



# LoRaWAN Agricultural Monitoring Node-to-APP Starter Kit Quick Guide



## Safety Precautions

Ursalink will not shoulder responsibility for any loss or damage resulting from not following the instructions of this operating guide.

- ❖ The kit must not be remodeled in any way.
- ❖ UC11-T1 and EM500 are not intended to be used as reference sensors, and Ursalink will not should responsibility for any damage which may result from inaccurate readings.
- ❖ Do not place the all devices close to objects with naked flames.
- ❖ Do not place all devices where the temperature is below/above the operating range.
- ❖ Make sure electronic components do not drop out of the enclosure while opening.
- ❖ When closing the lid, make sure the lid is fitted the right way, so that the enclosure is properly sealed.
- ❖ When installing the battery of sensors, please install it accurately, not reversely or with wrong model.
- ❖ The kit must never be subjected to shocks or impacts.

## Declaration of Conformity

Ursalink LoRaWAN agricultural kit is in conformity with the essential requirements and other relevant provisions of the CE, FCC, and RoHS.



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## Revision History

Date	Doc Version	Description
July 27, 2020	V 1.0	Initial version

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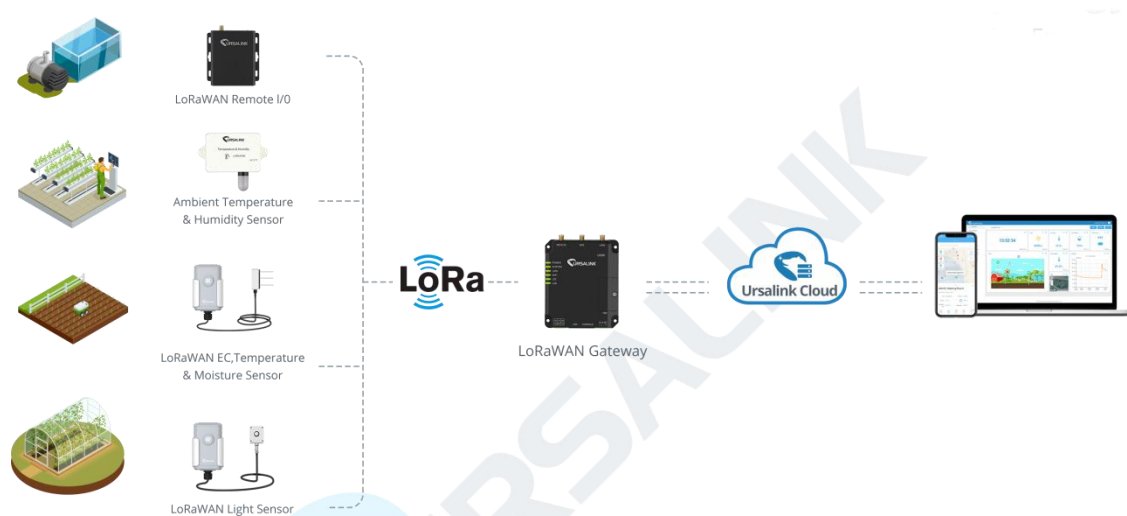
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# 1. Overview

## 1.1 Description

Ursalink LoRaWAN Agricultural Monitoring Node-to-App Starter Kit is designed for simplifying the process of PoC about LoRaWAN network establishment and remote monitoring for the agricultural environment. More information about every product is available on <https://www.ursalink.com/en/documents-download/>

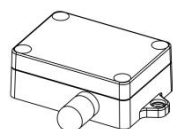
## 1.2 Topology



# 2. Introduction

## 2.1 Packing List

- |                  |                          |                               |                              |
|------------------|--------------------------|-------------------------------|------------------------------|
|                  |                          |                               |                              |
| 1 × UG85         | 1 × Ethernet Cable       | 1 × Power Adapter             | 1 × Stubby LoRa Antenna      |
|                  |                          |                               |                              |
| 1 × DIN Rail Kit | 4 × Setscrews (For UG85) | 1 × Magnetic Cellular Antenna | 1 × 6-Pin Pluggable Terminal |



1 × UC11-T1



1 × Magnet



Setscrews  
(For UC11-T1)



1 × UC1114



1 × Stubby LoRa  
Antenna



1 × 12-Pin Pluggable  
Terminal



Setscrews  
(For UC1114)



1 ×  
EM500-SMT-MEC20



1 ×  
EM500-LGT



Mounting Screws  
(For EM500)



Hose Clamps

**⚠ Please contact your Ursalink sales representative if the following situations occurs:**

- Any of above items is missing or damaged;
- Other accessories or device models are required for your application.

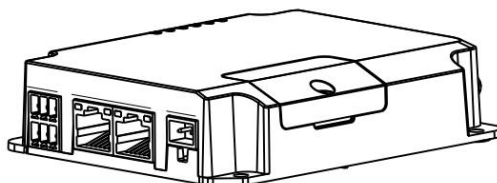
## 2.2 Software Preparation

Software	Introduction	Apply For	Download
Ursalink Toolbox	Windows software for NFC/USB configuration.	UC11-T1, UC1114, EM500 sensors	<a href="https://www.ursalink.com/en/software-download/">https://www.ursalink.com/en/software-download/</a>
Ursalink Toolbox (APP ver.)	Mobile APP for NFC configuration.	EM500 sensors	Apple Store or Google Play
Ursalink Cloud (APP ver.)	Add and manage the LoRaWAN nodes on the Ursalink Cloud.	Ursalink Cloud	Apple Store or Google Play

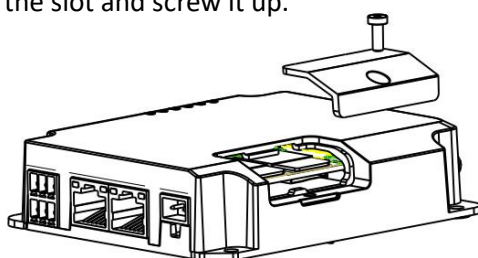
## 3. UG85 Gateway Configuration

### 3.1 SIM Card/Antenna Installation

A. Unscrew the cover of the SIM card then take it off.

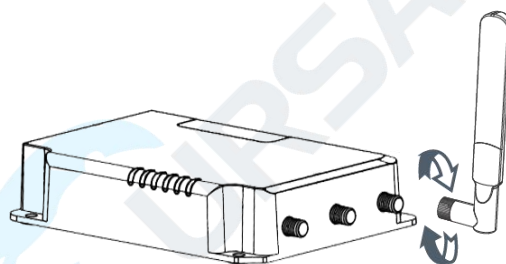


B. Put SIM card into the slot and screw it up.



C. Rotate the antenna into the antenna connector accordingly.

The external antenna should be installed vertically always on a site with a good signal.



