

LoRaWAN[®] Solenoid Valve Controller

UC51x Series

User Guide



Safety Precautions

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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.
- Make sure electronic components do not drop out of the enclosure while opening.
- When installing the battery, please install it accurately, and do not install the reverse or wrong model.
- The device must never be subjected to shocks or impacts.

Declaration of Conformity

UC51x series is in conformity with the essential requirements and other relevant provisions of the CE, FCC, and RoHS.



FCC Statement:

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.

-Increase the separation between the equipment and receiver.

-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator& your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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For assistance, please contact Milesight technical support: Email: <u>iot.support@milesight.com</u> Support Portal: <u>support.milesight-iot.com</u> Tel: 86-592-5085280 Fax: 86-592-5023065 Address: Building C09, Software Park III, Xiamen 361024, China

Revision History

Date	Doc Version	Description
Feb. 20, 2021	V 1.0	Initial version
Nov.26, 2021	V 1.1	Description Update
March 10, 2021	V 2.0	Update based on hardware 2.x
June 15, 2022	V 2.1	1. Add internal interface description;
		2. UC511 supports Class C to B mode;
		3. GPIO supports selecting DI or pulse mode;
		4. Update re-join mode and confirmed mode
		description.
Nov. 21, 2022	V 2.2	Add prevent jitter delay time when GPIO
		works as DI mode
March 23, 2023	V 3.0	Update based on hardware 3.x

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1. Product Introduction

1.1 Overview

UC51x series LoRaWAN[®] wireless solenoid valve controller is a device used to remotely control DC latching solenoids of the valve. It contains 2 solenoid interfaces and 2 GPIO interfaces, which can be easily controlled locally or remotely.

Besides ultra-low-power LoRaWAN[®] technology, UC51x series also provides both solar and built-in battery power supply for uninterrupted operation. For outdoor applications, it equips with IP67-rated enclosure and M12 connectors to protect from water and dust under harsh environments.

1.2 Features

- Compatible with standard DC latching solenoids
- OPEN/CLOSE control by mobile App locally or commands remotely
- Two GPIO interfaces for flow monitoring or valve status monitoring
- Transmission distance up to 15 km with line of sight
- Waterproof design including IP67 case and M12 connectors
- Solar powered and built-in chargeable batteries
- Quick wireless configuration via NFC
- Time and flow control via Milesight IoT Cloud

Hardware Introduction Packing List



¥ 2×5

1 × UC51x Device

2 × Data Cables (1.5m)

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1 × Mounting Bracket



4 × Wall Mounting Kits









2 × Hose Clamps

1 × Fixing Screw

1 × Quick Guide

1 × Warranty Card



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

2.2 Hardware Overview



Data Interface 1&2:

Pin	Description
1	DC+/OUT1 of Solenoid Valve
2	DC-/OUT2 of Solenoid Valve
3	GND
4	INSERT BOOT ¹
	·



¹ PIN3 and PIN4 do not need to connect, see "Solenoid Valve Switch" option in section 3.4.

5	GND
6	GPIO Interface

Power Interface (UC511-EA):

Pin	Description
1	VCC(5-24V)
2	GND



2.3 Internal Interfaces



DIP Switch:

Interface	DIP Switch
Solenoid Interface	12V: 1 on 2 off 3 off
	9V: 1 off 2 on 3 off
	5V: 1 off 2 off 3 on

Note:

- 1) The DIP switch is set to 12VDC by default.
- 2) The DIP switch does not support setting two solenoid interfaces as different voltage types.

Power Button:

Function	Action	LED Indication
Turn On	Press and hold the button for more than 3s.	Off → On
Turn Off	Press and hold the button for more than 3s.	On → Off
Reset	Press and hold the button for more than 10s.	Blinks.
Check	Quickly press the power button.	Light On: Device is on.
On/Off Status		Light Off: Device is off.

2.4 Dimensions (mm)

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3. Installation

3.1 Antenna Installation

Rotate the LoRaWAN® antenna into the antenna connector.

