Milesight UC11 Series LoRaWAN Controller User Guide

LoRaWAN® Controller
UC11 Series
User Guide

Contents

Applicability

This guide is applicable to UC11 series controllers shown as follows, except where otherwise indicated.

| Model	Description
UC1114	2 × Digital Inputs, 2 × Digital Outputs
UC1122	1 × Digital Input, 1 × Digital Output, 2 × Analog Inputs
UC1152	1 × Digital Input, 1 × Digital Output, 1 × RS232, 1 × RS485

Safety Precautions

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

- The device must not be remodeled in any way.
- Do not place the device close to objects with naked flames.
- Do not place the device where the temperature is below/above the operating range.
- Power off the device when installing or wiring.
- Make sure electronic components do not drop out of the enclosure while opening.
- The device must never be subjected to shocks or impacts.

Declaration of Conformity

UC11 series is in conformity with the essential requirements and other relevant provisions of the CE, FCC, and RoHS.
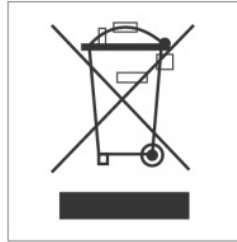
For assistance, please contact Milesight technical support: Email: **iot.support@milesight.com**
Tel: 86-592-5085280
Fax: 86-592-5023065
Address: Building C09, Software Park III,
Xiamen 361024, China

Revision History

Date	Doc Version	Description
Oct. 13, 2021	V 1.0	Initial version

# Product Introduction

1.1 Overview

UC11 series is a LoRaWAN® controller used for data acquisition from multiple sensors. It contains different I/O interfaces such as analog inputs, digital inputs, relay outputs, serial ports, and so on, which simplify the deployment and replacement of LoRaWAN® networks.

1.2 Features

- Easy to connect with multiple wired sensors through GPIO/AI/RS232/RS485 interfaces
- Long transmission distance up to 15 km with a line of sight
- Multiple triggering conditions and actions
- Embedded watchdog for work stability
- Industrial metal case design with an operating temperature range
- Compliant with standard LoRaWAN® gateways and network servers
- Quick and easy management with Milesight IoT Cloud solution

Hardware Introduction
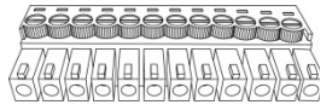
2.1 Packing List
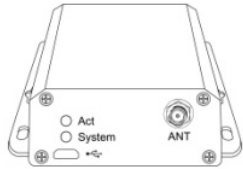
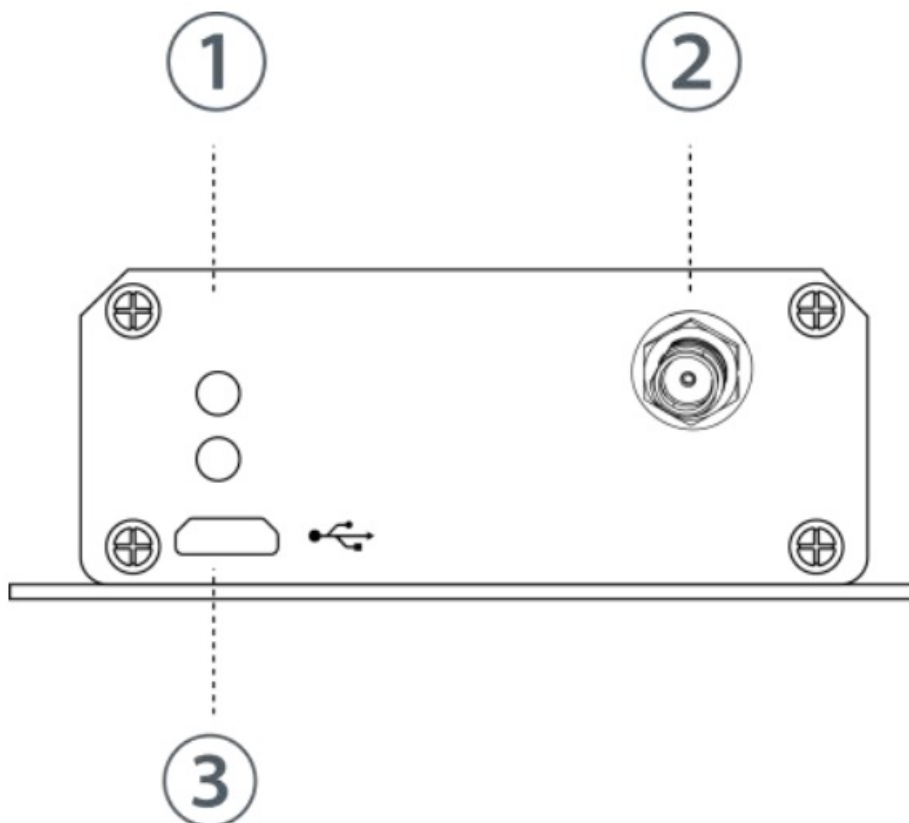| 1 × UC11 Series Device | 1 × LoRa Antenna | 1 × 12-Pin Pluggable Terminal | 2 × Wall Mounting Kits |
| 1 × Power Adapter | 1 × Warranty Card | | |
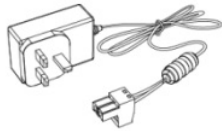
⚠️ **If any of the above items is missing or damaged, please contact your sales representative.**
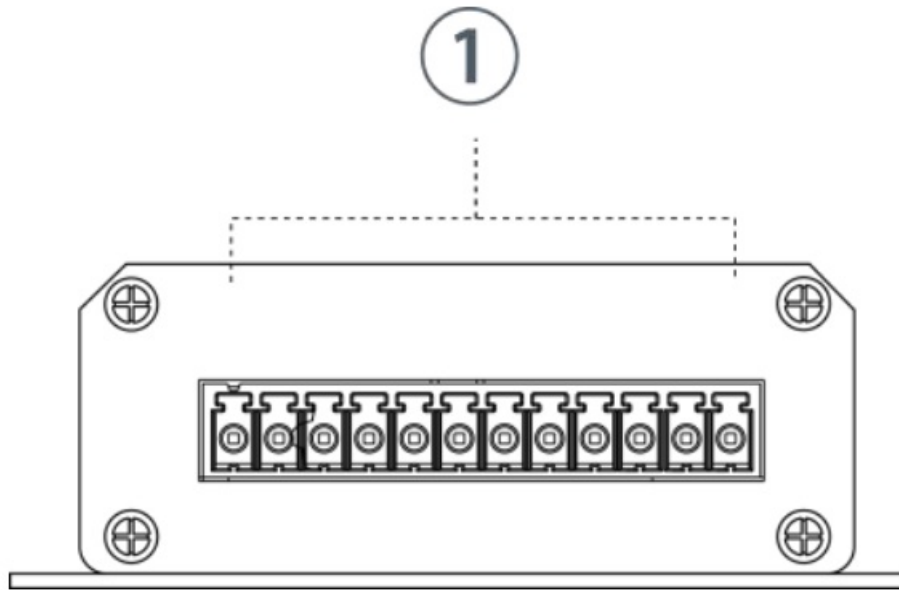
2.2 Hardware Overview

