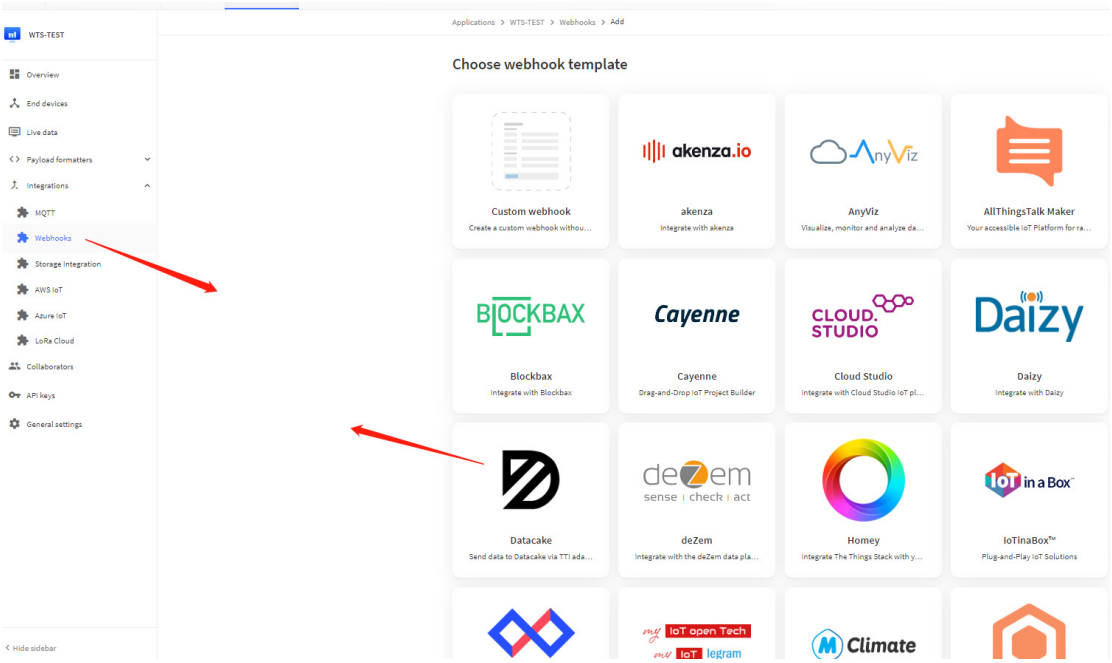
```
    decode.light_alarm_status=bytes[5]&0x40?"true":"false";
}
decode.Systimestamp=(bytes[7]<<24 | bytes[8]<<16 | bytes[9]<<8 | bytes[10] );
if(poll_message_status===0)
{
    if(bytes.length==11)
    {
        return decode;
    }
}

}
```

2.6 Show data on Datacake

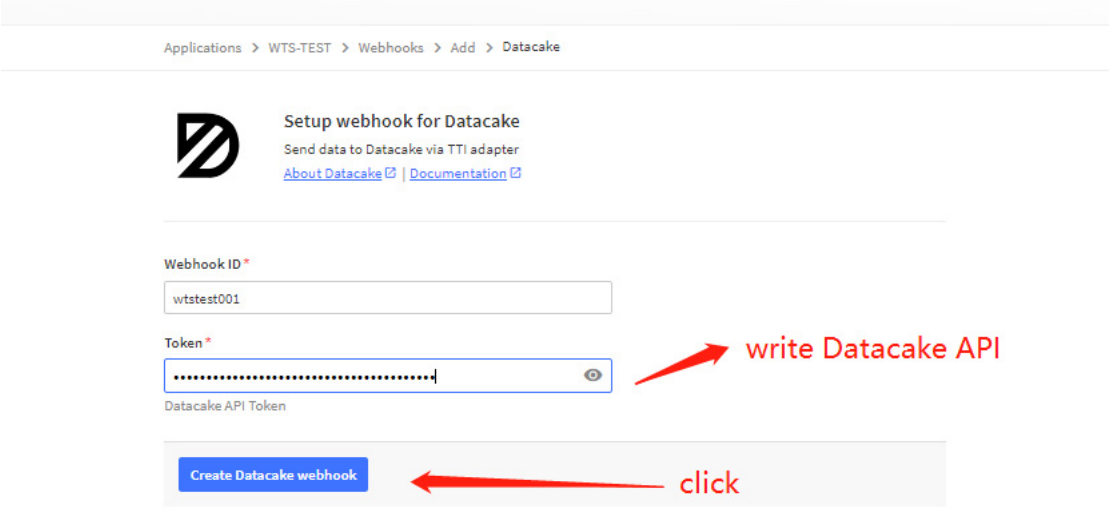
Datacake IoT platform provides a human friendly interface to show the sensor data, once we have sensor data in TTN V3, we can use Datacake to connect to TTN V3 and see the data in Datacake. Below are the steps:

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.



