

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



Xiamen Ursalink Technology Co., Ltd.



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

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Contents

1. Overview	4
1.1 Description	4
1.2 Topology	4
2. Introduction	4
2.1 Packing List	4
2.2 Software Preparation	5
3. UG85 Gateway Configuration	6
3.1 SIM Card/Antenna Installation	6
3.2 Web GUI Configuration	6
3.2.1 Login the Web GUI	6
3.2.2 Network Connection	8
3.2.3 Network Server Configuration	10
4. UC11-T1 Configuration	11
4.1 Turn ON/OFF UC11-T1	11
4.2 USB Configuration	11
5. UC1114 Configuration	12
5.1 Antenna Installation	12
5.2 UC1114 Configuration	12
6. EM500 Configuration	13
6.1 Turn on/off the Sensor	13
6.2 EM500 Configuration	14
6.2.1 Mobile APP Configuration	14
6.2.2 Windows Software Configuration	15
7. Ursalink Cloud Configuration	16
7.1 Ursalink Cloud Registration	16
7.2 Add a UG85 to Cloud	17
7.3 Add Ursalink LoRaWAN Nodes to Cloud	17
8. Hardware Installation	19
8.1 UG85 Installation	19
8.2 UC11-T1 Installation	19
8.3 UC1114 Installation	19
8.4 EM500 Installation	20
8.4.1 Sensor Installation	20
8.4.2 Transceiver Installation	21
Appendix	22
Default Uplink Channels	22
Default LoRaWAN Parameters	23



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







- 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
	Windows software for NEC/USP	UC11-T1,	https://www.ursalink.
Ursalink Toolbox	configuration	UC1114, EM500	<u>com/en/software-do</u>
	configuration.	sensors	wnload/
Ursalink Toolbox	Mobile APP for NFC	EN/EQQ concorr	Apple Store or
(APP ver.)	configuration.	EIVIDUU SEIISUIS	Google Play
Ursalink Cloud	Add and manage the LoRaWAN	Linealink Claud	Apple Store or
(APP ver.)	nodes on the Ursalink Cloud.		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" \rightarrow "Network and Internet" \rightarrow "Network and Sharing Center" of the PC and click "Ethernet".



Network and Sharing Center			- 0
→ × ↑ 🛂 « Network	and Internet > Network and Sharing Center	ٽ ~	Search Control Panel
Control Panel Home	View your basic network information	n and set up o	connections
	View your active networks		
Change adapter settings Change advanced sharing settings	Yeastar5G Private network	Access to HomeGr Connect	ype: Internet roup: Ready to create iions: M Wi-Fi (Yeastar5G)
	ldentifying	Access t Connect	ype: No network access ions: Q <u>Ethernet</u>
	Change your networking settings		
	Set up a new connection or network Set up a broadband, dial-up, or VPN of	connection; «	Ethernet
	Troubleshoot problems	ar, or get troubler	hosting information
See also			
HomeGroup			
Infrared			
Internet Options			
Windows Firewall			

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

Internet Protocol version 4 (ICP)	(IPv4) Properties 2
General	
You can get IP settings assigned this capability. Otherwise, you n for the appropriate IP settings.	automatically if your network supports eed to ask your network administrator
O Obtain an IP address auton	natically
• Use the following IP addres	s:
IP address:	192 . 168 . 23 . 200
Subnet mask:	255 . 255 . 255 . 0
Default gateway:	192 . 168 . 23 . 150
Obtain DNS server address	automatically
• Use the following DNS serve	er addresses:
Preferred DNS server:	8.8.8.8
Alternative DNS server:	
	Advanced

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.

- On Section		
← → C ① Not	secure 192.168.23.150/login.html	☆ (8)
		English



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" \rightarrow "Interface" \rightarrow "Port" page to select the connection type and configure WAN information.

Pon_1		
Enable	Ø	
Port	GE 0	
Connection Type	Static IP 🔹	
IP Address	192.168.22.229	
Netmask	255.255.255.0	
Gateway	192.168.22.1	
MTU	1500	
Primary DNS Server	8.8.8.8	
Secondary DNS Server	114.114.114.114	
Enable NAT		
Multiple ID Address		

B. Click "Save&Apply" for configuration to take effect.

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" \rightarrow "Network" to check Ethernet port status.

