

# LoRaWAN<sup>®</sup> Agricultural Monitoring Node-to App Start Kit

Quick Guide



# **Safety Precautions**

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

- $\Leftrightarrow$ The kit must not be remodeled in any way.
- \* EM300/EM500 are not intended to be used as reference sensors, and Milesight will not take responsibility for any damage which may result from inaccurate readings.
- \* Do not place 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 the wrong model.
- Make sure both batteries of EM300 are newest when install, or battery life will be \* reduced.
- $\dot{\mathbf{v}}$ The kit must never be subjected to shocks or impacts.

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Jul. 27, 2020	V 1.0	Initial Version
Dec. 8, 2020	V 2.0	Replace UC11-T1/UG85 with EM300-TH/UG65
June 10, 2021	V 3.0	Replace UC1114 with UC511
Dec. 9, 2021	V 3.1	Delete EM300 Type-C Port
Sept. 29, 2022	V 3.2	Replace UC511 V1 to UC511 V2

#### **Revision History**

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Milesight Mile

# 1. Overview

Milesight LoRaWAN<sup>®</sup> Agricultural Monitoring Node-to-App Starter Kit is designed for simplifying the process of PoC about LoRaWAN<sup>®</sup> network establishment and remote monitoring for the agricultural environment. More information about every product is available on Milesight IoT website.



# 2. Preparation

# 2.1 Packing List

UG65



#### EM300-TH





- 1 × EM300-TH
- Wall Mounting Kits

#### **EM500 Series**









1 ×

EM500-SMTC

1 × EM500-LGT **Mounting Screws** 

**Hose Clamps** 

UC511









1 × U511 Device

2 × Data Cables (30 cm)

1 × Mounting Bracket

Wall Mounting Kits



2 × Hose Clamps

1 × Fixing Screw

**Note:** Please contact your sales representative if the following situations occur:

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

# 2.2 Software Preparation

Software	Introduction	Appliance	Download
Milosight	Windowo ooftwara far	EM300/EM500	https://www.milesigh
Toolbox		sensors, UC500	<u>t-iot.com/software-do</u>
x001001	NFC/03B configuration.	Controllers	<u>wnload/</u>
Milesight	Mobile APP for NFC	EM300/EM500	Apple Store or Google

Toolbox	configuration.	sensors, UC500	Play
(APP ver.)		Controllers	
Milesight IoT	Add and manage the	Milogiaht IoT	Apple Store or Coogle
Cloud	LoRaWAN <sup>®</sup> nodes on the	Cloud	
(APP ver.)	Milesight IoT Cloud.	Ciouu	Pidy

# 3. Gateway Configuration

# **3.1 Fitting Installation**

**Step 1:** Insert the SIM card into the device according to the direction icon on the device. If you need to take out the SIM card, press into the SIM card and it will pop up automatically.



Note: UG65 does not support hot-plugging (also called hot swapping). please turn off the power before you insert or take off SIM cards.

**Step 2:** Install the power cable and Ethernet cable accordingly. After connecting the Ethernet cable and power cable to corresponding interfaces, you can pass them through the waterproof silicone and slide them into the grooves. Then screw the protective cover back to the device.



Step 3: Install the external antenna if necessary.



# 3.2 Web GUI Access

If this is the first time you configure the gateway, please use the default settings below: ETH IP Address: 192.168.23.150 Wi-Fi IP Address: 192.168.1.1 Wi-Fi AP: Gateway\_\*\*\*\*\*\* Username: admin Password: password Browser: Chrome (recommended)

Here are 2 ways to access the web GUI:

- Wireless Mode: Enable Wireless Network Connection on your computer and search for access point "Gateway\_\*\*\*\*\*\*" to connect it. After connected, type 192.168.1.1 to your Internet browser to log in the web GUI.
- Wired Mode: Connect the Ethernet port of UG6x to your computer and configure the • IP address of computer manually, then type 192.168.23.150 to your browser to log in the web GUI. Here are the steps of configuring computer IP address manually based on the Windows 10 system.

Step 1: Go to "Control Panel" → "Network and Internet" → "Network and Sharing Center", then click "Ethernet" (May have different names).



Step 2: Go to "Properties" → "Internet Protocol Version 4(TCP/IPv4) "and select "Use the following IP address", then assign a static IP manually within the same subnet of UG65.

	Pv4) Properties
eneral	
You can get IP settings assigned a this capability. Otherwise, you ne for the appropriate IP settings.	automatically if your network supports ed to ask your network administrator
O Obtain an IP address automa	atically
• Use the following IP address	
IP address:	192 . 168 . 23 . 200
Subnet mask:	255 . 255 . 255 . 0
Default gateway:	192 . 168 . 23 . 150
Obtain DNS server address a	automatically
• Use the following DNS server	r addresses:
Preferred DNS server:	8.8.8.8
Alternative DNS server:	a a .
Validate settings upon exit	Advanced

# **3.3 Network Connection**

This section explains how to connect the gateway to network via WAN connection or cellular.