### 3.2 Web GUI Configuration

Default settings of UG85:

IP Address: **192.168.23.150**

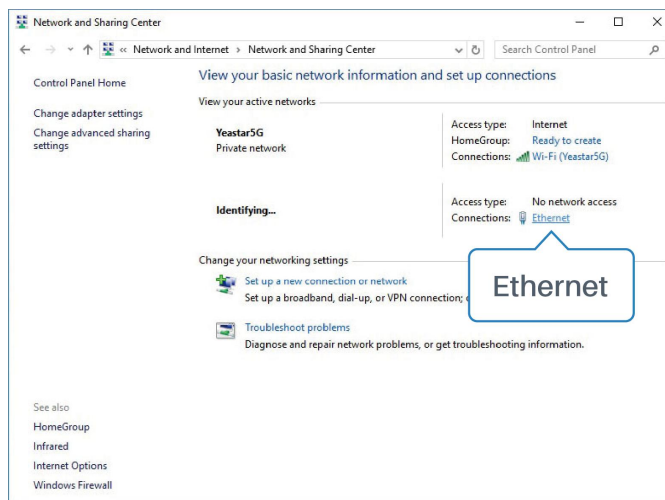
Username: **admin**

Password: **password**

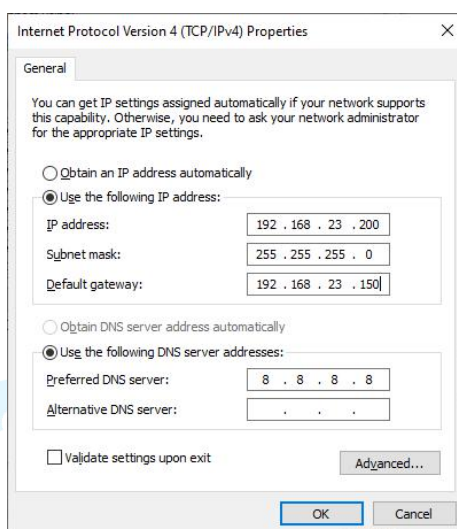
#### 3.2.1 Login the Web GUI

A. Connect PC to LAN port of UG85 directly.

B. Go to "Control Panel" → "Network and Internet" → "Network and Sharing Center" of the PC and click "Ethernet".

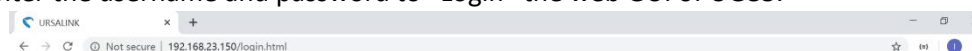


C. Click “Properties” → “Internet Protocol Version 4(TCP/IPv4)” to configure a static IP address manually and save the configuration.



D. Open a web browser on your PC (Chrome and IE are recommended) and type in the IP address 192.168.23.150.

E. Enter the username and password to “Login” the web GUI of UG85.



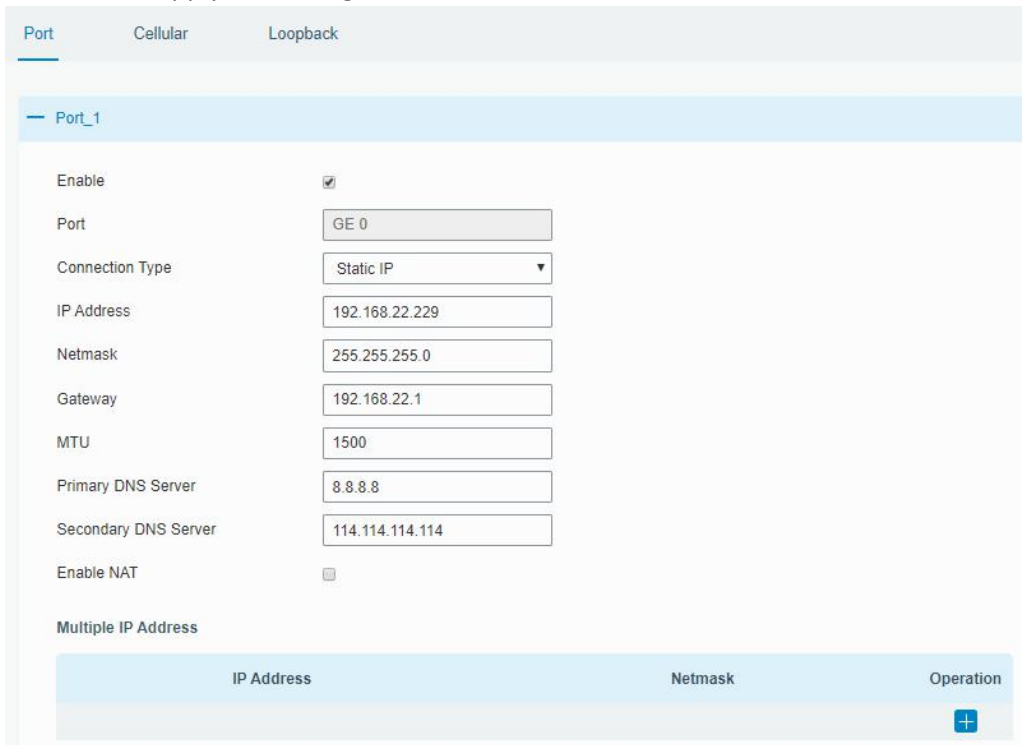
## 3.2.2 Network Connection

UG85 supports Ethernet, cellular(3G/4G) and Wi-Fi(option) backhaul. This guide will introduce how to make gateway access the network via Ethernet and cellular network.