Status	Overview	Pa	cket Forward	Cellular	Network	VPN	Host List	
Packet Forwarder	WAN							
	Port	Status	Туре	IP Address	Netmask	Gateway	DNS	Duration
Network Server	CEO		Ctatio	103 169 33 330	255 255 255 0	102 169 22 1	0000	03h 01m
Network	GEU	up	Static	152.100.22.225	200.200.200.0	192.100.22.1	0.0.0.0	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" \rightarrow "Interface" \rightarrow "Cellular" \rightarrow "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.

Status	Port Cellular	Loopback	
Packet Forwarder	Centrar Setting	SIM1	SIM2
Network Server	Enable		
Network 👻	APN		Auto
Interface	Username Password		
Firewall	Access Number		
QoS	PIN Code		
DHCP	Authentication Type	Auto 🗸	Auto 🗸
DDNS	SMS Center		
Link Failover	Connection Setting		
VPN	Dual SIM Strategy Enable NAT		
System	Restart When Dial-up failed		
Industrial	ICMP Server Secondary ICMP Server	8.8.8.8	
	ICMP Detection Max Retries	3	
Maintenance	ICMP Detection Timeout	5	3
· · · · · · · · · · · · · · · · · · ·	ICMP Detection Interval	15	3

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" \rightarrow "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.

LoRaWAN Agricultural Kit Quick Guide



Status		Overview	LoRa	Cellular	Network	VPN
LoRaWAN	•	Modem				
		Status		Ready		
Network	•	Model		EC25		
System		Current SIM		SIM1		
System		Signal Level		31asu (-51dl	3m)	
Industrial	•	Register Status		Registered (Home network)	
		IMEI		8611070323	21490	
Maintenance	•	IMSI		4601102694	96240	
ΔΡΡ		ICCID		8986031724	5923922835	
		ISP		CHN-CT		
		Network Type		LTE		
		PLMN ID		46011		
		LAC		5f02		
		Cell ID		5fb0d34		
		Network				
		Status		Connected	Connec	ted
		IP Address		172.21.143.1	187	
		Netmask		255.255.255	.248	
		Gateway		172.21.143.1	188	
		DNS		218.85.152.9	99	
		Connection Duration	ı	0 days, 00:0	1:39	

3.2.3 Network Server Configuration

A. Go to "Packet Forwarder" \rightarrow "General" page to enable the "Ursalink" type server.

Status		General	Radios	Advanced	(Custom	Traffic	
Packet Forwarder		General Setting						
Network Server		Gateway EUI Gateway ID	24E124FFF					
Network	Þ	Frequency-Sync	Disabled		•			
System	۲	Multi-Destination						
Maintananaa		ID	1	Enable		Туре	Server Address	Operation
Maintenance		0		Enabled		Ursalin <mark>k</mark>	localhost	
APP								H
		Save & Apply						

B. Go to "Network Server" \rightarrow "General" page to enable the network server and Ursalink Cloud mode.

LoRaWAN Agricultural Kit Quick Guide



Status	General	Applications	Profiles	Device	Packets
Packet Forwarder	General Settin	g			
Network Server	Enable Ursalink Cloud	×			
Network 🕨	NetID	010203			
	Join Delay	5		sec	
System 🕨	RX1 Delay	1		sec	
Maintananco	Lease Time	876000-0-0		hh-mm-ss	
Maintenance	Log Level	info	•		

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		
Turn On	3 seconds.		
Turp Off	Press and hold the button for more than	Static Groop > Off	
	3 seconds.		
	Press and hold the button for more than		
Reset	10 seconds.	Blink 3 times.	
	Note: EM500 will be switched on after reset.		
Chack On Off Status	luct a quick click	Light On: Device is on.	
CHECK ON/ON Status	JUST & YUICK CIICK.	Light Off: 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 verity 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.

SN	6126A13767	160030
Model	EM500-SMT-E	C5-915
Device EUI	24e124126a	137671
Firmware Version		V1.3
Hardware Version		V1.1
Device Status	ON	
Join Status	A	ctivated
RSSI/SNR		-81/12
Soil Moisture		22.0 %
Battery		100 %
Channel Mask	00000000000	000ff00
Uplink Frame Counter		792
	Read	

5. Enter the correct password and wait a few seconds until APP shows "Operate Successful!".

6. Go to "Device" \rightarrow "Settings" \rightarrow "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 <u>appendix</u>.