A. Front Panel

1. LED Indicator Area SYSTEM: System Indicator ACT: Network Status Indicator

2. Lora Antenna Connector

3. Micro USB Port
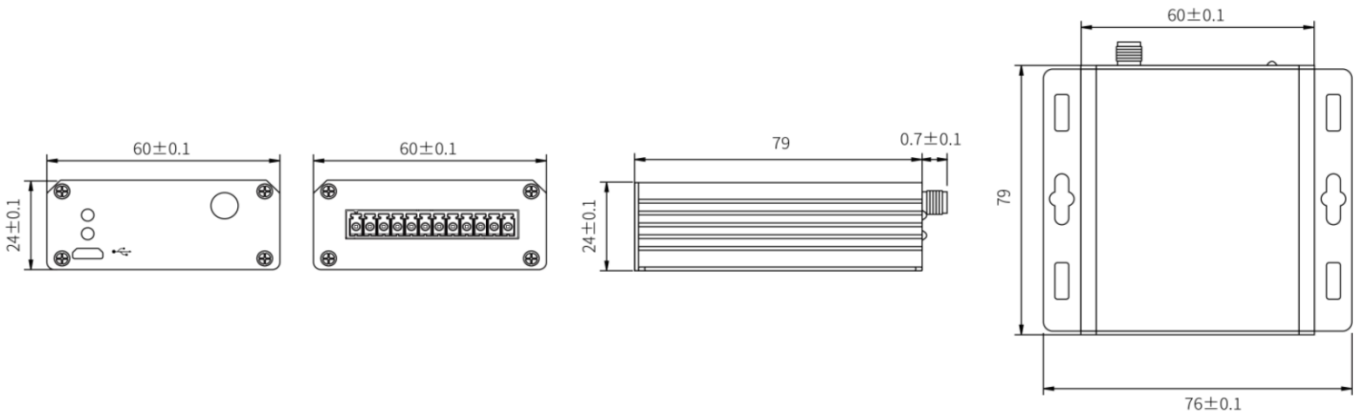
B. Rear Panel

1 Data Interfaces & Power Interface

PIN	UC1114 / UC1122 Definition	Description	Definition	Description	UC1152 Definition	Description
Model	UC1114 UC1122				UC1152 Definition Description	
1	GND	Ground	GND	Ground GND		Ground
2	VIN	5-24 VDC	VIN	5-24 VDC	VIN	5-24 VDC
3	IN1	NC		Reserved	RXD	
4	IN1_COM	DI 1	AIN1+	AI I	TXD	RS232
5	IN2		AIN1-	(4-20 mA)	GND	
6	IN2_COM	DI 2	AIN2+	AI 2	A	
7	OUT1_COM		AIN2-	(4-20 mA)	B	RS485
8	OWI_NC					
9	OUT1_NO	DO 1	ININ_COM	DI	ININ_COM	DI
10	OUT2_COM		OUT_COM		OUT_COM	
11	OUT2_NC	DO 2	OUT_NC	DO	OUT_NC	DO
12	OUT2_NO		OUT_NO		OUT_NO	

Note: OUT_NC=Normally Closed, OUT_No=Normally Open.

