LoRaWAN® Controller
UC11 Series

User Guide

Milesight IoT

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 wirings.
- 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: 4/F, No.63-2 Wanghai Road,
2nd Software Park, Xiamen, China

Revision History

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

Contents

1. Product Introduction

1.1 Overview

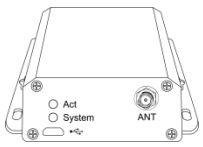
UC11 series is a LoRaWAN® controller used for data acquisition from multiple sensors. It contains different I/O interfaces such as analog inputs, digital inputs, relay outputs, serial ports and so on, which simplify the deployment and replacement of LoRaWAN® networks.

1.2 Features

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

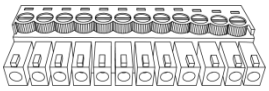
2. Hardware Introduction

2.1 Packing List

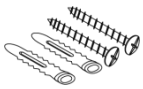


1 × UC11 Series Device

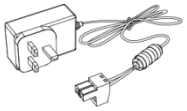
1 × LoRa Antenna



1 × 12-Pin Pluggable Terminal



2 × Wall Mounting Screws



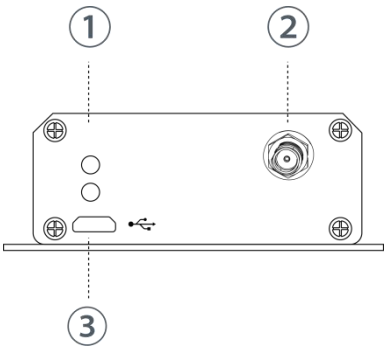
1 × Power Adapter

1 × Warranty Card

If any of the above items is missing or damaged, please contact your sales Representative.

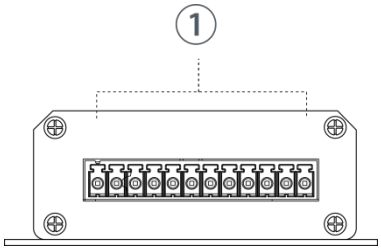
2.2 Hardware Overview

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

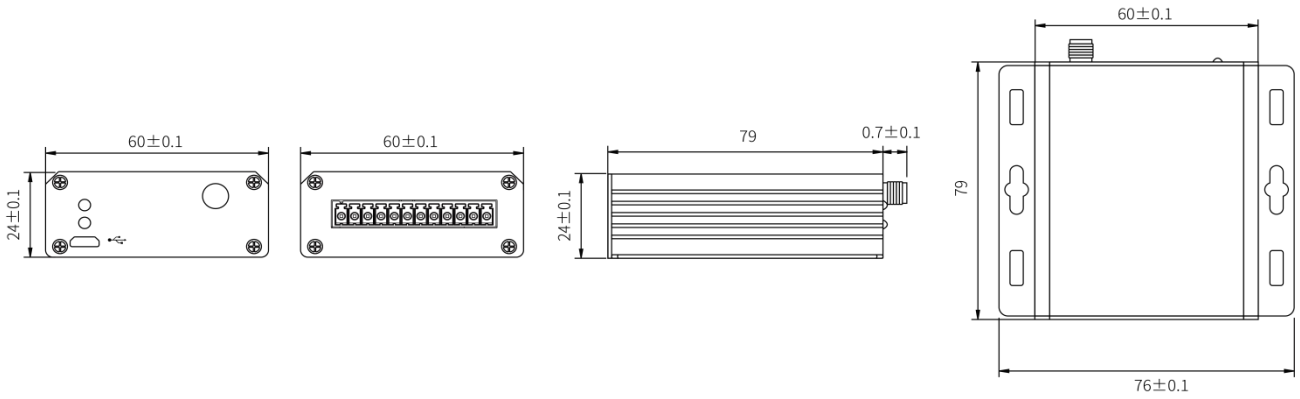
Model	UC1114		UC1122		UC1152	
PIN	Definition	Description	Definition	Description	Definition	Description
1	GND	Ground	GND	Ground	GND	Ground
2	VIN	5-24 VDC	VIN	5-24 VDC	VIN	5-24 VDC
3	IN1	DI 1	NC	Reserved	RXD	RS232
4	IN1_COM		AIN1+	AI 1 (4-20 mA)	TXD	
5	IN2	DI 2	AIN1-		GND	
6	IN2_COM		AIN2+	AI 2 (4-20 mA)	A	RS485
7	OUT1_COM	DO 1	AIN2-		B	
8	OUT1_NC		IN	DI	IN	DI
9	OUT1_NO		IN_COM		IN_COM	
10	OUT2_COM	DO 2	OUT_COM	DO	OUT_COM	DO
11	OUT2_NC		OUT_NC		OUT_NC	
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 server
Act	Network Status	Off	Fails to join the network
		On for 500 ms, off for 500 ms	Join the network successfully

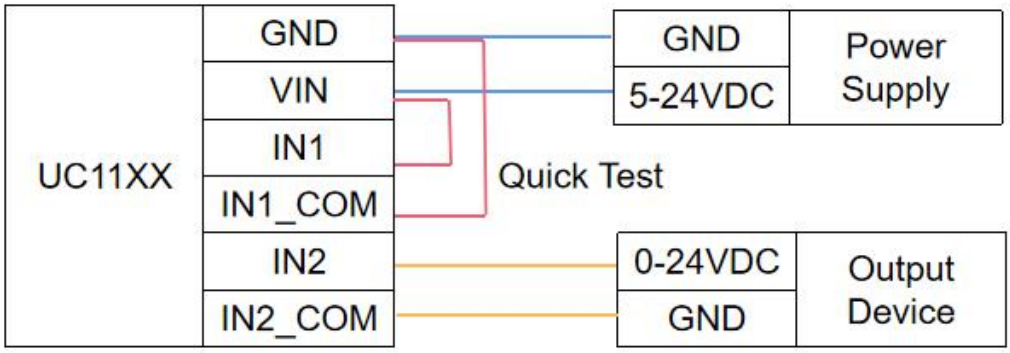
2.4 Dimensions (mm)



3. Hardware Installation

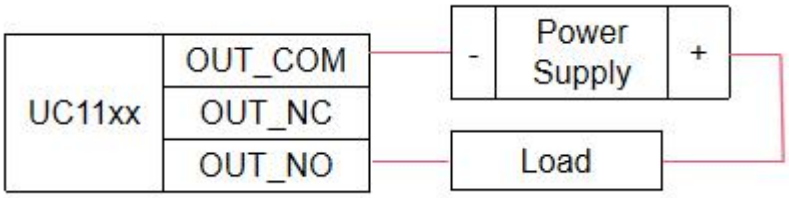
3.1 Application Wiring

Digital Input:

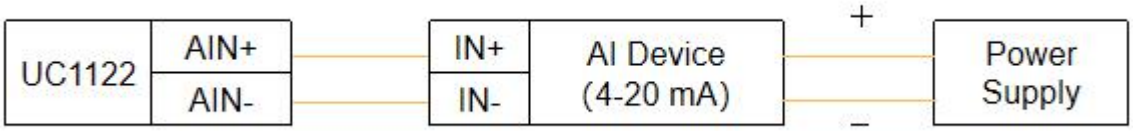


Digital Output:

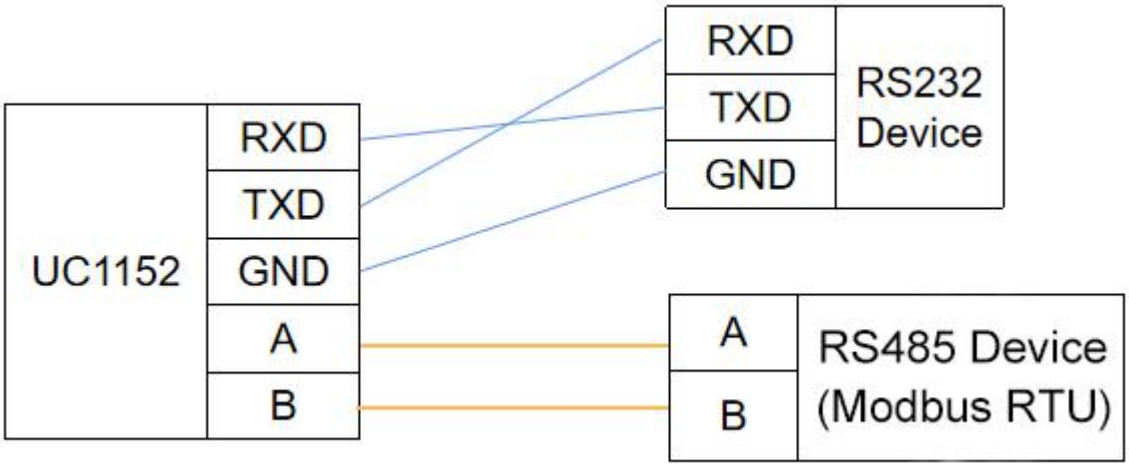
Connect load to either NC or NO according to your application.



Analog Input:



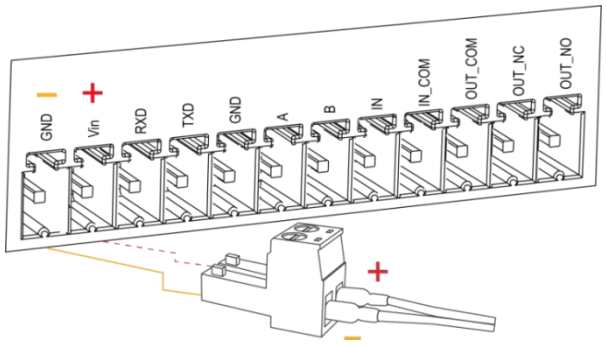
RS232 & RS485:



3.2 Power Supply

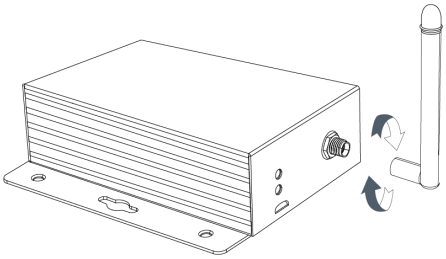
UC11 series device support 5-24 VDC power supply. You can use other supplies or power adapter to power on the device.

Note: For industrial applications, it's suggested not to release the metal case and use a independent power supply.



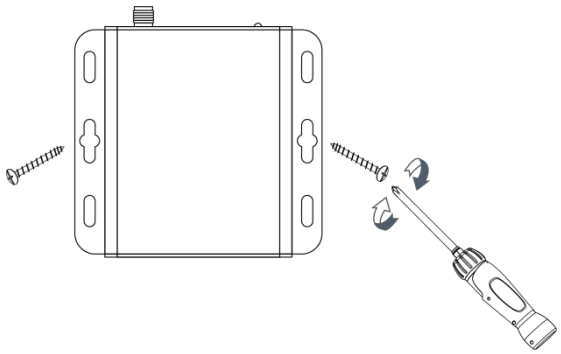
3.3 Antenna Installation

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

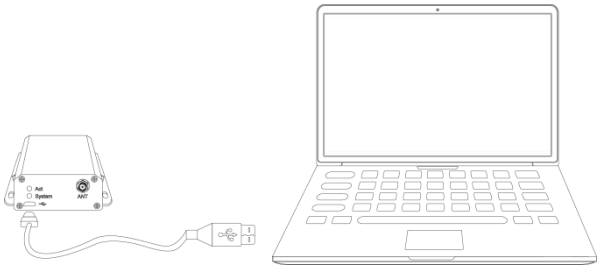
1. Align the UC11 device horizontally to the desired position on the wall, use a marker pen to mark two mounting holes on the wall.
Note: The connecting lines of adjacent points are at right angles.
2. Drill the two holes by using your drill with a 6 mm drill bit on the positions you marked previously on the wall.
3. Mount the device to the wall by passing the wall mounting screws (M3 * 20) into the device mounting holes.