### 3.2.2.1 Configure the WAN Connection

A. Go to “Network” → “Interface” → “Port” page to select the connection type and configure WAN information.

B. Click “Save&Apply” for configuration to take effect.



IP Address	Netmask	Operation
192.168.22.229	255.255.255.0	<a href="#">+</a>

C. Connect Ethernet port of gateway to network devices like router or modem.

D. Log in the web GUI via the newly assigned IP address and go to “Status” → “Network” to check Ethernet port status.



Port	Status	Type	IP Address	Netmask	Gateway	DNS	Duration
GE 0	up	Static	192.168.22.229	255.255.255.0	192.168.22.1	8.8.8.8	03h 01m 21s

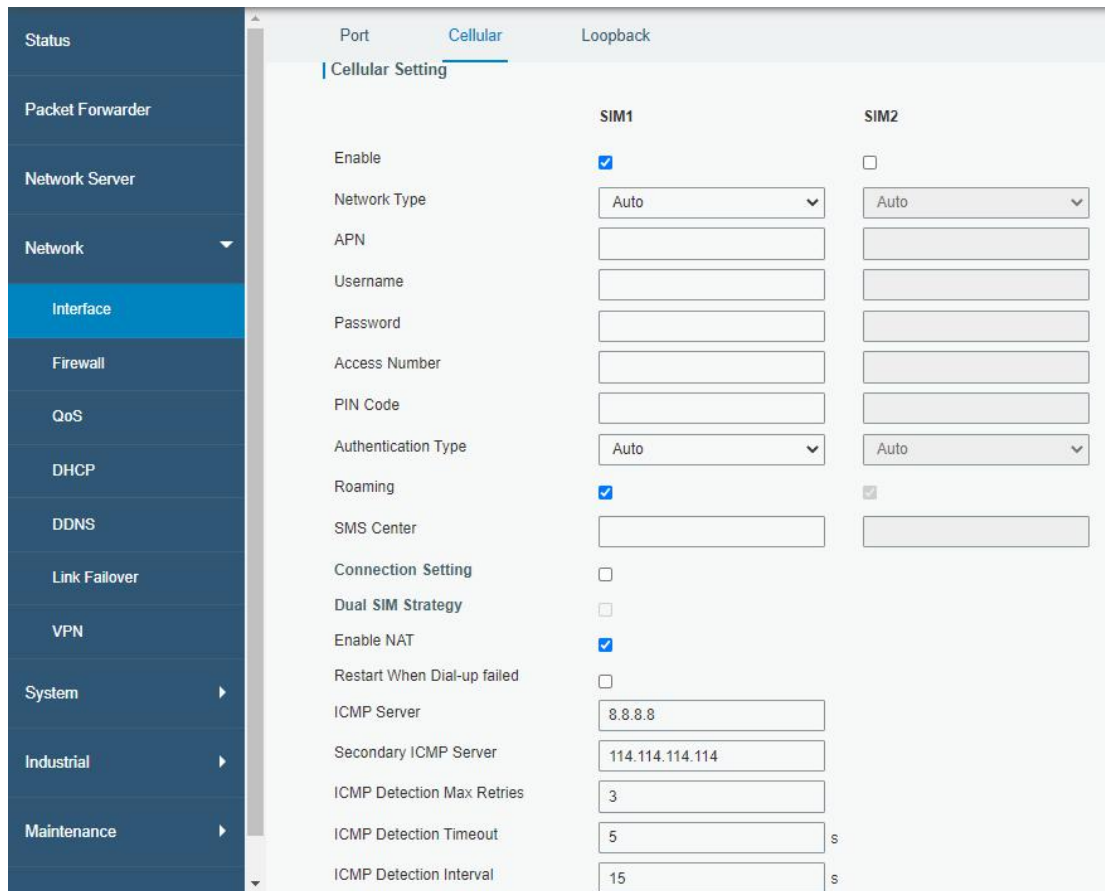
### 3.2.2.2 Configure the Cellular Connection

Take inserting SIM card into SIM1 slot as an example; please refer to the following detailed operations.

A. Go to “Network” → “Interface” → “Cellular” → “Cellular Setting” page to enable SIM1.



- B. Choose relevant network type and type SIM card information like APN and PIN code.  
 C. Click “Save” and “Apply” for configuration to take effect.



	SIM1	SIM2
Enable	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Network Type	Auto	Auto
APN		
Username		
Password		
Access Number		
PIN Code		
Authentication Type	Auto	Auto
Roaming	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SMS Center		
Connection Setting	<input type="checkbox"/>	
Dual SIM Strategy	<input type="checkbox"/>	
Enable NAT	<input checked="" type="checkbox"/>	
Restart When Dial-up failed	<input type="checkbox"/>	
ICMP Server	8.8.8.8	
Secondary ICMP Server	114.114.114.114	
ICMP Detection Max Retries	3	
ICMP Detection Timeout	5 s	
ICMP Detection Interval	15 s	

UG85 has two cellular interfaces named SIM1 & SIM2. Only one cellular interface is active at one time. If both cellular interfaces are enabled, SIM1 interface takes precedence by default.

D. Go to “Status” → “Cellular” page to view the status of the cellular connection. If it shows “Connected”, it means SIM1 has dialed up successfully. On the other hand, you can check the status of LTE indicator. If it keeps on green light statically, it means SIM has dialed up successfully.

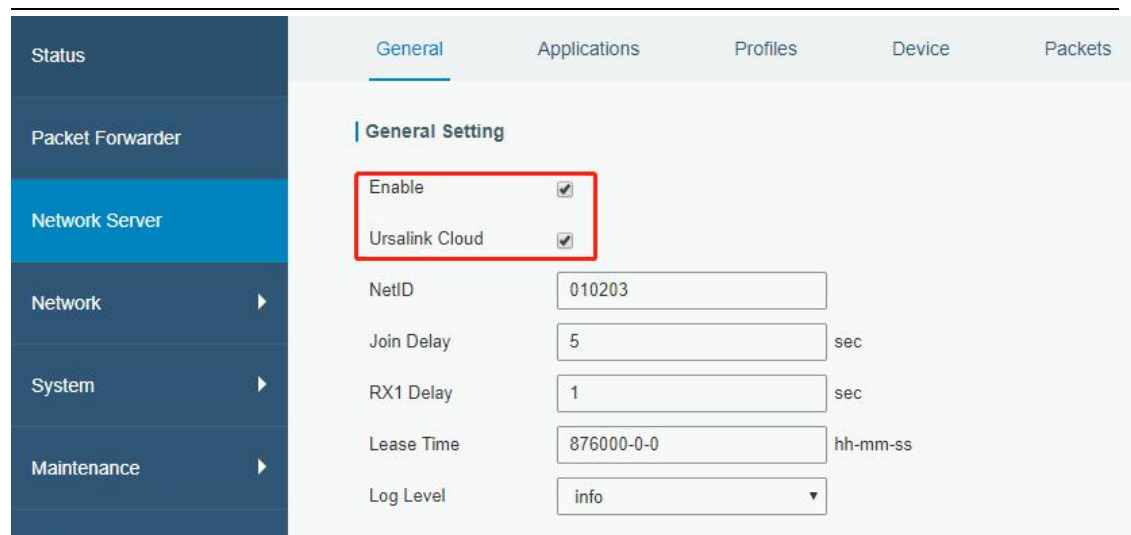
Section	Parameter	Value
Modem	Status	Ready
	Model	EC25
	Current SIM	SIM1
	Signal Level	31asu (-51dBm)
	Register Status	Registered (Home network)
	IMEI	861107032321490
	IMSI	460110269496240
	ICCID	89860317245923922835
	ISP	CHN-CT
	Network Type	LTE
	PLMN ID	46011
	LAC	5f02
	Cell ID	5fb0d34
Network	Status	Connected
	IP Address	172.21.143.187
	Netmask	255.255.255.248
	Gateway	172.21.143.188
	DNS	218.85.152.99
	Connection Duration	0 days, 00:01:39