Note:

- 1) The external antenna should be installed vertically always on a site with a good signal.
- 2) The magnetic base of antenna should be attached to the metal surface to get a good signal.
- 3) The installation height should more than 2m from the ground.
- 4) Keep away from walls or barriers and be closer to outdoors.
- 5) The distance between two antennas should more than 0.5m.

Antenna Specifications

Milesight provides a magnetic LoRaWAN[®] antenna and here is the specifications. **Specification-1:**

Electrical Properties

Frequency Range 902~928 MHz

Impedance	50Ω Nominal	
Radiation	Omni-directional	
Gain	5dBi	
Polarization	Vertical	
Input Power	50W	
Connector	SMA Male	
Physical Characteristics		
Dimension	Ф29×225mm	
Operating Temperature	-40°C ~ 70°C	

Specification-2:

Electrical Properties		
Frequency Range	860~930 MHz	
Impedance	50Ω Nominal	
Radiation	Omni-directional	
VSWR	<2	
Gain	≤ 1dBi	
Polarization Type	Vertical	
Connector	SMA Male	
Physical Characteristics		
Dimension	Φ29×111mm	
Operating Temperature	-40°C ~ 85°C	

3.2 Device Installation

UC51x series support wall mounting or pole mounting. 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. It's necessary to fix this bracket to device, or it will affect the signal.



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. It's necessary to fix this bracket to device, or it will affect the signal.



4. Operation Guide

4.1 Log in the ToolBox

UC51x series can be monitored and configured via ToolBox App or ToolBox software. Please select one of them to complete configuration.

4.1.1 NFC Configuration

1. Download and install "Milesight ToolBox" App from Google Play or Apple App Store.

- 2. Enable NFC on the smartphone and launch Milesight ToolBox.
- 3. Attach the smartphone with NFC area to the device to read basic information.

4. Basic information and settings of devices will be shown on ToolBox if it's recognized successfully. You can read and configure the device by tapping the button on the Device Status. In order to protect the security of devices, password validation is required when first configuration. Default password is **123456**.



Note:

1) Ensure the location of smartphone NFC area and it's recommended to take off phone case.

2) If the smartphone fails to read/write configurations via NFC, keep the phone away and back

to try again.

3) UC51x series can also be configured by dedicated NFC reader, which can be purchased from Milesight IoT.

4.1.2 USB Configuration

- 1. Download ToolBox from <u>Milesight IoT website</u>.
- 2. Open the case of UC51x and connect the UC51x to computer via type-C port.



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

Туре	General	-
Serial port	COM4	•
Login passwor	d	
Baud rate	115200	•
Data bits	8	-
Parity bits	None	_
Stop bits	1	•

4. After logging in the ToolBox, you can click "Power On" or "Power Off" to turn on/off device and change other settings.

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Status >		Power On
Model:	UC512-DI-868M	^
Serial Number:	646 .	
Device EUI:	24e1244	
Firmware Version:	02.02	
Hardware Version:	2.1	
Device Status:	Off	
Join Status:	÷.	
RSSI/SNR:	-	
Valve1 Status:		
Counter1:	12	
Valve2 Status:		
Counter2:	33	
Battery:	<i>ī.</i>	
Channel Mask:		
Uplink Frame-counter:	÷	
Downlink Frame-counter:	-	~

4.2 Solenoid Valve Control

Solenoid valve can be controlled by ToolBox App or ToolBox software locally.

Via ToolBox Software:

Click **Open** or **Close** button on the **Status** page to change the status of solenoid valves.

Status >		
Model:	UC512-DI-868M	
Serial Number:	6460C	
Device EUI:	24e1244	
Firmware Version:	02.02	
Hardware Version:	2.1	
Device Status:	On	
Join Status:	Activate	
RSSI/SNR:	-31/10	
Valve1 Status:	Open Close	
Counter1:	1 Clear	
Valve2 Status:	Close Open	
Counter2:	17 Clear	
Battery:	100%	
Channel Mask:	00ff	

Via ToolBox App:

Click buttons of Valve Status on the **Device > Status** page, then attach the smart phone to device to change the status of solenoid valves.