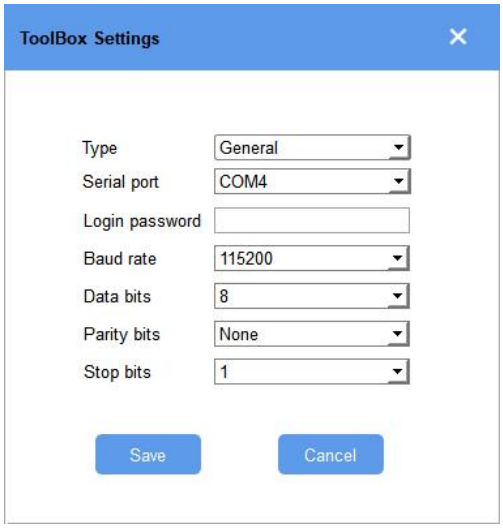
4. Operation Guide

4.1 Log in the ToolBox

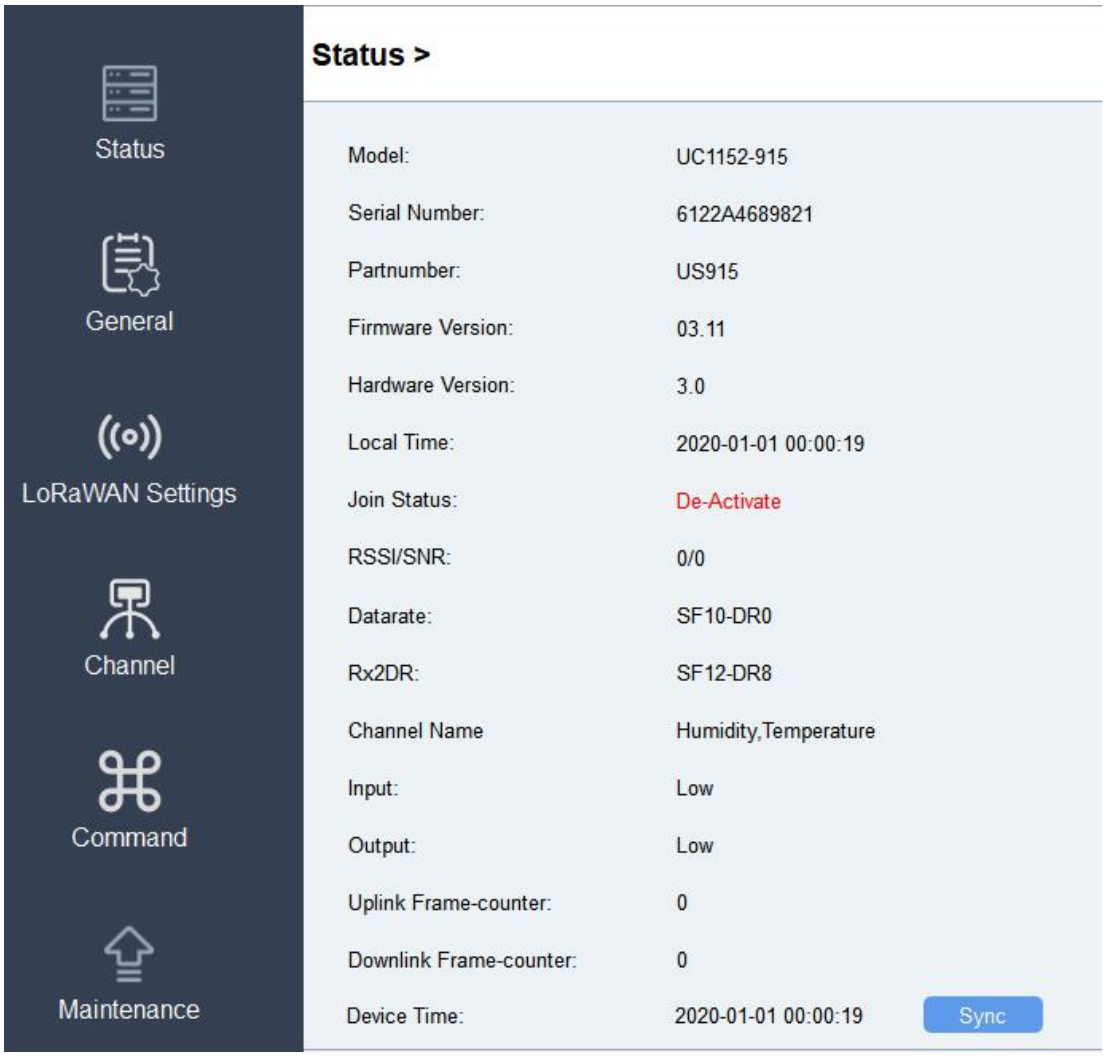
1. Download ToolBox software from Milesight IoT website.
2. Power on the UC11 device, then connect it to computer via micro USB port.



3. Open the ToolBox and select type as “General”, then click password to log in ToolBox. (Default password: **123456**)



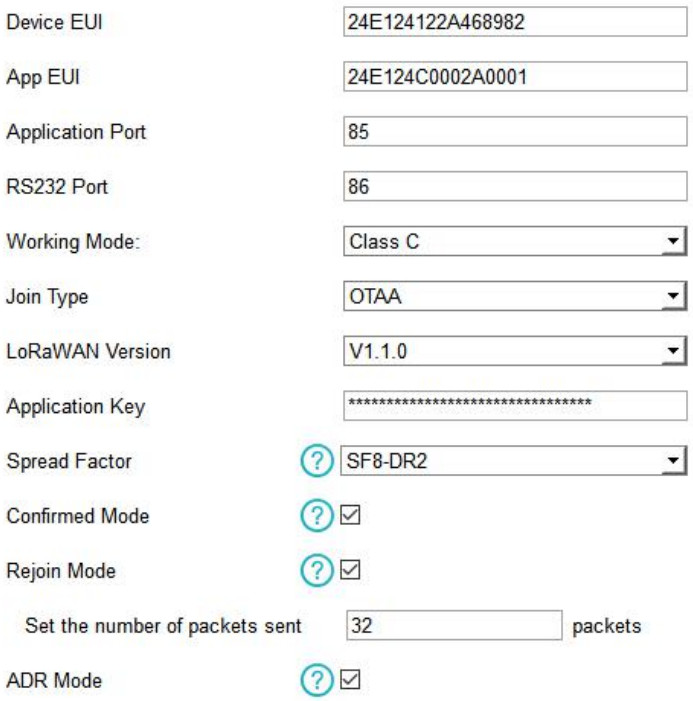
4. After logging in the ToolBox, you can change device settings.



4.2 LoRaWAN Settings

LoRaWAN settings is used for configuring the transmission parameters in 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.



