WSC2-L -- Weather Station Kit User Manual

Last modified by Xiaoling (/xwiki/bin/view/XWiki/Xiaoling) on 2025/09/08 15:45

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1. Introduction

1.1 Overview

The Dragino WSC2-L is the main unit in Dragino Weather Station solution which desianed for **measuring atmospheric conditions** to provide information for weatherforeca and to study the weather and climate.

WSC2-L can reads values from various sensors and upload these sensor data to IoT server via LoRaWAN wireless protocol.

WSC2-L supports input and **12V recharge power** and **build in 1000mAh rechargeable Li-ion battery**. If the user needs to connect other sensors, please kindly note the **externalpower supply is required**.

WSC2-L supports connecting 3rd party RS485 multiple sensors. Users can purchase DR-F6C-4M one-to-four cables to connect more sensors according to their needs.

1.2 Features & Spec for WSC2-L Transmitter

- LoRaWAN 1.0.3 Class A
- Bands: CN470/EU433/KR920/US915/EU868/AS923/AU915/IN865
- Ultra-low power consumption
- Support reading the Rain Gauge, Wind Speed/Direction, CO2/PM2.5/PM10, Rain/Snow Detect, Temperature, Humidiity, Iillumiance, Pressure, Total Solar Radiation, F
- Support WSS-09 9 in 1 Sensors: Wind Speed, Wind Direction, Temperature, Humidity, Air Pressure, Illumination, PM2.5, PM10, Noise
- Support WSS-08 optical Rain Gauge or tipping bucket Rain Gauge
- RS485 Interface for 3rd party Sensors
- Support Bluetooth v5.1 and LoRaWAN remote configure
- Support wireless OTA update firmware
- AT Commands to change parameters
- Downlink to change configure
- IP66 Waterproof Enclosure
- 1000mAh Rechargeable Li-ion Battery
- Input and Recharge power: 12v

1.3 Specification for WSS-09 9 in 1 weather sensors

Older versions of interfaces	New version of the interface


More Detail: WSS-09 Manual. (/xwiki/bin/view/Main/Agriculture%20%26%20Weather%20Stations/#H1.WSS099in1WeatherStationSensor)

Wind Speed:

- Range: 0~60m/s
- Accuracy: ±(0.2m/s±0.02*v)(v : the wind speed)
- Ultrasonic measurement,no start wind strength needed

Wind Direction:

- Range: 0~3599
- Accuracy: ±3°
- Ultrasonic measurement,no start wind strength needed
- Built-in electronic compass. No need to consider installation direction

Temperature:

- Range: -40°C ~ +80°C
- Accuracy: ±0.5°C

Humidity:

- Range: 0 ~ 99% RH
- Accuracy Tolerance : Typ ±3% RH

Air Pressure:

- Accuracy: ±0.15kPa@25°C 101kPa
- Range: 0~120kPa

Noise:

- Range: 30dB~120dB
- Accuracy: ±0.5dB

PM2.5:

- Range: 0~1000ug/m3
- Accuracy: ±3%FS
- Resolution: 1ug/m3

PM10:

- Range: 0~1000ug/m3
- Accuracy: ±3%FS
- Resolution: 1ug/m3

Ilumination:

- Range: 0~200k Lux
- Accuracy: ±7%(25 °C)

1.4 Specification for WSS-08 Optical Rain Guage

Older versions of interfaces **New version of the interface**

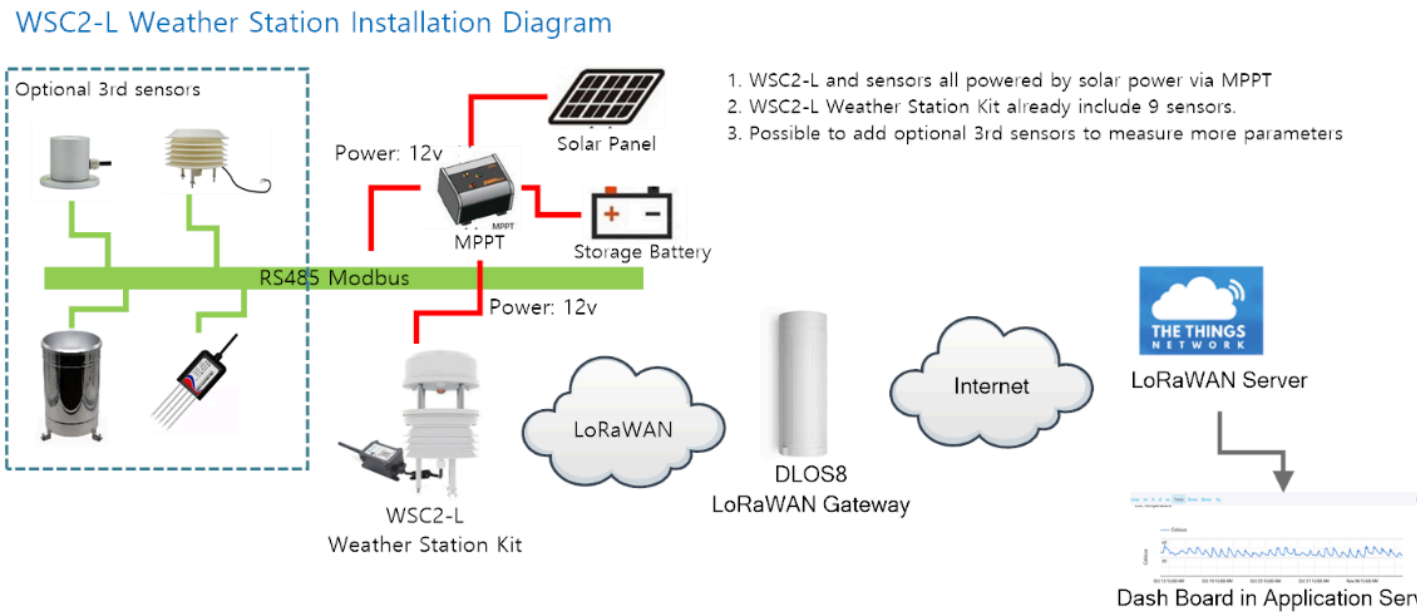

- Input Power: 9~30 VDC
- Sense diameter: 6cm
- Pulse Output

More Detail: WSS-08 Manual. (/xwiki/bin/view/Main/Agriculture%20%26%20Weather%20Stations/#H2.WSS08OpticalRangeGuage)

2. How to use

2.1 Installation

Below is an installation example for the weather station:



Wiring:

1. WSC2-L and sensors all powered by solar power via MPPT
2. WSC2-L Weather Station Kit already include 9 sensors.
3. Possible to add optional 3rd sensors to measure more parameter

Notice 1:

- All weather sensors and WSC2-L are powered by MPPT solar recharge controller. MPPT is connected to solar panel and storage battery.
- Weather sensors won't work if solar panel and storage battery fails.

Notice 2:

Due to shipment and importation limitation, user is better to purchase below parts locally:

- Solar Panel
- Storage Battery
- MPPT Solar Recharger
- Cabinet.

2.2 How it works?

Each WSC2-L is shipped with a worldwide unique set of OTAA keys. To use WSC2-L in a LoRaWAN network, user needs to input the OTAA keys in LoRaWAN network serv After finish installation as above. Create WSC2-L in your LoRaWAN server and Power on WSC2-L , it can join the LoRaWAN network and start to transmit sensor data. The default period for each uplink is 20 minutes.

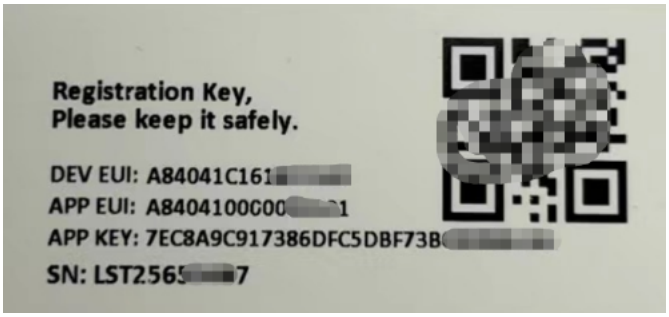
2.3 Example to use for LoRaWAN network

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

Assume the DLOS8 is already set to connect to TTN V3 network (https://eu1.cloud.thethings.network/) . We need to add the WSC2-L device in TTN V3:

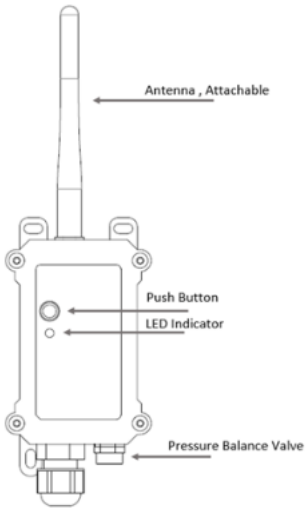
Step 1: Create a device in TTN V3 with the OTAA keys from WSC2-L.