### 3.2.3 Network Server Configuration

A. Go to “Packet Forwarder” → “General” page to enable the “Ursalink” type server.

ID	Enable	Type	Server Address	Operation
0	Enabled	Ursalink	localhost	[Edit] [Delete]
+				

B. Go to “Network Server” → “General” page to enable the network server and Ursalink Cloud mode.



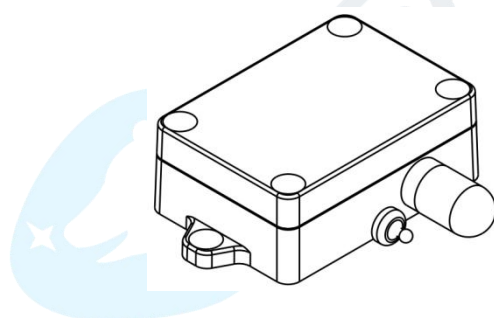
## 4. UC11-T1 Configuration

### 4.1 Turn ON/OFF UC11-T1


Place the magnet on the sign “U” about 2s to turn on/off UC11-T1.

Power on: Beep for 2 seconds

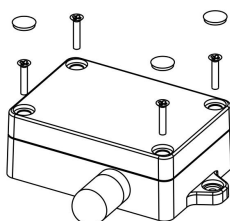
Power off: Beep for 6 seconds



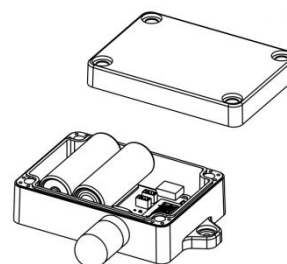
### 4.2 USB Configuration

 This chapter can be skipped if you don't need to change the basic settings of UC11-T1.

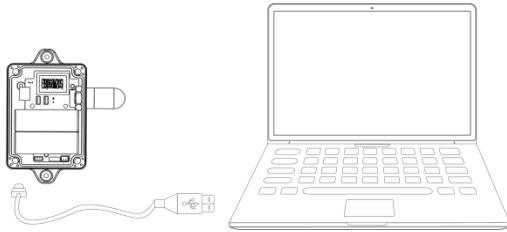
A. Remove the screw caps and unscrew the screws.



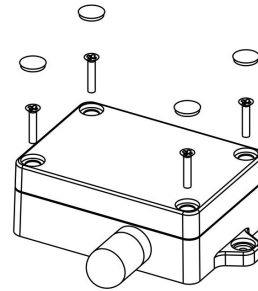
B. Take off the roof cover.



C. Connect UC11-T1 to Laptop with standard USB cable. Configure UC11-T1 via Ursalink Toolbox.



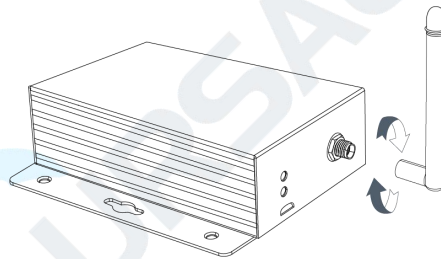
D. After configuration, put back the roof cover and screw the screws.



## 5. UC1114 Configuration

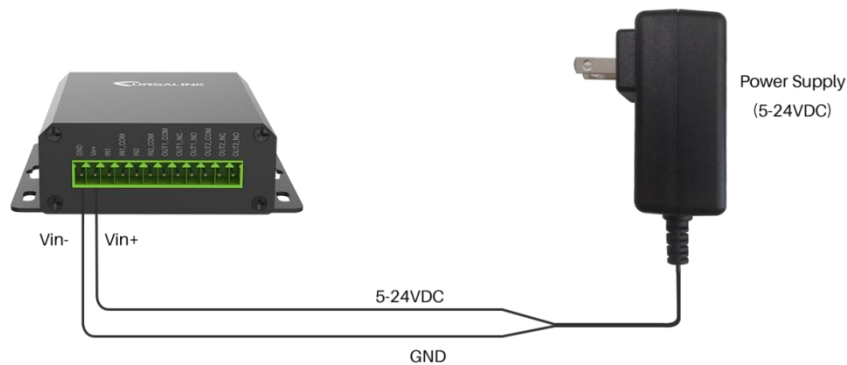
### 5.1 Antenna Installation

Rotate the antenna into the antenna connector accordingly.  
The external LoRa antenna should be installed vertically always on a site with a good signal.



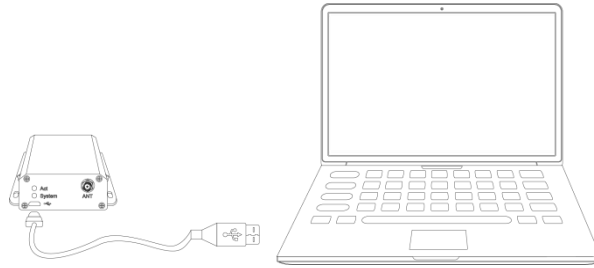
### 5.2 UC1114 Configuration

A. Power on the UC1114 via terminal block(VIN, GND).



B. Connect the terminal devices to digital input or reply output of the UC1114.

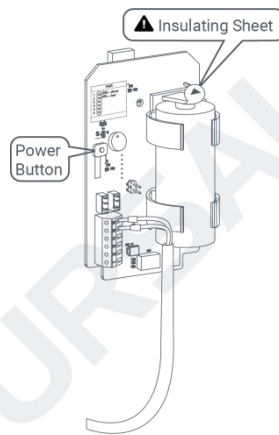
C. Connect UC1114 to computer via micro USB port and open the Toolbox to configure UC1114 if necessary.