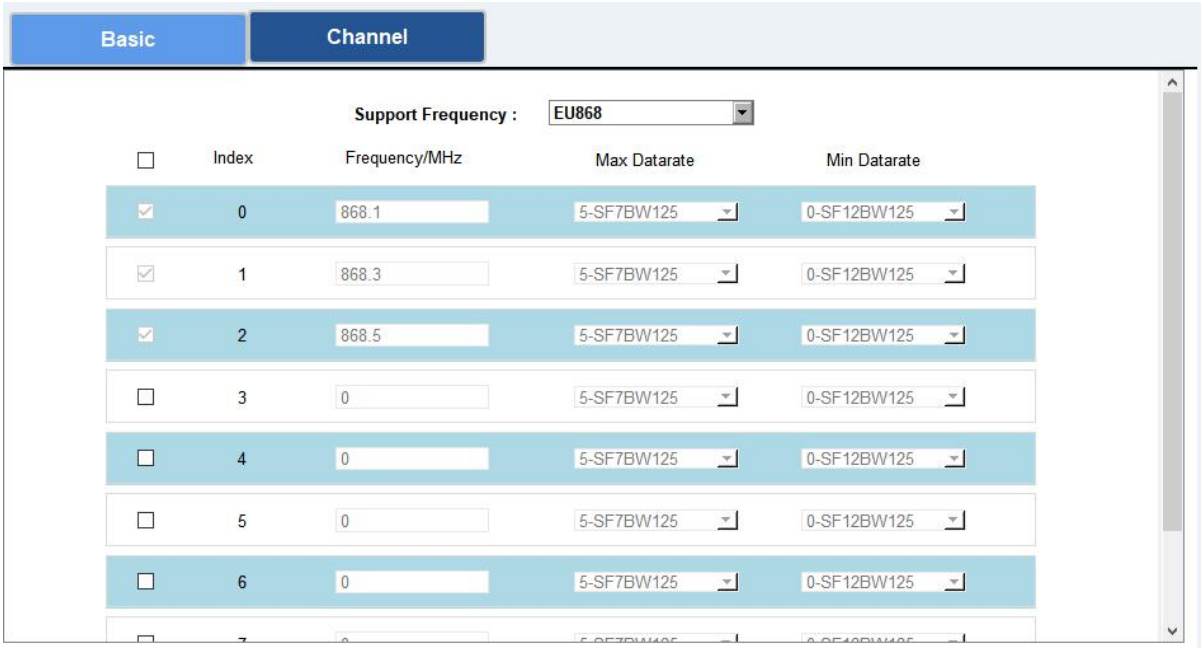
Parameters	Description
Device EUI	Unique ID of the device which can also be found on the label.
App EUI	Default App EUI is 24E124C0002A0001.
Application Port	The port used for sending and receiving data except RS232 data, default port is 85.
RS232 Port (UC1152 Only)	The port used for sending and receiving RS232 data, default port is 86.
Working Mode	It's fixed as Class C.
Join Type	OTAA and ABP mode are available.
LoRaWAN Version	V1.0.2, V1.0.3, V1.1 are available.
Application Key	Appkey for OTAA mode, default is 5572404C696E6B4C6F52613230313823.
Device Address	DevAddr for ABP mode, default is the 5th to 12th digits of SN.
Network Session Key	Nwkskey for ABP mode, default is 5572404C696E6B4C6F52613230313823.
Application Session Key	Appskey 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 ACK packet from network server, it will resend data 3 times at most.
Rejoin Mode	Reporting interval ≤ 30 mins: 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: device will send specific mounts of LoRaMAC packets every to check connection status every reporting interval; If no reply after specific packets, the device will re-join.
ADR Mode	Allow network server to adjust datarate of the device.
Tx Power	Transmit power of 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.

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

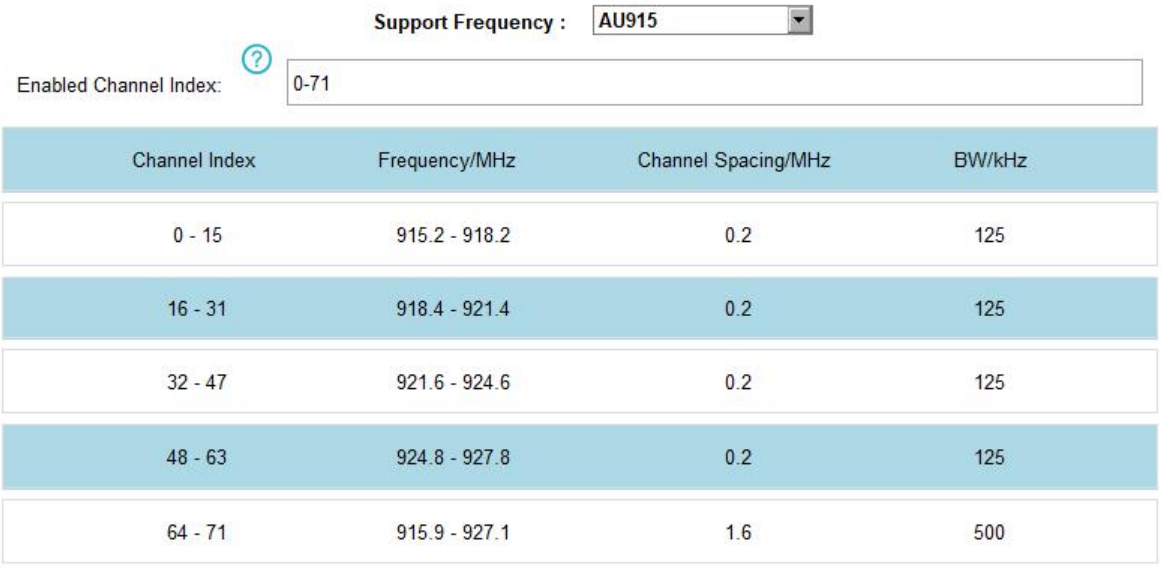


If frequency is one of CN470/AU915/US915, you can enter the index of the channel that you want to enable in the input box, making them separated by commas.

Examples:

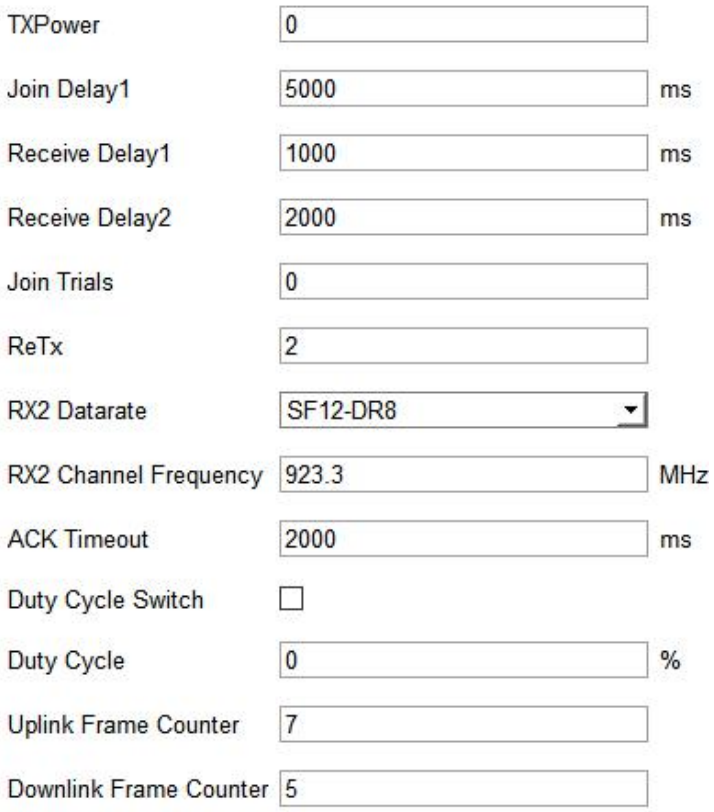
1, 40: Enabling Channel 1 and Channel 40