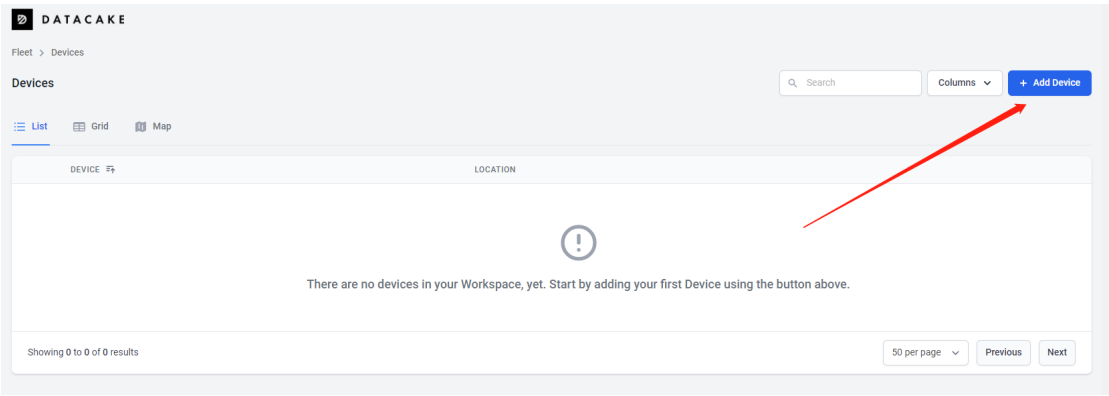
Add Datacake:

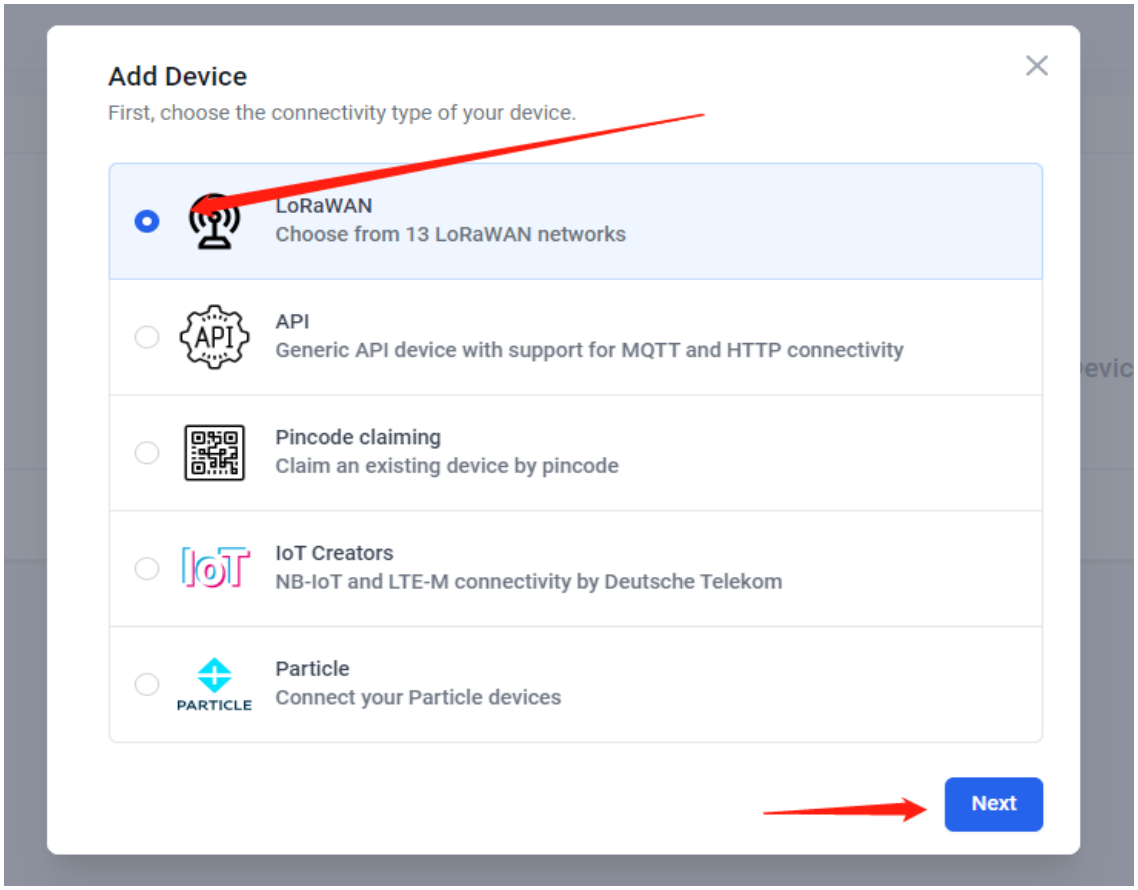


In Datacake console (https://datacake.co/) , add WTS:

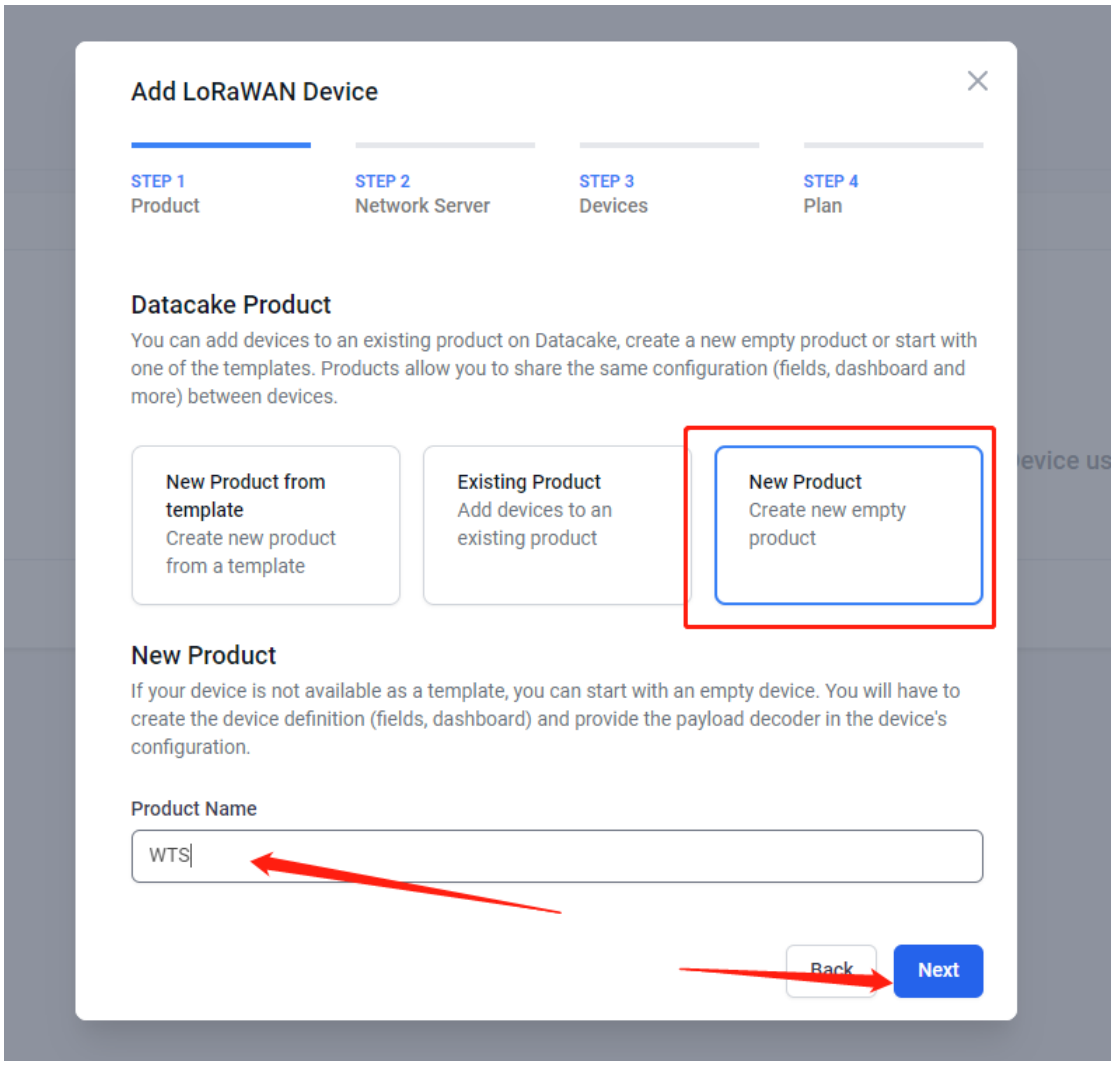
Create device:

1

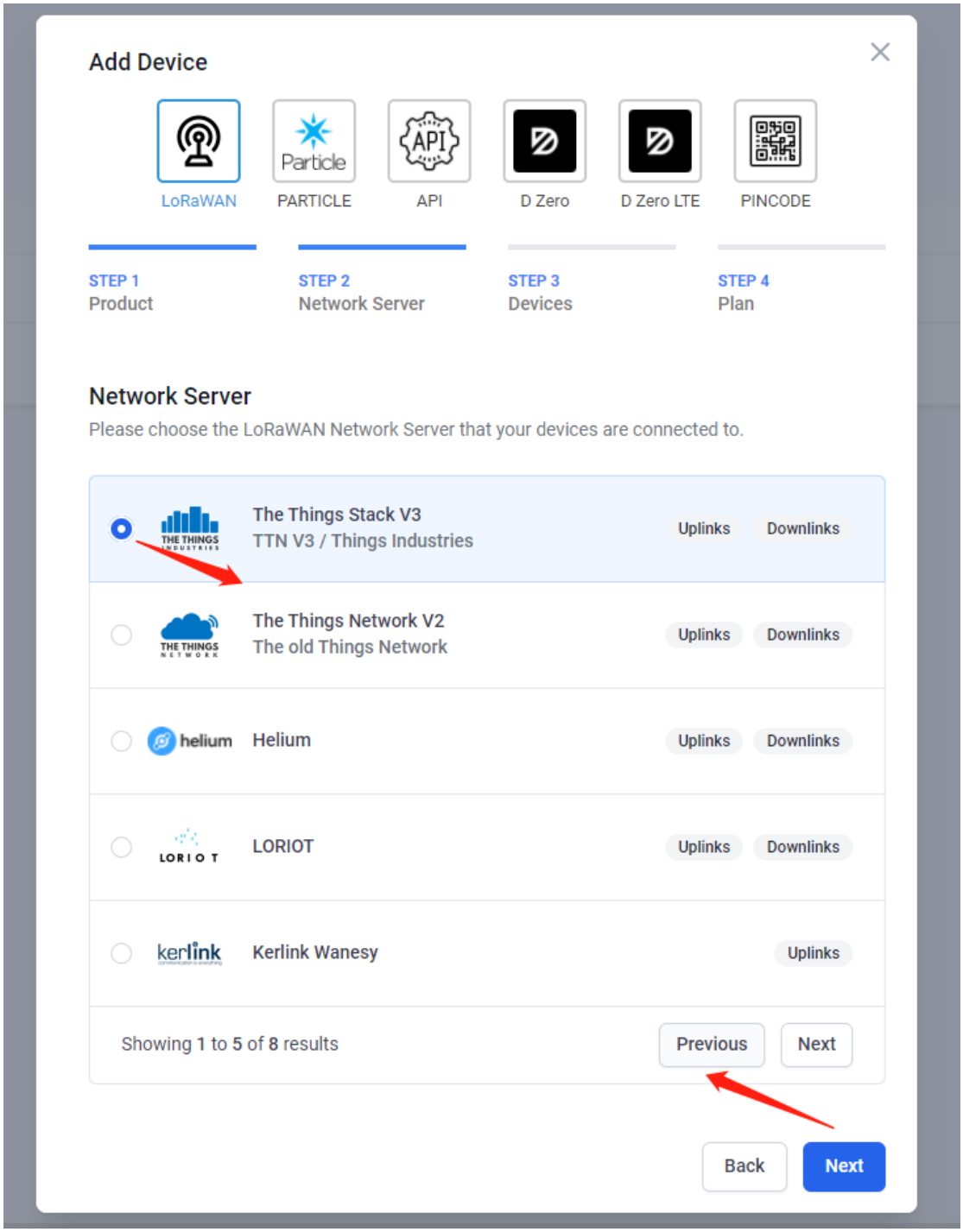



Add Device
First, choose the connectivity type of your device.
LoRaWAN
Choose from 13 LoRaWAN networks
API
Generic API device with support for MQTT and HTTP connectivity
Pincode claiming
Claim an existing device by pincode
IoT Creators
NB-IoT and LTE-M connectivity by Deutsche Telekom
Particle
Connect your Particle devices
Next