### **3.3.1 Configure the WAN Connection**

Step 1: Go to "Network"→ "Interface" → "Port" page to select the connection type and configure Ethernet port information.

Step 2: Connect Ethernet port of gateway to devices like router or modem.

ort WLAN	Cellular Loopback		
- Port_1			
Enable			
Port	eth 0		
Connection Type	Static IP	~	
IP Address	192.168.23.64		
Netmask	255.255.255.0		
Gateway	192.168.23.1		
MTU	1500		
Primary DNS Server	8.8.8.8		
Secondary DNS Server	114.114.114.114		
Enable NAT			
Multiple IP Address			
IP Add	ress	Netmask	Operation

## 3.3.2 Configure the Cellular Connection

Step 1: Go to "Network"  $\rightarrow$  "Interface"  $\rightarrow$  "Cellular"  $\rightarrow$  "Cellular Setting" page to enable cellular settings and fill in SIM card information like APN or PIN code.

Port	WLAN	Cellular	Loopback
Cellular S	etting		
Enable			
Network Ty	pe	Auto	~
APN			
Username			
Password			
Access Nu	mber		
PIN Code			
Authenticat	tion Type	Auto	~
Roaming			
SMS Cente	ər		
Connectio	n Setting		
Enable NA	т		

**Step 2:** Go to "Status"  $\rightarrow$  "Cellular" page to view the status of the cellular connection. If it shows "Connected", it means the SIM has dialed up successfully. On the other hand, you can check the status of LTE indicator. If it keeps on light statically, it means SIM has dialed up successfully.

Overview	Packet Forward	Cellular	Network	WLAN
Modem				
Status		Ready		
Model		EC25		
Version		EC25ECGAR06A07M	1G	
Signal Level		23asu (-67dBm)		
Register Status		Registered (Home net	work)	
IMEI		860425047368939		
IMSI		460019425301842		
ICCID		898601178380099341	20	
ISP		CHN-UNICOM		
Network Type		LTE		
PLMN ID				
LAC		5922		
Cell ID		340db83		
Network				
Status		Connected		
IP Address		10.132.132.59		
Netmask		255.255.255.240		
Gateway		10.132.132.60		

# **3.4 LoRaWAN Configuration**

**Step 1:** Go to "Packet Forwarder"  $\rightarrow$  "General" page to enable the embedded NS.

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		IU.	25	IVI
01	nτ	lQ	es	M

Status	General	Radios	Advanced	Custom	Traffic	
Packet Forwarder	General Setting					
Network Server	Gateway EUI Gateway ID	24E124FFF				
Network •	Frequency-Sync	Disabled	•	<b>~</b>		
System	Multi-Destination					
Maintenance >			Enable Enabled	Type Milesight	Server Address	Operation
арр 🕨			49.429.5249	29007500 <b>9</b> 200		0

Step 2: Go to "Packet Forwarder"  $\rightarrow$  "Radios" page to select the correct antenna type and frequency channels.

Status	General	Radios	Advanced	Custom	Traffic
Packet Forwarder	Antenna Type				
Network Server		Inter	nal Antenna		External Antenna
Network					
System 🕨					
Maintenance			•		·
APP 🕨					
	Radio Channel S	Setting			
	Supported Freq			EU868	~

Step 3: Go to "Network Server" → "General" page to enable the network server and Milesight IoT Cloud mode.

Status	General	Applications	Profiles	Device	Gateways
Packet Forwarder	General Settin	g			
Network Server	Enable Milesight IoT CI	oud 🔽			
Network 🕨	NetID	010203		]	
	Join Delay	5		sec	
System 🕨	RX1 Delay	1		sec	
Maintenance	Lease Time	8760-0-0		hh-mm-ss	
	Log Level	info	~	]	

#### **Sensors & Controllers Configuration** 4.

# 4.1 EM500 Assembly

Follow the steps below to connect light and soil sensor cables to EM500 transceiver if they are separated.

Step 1: Take off the mounting bracket, remove the cap, rubber seal and the screws on the bottom of the device, and then take off the enclosure cover.



Step 2: Pass the sensor cable through the cap, rubber seal and enclosure cover and lock the wires to the motherboard accordingly (see the label on the motherboard or following picture).

Note: The green wire of EM500-SMTC is used for debugging please keep it stay disconnected.



Step 3: Pull out the insulating sheet on the side of the battery.



**Step 4:** Put the motherboard back and restore everything in its due position.

## 4.2 Software Configuration

EM300/EM500/UC511 nodes can be configured by one of the following ways:

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

In order to ensure the security of these devices, please type the correct password to verity when changing the settings. Default password: **123456**.