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



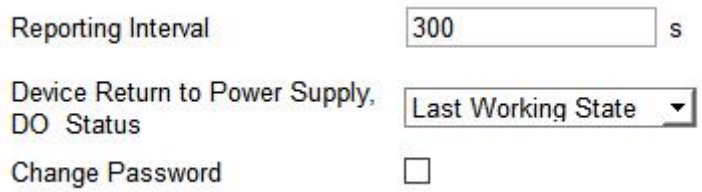
Channel Index	Frequency/MHz	Channel Spacing/MHz	BW/kHz
0 - 15	915.2 - 918.2	0.2	125
16 - 31	918.4 - 921.4	0.2	125
32 - 47	921.6 - 924.6	0.2	125
48 - 63	924.8 - 927.8	0.2	125
64 - 71	915.9 - 927.1	1.6	500

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



4.3 Data Interface Settings

4.3.1 Basic Settings

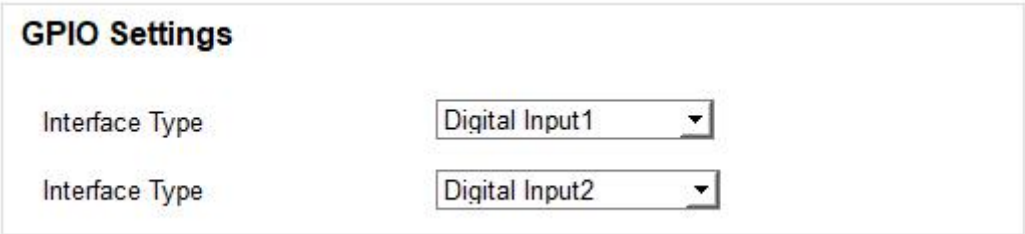


Parameters	Description
Reporting Interval	Reporting interval of transmitting data to network server.Default: 600s **Note:** RS232 transmission will not follow the reporting interval.
Device returns to the power supply state, DO Status	If the device loses power and return to power supply, the device relay output will be low or high according to this parameter.
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 "**General**" page of UC1114 or "**General -> Basic**" page of UC1122/UC1152, select type as Digital Input.



Digital Output:

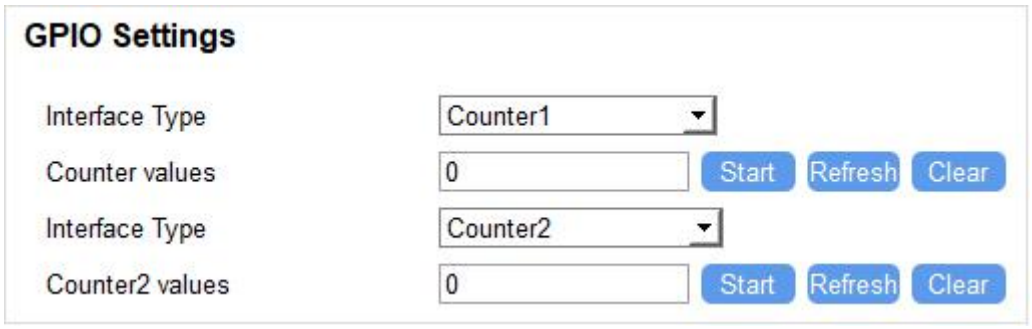
Connect devices to corresponding DO ports according to section 3.1, then you can send downlinks to trigger the DO.

Pulse Counter:

Pulse counter feature only works with UC11 series hardware version 3.0.

1. Connect devices to corresponding DI ports.

2. Go to "**General**" page of UC1114 or "**General -> Basic**" page of UC1122/UC1152, select type as Counter.



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.

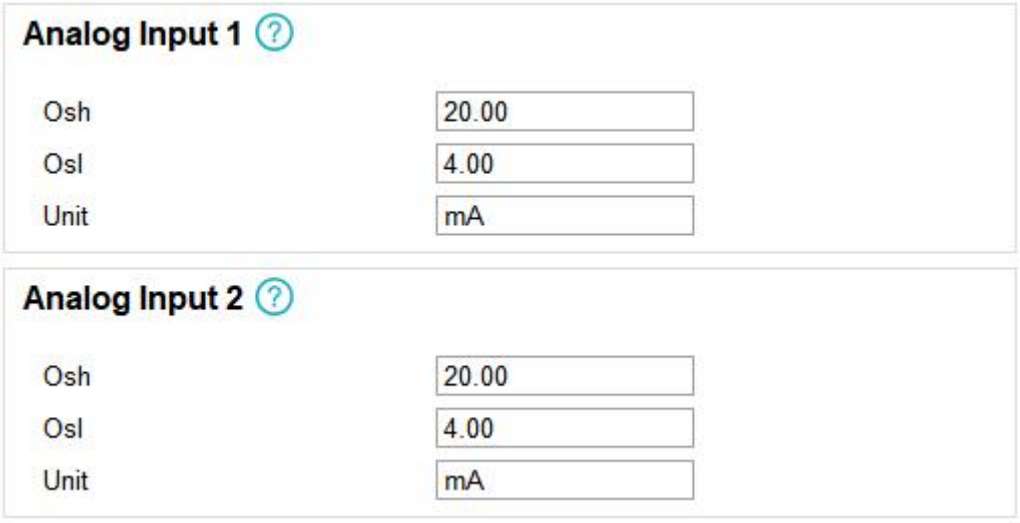
Note:

1) UC11xx only starts counting when it detects 6 pulses from pulse devices;
2) UC11xx will send non-changable counting values if you do not click "Start".

4.3.3 AI Settings

UC1122 has two analog inputs for analog device connection.