## 6. EM500 Configuration

### 6.1 Turn on/off the Sensor

1. Take off the mounting bracket and waterproof case.
2. Pull out the insulating sheet on the side of the battery.



3. Hold on the power button to turn on/off the sensor as following actions:

Function	Action	LED Indication
Turn On	Press and hold the button for more than 3 seconds.	Off → <b>Static Green</b>
Turn Off	Press and hold the button for more than 3 seconds.	<b>Static Green</b> -> Off
Reset	Press and hold the button for more than 10 seconds. <b>Note:</b> EM500 will be switched on after reset.	Blink 3 times.
Check On/Off Status	Just a quick click.	<b>Light On:</b> Device is on.
		<b>Light Off:</b> Device is off.



EM500 sensors can be also powered on/off or reset by mobile APP or software as shown in Chapter 6.2.

## 6.2 EM500 Configuration

EM500 sensors can be configured by one of the following ways:

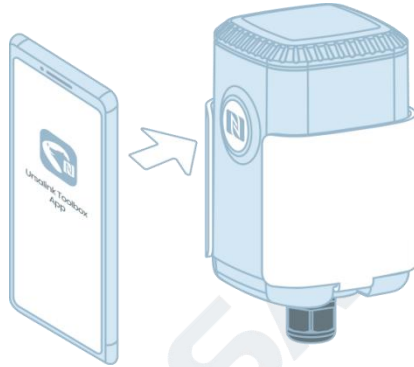
- Mobile APP (NFC);
- Windows Software (NFC or Type-C Port).

In order to ensure the security of the EM500 sensors, please type correct password to verify when changing the settings. Default password: **123456**.

### 6.2.1 Mobile APP Configuration

1. Enable NFC on the smartphone and open the APP "Toolbox".
2. Attach the smartphone with NFC area to the device.

**Note:** Ensure the location of your smartphone NFC area and it is recommended to take off phone case before using NFC.



3. Device information will be shown on the APP.
4. Switch the button of Device Status to turn on or off the device.


Status	Setting	Upgrade
SN	6126A13767160030	
Model	EM500-SMT-EC5-915	
Device EUI	24e124126a137671	
Firmware Version	V1.3	
Hardware Version	V1.1	
Device Status	ON	<input checked="" type="checkbox"/>
Join Status	Activated	
RSSI/SNR	-81/12	
Soil Moisture	22.0 %	
Battery	100 %	
Channel Mask	0000000000000ff00	
Uplink Frame Counter	792	

Read

Device
Template

5. Enter the correct password and wait a few seconds until APP shows "Operate Successful!".
6. Go to "Device" → "Settings" → "LoRaWAN Settings" to change the supported frequency and channels according to UG85 radio settings, then click "Write" to save the configurations. Frequency settings can be referred to [appendix](#).

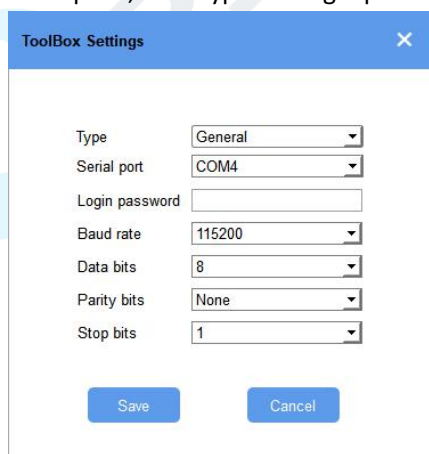
**Note:** Keep the two devices close together and do not move them in order that you can get the best connectivity as possible when turning on/off or writing configuration via NFC. No response can be caused by long distance, wrong location or rapid movement.



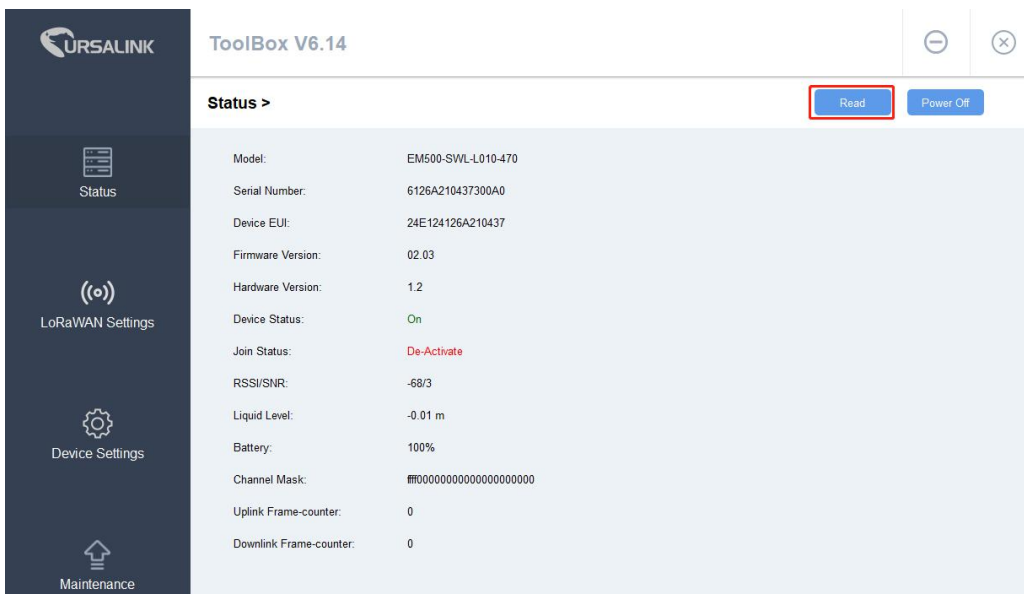
Index	Frequency/MHz
0 - 15	915.2 - 918.2
16 - 31	918.4 - 921.4
32 - 47	921.6 - 924.6
48 - 63	924.8 - 927.8