Each WSC2-L is shipped with a sticker with the default device EUI as below:

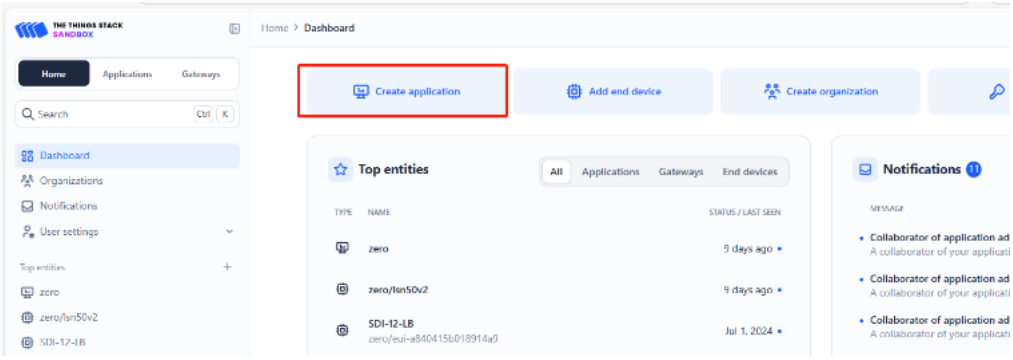


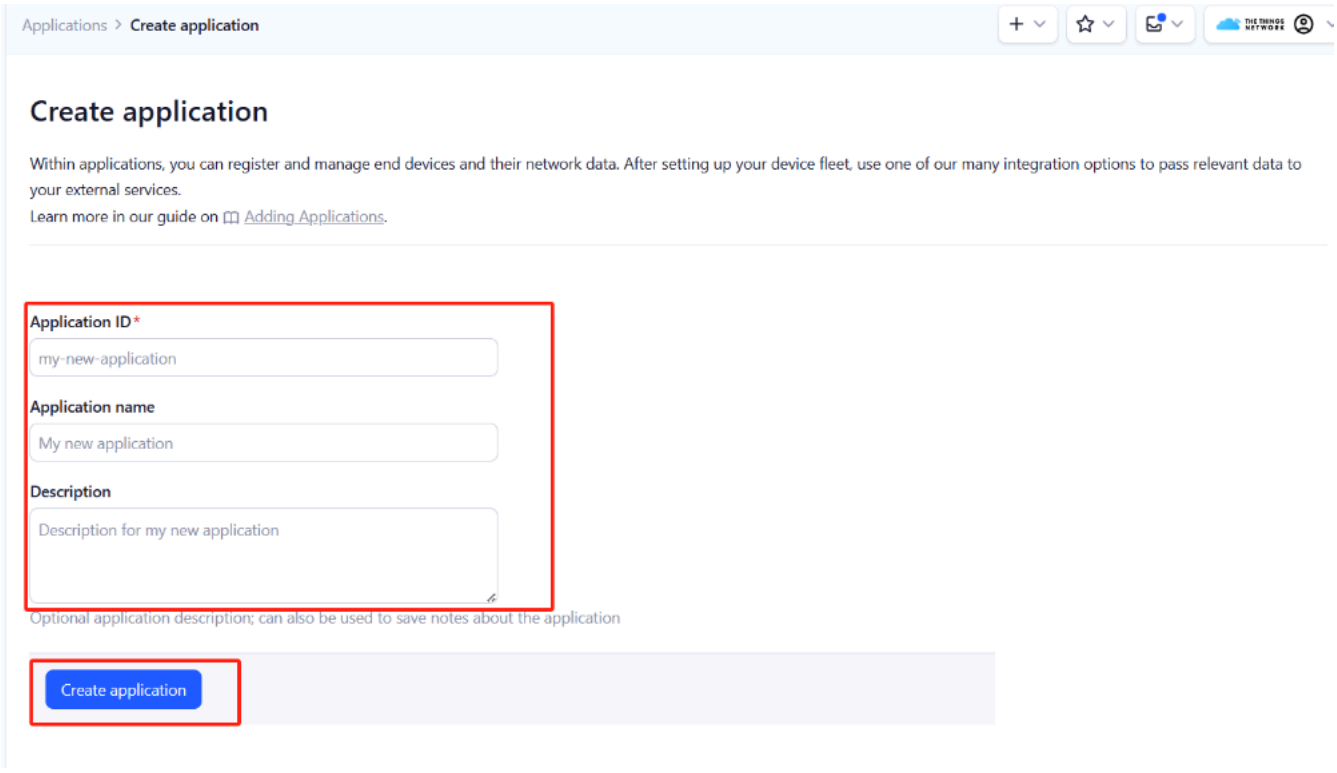
User can enter these keys in the LoRaWAN Server portal. Below is TTN V3 screen shot:

The user needs to press and hold the ACT button(Push button) for more than 3s to start the node.

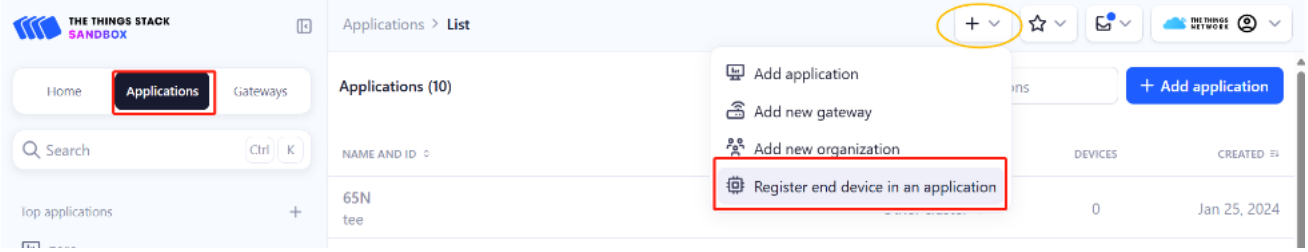


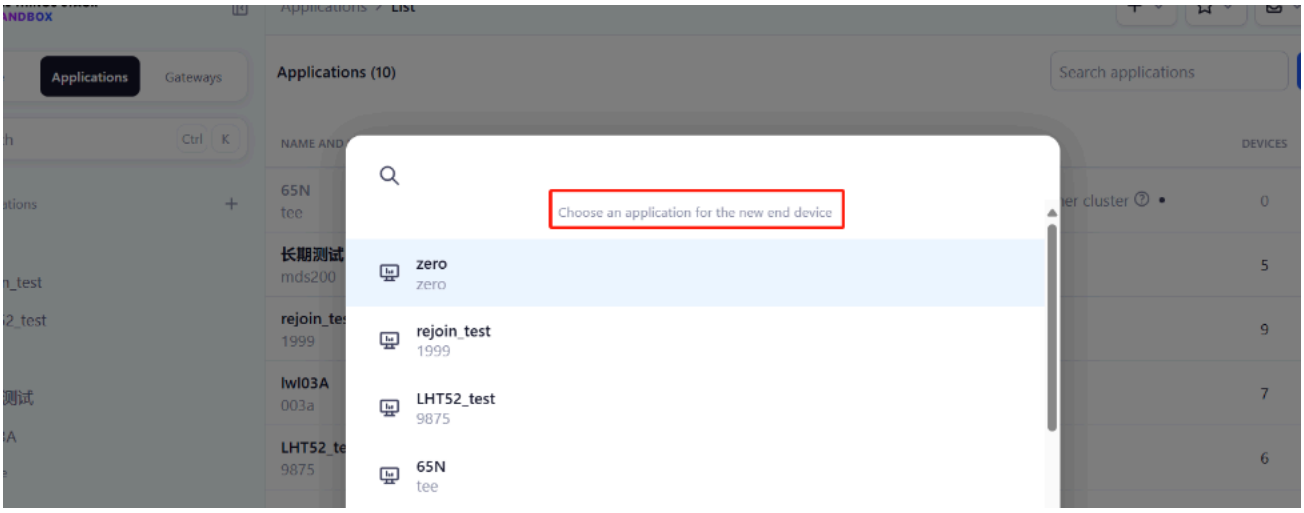
Create the application.



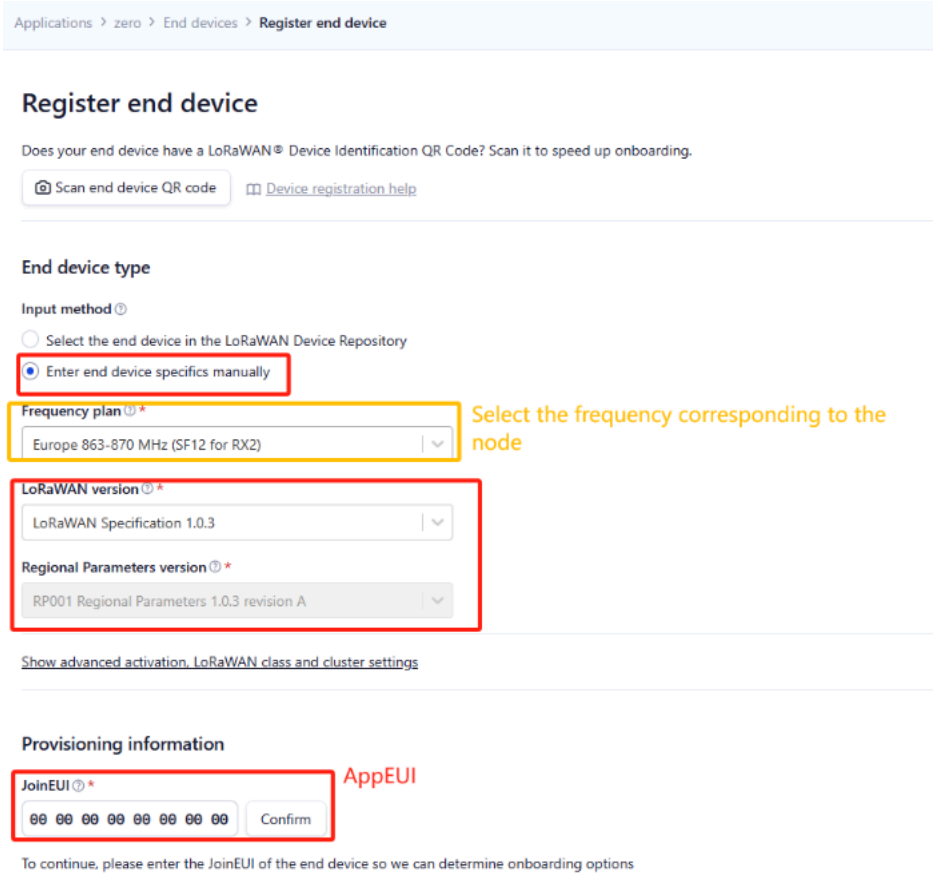


Add devices to the created Application.