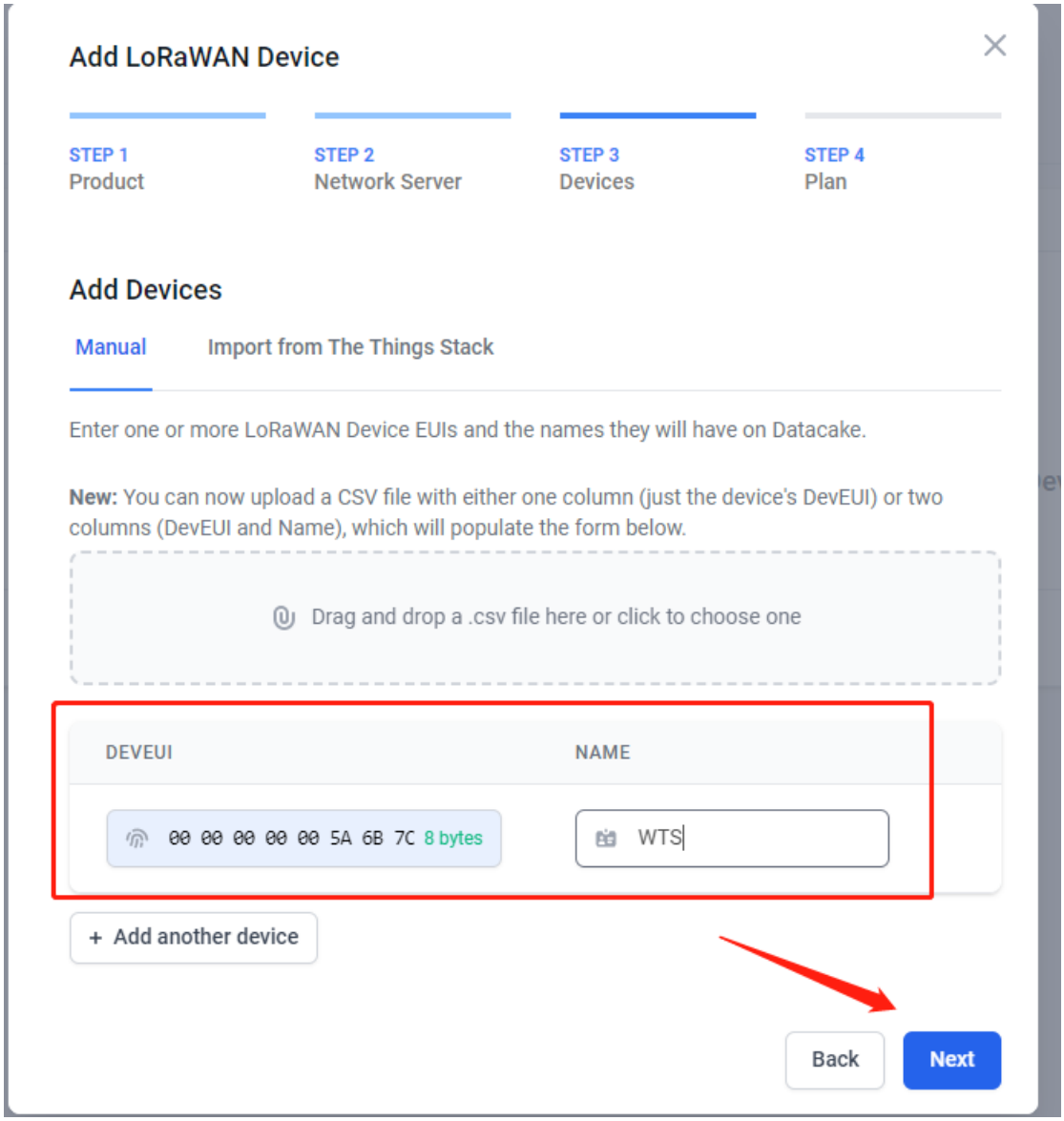
2


Add LoRaWAN Device
STEP 1
Product
STEP 2
Network Server
STEP 3
Devices
STEP 4
Plan
Datacake Product
You can add devices to an existing product on Datacake, create a new empty product or start with one of the templates. Products allow you to share the same configuration (fields, dashboard and more) between devices.
New Product from template
Create new product from a template
Existing Product
Add devices to an existing product
New Product
Create new empty product
New Product
If your device is not available as a template, you can start with an empty device. You will have to create the device definition (fields, dashboard) and provide the payload decoder in the device's configuration.
Product Name
WTS
Back
Next