2.3 LED Indicators

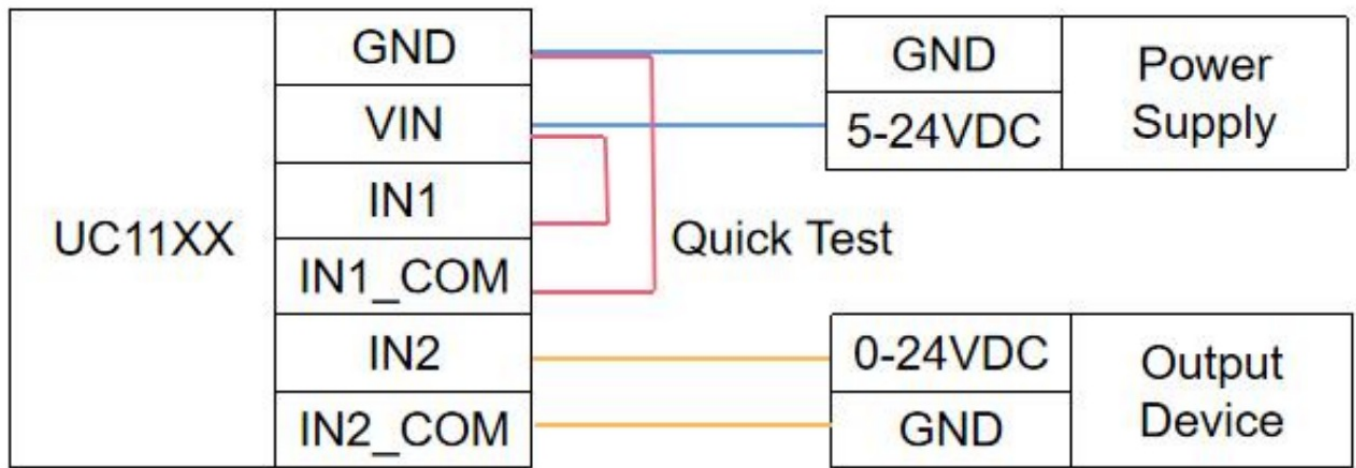| LED	Indication	Status	Description
System	System Status	Static	System Start-up
		On for 500 ms, off for 500 ms	The system is running properly
		On for 200 ms, off for 200 ms	The system does not connect to the server
Act	Network Status	Off	Fails to join the network
		On for 500 ms, off for 500 ms	Join the network successfully

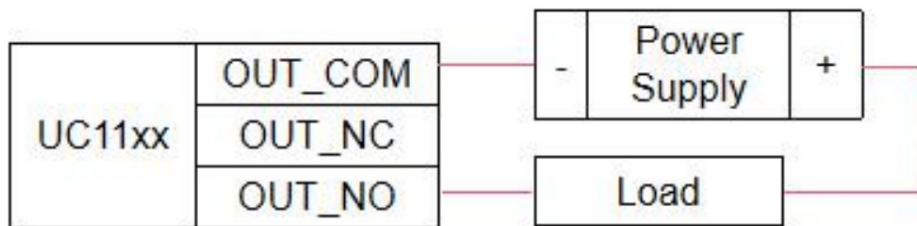## 2.4 Dimensions (mm)

Hardware Installation

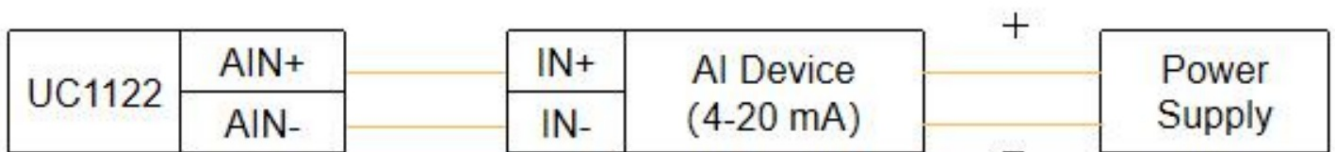### 3.1 Application Wiring

Digital Input:

UC11XX	GND		GND	Power Supply
	VIN		5-24VDC	
	IN1	Quick Test		
	IN1_COM			
	IN2		0-24VDC	Output Device
	IN2_COM		GND	

Digital Output:
Connect the load to either NC or NO according to your application.

UC11xx	OUT_COM	– Power Supply +
	OUT_NC	
	OUT_NO	Load

Analog Input:

| UC1122 | AIN+ | IN+ | AI Device | + Power Supply |
| | AIN- | IN- | (4-20 mA) | – |

RS232 & RS485:

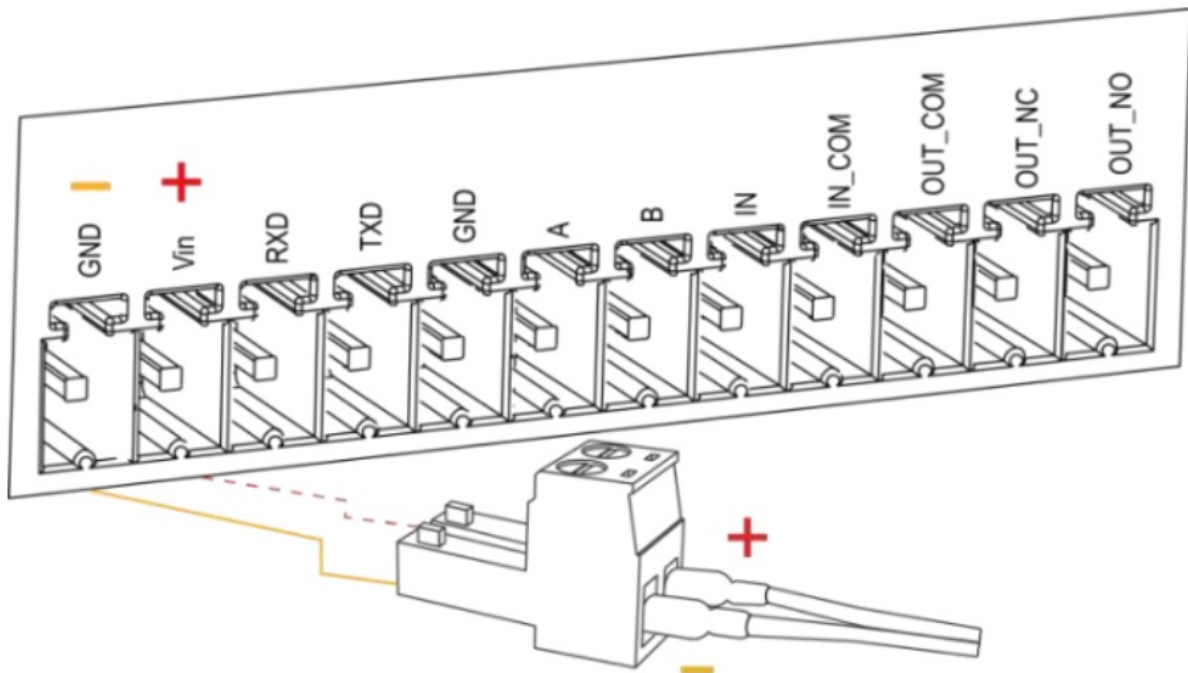| UC1152 | RXD | RXD | RS232 Device |
	TXD	TXD	
	GND	GND	
	A	A	RS485 Device
	B	B	(Modbus RTU)
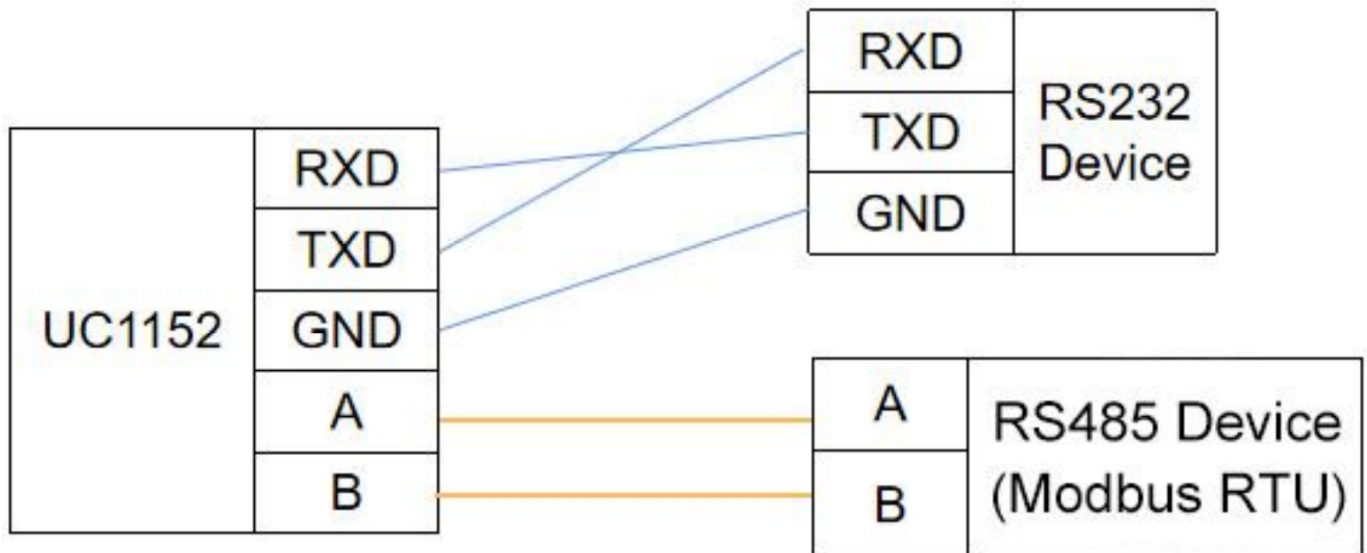
3.2 Power Supply

UC11 series device support 5-24 VDC power supply. You can use other supplies or a power adapter to power on the device.
Note: For industrial applications, it's suggested not to release the metal case and use an independent power supply.
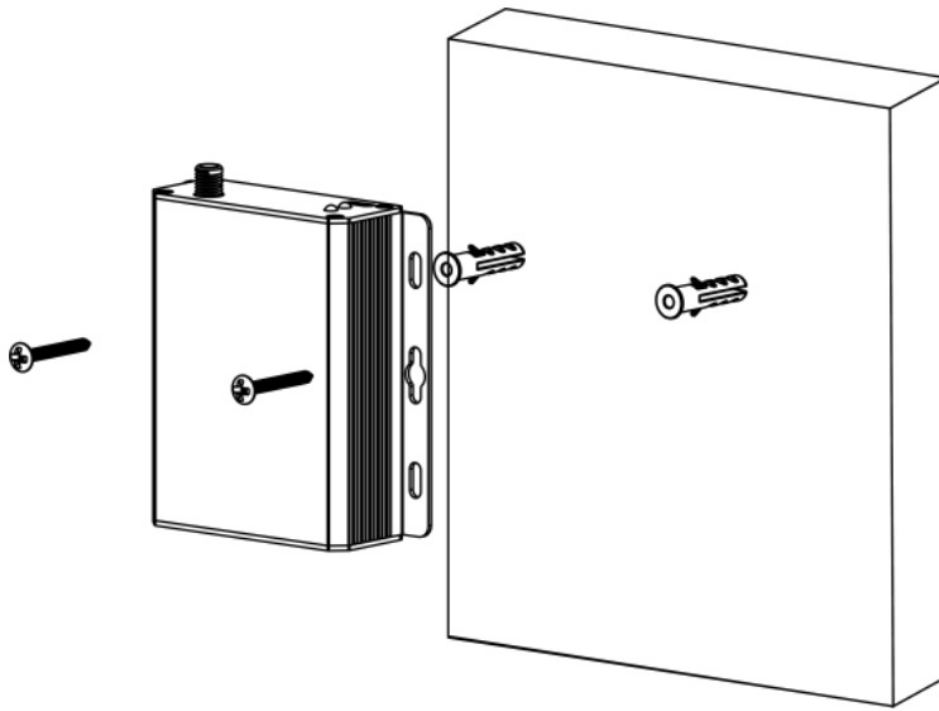
3.3 Antenna Installation