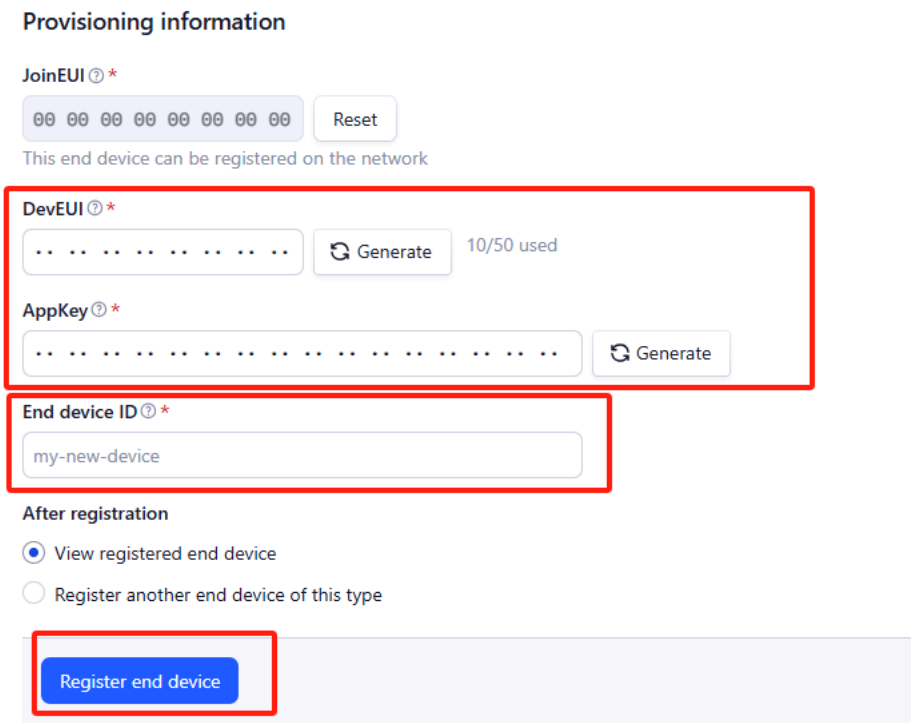


Enter end device specifics manually.



Add DevEUI and AppKey.

Customize a platform ID for the device.

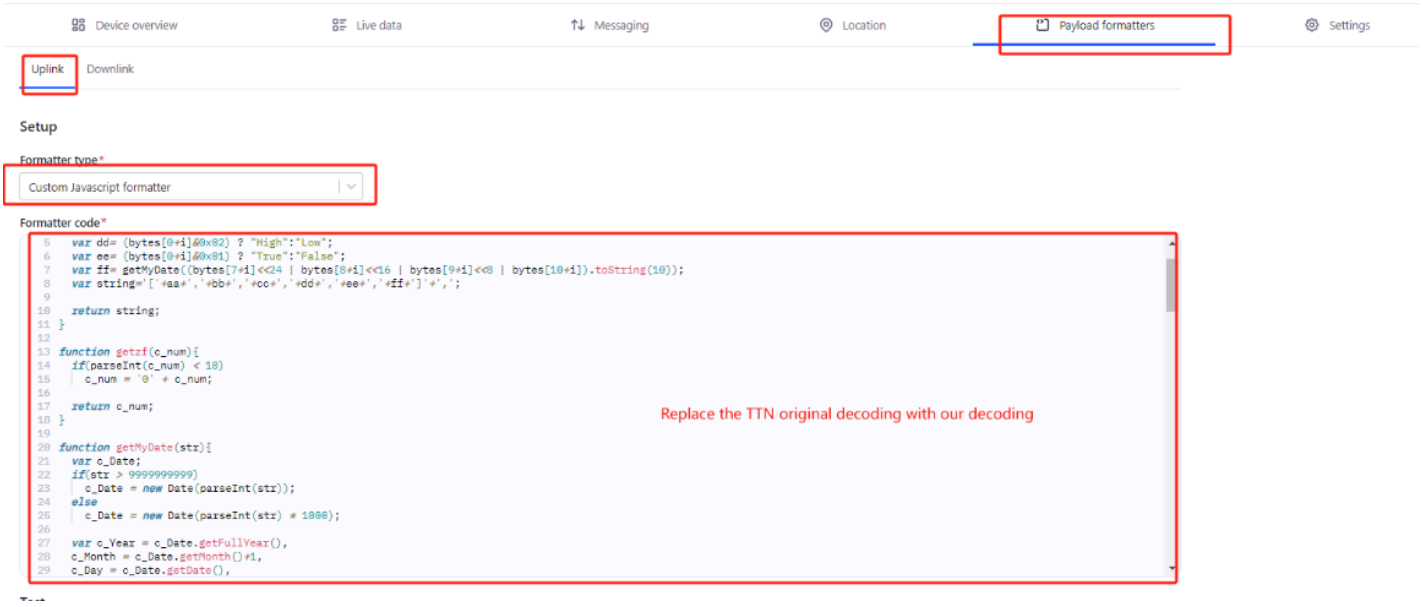


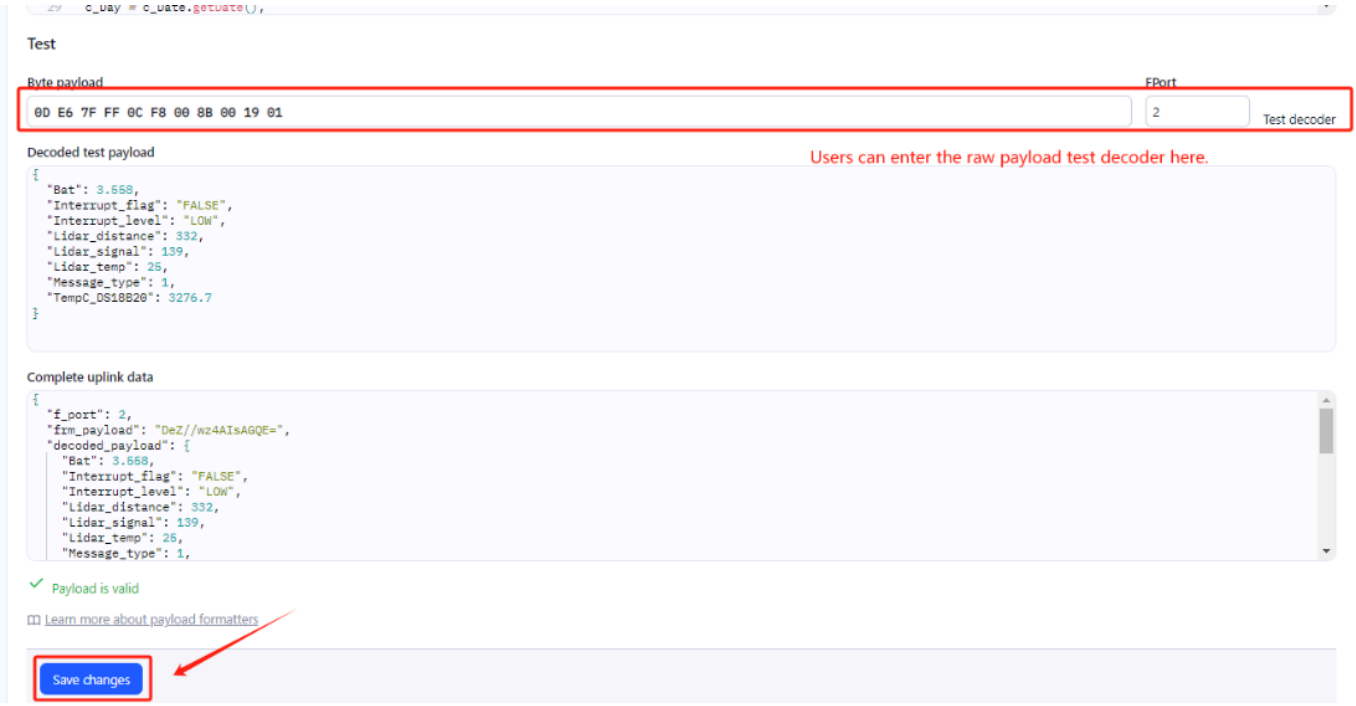
Step 2: Add decoder.

In TTN, user can add a custom payload so it shows friendly reading.

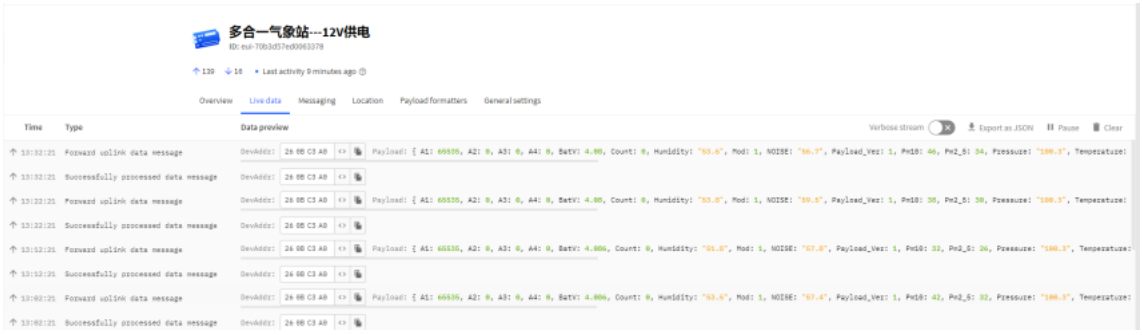
Click this link to get the decoder: https://github.com/dragino/dragino-end-node-decoder/tree/main/WSC2-LB (https://github.com/dragino/dragino-end-node-decoder/tree/main/WSC2-LB)

Below is TTN screen shot:





Step 3: Power on WSC2-L, it will start to join TTN server. After join success, it will start to upload sensor data to TTN V3 and user can see in the panel.



2.4 Uplink Payload

Uplink payloads include two types: Valid Sensor Value and other status / control command.

- Valid Sensor Value: Use FPORT=2
- Other control command: Use FPORT other than 2.

2.4.1 Uplink FPORT=5, Device Status

Uplink the device configures with FPORT=5. Once WSC2-L Joined the network, it will uplink this message to the server.

User can also use downlink command**(0x2601)** to ask WSC2-L to resend this uplink

Size(bytes)	**1**	**2**	**1**	**1**	**2**
Value	Sensor Model	Firmware Version	Frequency Band	Sub-band	BAT

Example Payload (FPort=5): 2E 0100 01 00 0FE4

Sensor Model:

For WSC2-L, this value is 0x2E.

Firmware Version:

0x0100, Means: v1.0.0 version.