4.3 LoRaWAN Settings

LoRaWAN settings is used for configuring the transmission parameters in LoRaWAN® network.

4.3.1 Basic Settings

UC51x supports basic configurations like join type, App EUI, App Key and other information. You can also keep all settings by default.

Device EUI	24E124	
App EUI	24E124C0002A0001	
Application Port	85	
Join Type	OTAA	<u> </u>
LoRaWAN Version	V1.1.0	<u> </u>
Application Key	****	
RX2 Date Rate	DR0 (SF12, 125k)	<u> </u>
RX2 Frequency	869525000	
Spread Factor	SF10-DR2	<u> </u>
Confirmed Mode	()□	
Rejoin Mode	⑦☑	
Set the number o	f packets sent 32	packets
ADR Mode	?⊠	
Parameters	Descrip	ption
Device EUI	Unique ID of the device which can also b	e found on the label.

App EUI	Default App EUI is 24E124C0002A0001.
Application Port	The port used for sending and receiving data, default port is 85.
Join Type	OTAA and ABP mode are available.
LoRaWAN Version	V1.0.2 and V1.0.3 are available.
Application Key	Appkey for OTAA mode, default is 5572404C696E6B4C6F52613230313823.
Device Address	DevAddr for ABP mode, default is the 5 th to 12 th digits of SN.
Network Session Key	Nwkskey for ABP mode, default is 5572404C696E6B4C6F52613230313823.
Application Session Key	Appskey for ABP mode, default is 5572404C696E6B4C6F52613230313823.
RX2 Data Rate	RX2 data rate to receive downlinks.
RX2 Frequency	RX2 frequency to receive downlinks. Unit: Hz
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 once.
Rejoin Mode	The device will send a specific number of LinkCheckReq MAC packets to the network server every 30 mins to validate connectivity; If there is no response, the device will re-join the network.
Set the number of packets sent	When rejoin mode is enabled, set the number of LinkCheckReq packets sent.
ADR Mode	Allow network server to adjust datarate 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.

4.3.2 Frequency Settings

Select supported frequency and channels to send uplinks. Make sure the channels match the LoRaWAN[®] gateway.

Basic		Channel				
		Support Frequency :	EU868	¥		
	Index	Frequency/MHz	Max Datarate		Min Datarate	
	0	868.1	5-SF7BW125	<u> </u>	0-SF12BW125	<u> </u>
	1	868.3	5-SF7BW125	<u></u>	0-SF12BW125	*
	2	868.5	5-SF7BW125	<u>×</u>	0-SF12BW125	<u>_</u>
	3	0	5-SF7BW125	<u></u>	0-SF12BW125	<u></u>
	4	0	5-SF7BW125	<u> </u>	0-SF12BW125	<u> </u>
	5	0	5-SF7BW125	Ŧ	0-SF12BW125	Y
	6	0	5-SF7BW125	<u> </u>	0-SF12BW125	<u>_</u>
_	-	0		-1	0.0540504405	-1

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

	Support Frequency :	AU915	
Enabled Channel Index: 0-7	1		
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

4.3.3 Multicast Settings

UC51x supports setting up several multicast groups to receive multicast commands from network servers and users can use this feature to control devices in bulks.

1. Enable Multicast Group and set a unique multicast address and keys to distinguish other groups. You can also keep these settings by default.