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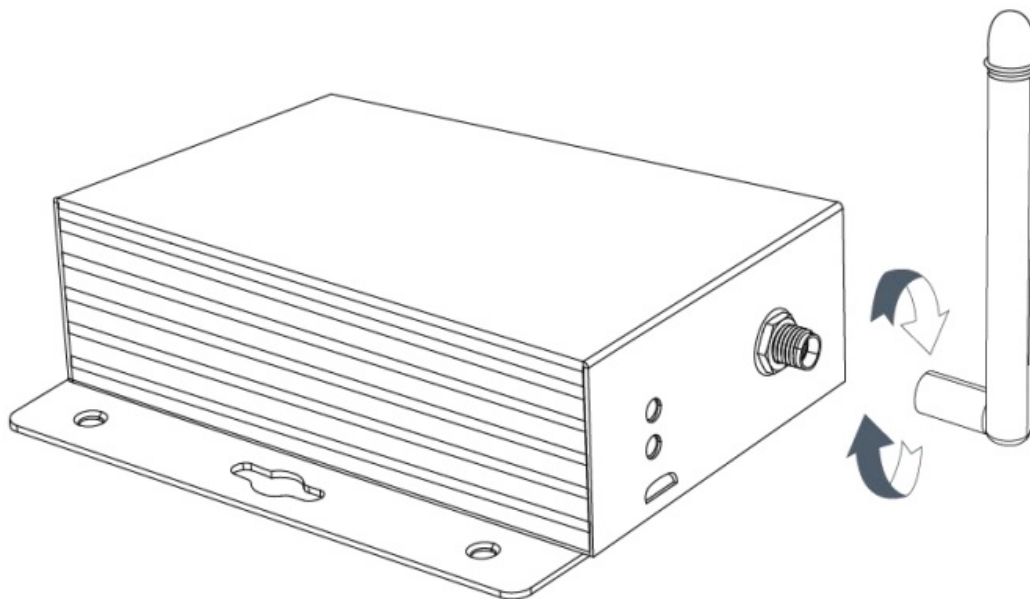
3.4 Wall Mounting

1. Drill 3 holes on the wall according to the device mounting holes, then fix the wall plugs into the wall.
2. Fix the device to the wall plugs with screws.

Operation Guide

4.1 Login to the ToolBox

1. Download ToolBox software from the Milesight IoT website.
2. Power on the UC11 device, then connect it to the computer via a micro USB port.
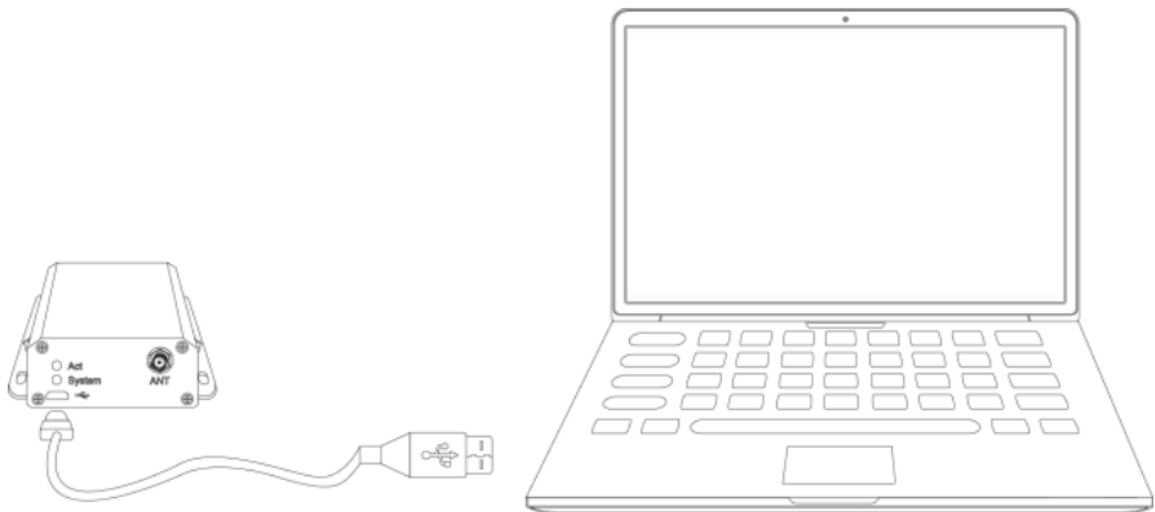
3. Open the ToolBox and select type as "General", then click password to log in to ToolBox. (Default password: 123456)

ToolBox Settings

Type	General ▼
Serial port	COM4 ▼
Login password	
Baud rate	115200 ▼
Data bits	8 ▼
Parity bits	None ▼
Stop bits	1 ▼

[Save] [Cancel]

4. After logging in to the ToolBox, you can change device settings.

Status >

Model:	UC1152-915
Serial Number:	6122A4689821
Partnumber:	US915
Firmware Version:	03.11
Hardware Version:	3.0
Local Time:	2020-01-01 00:00:19
Join Status:	De-Activate
RSSI/SNR:	0/0
Datarate:	SF10-DR0
Rx2DR:	SF12-DR8
Channel Name	Humidity,Temperature
Input:	Low
Output:	Low
Uplink Frame-counter:	0
Downlink Frame-counter:	0
Device Time:	2020-01-01 00:00:19 Sync

4.2 LoRaWAN Settings

LoRaWAN settings is used for configuring the transmission parameters in the LoRaWAN® network. 1. Go to "LoRaWAN -> Basic" to configure join type, App EUI, App Key, and other information. You can also keep all settings by default.