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.

* Support Frequer	ісу	
AU915		*
Enable Channel In	dex (1)	
8-15		
Index	Freque	ency/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
	Write	
Device		Template

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".

Type	General	-
Serial port	COM4	
Login passwo	rd	
Baud rate	115200	-
Data bits	8	-
Parity bits	None	-
Stop bits	1	•

4. Device information will be shown on the software.

LoRaWAN Agricultural Kit Quick Guide



	ToolBox V6.14			Θ	\otimes
	Status >		Read	Power Off	
	Model:	EM500-SWL-L010-470			
Status	Serial Number:	6126A210437300A0			
	Device EUI:	24E124126A210437			
	Firmware Version:	02.03			
((0))	Hardware Version:	1.2			
LoRaWAN Settings	Device Status:	On			
	Join Status:	De-Activate			
	RSSI/SNR:	-68/3			
හි	Liquid Level:	-0.01 m			
ۍين Device Settings	Battery:	100%			
	Channel Mask:	fff00000000000000000000000000000000000			
	Uplink Frame-counter:	0			
Maintenance	Downlink Frame-counter:	0			

5. Click "Power On" to turn on the device or "Power Off" to turn off the device.

6. Go to "LoRaWAN Settings" \rightarrow "Channel" to change the supported frequency and channels according to UG85 radio settings, then save the configurations. Frequency settings can be referred to <u>appendix</u>.

	ToolBox V6.		Θ	\otimes			
	LoRaWAN >				Read		
Status	Basic		Channel				
			Support Frequency :	EU868			
		Index	Frequency/MHz	Max Datarate	Min Datarate		
((0))		0	868.1	5-SF7BW125 _	0-SF12BW125 _		
LoRaWAN Settings		1	868.3	5-SF7BW125 -	0-SF12BW125 -		
		2	868.5	5-SF7BW125 _	0-SF12BW125		
හ		3	867.1	5-SF7BW125 -	0-SF12BW125 *		
کیک Device Settings		4	867.3	5-SF7BW125 🗾	0-SF12BW125 _		
		5	867.5	5-SF7BW125 *	0-SF12BW125 _		
~		6	867.7	5-SF7BW125 🗾	0-SF12BW125		
¥		-	007.0	r or touring -1	0.0E40D14405 -1		~
Maintenance			Firmware Version	01 17 Hardware Version 1	4		

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.

Salink Cloud				demo@u	rsalink.com 🧕
② Dashboard	Add Delete Refresh			Search	Q
My Devices	🔳 Status 🖨 Name 🖨	Model 💠 Partnumber 💠	Serial Number 👙	Version 💠 Update Time 🖨	Operation
La Gateway	Add Devi	ice	× Fim	nware:80.0.0.62 2020-03-30 09:00 lardware:V1.1	@ >
🖄 Мар			Fim	nware:80.0.0.62 2020-03-30 09:00 lardware:V1.1	(a) >
if. Triggers		SN			
Event Center		Name			
Sharing Center	0	Please enable Ursalink Cloud mode on gatew	ay first.		
E Device Groups		_			
A Me		Cancel	Add		

2. Check if gateway is online in Ursalink Cloud.

② Dashboard	Add	Delete	Refresh					Search	
My Devices	=	Status 🔶	Name 🖨	Model 🔶	Partnumber 🍦	Serial Number 🌢	Version 🝦	Update Time	Operation
La Gateway		\odot	231	UG85-L00E- EU868	L00E-EU868	621790101000	Firmware:80.0.0.62 Hardware:V1.1	2020-03-30 09:00	@ >
🖄 Мар		\odot	621793195782	UG85-L01CE- CN470	L01CE-CN470	62175***	Firmware:80.0.0.62 Hardware:V1.1	2020-03-30 09:00	@ >
if Triggers									

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.





SN	6127
Name	
Associated Gateway	231 (6217*******)
Device EUI	24e1241277
Application Key	5572404c696e6b4c6f526132303138

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

on Ursalink cloud.