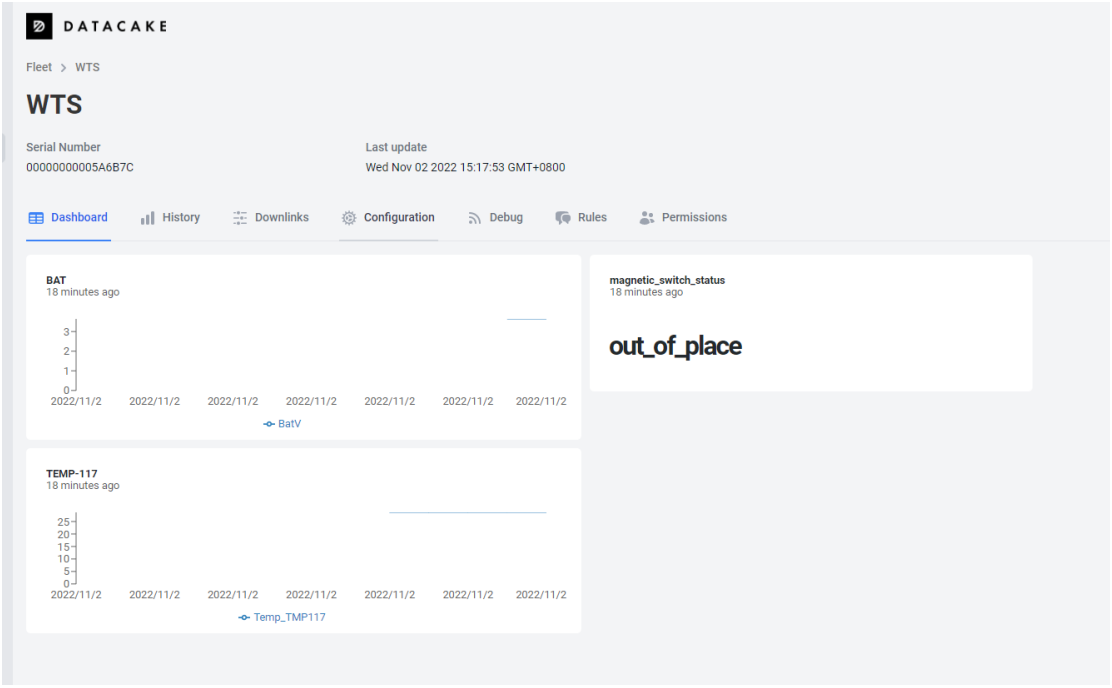
3


Add Device
LoRaWAN
PARTICLE
API
D Zero
D Zero LTE
PINCODE
STEP 1
Product
STEP 2
Network Server
STEP 3
Devices
STEP 4
Plan
Network Server
Please choose the LoRaWAN Network Server that your devices are connected to.
The Things Stack V3
TTN V3 / Things Industries
Uplinks
Downlinks
The Things Network V2
The old Things Network
Uplinks
Downlinks
Helium
Uplinks
Downlinks
LORIOT
Uplinks
Downlinks
Kerlink Wanesy
Uplinks
Showing 1 to 5 of 8 results
Previous
Next
Back
Next

4


Add LoRaWAN Device
STEP 1
Product
STEP 2
Network Server
STEP 3
Devices
STEP 4
Plan
Add Devices
Manual
Import from The Things Stack
Enter one or more LoRaWAN Device EUIs and the names they will have on Datacake.
New: You can now upload a CSV file with either one column (just the device's DevEUI) or two columns (DevEUI and Name), which will populate the form below.
Drag and drop a .csv file here or click to choose one
DEVEUI
NAME
00 00 00 00 00 5A 6B 7C 8 bytes
WTS
+ Add another device
Back
Next

5


DATACAKE
Fleet > WTS
WTS
Serial Number
00000000005A6B7C
Last update
Wed Nov 02 2022 15:17:53 GMT+0800
Dashboard
History
Downlinks
Configuration
Debug
Rules
Permissions
BAT
18 minutes ago
3
2
1
0
2022/11/2
2022/11/2
2022/11/2
2022/11/2
2022/11/2
2022/11/2
2022/11/2
BatV
magnetic_switch_status
18 minutes ago
out_of_place
TEMP-117
18 minutes ago
25
20
15
10
5
0
2022/11/2
2022/11/2
2022/11/2
2022/11/2
2022/11/2
2022/11/2
2022/11/2
Temp_TMP117

2.7 Datalog Feature

2.7.1 How Datalog works

WTS uses confirmed uplink to send each uplink packet to LoRaWAN server, after the packet is sent, WTS will waiting for the ACK message from LoRaWAN server.

If WTS didn't got the ACK, WTS will consider out of LoRaWAN service and mark the Status → None ACK Flag bit to 1, meanwhile, WTS will record this unarrived packet.

If WTS got the ACK from LoRaWAN server, WTS will consider it is in LoRaWAN service. Then WTS will check if there is some old unarrived packets and send them together to the server.

Each Normal data entry is 11 bytes,

To save airtime and battery, WTS will send max date entries 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