## 6.2.2 Windows Software Configuration

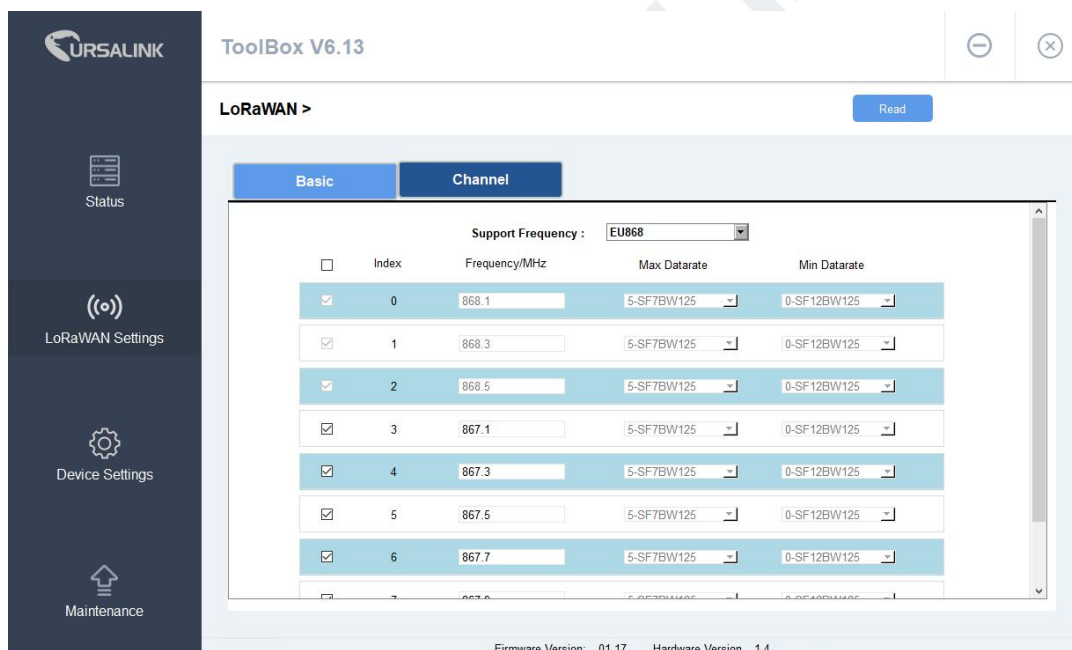
1. Open configure software “Ursalink Toolbox” on the computer.
2. Connect type-C USB to computer (Type-C port is inside the device).
3. Select type as General and serial port , then type the login password and click “save”.



4. Device information will be shown on the software.



5. Click “Power On” to turn on the device or “Power Off” to turn off the device.
6. Go to “LoRaWAN Settings”→”Channel” to change the supported frequency and channels according to UG85 radio settings, then save the configurations. Frequency settings can be referred to [appendix](#).



## 7. Ursalink Cloud Configuration

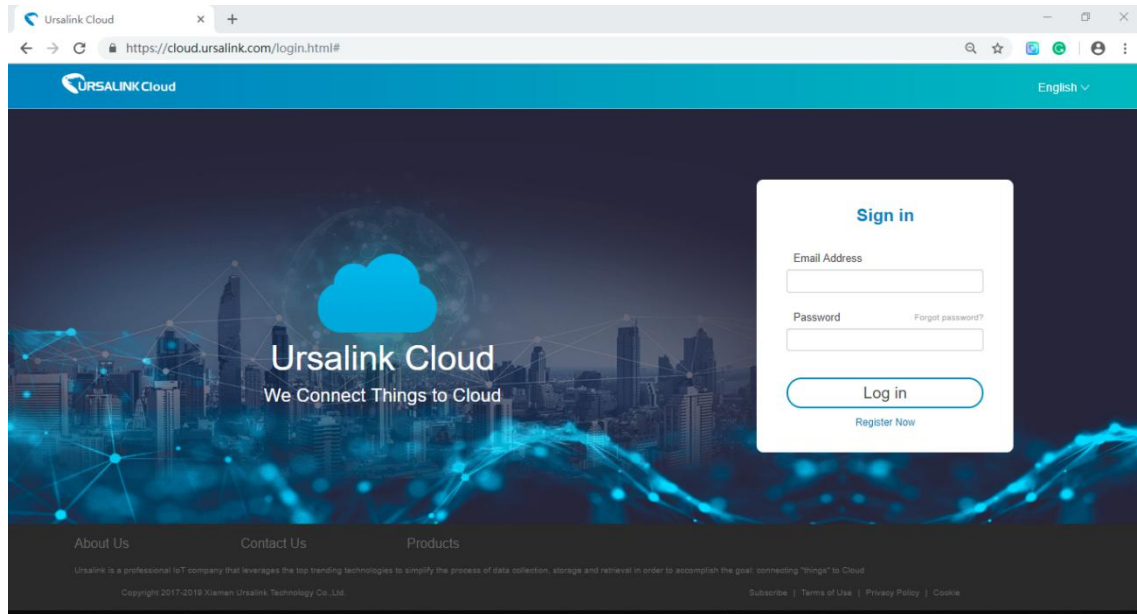
Ursalink cloud is a comprehensive platform that provides multiple services including device remote management and data visualization with the easiest operation procedures.

### 7.1 Ursalink Cloud Registration

Click “Register Now” to register the account as instructions and log in Ursalink Cloud.

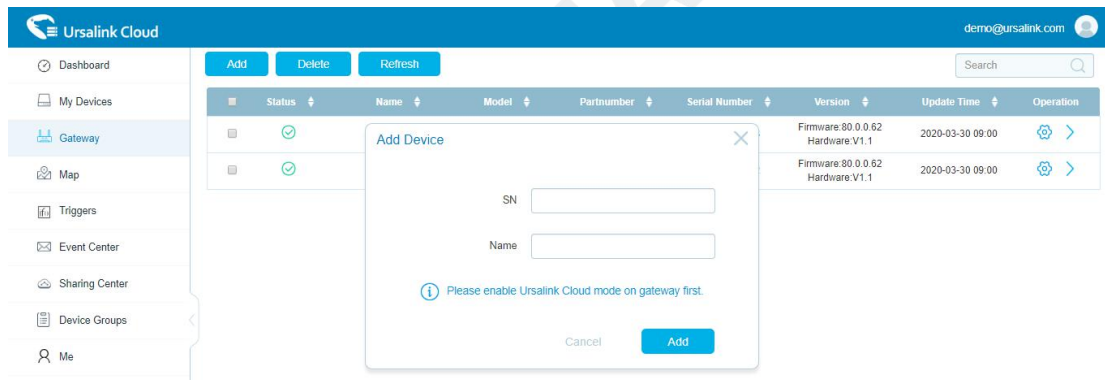


Ursalink Cloud URL: <https://cloud.ursalink.com/login.html>



## 7.2 Add a UG85 to Cloud

1. Go to “My Devices->Gateway” of Ursalink Cloud and click “Add” to add gateway to Ursalink Cloud via SN.



2. Check if gateway is online in Ursalink Cloud.



## 7.3 Add Ursalink LoRaWAN Nodes to Cloud

1. Go to “Device->My Devices” and click “Add Device”. Fill in the SN of LoRaWAN nodes and select associated gateway. You can also scan the QR code on the device label to add all devices via Ursalink Cloud APP.