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Multicast Group 1	
Multicast Aaddress	(?) 1111111
Multicast McAppSKey	*****
Multicast McNetSKey	*****
Multicast Group 2	0
Multicast Group 3	Ο
Multicast Group 4	Ο

Parameters	Description
Multicast Address	Unique 8-digit address to distinguish different multicast groups.
Multicast McAppSkey	32-digit key. Default values:
	Multicast Group 1: 5572404C696E6B4C6F52613230313823
	Multicast Group 2: 5572404C696E6B4C6F52613230313824
	Multicast Group 3: 5572404C696E6B4C6F52613230313825
	Multicast Group 4: 5572404C696E6B4C6F52613230313826
	32-digit key. Default values:
	Multicast Group 1: 5572404C696E6B4C6F52613230313823
Multicast	Multicast Group 2: 5572404C696E6B4C6F52613230313824
MCNetSkey	Multicast Group 3: 5572404C696E6B4C6F52613230313825
	Multicast Group 4: 5572404C696E6B4C6F52613230313826

2. Add a multicast group on the network server. Take Milesight UG6x gateway as an example, go to **Network Server > Multicast Groups**, and click **Add** to add a multicast group.

Status	General	Applications	Profiles	Device	Multicast Groups	Gateway Fleet	Packets	
Packet Forwarder	Multicast Group	05						
Network Server	Add						Search	O,
		Multicast Address		Group Name		Number of Devices	Operation	ation
Network				No m	atching records found			

Fill in the multicast group information that is the same as device settings, and select the devices that you need to control, then click **Save**.

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General Aulticast Grou	Applications ups	Payload Codec	Profiles	Device	Multicast Groups	Gateway Fleet	Packets	0,
General Iulticast Grou	Applications	Payload Codec	Profiles	Device	Multicast Groups	Gateway Fleet	Packets	J
General	Applications	Payload Codec	Profiles	Device	Multicast Groups	Gateway Fleet	Packets	J
								J
Fran Sele	me-counter ected Devices C51X ×					0]
Free	quency				[505300000		Hz
Data	arate				[DR0 (SF12, 125 k	(Hz) 🗸]
Clas	ss Type				[Class C	~	
Mult	ticast Application	Session Key			[5572404C696E6B	4C6F526132]
WU	ticast Network Se	ession Key			[5572404C696E6B	4C6F526132	
N.A Is	licasi Address					11111111]
Mult	ticast Addross							

3. Go to **Network Server > Packets**, select the multicast group and fill in the downlink command, then click **Send**. The network server will broadcast the command to devices that belong to this multicast group.

Note: ensure all devices' application ports are the same.

Status	Gener	al Applications	Payload Codec	Profiles	Device	Multicast Groups	Gateway Fleet	Packets	
Packet Forwarder	Send D	ata To Device							
		Device EUI	Туре			Payload	Port	Confirmed	
Network Server	0	0000000000000	ASCII	~			85	0	Send
Protocol Integration	•								
	Send D	ata to Multicast Group							
Network		Multicast Group	Туре			Payload	Port		
System		Valve Control	✓ hex	~	ff1d2100		85		Send

4.4 Solenoid Settings

Go to **Device Settings > Basic** of ToolBox software or **Setting > General Settings** of ToolBox App to change the reporting configurations.

Reporting Interval	20	min
Data Storage	⑦ ■	
Data Retransmission	0	
Solenoid Valve Wiring Switch	⊘ ◙	
GPIO1 Acquisition Type	Pulse Counter	-
GPIO2 Acquisition Type	Digital input	•
Prevents jitter delay time	40	S
Data Reporting	All	-
Device Return to Power Supply State	Return to previous working state	_
Class Type	Class C	<u> </u>
Change Password	0	