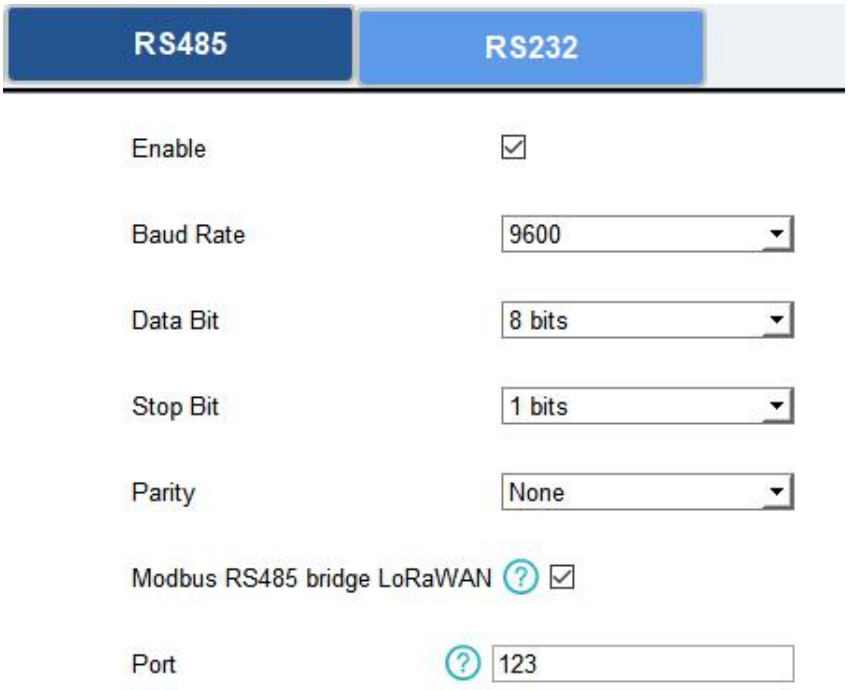
1. Connect analog device to analog input ports.
2. Go to "**General** " page to configure range and unit, you can keep all settings by default.



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.



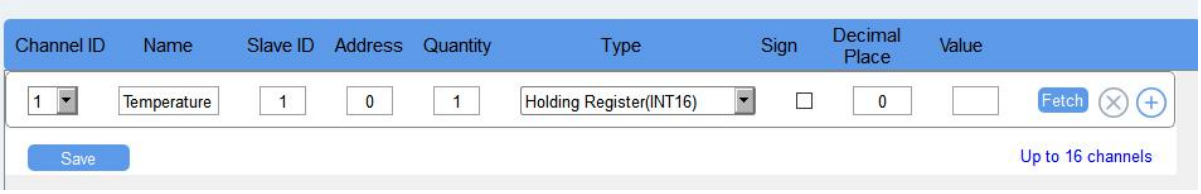
Parameters	Description
Baud Rate	4800/9600/19200/38400/57600/115200 are available.
Data Bit	8 bit is available.
Stop Bit	1 bit/2 bit are available.
Parity	None, Odd and Oven are available.
Modbus RS485 bridge LoRaWAN	If this mode is enabled, UC1152 will transparent Modbus RTU commands from network server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

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

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 device fails to read data from RS485 terminal devices.
Channel ID	Select the channel ID you want to configure, 16 channels selectable.
Name	Customize the name to identify every Modbus channel.
Slave ID	Set Modbus slave ID of terminal device.
Address	The starting address for reading.
Quantity	Set read how many digits from starting address. It fixes to 1.
Type	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. **Example:** 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 following picture, UC1152 will send Modbus read command to terminal device regularly: 01 03 00 00 00 01 84 0A



4. Click “Fetch” to check if UC1152 can read correct data from terminal devices.

Note:

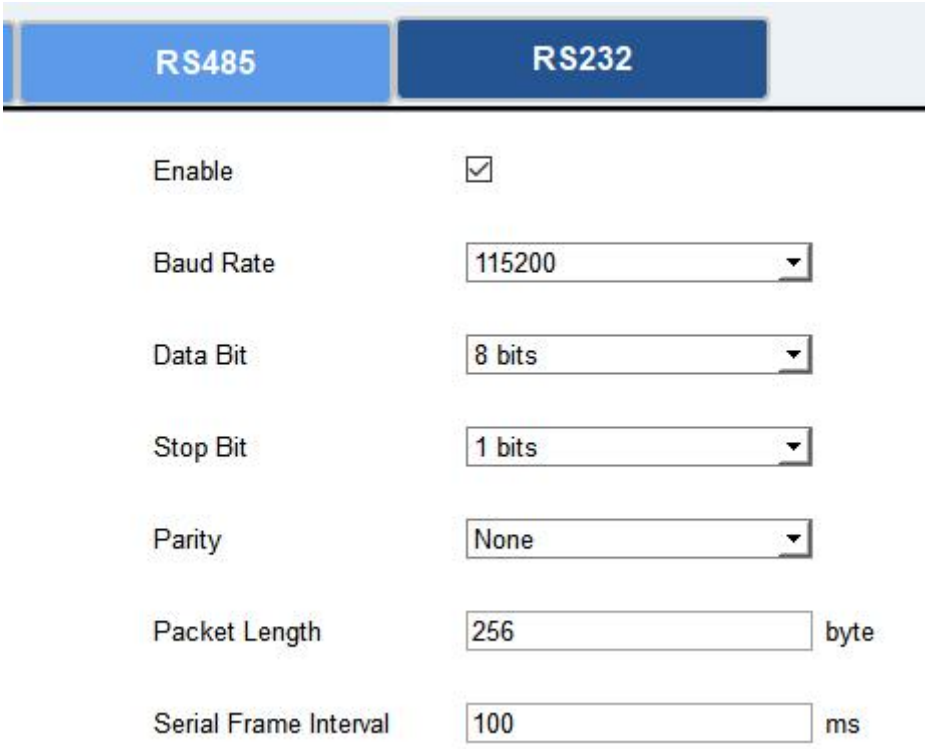
1) Do not click “Fetch” frequently since response time to reply is differ for every terminal device.

2) For hardware version 1.0/2.0, 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.