Device EUI	24E124122A468982
App EUI	24E124C0002A0001
Application Port	85
RS232 Port	86
Working Mode:	Class C
Join Type	OTAA
LoRaWAN Version	V1.1.0
Application Key	********************************
Spread Factor (?)	SF8-DR2
Confirmed Mode (?)	☑
Rejoin Mode (?)	☑
Set the number of packets sent	32 packets
ADR Mode (?)	☑

Parameters	Description
Device EUI	The unique ID of the device can also be found on the label.
App EUI	Default App EUI is 24E124C0002A0001.
Application Port	The port used for sending and receiving data except RS232 data, the default port is 85.
RS232 Port (UC1152 Only)	The port used for sending and receiving RS232 data, the default port is 86.
Working Mode	It's fixed as Class C.
Join Type	OTAA and ABP modes are available.
LoRaWAN Version	V1.0.2, V1.0.3, and V1.1 are available.
Application Key	Appkey for OTAA mode, default is 5572404C696E6B4C6F52613230313823.
Device Address	Devendra for ABP mode, the default is the 5th to 12th digits of SN.
Network Session Key	Nwkskey for ABP mode, default is 5572404C696E6B4C6F52613230313823.
Spread Factor	If ADR is disabled, the device will send data via this spread factor.
Confirmed Mode	If the device does not receive an ACK packet from a network server, it will resend data 3 times at most.
Rejoin Mode	Reporting interval ≤ 30 mins: the device will send specific mounts of LoRaMAC packets to check connection status every 30 mins; If no reply after specific packets, the device will re-join. Reporting interval > 30 mins: the device will send specific mounts of LoRaMAC packets every to check the connection status every reporting interval; If no reply after specific packets, the device will re-join.
ADR Mode	Allow the network server to adjust the data rate of the device.
ADR Mode	Allow the network server to adjust the data rate of the device.
Tx Power	Transmit power of the device.

Note

1. Please contact sales for device EUI list if there are many units.
2. Please contact sales if you need random App keys before purchase.
3. Select OTAA mode if you use Milesight IoT cloud to manage devices.
4. Only OTAA mode supports rejoin mode.

Go to "LoRaWAN -> Channel" to select the supported frequency and select channels to send uplinks. Make sure the channels match the LoRaWAN® gateway.

If the frequency is one of CN470/AU915/US915, you can enter the index of the channel that you want to enable in the input box, making them separated by commas. **Examples:**

1, 40: Enabling Channel 1 and Channel 40

1-40: Enabling Channel 1 to Channel 40

1-40, 60: Enabling Channel 1 to Channel 40 and Channel 60

All: Enabling all channels

Null: Indicates that all channels are disabled

Channel Index	Frequency/MHz	Channel Spacing/MHz	BW/kHz
0 - 15	915.2 - 918.2	0.2	125
16 - 31	918.4 - 921.4	0.2	125
32 - 47	921.6 - 924.6	0.2	125
48 - 63	924.8 - 927.8	0.2	125
64 - 71	915.9 - 927.1	1.6	500

3. Go to "LoRaWAN -> Advanced" to configure advanced settings. You can also keep all values by default.

TXPower	0	
Join Delay1	5000	ms
Receive Delay1	1000	ms
Receive Delay2	2000	ms
Join Trials	0	
ReTx	2	
RX2 Datarate	SF12-DR8	
RX2 Channel Frequency	923.3	MHz
ACK Timeout	2000	ms
Duty Cycle Switch	☐	
Duty Cycle	0	%
Uplink Frame Counter	7	
Downlink Frame Counter	5	

4.3 Data Interface Settings

4.3.1 Basic Settings

Reporting Interval   300   s

Device Return to Power Supply, DO Status   Last Working State ▼

Change Password   ☐

Parameters	Descr
Reporting Interval	Reporting interval of transmitting data to a network server.C porting interval.
The device returns to the power supply state, DO Status	If the device loses power and return to power supply, the d eter.
Change Password	Change the password to loggin ToolBox.

4.3.2 DI/DO Settings

Digital Input:

1. Connect devices to corresponding DI ports according to section 3.1.
2. Go to the "General" page of UC1114 or the "General -> Basic" page of UC1122/UC1152, and select type as Digital Input.

GPIO Settings

Interface Type   Digital Input1 ▼

Interface Type   Digital Input2 ▼

Digital Output:
Connect devices to corresponding DO ports according to section 3.1, then you can send downlinks to trigger the DO.
Pulse Counter:
The pulse counter feature only works with UC11 series hardware version 3.0.

1. Connect devices to corresponding DI ports.
2. Go to the "General" page of UC1114 or the "General -> Basic" page of UC1122/UC1152, and select type as Counter.

GPIO Settings

Interface Type	Counter1 ▼			
Counter values	0	Start	Refresh	Clear
Interface Type	Counter2 ▼			
Counter2 values	0	Start	Refresh	Clear

3. Click "Start" or "Stop" to make the device start/stop counting.

4. Check current count values by clicking "Refresh".

5. Click "Clear" to make the device count from 0.

Note

1. UC11xx only starts counting when it detects 6 pulses from pulse devices;

2. UC11xx will send non-changeable counting values if you do not click "Start".

4.3.3 AI Settings
UC1122 has two analog inputs for analog device connection.

1. Connect the analog devices to analog input ports.

2. Go to the "General " page to configure range and unit, you can keep all settings by default.

Analog Input 1 ⑦

Osh	20.00
Osl	4.00
Unit	mA

Analog Input 2 ⑦

Osh	20.00
Osl	4.00
Unit	mA

4.3.4 RS485 Settings
UC1152 has one RS485 port for Modbus RTU device connection.

1. Connect RS485 device to RS485 port

2. Go to "General -> RS485" to enable RS485 and configure serial port settings. Serial port settings should the same as RS485 terminal devices.