Parameters	Description
	Reporting interval of transmitting data to the network server. Default:
Reporting Interval	20min, Range: 1-1080 mins.
Data Storage	Disable or enable data storage locally. (see section 3.6 to export data)
Data	Dischlary angela data natura anisairan (ana saatian 27)
Retransmission	Disable of enable data retransmission. (see section $\frac{3.7}{2}$)
Solenoid Valve	After this parameter is enabled, when users connect the solenoid cable to
Wiring Switch	any solenoid interface, the device will turn on automatically.
	Select Digital Input or Pulse Counter.
GPI01/2	Digital input: detect the real state of the valve to know if valve control
Acquisition Type	takes effect.
	Pulse counter: connect the water meter to measure the flow.
Drovent litter Delev	The device will not upload GPIO status during this time to avoid frequent
Time	uplinks. This only works when GPIO mode is DI and also applies to both
Time	GPIO interfaces.
	Select the contents to report to the network server.
	All: Report all interface status;
Data Daparting	Valve 1 & Water Meter 1: Report the status of the Valve 1 interface and
Data Reporting	data of GPI01;
	Valve 2 & Water Meter 2: Report the status of the Valve 2 interface and
	data of GPIO2.

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Device Return to	If the device loses power and returns to power supply, the device will be
Power Supply State	on or off according to this parameter.
	Working mode of LoRaWAN [®] device.
	UC511: Class A, Class B, Class C and Class C to B are available;
	UC512: Class A and Class B are available.
Class Type	Note: for Class B mode, if the device does not receive beacons for more
	than 30 minutes, it will switch to Class A mode automatically; for Class C
	to B mode, if the device does not receive beacons for more than 30
	minutes, it will switch to Class C mode automatically.
	When the device works under Class A mode, it only receives control
	commands at every reporting interval. In order to shorten the delay time of
Response Time	control, the device will send a blank package to allow to receive the
	control commands at every Response Time interval.
	Note: The shorter the response time, the shorter the battery life.
Ping Slot	When the device works under Class B or Class C to B mode, set the
Periodicity	interval to open the reception window.
	Change the password for ToolBox App or software to read/write this
Change Password	device.

Note:

1) When the device connects to the network server of Milesight gateway, the blank package will take up the frame count but not show on the package list.

2) Reboot or re-join will not affect the counting.

4.5 Schedule Settings

Go to **Device Settings > Schedule** of ToolBox software or **Setting > Schedule** of ToolBox App to configure the solenoid switch plans.