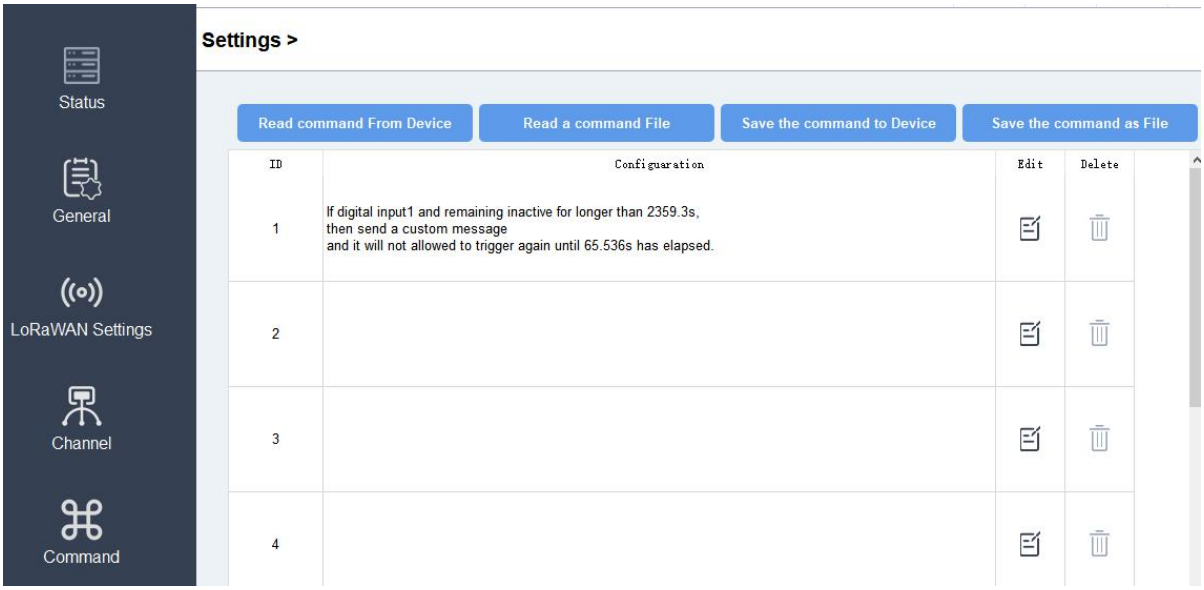


Parameters	Description
Baud Rate	4800/9600/19200/38400/57600/115200 are available.
Data Bit	8 bit is available.
Stop Bit	1 bit/2 bit are available.
Parity	None, Odd and Oven are available.
Packet Length	When UC1152 receive RS232 data up to this length, it will fragment it as a single packet and send to network server.
Serial Frame Interval	The interval that the device sends out real serial data stored in the buffer area to public network. The range is 10-65535 milliseconds. **Note:** data will be sent out to public network when 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 network connection. Besides, you can backup your command settings and import to other devices.

1. Go to “Command” page, 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 a 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 Status page or you can send downlink command to configure the time.
Digital Input	When UC11 device detect the DI as a specific status. **is contined for:** the DI changed status should last for some time. **Set lockout time:** after the lockout time, UC11 device will detect if DI status matches the condition. 0 means this IF condition will only be detected once.

Received a message	When UC11 device receive a specific message from 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 message as ff120450.(whole message length is 4 bytes, 50 means "P").
The Device Restarts	Reboot the device.
Channel	When Modbus channel reaches a specific value/range. This only works in UC1152 device. **is contined for:** the Modbus channel value should last for some time. **Set lockout time:** after the lockout time, UC11 device will detect if Modbus value matches the condition. 0 means this IF condition will only be detected once.
Analog	When analog value reaches a specific value/range. This only works in UC1122 device. **is contined for:** the analog value should last for some time. **Set lockout time:** after the lockout time, UC11 device will detect if analog value matches the condition. 0 means this IF condition will only be detected once.
Counter	When 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 message to network server.
Output Trigger	DO can be set to activated/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 other device, click "Read a command File" to import the .dat file.

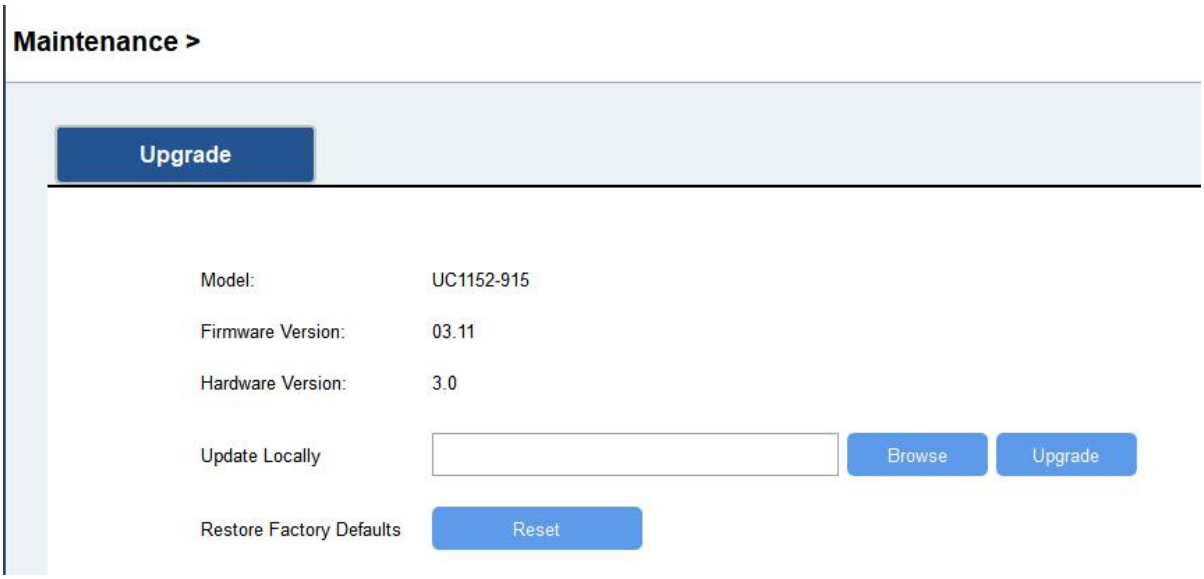
4.5 Maintenance

4.5.1 Upgrade

UC11 series support upgrade locally via ToolBox software.