Add Device ✕

SN

Name

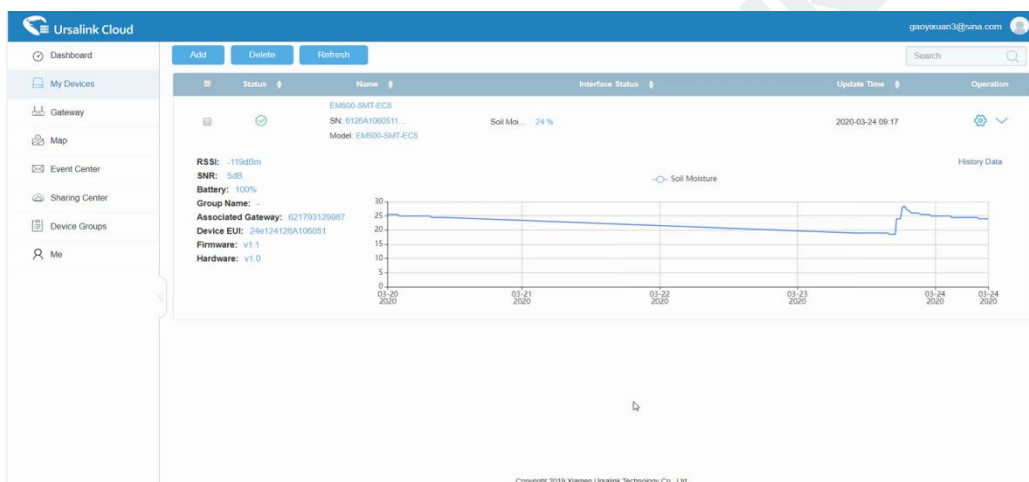
Associated Gateway

Device EUI

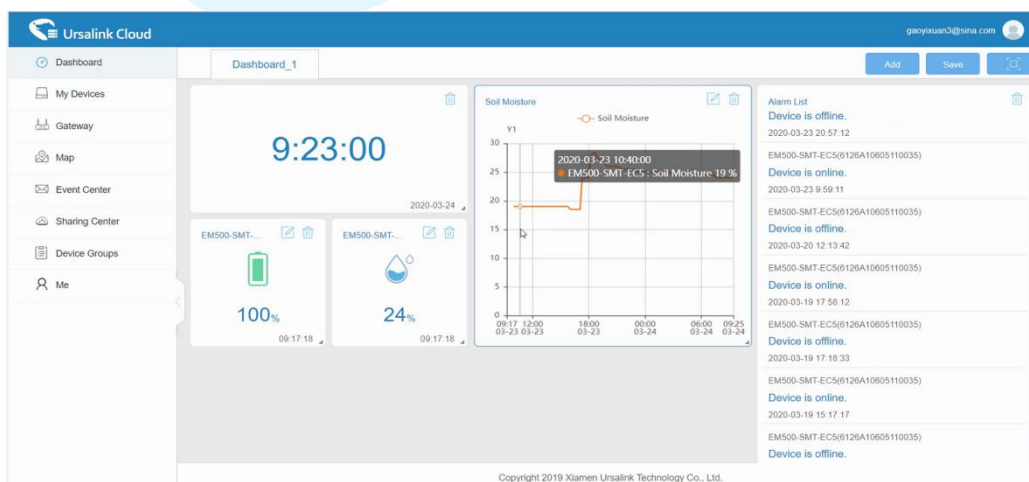
Application Key

Cancel
Add

2. After all nodes are connected to Ursalink Cloud, Click or "History Data" to check the data on Ursalink cloud.



3. Go to "Dashboard" page to add and edit the dashboard.




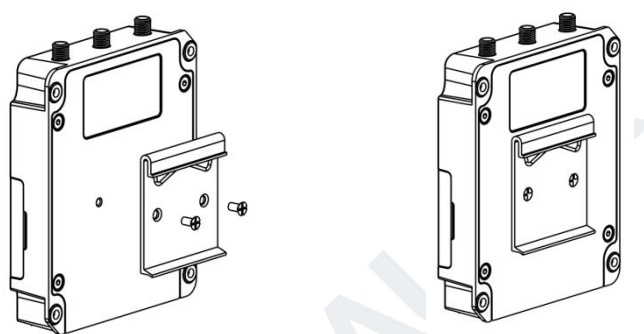
## 8. Hardware Installation

### 8.1 UG85 Installation

UG85 can be placed on a desktop or mounted onto a wall or a DIN rail. Please contact sales for wall mounting accessories before purchasing. This guide will introduce how to mount the gateway via DIN rail.

Use 2 pieces of M3 × 6 flat head Phillips screws to fix the DIN rail to the gateway, and then hang the DIN rail on the mounting bracket. It is necessary to choose a standard bracket.

 **Recommended torque for mounting is 1.0 N·m, and the maximum allowed is 1.2 N·m.**



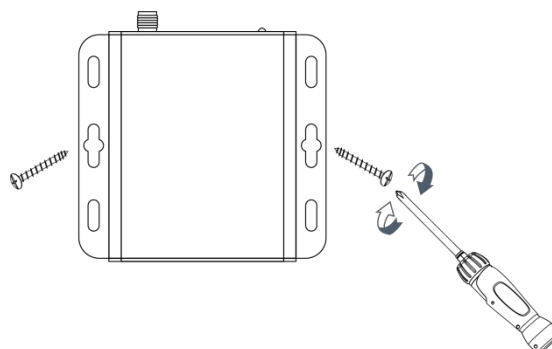
### 8.2 UC11-T1 Installation

Use 2 pcs of flat head Phillips screws to fix the UC11-T1 onto the wall mounting. After that, cover the screws with two screw caps.



### 8.3 UC1114 Installation

Use 2 pcs of flat head Phillips screws to fix the UC1114 onto the wall mounting.