1. Configure a plan as your request and enable it.

	Item	Status	Initial st	tate of solenoid valve	Start Time	End Time	Water Volume(Pulses)	Repeat	Valve	
	1		open	•	7: <mark>1</mark> 5	7:18	5	Every Saturday	182 -	
	2		Closure	<u> </u>	0:0	0:0			·	
	3		Closure	•	0:0	0:0			<u> </u>	
	4		Closure	-	0:0	0:0				
	5		Closure	<u>·</u>	0:0	0:0				
	6		Closure	-	0:0	0:0			<u> </u>	
	7		Closure	-	0:0	0:0			·	
	8		Closure	<u>•</u>	0:0	0:0			·	
	9		Closure	<u>*</u>	0:0	0:0			<u> </u>	
	10		Closure	<u> </u>	0:0	0:0			·	
	11		Closure	•	0:0	0:0			<u> </u>	
	12		Closure	-	0:0	0:0			·	
	13		Closure	•	0:0	0:0				
	14		Closure	•	0:0	0:0			<u> </u>	
	15		Closure	<u> </u>	0:0	0:0			<u> </u>	
	16		Closure	-	0:0	0:0			<u> </u>	
	Clea	ir All		Re	ad Schedule		Save Schedu	ile		Write
	Со	nditio	on				Description			
	Coi	nditio Item	n	It supports a	dding 16	olans at n	Description			
	Cor I S	nditio Item tatus	on	It supports a Enable or dis	dding 16 able this	olans at n olan.	Description			
	Co I S nitial	nditio Item tatus I State	on e of	It supports a Enable or dis	dding 16 sable this	olans at n olan.	Description			
I	Co I S ⁻ nitial	nditio Item tatus I State	e of alve	It supports a Enable or dis Control the s	dding 16 sable this solenoid to	olans at n olan. o open or	Description nost. close the valve	during the	plan.	
I S S	Cor I S nitial colen	nditio Item tatus I State oid V Time	e of alve /End	It supports a Enable or dis Control the s	dding 16 sable this solenoid to	olans at n olan. o open or	Description nost. close the valve	during the	plan.	
l S	Cor I S nitial colen tart	nditio Item tatus I State oid V Time/	e of alve /End	It supports a Enable or dis Control the s Set the time	dding 16 p sable this p solenoid to range to e	olans at n olan. o open or execute th	Description nost. close the valve iis plan.	during the	plan.	
l S S	Col I S nitial colen tart	nditio Item tatus I State oid V Time/ Time	e of alve /End	It supports a Enable or dis Control the s Set the time	dding 16 sable this solenoid to range to e	olans at n olan. o open or execute th	Description nost. close the valve iis plan.	during the	plan.	
l S S	Col I S nitial colen tart	nditio Item tatus I Stata oid V Time/ Time	e of alve /End	It supports a Enable or dis Control the s Set the time Set the amo	dding 16 p sable this p solenoid to range to e unt of wat	olans at n olan. o open or execute th ter flow tl	Description nost. close the valve is plan. nrough the valve	during the	plan. is plan, 0 n	neans this
l S	Co I S nitia olen tart	nditio Item tatus I Statu oid V Time/ Time	e of alve /End	It supports a Enable or dis Control the s Set the time Set the amo condition wil	dding 16 p sable this p solenoid to range to e unt of wat I not work	olans at n olan. o open or execute th ter flow th	Description nost. close the valve is plan. nrough the valve	during the e during th	plan. is plan, 0 n	neans this
l S S	Coo I S nitial colen tart ⁻ 1	nditio Item tatus I State oid V Time Time	e of alve /End	It supports a Enable or dis Control the s Set the time Set the amo condition will	dding 16 p able this p colenoid to range to e unt of wat I not work	olans at n olan. o open or execute th ter flow th	Description nost. close the valve is plan. nrough the valve	during the	plan. is plan, 0 n	neans this
I S S	Coo I S nitial colen tart ⁻ 1 Vate	nditio Item tatus I Statu oid V Time Time r Volu	e of alve /End	It supports a Enable or dis Control the s Set the time Set the amo condition will Note:	dding 16 p sable this p solenoid to range to e unt of wat I not work	olans at n olan. o open or execute th ter flow th	Description nost. close the valve is plan. nrough the valve	during the e during th	plan. is plan, 0 n	neans this

 and will stop executing.

 2) When the GPIO type is not pulse counter, this condition will not work.

 Repeat
 Set the regularly weekly schedule to execute this plan. If none is selected, the plan will only execute once.

🙆 week					×
🗌 Monday	Tuesday	🗌 Wednesday	🗌 Thursday		
☑ Friday	Saturday	Sunday			
		confim			
	🤮 week □ Monday ☑ Friday	🧐 week □ Monday 🛛 Tuesday ☑ Friday ☑ Saturday	 ♦ week Monday ☐ Tuesday ☐ Wednesday ☑ Friday ☑ Saturday ☐ Sunday 	Sweek − Monday □ Tuesday □ Wednesday □ Thursday Friday □ Saturday □ Sunday confim	week - □ Monday □ Tuesday □ Wednesday □ Thursday Friday □ Saturday □ Sunday confin

2. Click **Write** to write the schedule plan setting into the device.

3. Click **Save Schedule** to backup the schedule plan settings as a file; if you need to import this schedule from other devices, click **Read Schedule** to import the setting.

4. Click Clear All to reset all schedule plan settings in this device.

Note:

Ensure the device time is correct. After joining the network, the network server will assign the time to the device. You can also manually sync the time via ToolBox or downlink commands.
 When the device has multiple schedule plan settings that are conflicted, the device will only execute one plan whose item number is the largest.

4.6 Data Storage

UC51x series supports storing 1000 data records locally and exports data via ToolBox App or ToolBox software. The device will record the data according to the reporting interval even if it is not connected to a network.

1. Go to Status of ToolBox software or Device > Status of ToolBox App to sync the device time;

 Go to Device Settings > Basic of ToolBox software or Device > Settings > General Settings of ToolBox App to enable data storage feature.