#### 4.2.1 Mobile App Configuration

**Step 1:** Enable NFC on the smartphone and open the APP "Toolbox", then 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 the phone case before using NFC.



**Step 2:** Switch the button of Device Status to turn on or off the device, then attach the smartphone with NFC area to the device until the APP shows a successful prompt.

≡ EM30	00-SLD-47	70M
SN	61364	34715402206
Model	EM	300-SLD-470M
Device EUI	24e12	24136a347154
Firmware Version	1	V1.11
Hardware Versio	n	V2.0
Device Status		Off 🕕
Device Status		Off

**Step 3:** Go to "Device"  $\rightarrow$  "Settings"  $\rightarrow$  "LoRaWAN Settings" to change the supported frequency and channels according to UG65 radio settings, then click "Write" to save the configurations. Frequency settings can be referred to <u>appendix</u>.

* Support Frequ	iency		
AU915			*
Enable Channel	Index (1)		
8-15			
Index	Freque	ncy/MHz	1
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		

**Step 4:** Configure other parameters like reporting interval and alarms.

# 4.2.2 Windows Software Configuration

**Step 1:** Open the case and connect the devices to a computer via Type-C port or TTL port.



**Step 2:** Open Toolbox, select type as "General" and click password to log in Toolbox. (Default password: 123456)

General	-
COM4	•
rd	
115200	<b>_</b>
8	-
None	<u>_</u>
1	-
	General   COM4   115200   8   None   1



	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
ත	Liquid Level:	-0.01 m
ہے۔ Device Settings	Battery:	100%
	Channel Mask:	##0000000000000000000
	Uplink Frame-counter:	0
Maintenance	Downlink Frame-counter:	0

**Step 4:** Go to "LoRaWAN Settings"  $\rightarrow$  "Channel" to change the supported frequency and channels according to UG65 radio settings, then save the configurations. Frequency settings can be referred to <u>appendix</u>.

	LoRaWAN >				Read
Status	Basic		Channel		
		Index	Support Frequency : Frequency/MHz	EU868 💌	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
63		3	867.1	5-SF7BW125 <u>*</u>	0-SF12BW125
کی Device Settings		4	867.3	5-SF7BW125 🗾	0-SF12BW125
		5	867.5	5-SF7BW125 💌	0-SF12BW125
~		6	867.7	5-SF7BW125 *	0-SF12BW125
딸 Maintenance		-	0.7.0	c. 057014405 -1	o or toputtor -1
			-		

Step 5: Configure other parameters like reporting interval and alarms.

# 5. Milesight IoT Cloud Configuration

Milesight IoT Cloud is a comprehensive platform that provides multiple services including device remote management and data visualization with the easiest operation procedures. Please register a Milesight IoT Cloud account before operating the following steps: cloud.milesight-iot.com.

**Step 1:** Go to "My Devices" page and click "+New Devices" to add gateway to Milesight IoT Cloud via SN. Gateway will be added under "Gateways" menu.

② Dashboard	Devic	es	Gate	ways	History	+				
My Devices	Sear	sh	٩		Normal 1	🛱 Alarm 1	M Offline 1	⊗ Inactive 3		+ New Devices
🖄 Мар			-	Add Device				×		
0 Triggers		$\otimes$	具头设备-EN 6136A39023						i.	@ M @
B Reports		$\otimes$	UC3X52-虚 61151109	* SN:				sociated with your	-	@ M ()
Event Center 30		]u/	UC3X5	* Name :					15 minutes and	(a) las (a)
Sharing Center		DUDĄ	6123A124						15 minutes ago	
λ Me		当	AM102- 6128A2175-	CO2	TVOC	Cancel	Confirm Barometric Pressure	<b>ux</b> ination	a few seconds ago	@ <u>M</u> @
				27℃	51%		)	2lux		
Ξ·			4	e remperature	Humidity		Covicy Level (Pin)	munniacovi		



SN	6127
Name	
Associated Gateway	231 (62170010000)
Device EUI	24e124127/
Application Key	5572404c696e6b4c6f52613230313

**Step 3:** After all devices are online in Milesight IoT Cloud, check the device information and data and create dashboard for it.