Frequency Band:

0x01: EU868

0x02: US915

0x03: IN865

0x04: AU915

0x05: KZ865

0x06: RU864

0x07: AS923

0x08: AS923-1

0x09: AS923-2

0x0a: AS923-3

Sub-Band:

value 0x00 ~ 0x08(only for CN470, AU915,US915. Others are0x00)

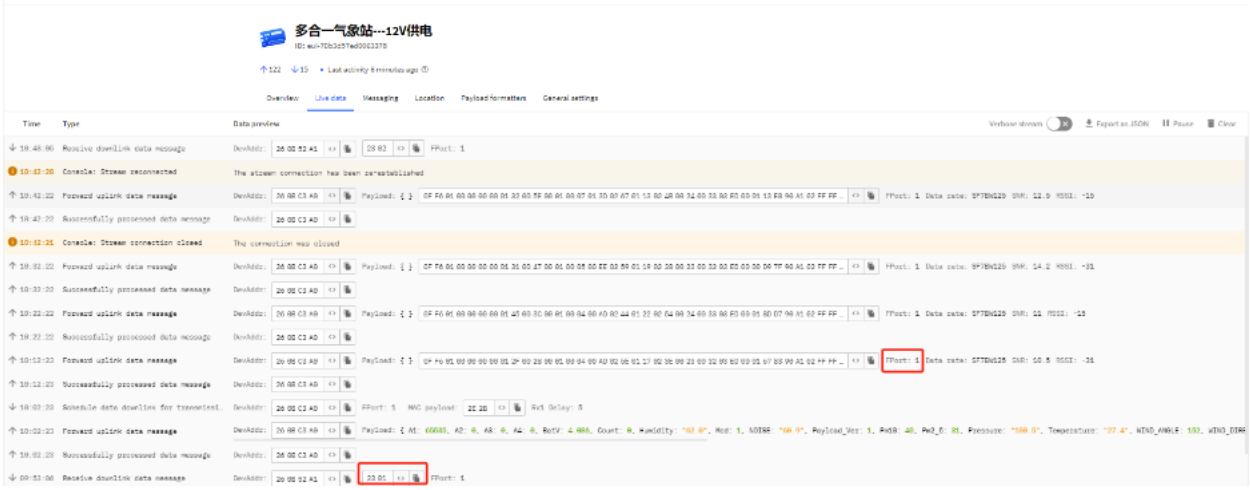
BAT:

shows the battery voltage for WSC2-L MCU.

Ex1: 0x0FE4/1000 = 4068/1000=4.068V

Users can also use the downlink command (0x2301) to change the uplink port of WSC2-L:

Example Downlink:0x23 01(Change to port 1)



2.4.2 Uplink FPORT=2, Real time sensor value

Note: Since firmware V1.1.1, MSP mode has been added for WSS-22&WSS-09. Thus the wind speed paylaod length increases(Add 4 bytes for maximum wind sp and average wind speed).

WSC2-L will send this uplink after Device Config uplink once join LoRaWAN network successfully. And it will periodically send this uplink. Default interval is 20 minutes and g be changed.

Uplink uses FPORT=2 and every 20 minutes send one uplink by default.

The upload length is dynamic, depends on what type of weather sensors are connected. The uplink payload is combined with sensor segments. As below:

Uplink Payload:

Sensor Segment 1	Sensor Segment 2	……	Sensor Segment n

Sensor Segment Define:

Type Code	Length (Bytes)	Measured Value

Sensor Type Table:

Sensor Type	**Type Code**	**Range**	**Length(Bytes)**	**Example**
Wind Speed	0x01	①Speed: 0 ~ 60m/s ②**Maximum wind speed:** 0 ~ 60m/s ③**Average wind speed:** 0 ~ 60m/s ④Level: 0 ~ 17	0x07	①0x0015/10=2.1m/s (0x02FE: No Sensor, 0x02EE: Value Error) ②0x0024/10=3.6m/s ③0x000E/10=1.4m/s ④0x02=2 (0x14: No Sensor, 0x15: Value Error)
Wind Level	0x02	Wind Level: (0 ~18)	0x02	0x0002=2(Current wind level)
Wind Direction	0x03	Direction: 0~7	0x02	0X0004=3(Due north is 0, increasing clockwise, and due east is 2)
Wind Angle	0x04	Angel: 0 ~ 359°	0x02	0x02C9/10=66.6°(Due north is 0°, increasing clockwise, due east is 90°)
Humidity	0x05	Hum: 099%RH	0x02	0x0164/10=35.6%RH
Temperature	0x06	Temp: -40 ~ +80°C	0x02	0xFFDD/10=-3.5°C
Noise	0x07	Nosie: 30~120dB	0x02	0x023e/10=57.4dB
PM2.5 / CO2	0x08	PM2.5: 01000μg/m^3 CO2: 0~5000ppm	0x02	0x0023=35μg/m^3 0x04fb=1275ppm
PM10	0x09	PM10: 01000μg/m^3	0x02	0x002D=45μg/m^3
Pressure	0x0A	0~120kPa/y	0x02	0x2748/10=1005.6kPa
illumination	0x0B	0200000kLux	0x04	0x04D2*10=12340kLux

Below is an example payload: 0FF60100000000012F00280001000400AD025E0117023E0023003203ED0001678390A102FFFF

When sending this payload to LoRaWAN server. WSC2-L will send this in one uplink or several uplinks according to LoRaWAN spec requirement. For example, total length o Payload is 54 bytes.

- When WSC2-L sending in US915 frequency DR0 data rate. Because this data rate has limitation of 11 bytes payload for each uplink. The payload will be split into bel packets and uplink.

  Uplink 1: 0FF6 01 00000000 012F 0028

  Uplink 2: 0001 0004 00AD 025E 0117 023E 0023 0032 03ED 00016783 90 A10400000011 A203000041 A303000572 A4020088

- When WSC2-L sending in EU868 frequency DR0 data rate. The payload will be split into below packets and uplink:

  Uplink 1: 0FF6 01 00000000 012F 0028 0001 0004 00AD 025E 0117 023E 0023 0032 03ED 00016783 90 A10400000011 A203000041 A303000572

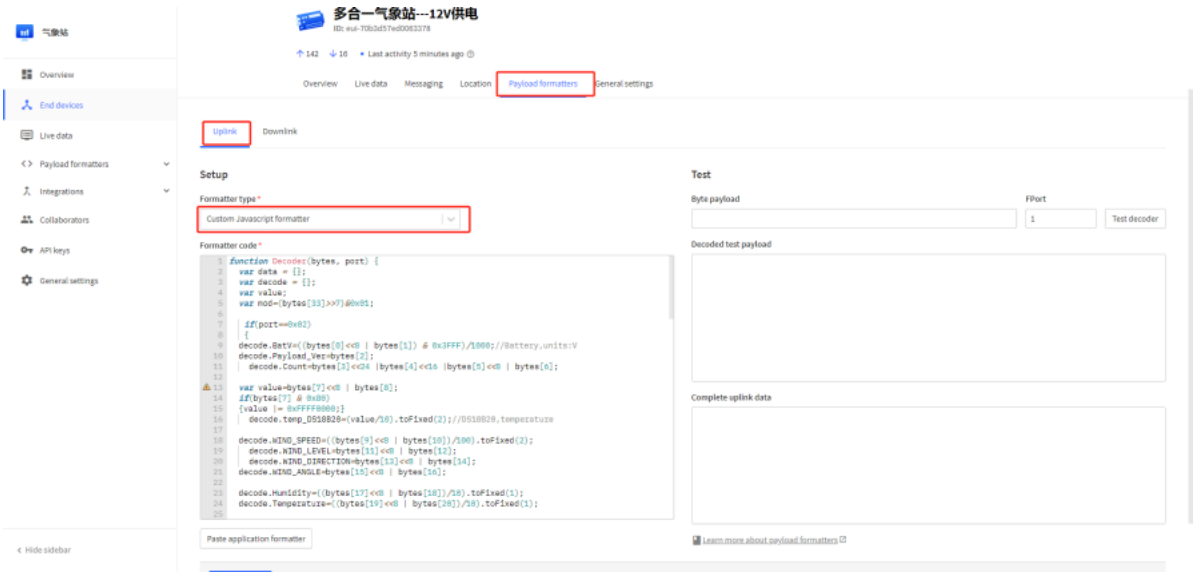
  Uplink 2: A4020088

2.4.3 Decoder in TTN V3

In LoRaWAN platform, user only see HEX payload by default, user needs to use payload formatters to decode the payload to see human-readable value.

Download decoder for suitable platform from: https://github.com/dragino/dragino-end-node-decoder (https://github.com/dragino/dragino-end-node-decoder)

and put as below:

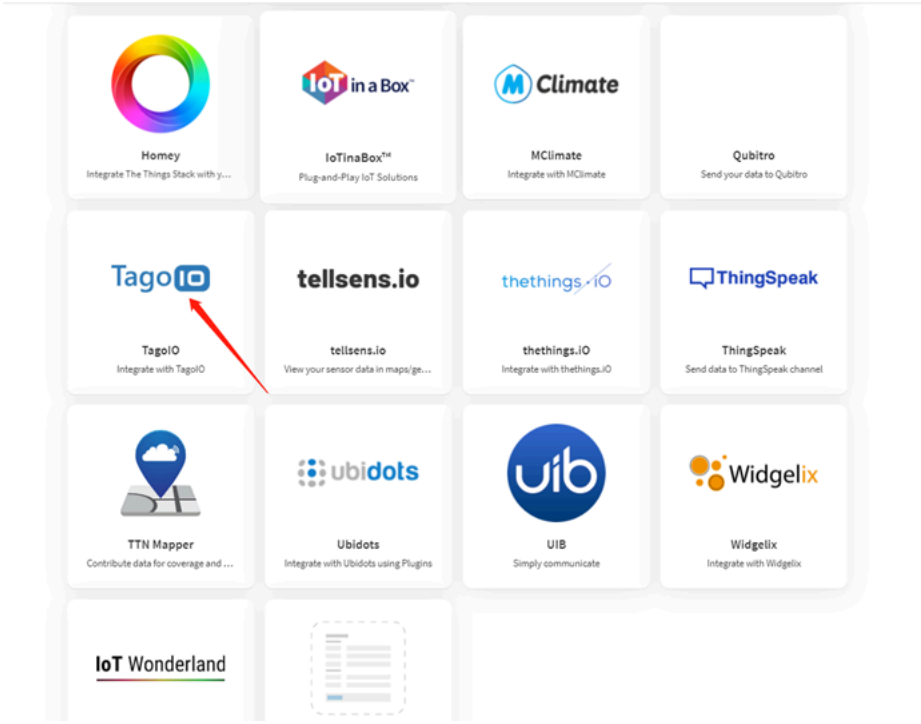


2.5 Show data on Application Server

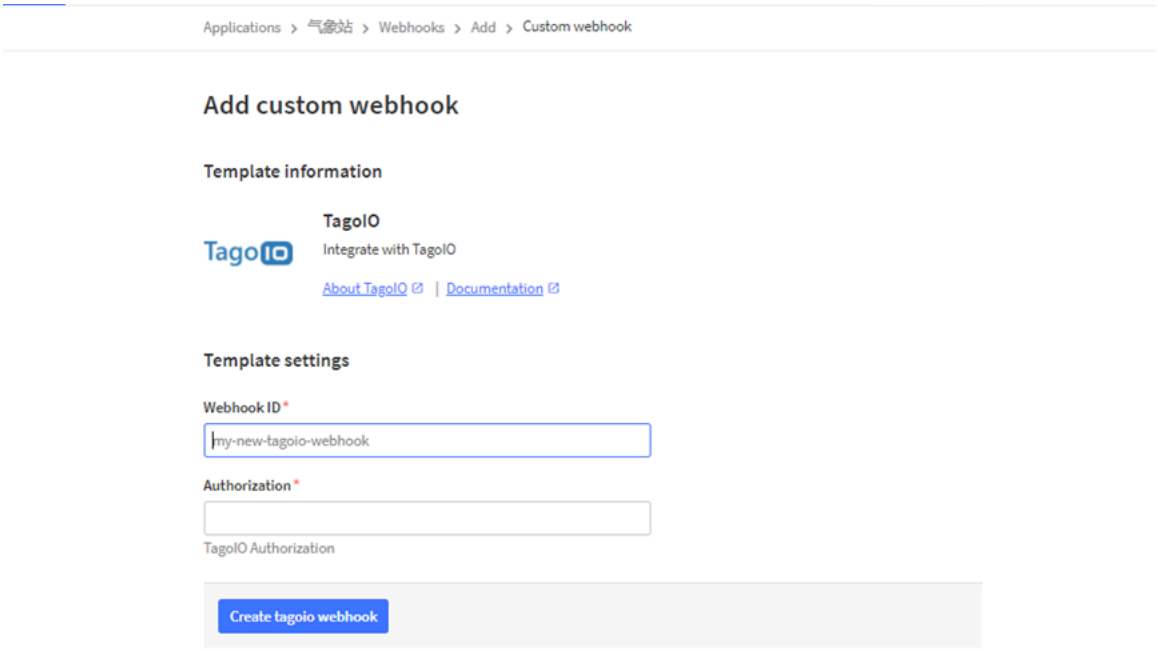
Application platform provides a human friendly interface to show the sensor data, once we have sensor data in TTN V3, we can use Datacake to connect to TTN V3 and see the data in Datacake. Below are the steps:

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

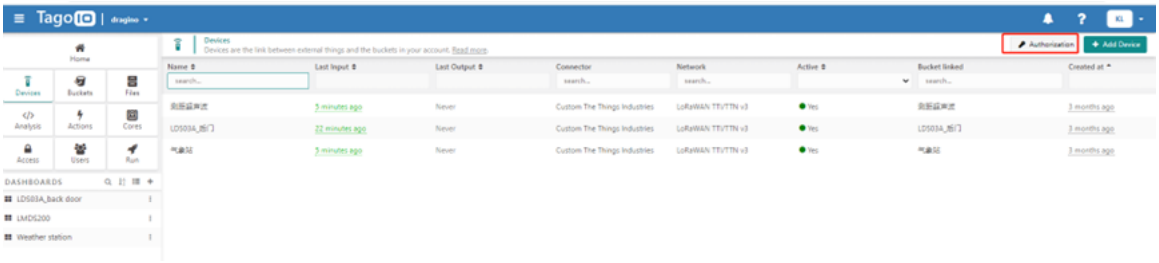
Step 2: Configure your Application to forward data to Datacake you will need to add integration. Go to TTN V3 Console --> Applications --> Integrations --> Add Integrations.



Add TagoIO:



Authorization:



In TagoIO console (https://admin.tago.io// (https://datacake.co/)) , add WSC2-L:

2.6 Frequency Plans

The WSC2-L uses OTAA mode and below frequency plans by default. Each frequency band use different firmware, user update the firmware to the corresponding band for t country.

http://wiki.dragino.com/xwiki/bin/view/Main/End%20Device%20Frequency%20Band/ (http://wiki.dragino.com/xwiki/bin/view/Main/End%20Device%20Frequency%20Band/)

3. Configure WSC2-L

3.1 Configure Methods

WSC2-L supports below configure method:

- AT Command via Bluetooth Connection (**Recommended**): BLE Configure Instruction (http://wiki.dragino.com/xwiki/bin/view/Main/BLE%20Bluetooth%20Remote%20Configure/) .
- AT Command via UART Connection : See UART Connection (http://wiki.dragino.com/xwiki/bin/view/Main/UART%20Access%20for%20LoRa%20ST%20v4%20base%20model/#H2.3UARTConnectionforSN50v3basemotherboard
- LoRaWAN Downlink. Instruction for different platforms: See IoT LoRaWAN Server (http://wiki.dragino.com/xwiki/bin/view/Main/) section.

3.2 General Commands

These commands are to configure:

- General system settings like: uplink interval.
- LoRaWAN protocol & radio related command.

They are same for all Dragino Devices which support DLWS-005 LoRaWAN Stack. These commands can be found on the wiki:

http://wiki.dragino.com/xwiki/bin/view/Main/End%20Device%20AT%20Commands%20and%20Downlink%20Command/
(http://wiki.dragino.com/xwiki/bin/view/Main/End%20Device%20AT%20Commands%20and%20Downlink%20Command/)

3.3 Commands special design for WSC2-L

These commands only valid for WSC2-L, as below:

3.3.1 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

3.3.2 Set the CO2 or PM mode

Note: Default shipment is PM sensor, optional CO2 or PM sensor is available at the time of purchase, which needs to be modified according to the sensor select at the time of purchase.

Feature: Set the CO2/PM mode, and the user can set the corresponding mode according to the purchased sensor.

AT Command:

Command Example	Function	Response
AT+PMMOD=1	The working sensors are PM2.5 and PM10	OK
AT+PMMOD=0	The working sensors are CO2	OK

Downlink Command:

- 0xE101 Same as: AT+PMMOD=1
- 0xE100 Same as: AT+PMMOD=0

3.3.3 Add or Delete RS485 Sensor

Feature: User can add or delete 3rd party sensor as long they are RS485/Modbus interface,baud rate support 4800.Maximum can add 4 sensors.

AT Command:

AT+DYSENSOR=Type_Code, Query_Length, Query_Command , Read_Length , Valid_Data ,has_CRC,timeout

- Type_Code range: A1 ~ A4
- Query_Length: RS485 Query frame length, Value cannot be greater than 10
- Query_Command: RS485 Query frame data to be sent to sensor, cannot be larger than 10 bytes
- Read_Length: RS485 response frame length supposed to receive. Max can receive
- Valid_Data: valid data from RS485 Response, Valid Data will be added to Payload and upload via LoRaWAN.
- has_CRC: RS485 Response crc check (0: no verification required 1: verification required). If CRC=1 and CRC error, valid data will be set to 0.
- timeout: RS485 receive timeout (uint:ms). Device will close receive window after timeout

Example:

User need to change external sensor use the type code as address code.

With a 485 sensor, after correctly changing the address code to A1, the RS485 query frame is shown in the following table:

Address Code	Function Code	Start Register		Data Length		CRC Check Low	CRC Check High
0xA1	0x03	0x00	0x00	0x00	0x01	0x9C	0xAA

The response frame of the sensor is as follows:

Address Code	Function Code	Data Length		Data		CRC Check Low	CRC Check High
0xA1	0x03	0x00	0x02	0x00	0x0A	0x7C	0xAD

Then the following parameters should be:

- Address_Code range: A1
- Query_Length: 8
- Query_Command: A103000000019CAA
- Read_Length: 8
- Valid_Data: 23 (Indicates that the data length is 2 bytes, starting from the 3th byte)
- has_CRC: 1
- timeout: 1500 (Fill in the test according to the actual situation)

So the input command is:

AT+DYSENSOR=A1,8,A103000000019CAA,8,24,1,1500

In every sampling. WSC2-L will auto append the sensor segment as per this structure and uplink.

Type Code	Length (Bytes)	Measured Value
A1	2	0x000A

Related commands:

AT+DYSENSOR=A1,0 --> Delete 3rd party sensor A1.

AT+DYSENSOR --> List All 3rd Party Sensor. Like below:

Downlink Command:

delete custom sensor A1:

- 0xE5A1 Same as: AT+DYSENSOR=A1,0

Remove all custom sensors

- 0xE5FF

3.3.4 RS485 Test Command

AT Command:

Command Example	Function	Response
AT+RSWRITE=xxxxxx	Send command to 485 sensor. Range : no more than 10 bytes	OK

Eg: Send command **01 03 00 00 00 01 84 0A** to 485 sensor

AT+RSWRITE=0103000001840A

Downlink Command:

- 0xE20103000001840A Same as: AT+RSWRITE=0103000001840A

3.3.5 RS485 response timeout

Feature: Set or get extended time to receive 485 sensor data.

AT Command:

Command Example	Function	Response
AT+DTR=1000	Set response timeout to: Range : 0~10000	OK

Downlink Command:

Format: Command Code (0xE0) followed by 3 bytes time value.

If the downlink payload=E0000005, it means set the END Node's Transmit Interval to 0x000005=5(S), while type code is E0.

- Example 1: Downlink Payload: E0000005 // Set Transmit Interval (DTR) = 5 seconds
- Example 2: Downlink Payload: E000000A // Set Transmit Interval (DTR) = 10 seconds

3.3.6 Set or get the total count value(only applicable to WSS-08)

Feature: The user can set the counting to start from the set value according to the requirements. (only available in counting mode).

AT Command:

Command Example	Function	Response
AT+SETCNT=1000	Set the total count to start from 1000	OK

Downlink Command:

Format: Command Code (0x09) followed by 4 bytes time value.

If the downlink payload=09000003E8, This means that the count of the END node will start counting from setting 0x000003E8=1000 (times). while type code is 09.

- Example 1: Downlink Payload: 09000003E8 // Set the value to start counting from 1000 = 1000 (times)

3.3.7 Set interrupt or counting mode

Feature: Users can set the trigger mode to counting mode or interrupt mode as needed.

The WSS-08 Rain Gauge requires the counting mode to be on in order to accumulate pulse counts.

AT Command:

Command Example	Function	Response
AT+COUNTMOD=0	set to interrupt mode	OK
AT+COUNTMOD=1	set to counting mode	OK

Downlink Command:

Format: Command Code (0x10) followed by 1 bytes time value.