Ursalink Cloud						iyixuan3@sina.com 🧃
③ Dashboard	Add Delete Re	trosh			Se	arch Q
My Devices	🔳 Status 🋊	Name Ø	Interf	ace Status 🕴	Update Time 🏼 🏼 🏼 🌢	Operation
dateway	. 0	EM500-SMT-EC5 SN: 6126A1060511	Soil Moi 24 %		2020-03-24 09:17	@ ~
🔄 Мар		Model: EM500-SMT-EC5				
S Event Center	R\$SI: -119dBm SNR: 5dB			-O- Soil Moisture		History Data
Sharing Center	Battery: 100% Group Name:	30 1			A	
Device Groups	Associated Gateway: 621793129 Device EUI: 24e124126A106051	987 25 20 -				
R Me	Firmware: v1.1 Hardware: v1.0	15 - 10 - 5 -				
		0 03-20 2020	03-21 2020	03-22 2020	03-23 2020	03-24 03-24 2020 2020
				Q.		
			Copyright 2019 Xiamen U	rsalink Technology Co. Ltd.		

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

Salink Cloud				gaoyixuan3@sina.com 🧕
Ø Dashboard	Dashboard_1			Add Save 🔲
My Devices		Û	Soil Moisture	Alarm List Device is offline. 2020-03-23 20 57 12
 ☑ Map ☑ Event Center 	9:23	:00	30 2020-03-23 10:40:00 25 EM500-SMT-EC5 : Soil Moisture 19 %	EM500-SNT-EC5(6126A10605110035) Device is online. 2020-03-23 9:59:11
Sharing Center Device Groups	ем500-SMT 🗹 💼	2020-03-24 , EM500-SMT 🗹 🛍	15	EM500-SNT-EC5(8126A10805110035) Device is offline. 2020-03-20 12:13:42
A We		○ °	5	EM500-SNT-EC5(6126A10605110035) Device is online. 2020-03-19 17 58 12
	09:17:18	24% 09:17:18 」	09-17 12:00 18:00 00:00 06:00 09:2 03-23 03-23 03-23 03-24 03-24 03-2	5 EM500-SNT-EC5(6126A10605110035) Device is offline. 2020-03-19 17.18.33
				EM500-SMT-EC5(6126A10605110035) Device is online. 2020-03-19 15 17-17
				EM500-SMT-EC5(6126A10605110035) Device is offline.



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 \times 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
	433.175, 433.375, 433.575,	<i>v</i>
EU433	433.775, 434.065, 434.265, 434.465,	433.175, 433.375, 433.575
	434.665	
CN470	471.9, 472.1, 472.3, 472.5, 472.7,472.9,	470.3~489.3
CN470	473.1, 473.3 (Channel 8~15)	(All 95 channels)
ELIOCO	868.1, 868.3, 868.5,	060 1 060 2 060 E
E0808	867.1, 867.3, 867.5, 867.7, 867.9	808.1, 808.3, 808.3
	865.0625, 865.4025, 865.6025,	
IN865	865.985, 866.185, 866.385, 866.585,	865.0625, 865.4025, 865.6025
	866.785	
DURCA	868.9, 869.1,	868 0 860 1
KU804	869.3, 867.3, 867.5, 867.7, 867.9, 868.1	808.9, 809.1
AU015	916.8, 917, 917.2, 917.4, 917.6, 917.8, 918,	915.2~927.1
AU915	918.2(Channel 8~15)	(All 72 channels)
	903.9, 904.1, 904.3, 904.5, 904.7,	902.3~914.2
03915	904.9,905.1, 905.3 (Channel 8~15)	(All 72 channels)
KDOOO	922.1, 922.3, 922.5,	
KK920	922.7, 922.9, 923.1, 923.3, 923.5	922.1, 922.3, 922.3
45022	923.2, 923.4,	022.2.022.4
A3923	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 th to 12 th digits of SN
	e.g. SN = 61 26 a1 01 84 96 00 41
	Then DevAddr = a1018496
АррКеу	5572404c696e6b4c6f52613230313823
NwkSKey	5572404c696e6b4c6f52613230313823
AppSKey	5572404c696e6b4c6f52613230313823

-END-