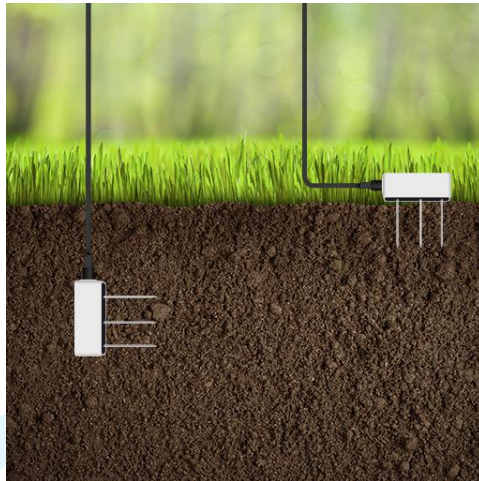
## 8.4 EM500 Installation

### 8.4.1 Sensor Installation

#### EM500-SMT-MEC20 Installation

**Quick Test:** Choose a suitable measurement place, and avoid rocks or other hard objects. Insert the sensor vertically into the soil. Do not rock the probe while inserting it. This method can only make a small range of measurements and needs multiple measurements to get the average value as calibration value.

**Underground Test:** Dig a pit of a certain depth vertically, and insert the sensor horizontally into the measured position, and then fill the pit. This method can measure and record value for a long time.

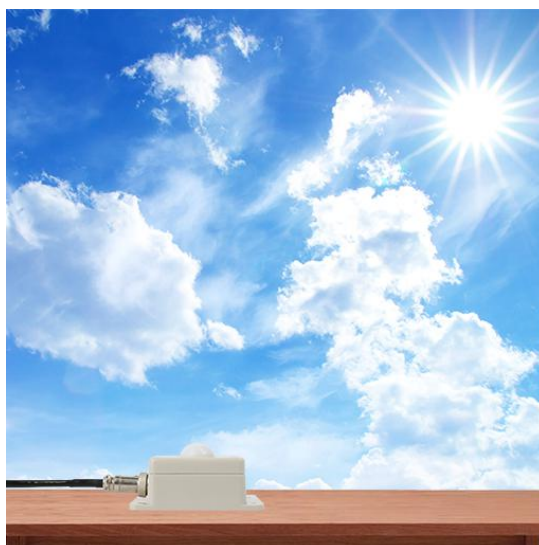


#### Installation Note:

- Abnormal data may show up if sensor prongs are exposed in the air.
- It is possible to get sticks, bark, roots or other material stuck between the sensor prongs, which will severely affect the sensor data readings. Any air gaps or excessive soil compaction around the sensor can also influence the readings.
- Do not install the sensor adjacent to large metal objects.
- Be careful when inserting the sensor into dense soil, as the prongs will break if excessive sideways force is used.
- When installing the sensor in a lightning prone area, please check your lightning protection.
- When removing the sensor from the soil, do not pull it out of the soil by the cable. Doing so may break internal connections and make the sensor unusable.

## EM500-LGT Installation

Be sure place the round area of the sensor always on top and always towards the sun while using it.



### 8.4.2 Transceiver Installation

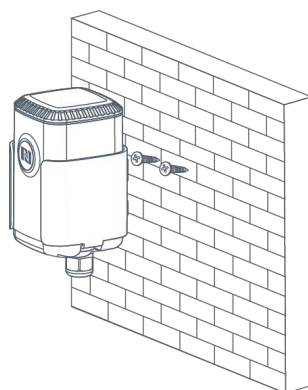
EM500 transceiver support wall, pole and DIN rail mounting. Please contact sales for DIN rail mounting accessories before purchasing it. This guide will introduce how to mount the sensor to wall or pole.

#### 8.4.2.1 Wall Mounting

1. Attach the mounting bracket to the wall and drill. (Around 16mm)

**Note:** The connecting line of two holes must be a horizontal line.

1. Mount the device on the wall.

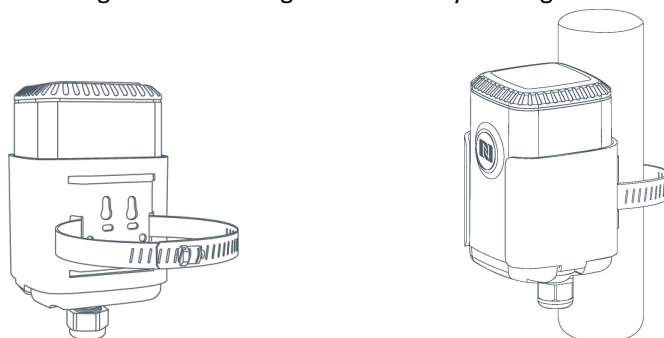


#### 8.4.2.2 Pole Mounting

1. Loosen the hose clamp by turning the locking mechanism counter-clockwise.



2. Straighten out the hose clamp and slide it through the rectangular holes in the mounting bracket, wrap the hose clamp around the pole.
3. Use a screwdriver to tighten the locking mechanism by turning it clockwise.



## Appendix

### Default Uplink Channels

Frequency	UG85	UC11-T1/UC1114/EM500 Sensors
EU433	433.175, 433.375, 433.575, 433.775, 434.065, 434.265, 434.465, 434.665	433.175, 433.375, 433.575
CN470	471.9, 472.1, 472.3, 472.5, 472.7, 472.9, 473.1, 473.3 (Channel 8~15)	470.3~489.3 (All 95 channels)
EU868	868.1, 868.3, 868.5, 867.1, 867.3, 867.5, 867.7, 867.9	868.1, 868.3, 868.5
IN865	865.0625, 865.4025, 865.6025, 865.985, 866.185, 866.385, 866.585, 866.785	865.0625, 865.4025, 865.6025
RU864	868.9, 869.1, 869.3, 867.3, 867.5, 867.7, 867.9, 868.1	868.9, 869.1
AU915	916.8, 917, 917.2, 917.4, 917.6, 917.8, 918, 918.2(Channel 8~15)	915.2~927.1 (All 72 channels)
US915	903.9, 904.1, 904.3, 904.5, 904.7, 904.9, 905.1, 905.3 (Channel 8~15)	902.3~914.2 (All 72 channels)
KR920	922.1, 922.3, 922.5, 922.7, 922.9, 923.1, 923.3, 923.5	922.1, 922.3, 922.5
AS923	923.2, 923.4, 922, 922.2, 922.4, 922.6, 922.8, 923	923.2, 923.4

## Default LoRaWAN Parameters

DevEUI	On the device label.
AppEUI	24E124C0002A0001 24E124C0002A0002 (UC1114)
Appport	0x55
NetID	0x010203
DevAddr	The 5 <sup>th</sup> to 12 <sup>th</sup> digits of SN e.g. SN = 61 26 a1 01 84 96 00 41 Then DevAddr = a1018496
AppKey	5572404c696e6b4c6f52613230313823
NwkSKey	5572404c696e6b4c6f52613230313823
AppSKey	5572404c696e6b4c6f52613230313823

**-END-**