If the downlink payload=10 00, Set the trigger mode to interrupt mode, while type code is 10.

- Example 1: Downlink Payload: 10 00 // Same as: AT+COUNTMOD=0 set to interrupt mode

3.4 Add 3rd RS485 / Modbus Sensor

3.4.1 Hardware Connection

WSC2-L has a 1 to 3 cables. All the three connectors has same defination as below. It include Five Pins: VCC, GND, RS485-A, RS485-B, Count.

Notice: RS485-A,RS485-B can be used to connect multiply sensors. but the COUNT can be only use for one sensor. Which means if you already add a Pulse out Rain Guage in the system, you are not able to add another Pulse Output device.

3.4.2 Software Setup

Send AT+DYSENSOR to activate the RS485 sensor for collecting 3rd RS485 sensor. You can refer to the instructions in section 3.3.3 of the manual.

For example: AT+DYSENSOR=A1,8,A103000000019CAA,8,24,1,1500

3.4.3 Payload

0FC6 01 00000000 00DC 001B 0001 0003 0091 0260 00CA 01FE 001B 0020 03EC 00000102
90 A1020000↵

For example: A1 02 00 00

A1 : A1 register data acquisition instruction

02 : The valid data returned is 2 bytes in total.

00 00 : Return valid data

3.5 Add tipping bucket total solar radiation sensor

3.5.1 Hardware Connection

The following is an example of connecting a total solar radiation sensor to a matching interface cable, and then using the interface to connect the WSC2-L.

Users can also choose to connect the sensor directly to the WSC2-L via the cable and pin instructions below.

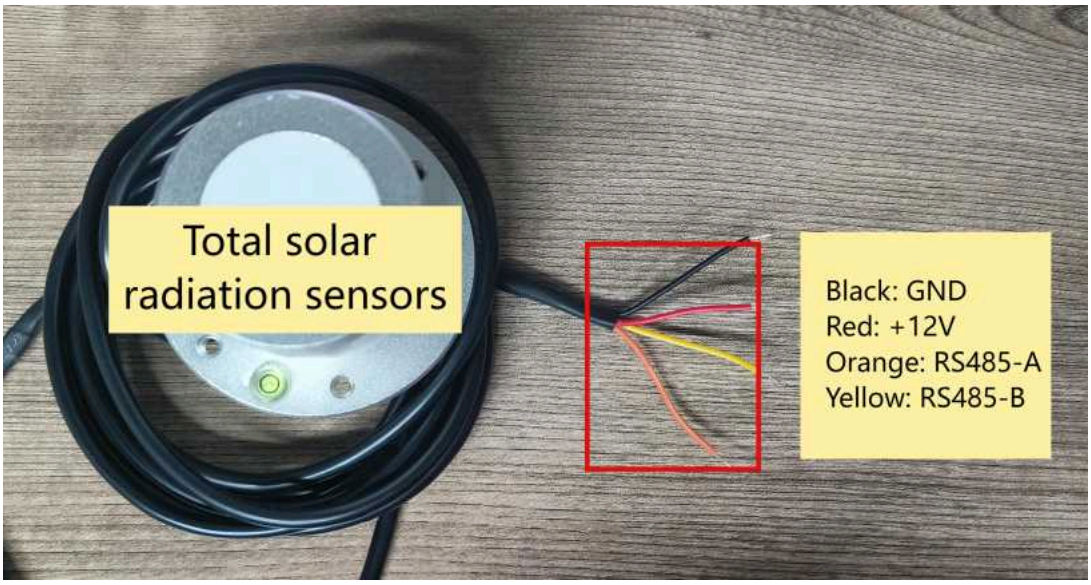
The following is an explanation of the pins required for WSC2-L：

A: RS485-A (Connect the RS485 sensor)

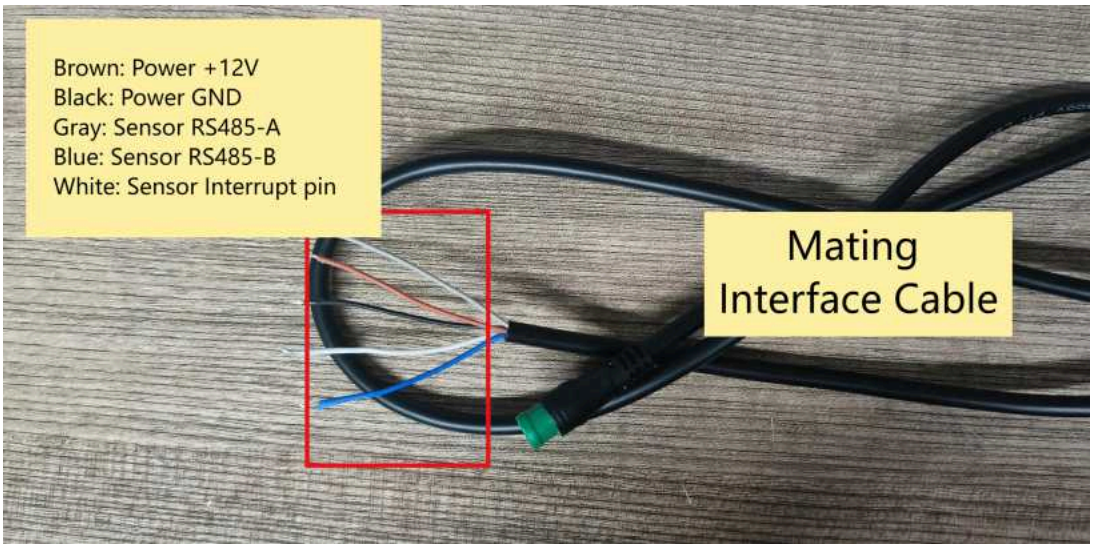
B: RS485-B (Connect the RS485 sensor)

GPIO_EXTI: Interrupt pin (Can be used to connect an additionally added pulsed rain gauge)

- Total Solar Radiation Sensor Cable Descripti

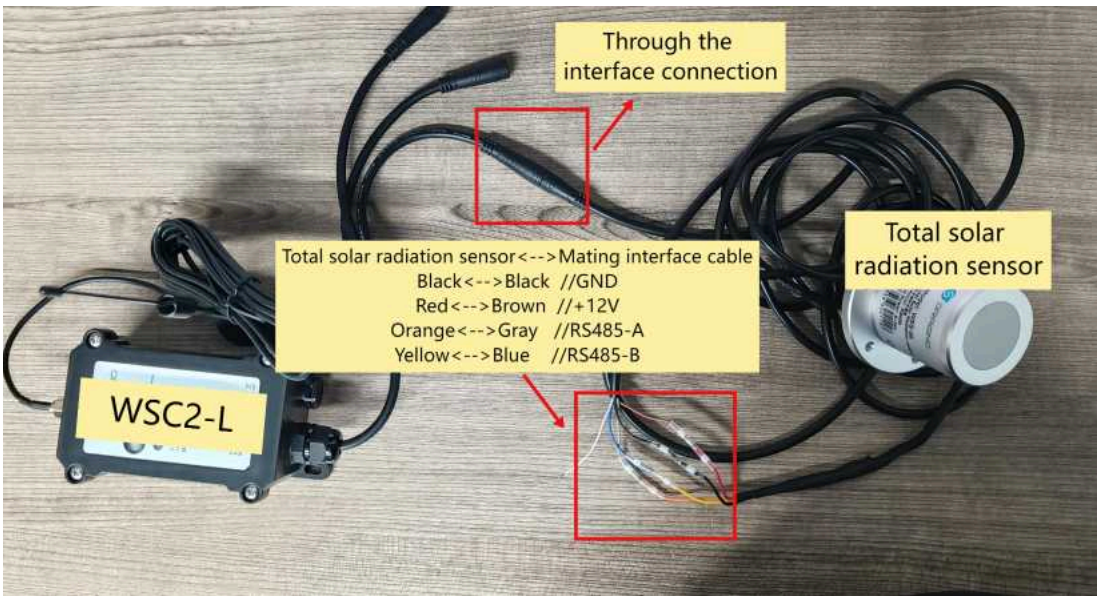


- Mating Interface Cable Description



- Connect to WSC2-L

The Total solar radiation sensor does not need to connect the interrupt pin, so the white cable is not wired.



3.5.2 Calculating & Decode

0FC6 01 00000000 00EB 000F 0000 0003 008E 0251 00CE 0213 0017 001B 03EC 000000DE 90 A1020000 A2020032

For example: A2 02 00 32

A2 : A2 register data acquisition instruction

02 : The valid data returned is 2 bytes in total.

00 32(HEX) : Return valid data = 50(DEC)W/m2

3.6 MSP mode(Since version 1.1.1)

This function is used for the continuous collection of wind speed.

When MSP mode is turned on (AT+MSP=1), WSC2-L will collect real-time wind speed **every 10 seconds**. Then it will judge the maximum wind speed in this period accordir to the wind speed collected in TDC time, and calculate the average wind speed according to the wind speed data collected in TDC time and the number of data groups.

AT Command:

Command Example	Function	Response
AT+MSP=1	Enable MSP mode	OK
AT+MSP=0	Disable MSP mode	OK

Downlink Command:

Format: Command Code (0x34) followed by 1 bytes time value.

If the downlink payload=3400, then set the MSP mode to enable and the type code is 34.

- Example 1: Downlink Payload: 34 01 // Same as: AT+MSP=1 set to enable MSP mode.
- Example 1: Downlink Payload: 34 00 // Same as: AT+MSP=1 set to disable MSP mode.

Note:

1. When MSP mode is enabled, the uplink payload is increased by 4 bytes, the average wind speed from the last uplink to this one (2 bytes) and the maximum wind speed f the last uplink to this one (2 bytes).