Parameters	Description
Baud Rate	4800/9600/19200/38400/57600/115200 are available.
Data Bit	8 bit is available.
Stop Bit	1 bit/2 bit is available.
Parity	None, Odd and Oven are available.
Modbus RS485 bridge LoRaWAN	If this mode is enabled, UC1152 will transparent Modbus RTU commands from the n eply originally back to the network server. Port: Select from 2-84, 86-223.

3. Go to the "Channel" page, click **+** to add Modbus channels, then save configurations.

Channel >

Parameters	Description
Execution	The execution interval between each Modbus command.
Interval	
Max Resp Time	The maximum response time that the UC1152 waits for the reply to the command. If it does not get a response after the max response time, it is determined that the command has timed out.
Max Retry Time	Set the maximum retry times after the device fails to read data from RS485 terminal devices.
Channel ID	Select the channel ID you want to configure, 16 channels are selectable.
Name	Customize the name to identify every Modbus channel.
Slave ID	Set Modbus slave ID of the terminal device.
Address	The starting address for reading.
Quantity	Set read how many digits from starting address. It fixes to 1.
Type	The select data type of Modbus channels.
Sign	The tick indicates that the value has a plus or minus sign.
Decimal Place	Indicate the decimal place of the channel reading.
For example: if the channel value is 1234, and a Decimal Place is set to 2, then the actual value is 12.34 **.**	

Example: If you configure as the following picture, UC1152 will send Modbus read command to terminal device

regularly: 01 03 00 00 00 01 84 0A

Channel ID	Name	Slave ID	Address	Quantity	Type	Sign	Decimal Place	Value	
1 ▾	Temperature	1	0	1	Holding Register(INT16) ▾	☐	0		Fetch ⊗ ⊕
Save									Up to 16 channels

Click "Fetch" to check if UC1152 can read correct data from terminal devices.

Channel ID	Name	Slave ID	Address	Quantity	Type	Sign	Value		
1 ▾	1	1	16	1	Input Register(INT16) ▾	☐	554	✓ Fetch	⊗
2 ▾	2	2	12	1	Holding Register(INT16) ▾	☐		Fetch	⊗
3 ▾	1	1	17	1	Input Register(INT16) ▾	☐		Fetch	⊗ ⊕

Note

1. Do not click "Fetch" frequently since the response time to reply is different for every terminal device.
2. For hardware version 1.x/2.x, UC1152 supports 8 Modbus channels; for hardware version 3.0, UC1152 supports 16 Modbus channels.

4.3.5 RS232 Settings
UC1152 has one RS232 for device transparent communication.

1. Connect RS232 device to RS232 port.
2. Go to "General -> RS232" to enable RS232 and configure serial port settings. Serial port settings should the same as RS232 terminal devices.

Parameters	Description
Baud Rate	4800/9600/19200/38400/57600/115200 are available.
Data Bit	8 bit is available.
Stop Bit	1 bit/2 bit is available.
Parity	None, Odd and Oven are available.
Packet Length	When UC1152 receives RS232 data up to this length, it will fragment it as a single packet and send to a network server.
Serial Frame Interval	The interval that the device sends out real serial data stored in the buffer area to a public network. The range is 10-65535 milliseconds. **Note:** Data will be sent out to the public network when the real serial data size reaches the preset packet size, even though it's within the serial frame interval.

4.4 IF-THEN Command

UC11 series support configuring locally IF-THEN commands to do some actions automatically even without a network connection. Besides, you can back up your command settings and import to other devices.

1. Go to the "Command" page, and click "Read command From Device" to check device command settings. If there is not any command or you need to change one command, click "Edit".

2. Set an IF condition based on the terminal device data or UC11 device status.

Condition	Description
Time	Set the time condition. The device time can be synced in the Status page or you can send a downlink command to configure the time.
Digital Input	When UC11 device detects the DI as a specific status.is continued for: the DI changed status should last for some time. Set lockout time: after the lockout time, the UC11 device will detect if DI status matches the condition. 0 means this IF condition will only be detected once.
Received a message	When the UC11 device receives a specific message from a network server. The NS message hex format is ff12+message length + message content. Example: set the message content as character "P", then you need to send a message as ff120450.(whole message length is 4 bytes, 50 means "P").
The Device Restarts	Reboot the device.
Channel	When the Modbus channel reaches a specific value/range. This only works in the UC1152 device. is continued for: the Modbus channel value should last for some time. Set lockout time: after the lockout time, the UC11 device will detect if the Modbus value matches the condition. 0 means this IF condition will only be detected once.
Analog	When the analog value reaches a specific value/range. This only works in the UC1122 device. is continued for: the analog value should last for some time. Set lockout time: after the lockout time, the UC11 device will detect if the analog value matches the condition. 0 means this IF condition will only be detected once.
Counter	When the pulse counter reaches a specific value. This only works when DI works as counter mode.

3. Set THEN action according to your request. You can add at most 3 actions in one command.

Action	Description
Send a custom message	Send a message to a network server.
Output Trigger	DO can be set to activate/de-activated/change status. Delay Time: this action will trigger after a specific time; Duration: the output status will last for a specific time, 0 means permanent.
Restart the Device	Reboot the device.

4. Save the command, then click "Save the command to Device" to make it work. 5. Click "Save the command as File" to save your current command settings to a .dat file. If you need to import it to another device, click "Read a command File" to import the .dat file.

Maintenance

4.5.1 Upgrade
UC11 series support upgrades locally via ToolBox software.

1. Download firmware from www.milesight-iot.com to your PC.
2. Go to "Maintenance -> Upgrade and", click "Browse" to import firmware and upgrade the device

Note: Any operation on ToolBox is not allowed during upgrading, otherwise the upgrading will be interrupted, or even the device will break down.