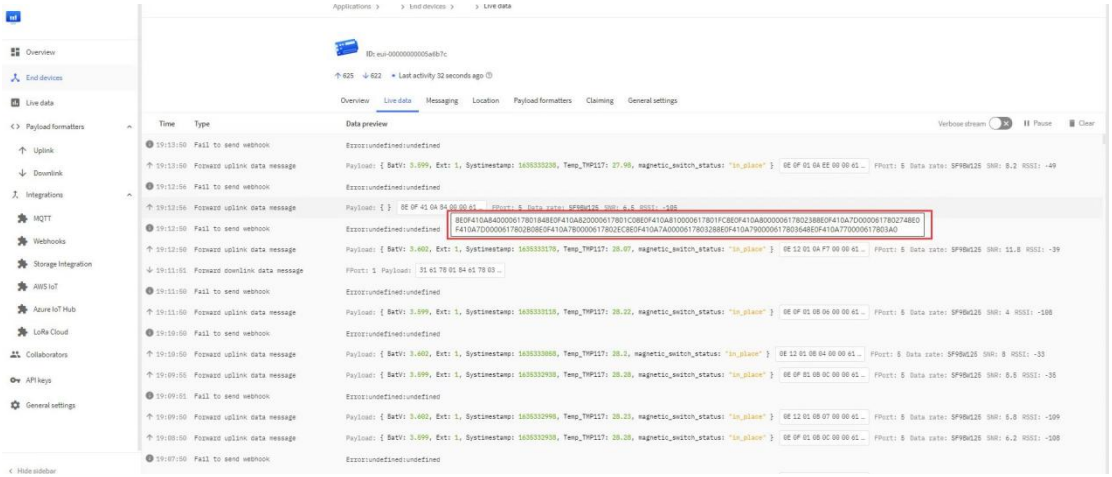
Example:

If WTS has below data inside Flash:

Flash Addr	Time | Ext | BAT voltage | Value

```
8019540 systime= 2021/10/26 13:24:20 1 3599 Temp1=26.92 Temp2=0.00 1
8019550 systime= 2021/10/26 13:25:20 1 3599 Temp1=26.90 Temp2=0.00 1
8019560 systime= 2021/10/26 13:26:20 1 3599 Temp1=26.89 Temp2=0.00 1
8019570 systime= 2021/10/26 13:27:20 1 3599 Temp1=26.88 Temp2=0.00 1
8019580 systime= 2021/10/26 13:28:20 1 3599 Temp1=26.85 Temp2=0.00 1
8019590 systime= 2021/10/26 13:29:20 1 3599 Temp1=26.85 Temp2=0.00 1
80195A0 systime= 2021/10/26 13:30:20 1 3599 Temp1=26.83 Temp2=0.00 1
80195B0 systime= 2021/10/26 13:31:20 1 3599 Temp1=26.82 Temp2=0.00 1
80195C0 systime= 2021/10/26 13:32:20 1 3599 Temp1=26.81 Temp2=0.00 1
80195D0 systime= 2021/10/26 13:33:20 1 3599 Temp1=26.79 Temp2=0.00 1
```

WTS will uplink this payload when in LoRaWAN service



Uplinkpayload:

8E0F410A840000617801848E0F410A82000617801C008E0F410A81000617801FC8E0F410A8000
00617802388E0F410A7D000617802748E0F410A7D0000617802B08E0F410A7B0000617802EC8E
0F410A7A0000617803288E0F410A790000617803648E0F410A770000617803A0

Where the first 11 bytes is for the first entry:

8E0F410A84000061780184

BAT:0x8E0F=1000 1110 0000 1111

00 1110 0000 1111/1000=3.599V

Temp_TMP117:0x0A84/100=26.92℃

EXT:0x41=0100 0001

1(3:0th bit)

Magnetic_switch_status:0x8E0F=1000 1110 0000 1111

1(15th bit)

1:out_of_place

0:in_place

Unix time is 0x61780184=1635254660=2021-10-26 21:24:20(GMT+8)

2.7.2 Unix TimeStamp

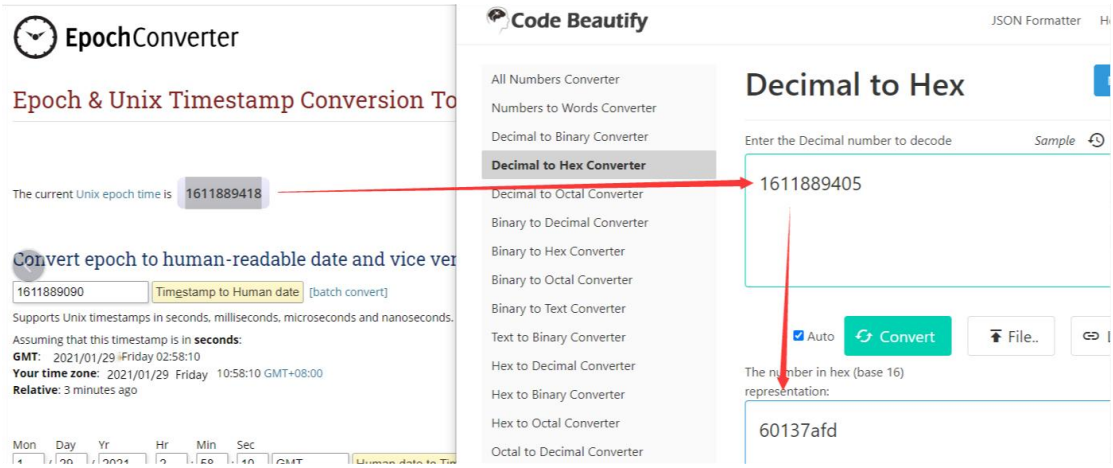
WTS use Unix TimeStamp format base on

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 downlink 3060137afd00 to set current time2021– Jan -- 29Friday 03:03:25