2. If WSS-09 and WSS-22 are connected at the same time, the uplink payload will prioritize WSS-09 as follows:

3.7 Set the registers read by the rain gauge(Since firmware V1.1.1, only applicable to WSS-21)

AT Command:

Command Example	Function	Response
AT+RAINFALLSWITCH=?	Query the current register read by the rain gauge	OK
AT+RAINFALLSWITCH=10	Set to read the rainfall within 24 hours	OK

Downlink Command:

- 0xE703 Same as: AT+RAINFALLSWITCH=3

Value Definition:

- **3**: The total rainfall after the sensor is powered on (for example Total rainfall: 166.5mm)
- **4**: Hourly rainfall: 0.2mm
- **5**: Rainfall in last hour: 0.2mm
- **6**: 24-hour maximum rainfall 10.0mm
- **8**: 24-hour minimum rainfall:0.0mm
- **10**: Rainfall in 24 hours: 8.0mm (Rainfall in the last 24 hours)

4. Power consumption and battery

4.1 Total Power Consumption

Dragino Weather Station serial products include the main process unit (WSC2-L) and various sensors. The total power consumption equal total power of all above units. The power consumption for main process unit WSC2-L is 18ma @ 12v. and the power consumption of each sensor can be found on the Sensors chapter.

4.2 Reduce power consumption

The main process unit WSC2-L is set to LoRaWAN Class C by default. If user want to reduce the power consumption of this unit, user can set it to run in Class A. In Class A mode, WSC2-L will not be to get real-time downlink command from IoT Server.

4.3 Battery

All sensors are only power by external power source. If external power source is off. All sensor won't work.

Main Process Unit WSC2-L is powered by both external power source and internal 1000mAh rechargeable battery. If external power source is off, WSC2-L still runs and can send periodically uplinks, but the sensors value will become invalid. External power source can recharge the 1000mAh rechargeable battery.

5. Main Process Unit WSC2-L

WSC2-L is the main process unit in Dragino Weather Station solution. WSC2-L is an an outdoor LoRaWAN RS485 end node. It is powered by external 12v solar power and have a built-in Li-ion backup battery.

WSC2-L reads value from various sensors and upload these sensor data to IoT server via LoRaWAN wireless protocol.

WSC2-L is full compatible with LoRaWAN Class A protocol, it can work with standard LoRaWAN gateway.

WSC2-L Supports BLE configure and wireless OTA update which make user easy to use.

Each WSC2-L is pre-load with a set of unique keys for LoRaWAN registration, register these keys to local LoRaWAN server and it will auto connect after power on.

5.1 Features

- LoRaWAN v1.0.3 Class A protocol.
- RS485 / Modbus protocol
- Frequency Bands: CN470/EU433/KR920/US915/EU868/AS923/AU915
- AT Commands to change parameters
- Downlink to change configure

- Powered by external 12v battery
- Back up rechargeable 1000mAh battery
- IP Rating: IP65
- Support default sensors or 3rd party RS485 sensors
- Support Bluetooth v5.1 and LoRaWAN remote configure
- Support wireless OTA update firmware
- Wall Attachable.

5.2 Power Consumption

WSC2-L (without external sensor): Idle: 4mA, Transmit: max 40mA

5.3 Storage & Operation Temperature

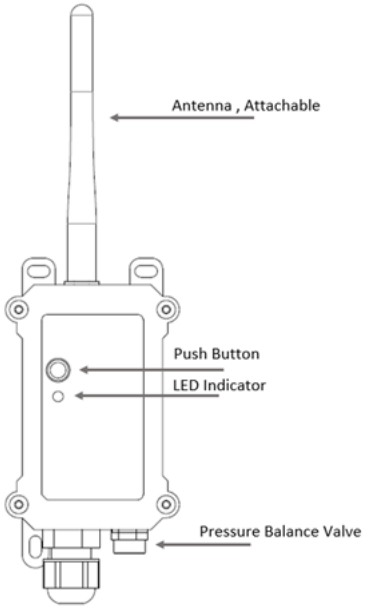
-20°C to +60°C

5.4 Sleep mode and working mode

Deep Sleep Mode: Sensor doesn't have any LoRaWAN activate. This mode is used for storage and shipping to save battery life.

Working Mode: In this mode, Sensor will work as LoRaWAN Sensor to Join LoRaWAN network and send out sensor data to server. Between each sampling/tx/rx periodical sensor will be in IDLE mode), in IDLE mode, sensor has the same power consumption as Deep Sleep mode.

5.5 Button & LEDs



Behavior on ACT	Function	Action
1~3s	Send an uplink	If sensor is already Joined to LoRaWAN network, sensor will send an uplink packet, **blue led** will blink once. Meanwhile, BLE module will be active and user can connect via BLE to configure device.
>3s	Active Device	**Green led** will fast blink 5 times, device will enter **OTA mode** for 3 seconds. And then start to JOIN LoRaWAN network. **Green led** will solidly turn on for 5 seconds after joined in network. Once sensor is active, BLE module will be active and user can connect via BLE to configure device, no matter if device join or not join LoRaWAN network.

x5	Deactivate Device	**Red led** will solid on for 5 seconds. Means device is in Deep Sleep Mode.

5.6 BLE connection

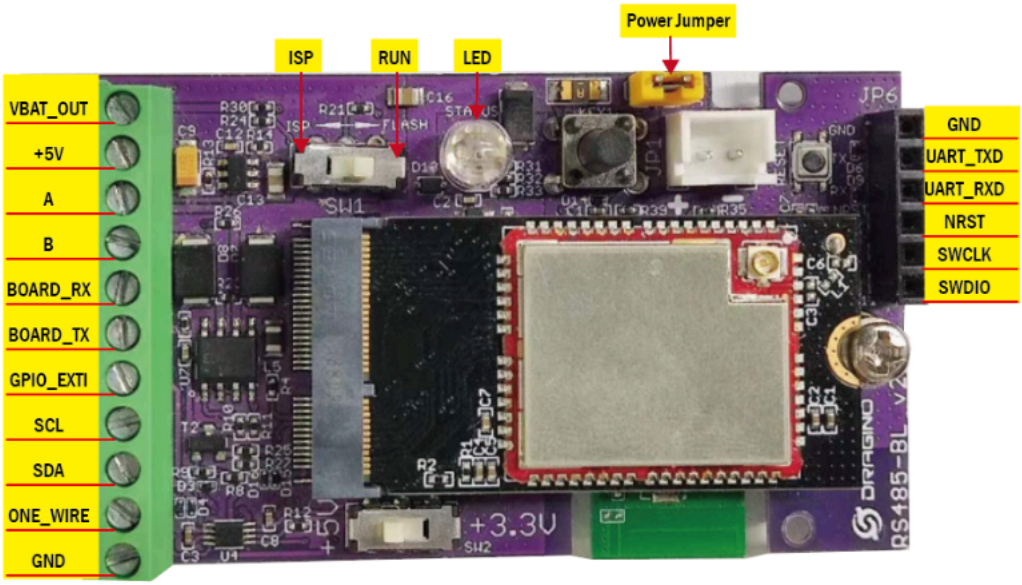
WSC2-L supports BLE remote configure.

BLE can be used to configure the parameter of sensor or see the console output from sensor. BLE will be only activate on below case:

- Press button to send an uplink
- Press button to active device.
- Device Power on or reset.

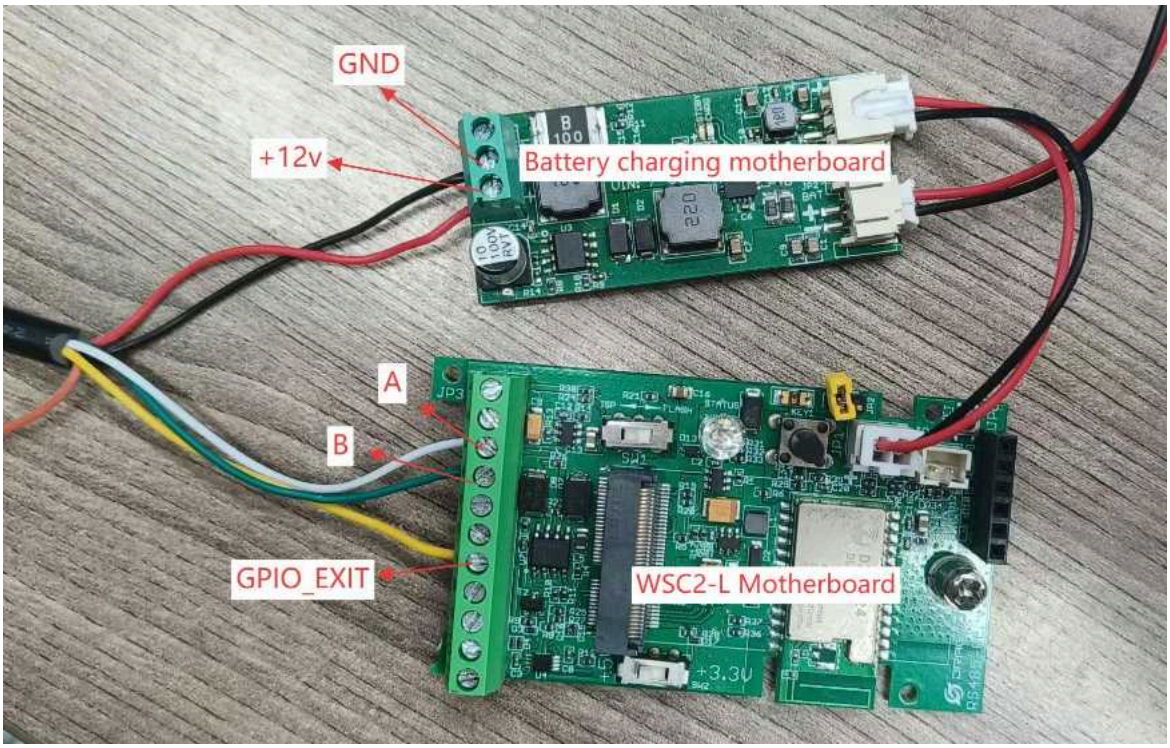
If there is no activity connection on BLE in 60 seconds, sensor will shut down BLE module to enter low power mode.