4.5.2 Reset to Factory Default
Please select one of the following methods to reset the device: Via Hardware: Power off and open the case of UC11, hold on the button on the board and then power on the device at the same time, and release the button when the LED blinks. Via ToolBox Software: Go to "Maintenance->Upgrade" to click "Reset".


Milesight IoT Cloud Management

UC11 series can be managed by the Milesight IoT Cloud platform. 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.

1. Ensure the Milesight LoRaWAN® gateway is online in Milesight IoT Cloud. For more info about connecting the gateway to the cloud please refer to Gateway User Guide.
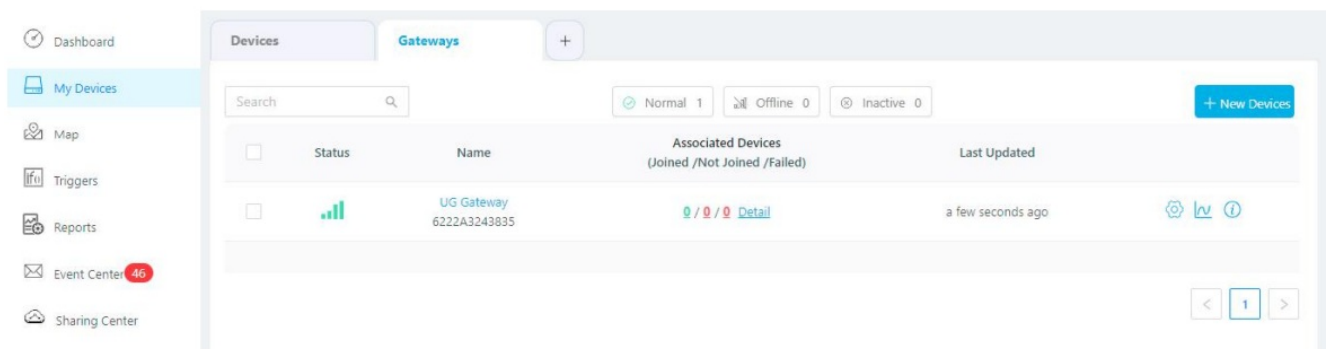
2. Go to the "My Devices" page and click "+New Devices". Fill in the SN of the UC11 series and select the associated gateway.

3. After the UC11 series is online in Milesight IoT Cloud, click and go to "Interface Settings" to select used interfaces and customize the name, sign, and formulas.

   Note: Modbus channel settings should be the same as the configuration in ToolBox.2
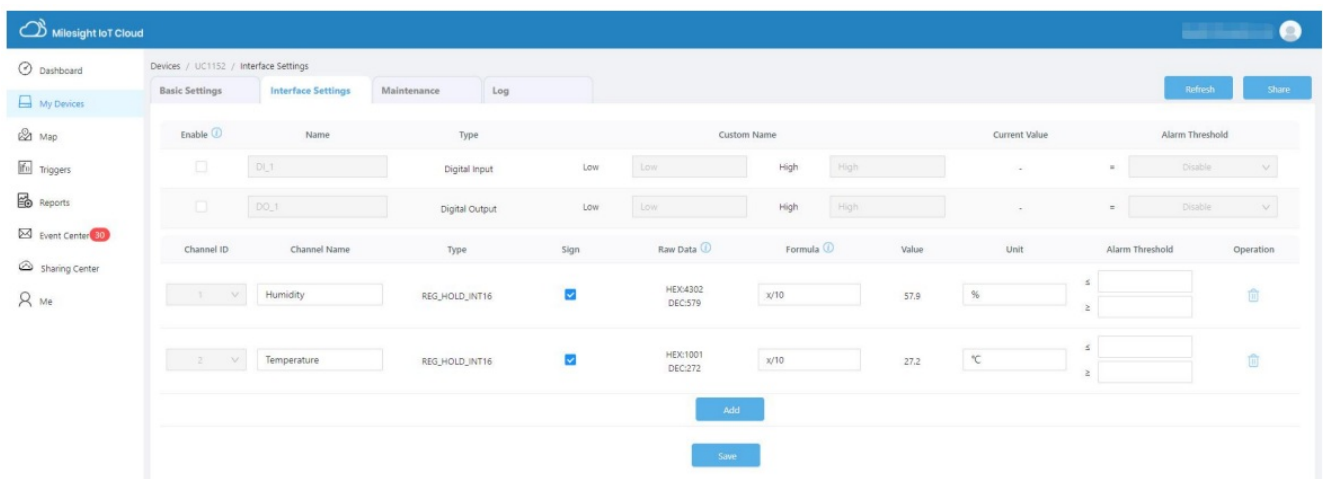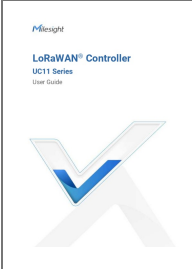

Device Payload

UC11 Series uses the standard Milesight IoT payload format based on IPSO. Please refer to the UC11 Series Communication Protocol; for decoders of Milesight IoT products please click here.

-END-

Documents / Resources

LoRaWAN® Controller UC11 Series User Guide	**Milesight UC11 Series LoRaWAN Controller** [pdf] User Guide UC11 Series, LoRaWAN Controller, UC11 Series LoRaWAN Controller
LoRaWAN® Controller UC11 Series User Guide	**Milesight UC11 Series LoRaWAN Controller** [pdf] User Guide UC11 Series LoRaWAN Controller, UC11 Series, LoRaWAN Controller, Controller

References

- **Milesight IoT - LoRaWAN, 5G & AIoT**