2.7.3 Set Device Time

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

2.8 Out of place indication

WTS support out of place detection. If WTS is taken out from the holder, device will send an uplink packet to indicate this event. Payload detail please see Payload Decoder. When put the device back to holder, it will also send an uplink

2.9 Light on/off Detection (WTS-12 only)

Model WTS-12 has built-in Light Detection Feature. It can detect if there is bright on the front surface. If the environment is from dark to bright, the WTS-12 will uplink a packet with this indication. Payload detail please see Payload Decoder.

2.10 Transmit Data Rate

Feature:Lock SF

AT Command: AT+HDR

Command Example	Function	Response
AT+HDR=1	Lock SF	The sending rate will be in DR2-DR5 OK

Downlink Command: 0xA1

➢ Example: 0xA101 //Same as AT+HDR=1

2.11 LED Indicator

The WTS 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

✓ WTS-12 only lights up during sleep and restart. TheRED LED light is on during sleep, and the GREEN LED light flashes 5 times quickly after restarting.

3. Configure WTS via AT Command or LoRaWAN Downlink

Use can configure WTS via AT Command or LoRaWAN Downlink.

➢ AT Command Connection: See FAQ.

➢ LoRaWAN Downlink instruction for different platforms:

http://wiki.dragino.com/index.php?title=Main_Page#Use_Note_for_Server

Since firmware v1.0(Note*), there are two kinds of commands to configure WTS, they are:

➢ **General Commands**.

These commands are to configure:

✓ General system settings like: uplink interval.

✓ LoRaWAN protocol & radio related command.

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

http://wiki.dragino.com/index.php?title=End_Device_Downlink_Command

Note**: Please check early user manual if you don't have v1.0 firmware.

➢ **Commands special design for WTS**

These commands only valid for WTS, as below:

3.1 SetTransmit 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

3.2 SetExternal Sensor Mode

Feature: Change External Sensor Mode.

AT Command: AT+EXT

Command Example	Function	Response
AT+EXT=1	Set the working mode to TMP117	
AT+EXT=2	Set the working mode to TMP117 and PT100	
AT+EXT=3	Set the working mode to photoresistor	
	photoresistor works: If the sensor goes from black to light, and at the same time exceeds the set time in the bright area, it will send a packet.	

Downlink Command: 0xA2

Total bytes: 2 ~3 bytes

Example:

✧ 0xA201: Set model to TMP117

✧ 0XA202: Set model to TMP117 and PT100

- ✧ 0xA2030005: Same as AT+EXT=3,5 (Model to photoresistor, and set bright timeout to 5 Second)
- ✧ 0xA200: Get the current timeout setting

3.3 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

3.4 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

3.5 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

3.6 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. FAQ

4.1 What is the frequency plan of WTS?

WTS use the same frequency as other Dragino products. User can see the detail from this link:
http://wiki.dragino.com/index.php?title=End_Device_Frequency_Band#Introduction

4.2 Why I see packet payload is 00?

WTS will send MAC command to request time, in the case if DR only support max 11 bytes, this MAC command will be bundled to a separate uplink payload with 0x00.

5. Order Info

Part Number: **WTS-XX-YY**

XX: Model Variant

- ✓ **1**: Basic Model, with internal Temperature sensor.
- ✓ **2**: Equal to WTS-11 + External Temperature Sensor
- ✓ **3**: Equal to WTS-12 + Light Detection Sensor

YY: 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

6. Packing Info

Package Includes:

- ✓ WTS Temperature & Humidity Sensor x 1
- ✓ Program cable x 1
- ✓ Optional external sensor

Dimension and weight:

- ✓ Device Size: 13.5 x 7 x 3 cm
- ✓ Device Weight: 105g
- ✓ Package Size / pcs : 14.5 x 8 x 5 cm
- ✓ Weight / pcs : 170g

7. Support

- ➢ Support is provided Monday to Friday, from 09:00 to 18:00 GMT+8. Due to different timezones we cannot offer live support. However, your questions will be answered as soon as possible in the before-mentioned schedule.
- ➢ Provide as much information as possible regarding your enquiry (product models, accurately describe your problem and steps to replicate it etc) and send a mail to

support@dragino.com

8. warning

FCC Caution:

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

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.

IMPORTANT NOTE:

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.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.