5.7 Pin definitions of the WSC2-L motherboard



5.8 Pin definitions of the matching cables

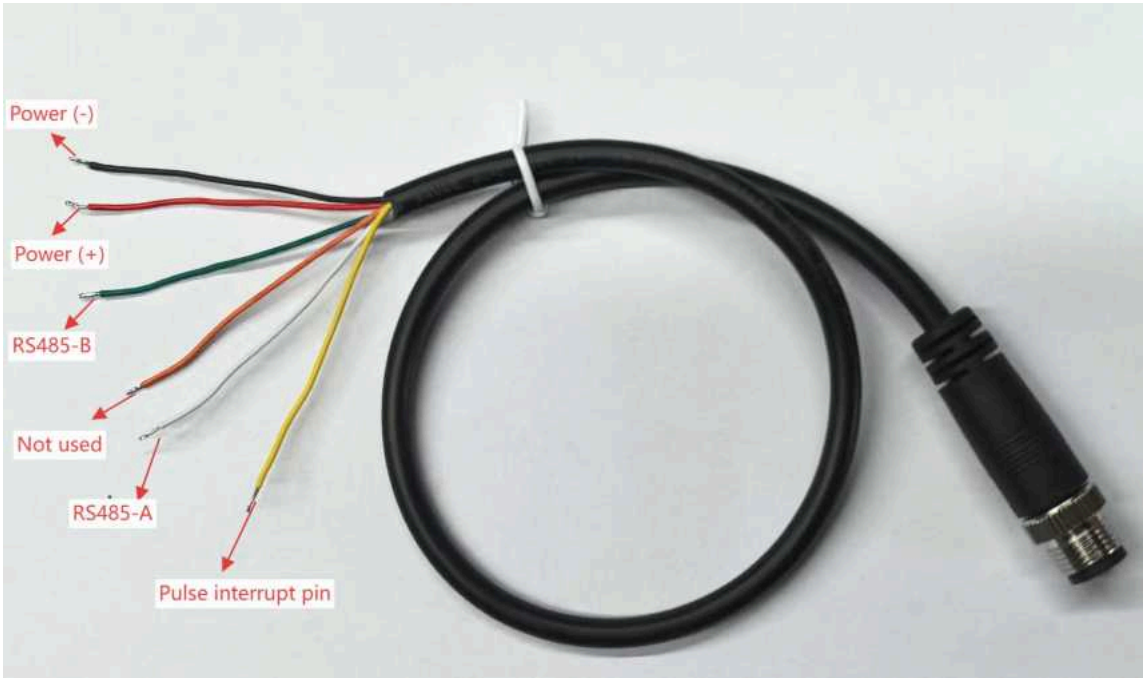
5.8.1 Wiring configuration between the 1-to-4 splitter main cable and the WSC2-L motherboard



- Black line <------> GND of battery charging motherboard

- Red line <------> GND of battery charging motherboard
- White line <------> A pin of WSC2-L motherboard
- Green line <------> B pin of WSC2-L motherboard
- Yellow line <------> GPIO_EXIT pin of WSC2-L motherboard

5.8.2 The internal cable definition of single-interface wires



- Black line <------> Power pin
- Red line <------> Power pin
- White line <------> RS485-A pin
- Green line <------> RS485-B pin
- Yellow line <------> Pulse interrupt pin
- Orange line <------> Not used (can be cut off)

5.9 Mechanical

Refer LSn50v3 enclosure drawing in: https://www.dropbox.com/scl/fo/ztlw35a9xbkomu71u31im/ADY2192VNMFoMmryPGdwkRk/LoRaWAN%20End%20Node/SN50v3-LB/Mechinical?dl=0&rlkey=ojjcsw927eaow01dgooldq3nu&subfolder_nav_tracking=1 (https://www.dropbox.com/scl/fo/ztlw35a9xbkomu71u31im/ADY2192VNMFoMmryPGdwkRk/LoRaWAN%20End%20Node/SN50v3-LB/Mechinical?dl=0&rlkey=ojjcsw927eaow01dgooldq3nu&subfolder_nav_tracking=1)

6. OTA Firmware update

User can change firmware WSC2-L to:

- Change Frequency band/ region.
- Update with new features.
- Fix bugs.

Firmware and changelog can be downloaded from : Firmware download link (https://www.dropbox.com/sh/8j3ioji411ni9gu/AADnOw3ErB1REsthKilfaq_Pa?dl=0)

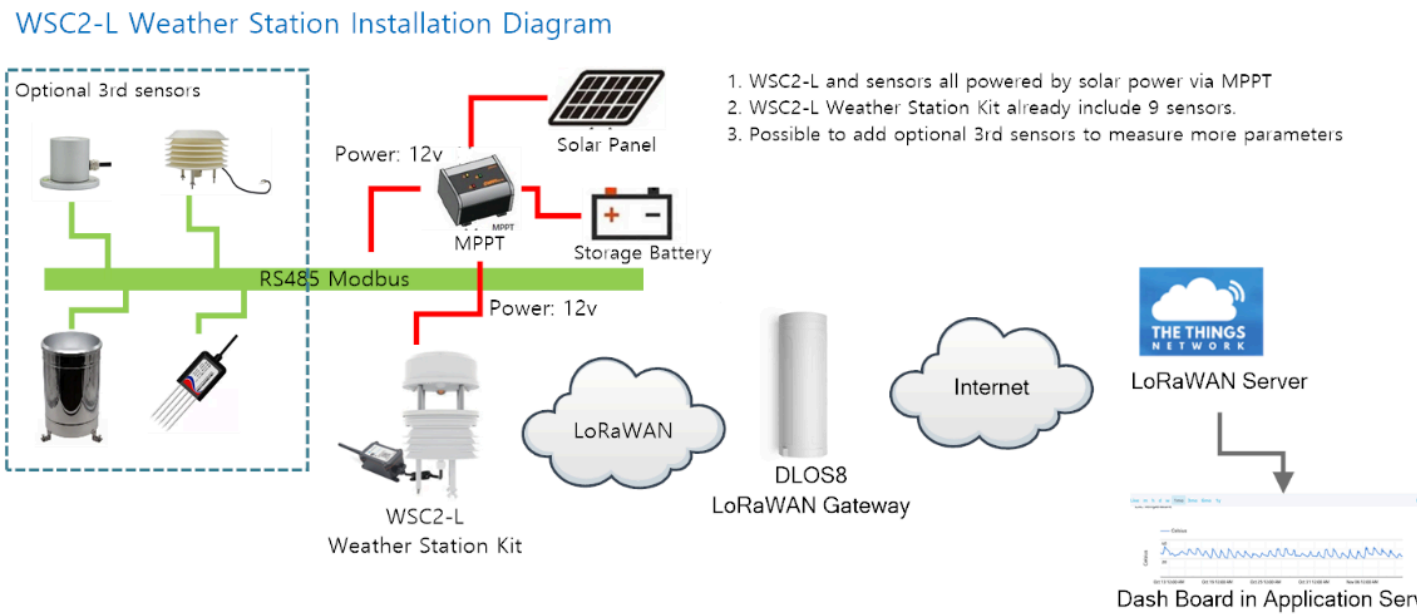
Methods to Update Firmware:

- (Recommanded way) OTA firmware update via wireless: **http://wiki.dragino.com/xwiki/bin/view/Main/Firmware%20OTA%20Update%20for%20Sensors/ (http://wiki.dragino.com/xwiki/bin/view/Main/Firmware%20OTA%20Update%20for%20Sensors/)**
- Update through UART TTL interface: **Instruction (http://wiki.dragino.com/xwiki/bin/view/Main/UART%20Access%20for%20LoRa%20ST%20v4%20base%20model/#H1.LoRaSTv4baseHardware)** .

7. FAQ

7.1 What else do I need to purchase to build Weather Station?

Below is the installation photo and structure:



7.2 Where can i find the modbus command for the WSS-09 sensor?

See this link for the modbus command set (https://www.dropbox.com/scl/fo/ztlw35a9xbkomu71u31im/AK7twfUnkB4qKMvtU4XcEss/LoRaWAN%20End%20Node/WSC2-L%20Combine%20Weather%20Station%20Kit?dl=0&e=2&preview=Weather_Sensors_Modbus_Command_List.xlsx&rlkey=ojjcsw927eaow01dgooldq3nu&subfolder_nav_tracking=1) .

8. Trouble Shooting

8.1 What should I do when the RS485 sensor cannot collect data?

1. Recheck whether the sensor's power supply voltage is 12V at maximum.

2. Recheck whether the A and B signal lines of the sensor are connected reversely.

3. Check whether the sensor's transmission baud rate is 4800. If not, please change it to 4800 and try reading again.

8.2 Why does the weather station make electric current sounds during operation?

1. Because a certain amount of sound will be produced during long-term power supply operation. This is a normal phenomenon and does not affect use.

8.3 How to solve the problem of temperature difference in weather stations?

You can use AT+RSWRITE (downlink: E2 xx xx xx xx xx xx) to modify the temperature compensation function in the weather station.

For example:

When the temperature of the weather station is 3°C different from the right value, you can use AT+RSWRITE=01 06 00 50 00 1E 09 D3 (downlink: E2 01 06 00 50 00 1E 09 D3) to modify the temperature compensation value of the weather station to +3°C .

8.4 Why does the rain gauge have no data?

The default mode of the rain gauge is trigger mode.
When it rains, it will trigger an uplink, and the data does not include rainfall data.
If you want to query rainfall data, please change to counting mode

Feature: Users can set the trigger mode to counting mode or interrupt mode as needed.

AT Command:

Command Example	Function	Response
AT+COUNTMOD=0	set to interrupt mode	OK
AT+COUNTMOD=1	set to counting mode	OK

Downlink Command:

Format: Command Code (0x10) followed by 1 bytes time value.

If the downlink payload=10 00, Set the trigger mode to interrupt mode, while type code is 10.

- Example 1: Downlink Payload: 10 00 // Same as: AT+COUNTMOD=0 set to interrupt mode

9. Order Info

Please note that the WSC2-L only includes the wireless transmitter, and the WSS-08, WSS-09, WSS-21, WSS-22, WSS-23, WSS-24, WSS-25, WSS-26, WSS-27 sen need to be purchased separately. If you need to connect more than 3 sensors, please purchase an additional one to four adapter cable (DR-F6C-4M).

Part Number:

Wireless Transmitter : WSC2-L-XX

XX: the default frequency band

- **AS923**: LoRaWAN AS923 band
- **AU915**: LoRaWAN AU915 band
- **EU433**: LoRaWAN EU433 band
- **EU868**: LoRaWAN EU868 band
- **KR920**: LoRaWAN KR920 band
- **S915**: LoRaWAN US915 band
- **IN865**: LoRaWAN IN865 band
- **CN470**: LoRaWAN CN470 band

Sensors Option : WSS-08, WSS-09, WSS-21, WSS-22, WSS-23, WSS-24, WSS-25, WSS-26, WSS-27

10. 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 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 (file:///D:/市场资料/说明书/LoRa/LT系列/support@dragino.com) .