Milesight IoT Cloud									
② Dashboard	Devices		Gateways	Farm	× +				
My Devices	Search		٩	⊘ No	rmal 3 👖 Alarm 0	3€ Offline 0 ⊗ Inactive 0		Add Device to Group	^ ^
🖄 Мар		Status	Name			interface Status	Update Time		
fo Triggers		đ	EM300-TH 641094100426	22.2℃ Temp	53% Humidity		9 minutes ago	@ <u>w</u> @	^
Event Center 99+		al	Garden LGT - EM500 6126A23760337006	13360lux Illumination			9 minutes ago	@ <u>~</u> 0	
Sharing Center		ali.	Garden SMTC - EM500 6126A23289152025	<b>19.2℃</b> Temperature	29% Soil Moisture	534us/cm Conductivity	a few seconds ago	@ <u>M</u> @	÷
								< 1	
Ξ.									× -

Milesight IoT Cloud						
Ø Dashboard	Ursalink Farm ···· EM300-T1	New Dashboard	New Dashboard	New Dashboard		Add Save 🗐
My Devices	13.22.37	Garde 🗹 🗊	Garde 🗹 🗊	Garde 🗹 🛍	Garde 🗹 🗇	Garden LGT - EM500-Illumination 🗹 🛍
Triggers	2021-01-28	98%	<b>19.2</b> ℃	29%	534 <sub>us</sub>	✓ TSU2Ulux
Event Center	Farm		Line Chart -O- Y1 30 1	Temperature -O- Soil Moi	sture	
<u>А</u> ме			25 20 15 10 5 0 13:27 18:00 01-27 01-27	0000 06 01-28 01	00 1200 28 01-28	
Ξı						, i

# 6. Hardware Installation

# 6.1 UG65 Installation

#### **Step 1: Mounting Bracket Mounted**

#### Wall mounting:

A. Align the mounting bracket horizontally to the desired position on the wall, use a marker pen to note four mounting holes on the wall, and then remove the mounting bracket from the wall.

B. Drill four holes with a depth of 32 mm by using your drill with a 6 mm drill bit on the positions you marked previously on the wall and insert four wall plugs into the holes respectively.

C. Mount the mounting bracket horizontally to the wall by fixing the wall mounting screws into the wall plugs.



**Pole mounting:** Straighten out the hose clamp and slide it through the rectangular rings in the mounting bracket, wrap the hose clamp around the pole. After that use a screwdriver to tighten the locking mechanism by turning it clockwise.



#### **Step 2: Gateway Mounted**

Screw the bracket mounting screws behind the equipment and hang the device to the mounting bracket via bracket mounting screws on the back of device.



#### 6.2 UC511 Installation

Before installation, make sure you have the mounting bracket, wall or pole mounting kits and other required tools.

#### Wall Mounting

1. Fix the wall plugs into the wall, then fix the mounting bracket to the wall plugs with screws.

2. Put the device on the mounting bracket, then fix the bottom of the device to the bracket with a fixing screw.



#### **Pole Mounting:**

1. Straighten out the hose clamp and slide it through the rectangular rings in the mounting bracket, wrap the hose clamp around the pole. After that use a screwdriver to tighten the locking mechanism by turning it clockwise.

2. Put the device on the mounting bracket, then fix the bottom of the device to the bracket with a fixing screw.

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## 6.3 EM300 Installation

**Step 1:** Attach EM300 to the wall and mark the two holes on the wall. The connecting line of two holes must be a horizontal line. Drill the holes according to the marks and screw the wall plugs into the wall.

**Step 2:** Mount the EM300 to the wall via mounting screws and cover the mounting screws with screw caps.





## 6.4 EM500 Installation

#### 6.4.1 Sensor Installation

#### **EM500-SMTC 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 to place the round area of the sensor always on top and always towards the sun while using it.



#### 6.4.2 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.

**Wall mounting:** Attach the mounting bracket to the wall and drill 2 holes, then mount the device with bracket on the wall.



**Pole mounting:** Straighten out the hose clamp and slide it through the rectangular holes in the mounting bracket, wrap the hose clamp around the pole. After that use a screwdriver to tighten the locking mechanism by turning it clockwise.





# Appendix

## **Default Uplink Channels**

Frequency	UG65	EM300/EM500/UC511 Nodes
01470	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)
ELIOGO	868.1, 868.3, 868.5,	969 1 969 2 969 E
EU000	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	

	868.9, 869.1,	868 0 860 1		
KU004	869.3, 867.3, 867.5, 867.7, 867.9, 868.1	000.9, 009.1		
411015	916.8, 917, 917.2, 917.4, 917.6, 917.8,	915.2~927.1		
AU915	918, 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)		
KD020	922.1, 922.3, 922.5,	022.1.022.2.022.5		
KR920	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					
Appport	0x55					
NetID	0x010203					
	The 5 <sup>th</sup> to 12 <sup>th</sup> digits of SN					
DevAddr	e.g. SN = 61 26 a1 01 84 96 00 41					
	Then DevAddr = a1018496					
АррКеу	5572404c696e6b4c6f52613230313823					
NwkSKey	5572404c696e6b4c6f52613230313823					
AppSKey	5572404c696e6b4c6f52613230313823					

-END-