1. Download firmware from www.milesight-iot.com to your PC.

2. Go to "**Maintenance -> Upgrade**", 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.

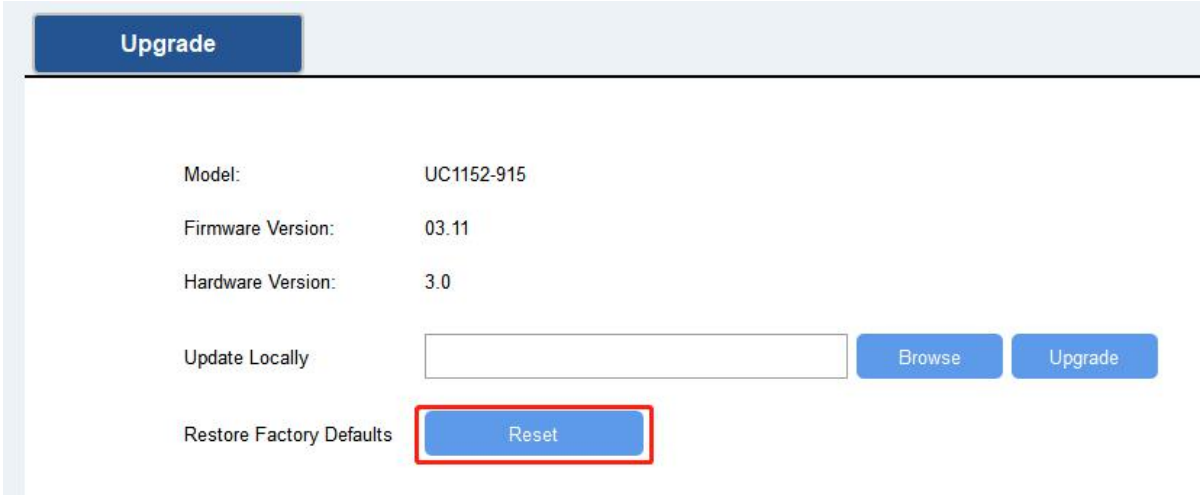


4.5.2 Reset to Factory Default

Please select one of following methods to reset device:

Via Hardware: Open the case of UC11 and hold on button on the board for more than 10s.

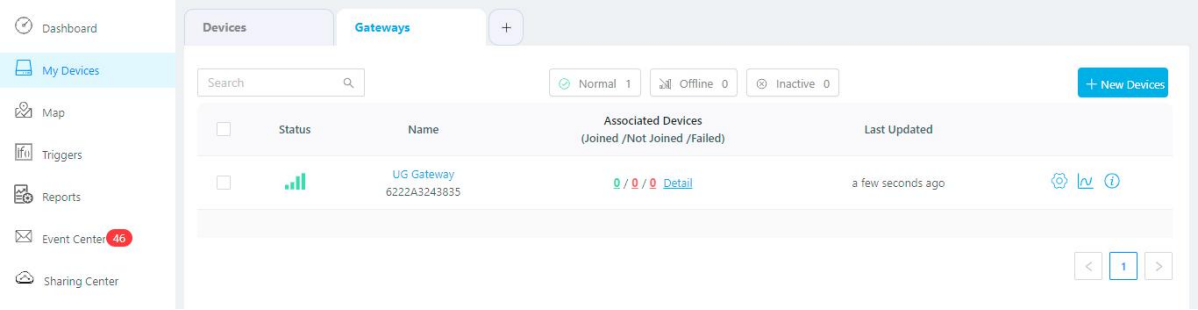
Via ToolBox Software: Go to "Maintenance->Upgrade" to click "Reset".



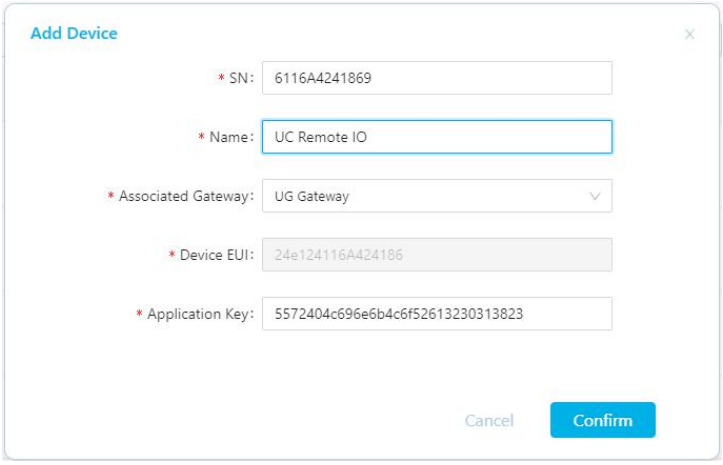
5. Milesight IoT Cloud Management

UC11 series can be managed by 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 following steps.

1. Ensure Milesight LoRaWAN® gateway is online in Milesight IoT Cloud. For more info about connecting gateway to cloud please refer to Gateway User Guide.

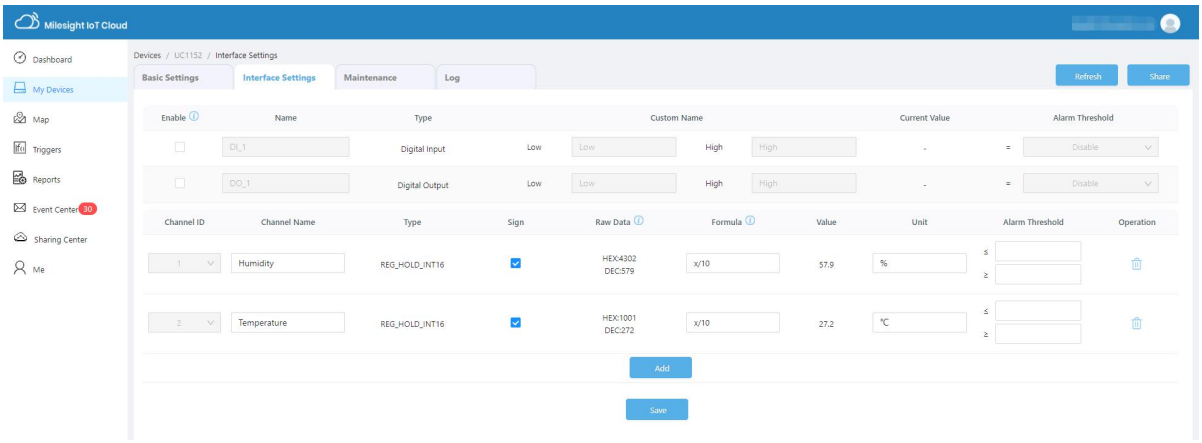


2. Go to “My Devices” page and click “+New Devices”. Fill in the SN of UC11 series and select associated gateway.



3. After 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.



6. Device Payload

UC11 Series use 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.

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