3. Go to **Maintenance > Basic** of ToolBox software or **Device > Maintenance** of ToolBox App, click **Export**, then select the data time range and click **Save** to export data.

Note: ToolBox App can only export the last 14 days' data. If you need to export more data, please use ToolBox software.

4. Click **Clear** to clear all stored data inside the device.

Maintenance >



4.7 Data Retransmission

UC51x series supports data retransmission to ensure the network server can get all data even if the network is down for some times. There are two ways to get the lost data:

- Network server sends downlink commands to enquire the historical data for specified time range, see *UC51x Series Communication Protocol;*
- When network is down if no response from LinkCheckReq MAC packets for a period of time, the device will record the network disconnected time and re-transmit the lost data after the device re-connects the network.

Here are the steps for data retransmission:

1. Use Toolbox software or ToolBox App to sync the time. If you set LoRaWAN® version as 1.0.3,

the device will send a request to enquire time from the network server.

2. Enable data storage feature and data retransmission feature;

Settings >

Basic		
	Data Storage	⑦ ☑
	Data Retransmission	⑦ ☑

3. Enable rejoin mode feature and set the number of packets sent. Take below as an example, the device will send LinkCheckReq MAC packets to the network server at least every 30 mins to check if the network is disconnected; if there is no response for 8 times (8 * 30 mins = 240 mins = 4 hours), the device will record a data lost time point(disconnection time minus 4 hours).

Basic	Channel	
	Device EUI	24E124707C300073
	App EUI	24E124C0002A0001
	Application Port	85
	Join Type	OTAA
	LoRaWAN Version	V1.0.3
	Application Key	****
	Spread Factor	SF7-DR5
	Confirmed Mode	()□
	Rejoin Mode	⑦ ☑
	Set the number of packets se	ent 8 packet

4. After the network connected back, the device will send the missing data, starting from the point in time when the data was lost, according to the reporting interval.

Note:

1) If the device is rebooted or powered off during data retransmission and the process is not completed, the device will resend all retransmitted data again after reconnecting to the network;

2) If the network is disconnected again during data retransmission, it will only send the latest disconnection data;

3) The retransmission data format is started with "20ce", please refer to *UC51x Series Communication Protocol*.

4) Data retransmission will increase the uplinks and shorten the battery life.

4.8 Maintenance

4.8.1 Upgrade ToolBox Software: 1. Download firmware from www.milesight-iot.com to your PC.

2. Go to **Maintenance > Upgrade** of ToolBox software, click **Browse** to import firmware and upgrade the device.

Mainten	ance >		
	Upgrade	Backup and Reset	
	Model:	UC512-DI-868M	
	Firmware Version	.: 02.02	
	Hardware Version	1: 2.1	
	Domain:	Beijing Server	•
	FOTA:	Up to date	
	Update Locally		Browse Upgrade

ToolBox App:

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

2. Open ToolBox App and click **Browse** to import firmware and upgrade the device.

Note:

- 1) Operation on ToolBox is not supported during the upgrade.
- 2) Only Android version ToolBox supports the upgrade feature.



4.8.2 Backup

UC51x devices support configuration backup for easy and quick device configuration in bulk.

Backup is allowed only for devices with the same model and LoRaWAN[®] frequency band. Note that the backup file will not save schedule setting, please backup plan setting on **Schedule** page. Please select one of following methods to backup device:

ToolBox Software:

1. Go to **Maintenance > Backup and Reset**, click **Export** to save current configuration as json format backup file.

2. Click **Browse** to select backup file, then click **Import** to import the configurations.

Upgrade	Backup and Reset			
Config Backup	Exp	ort		
Config File			Browse	Import
Restore Factor	ry Defaults Res	iet		

ToolBox App:

1. Go to **Template** page on the App and save current settings as a template. You can also edit the template file.

2. Select this template and attach to another device to write configuration.



4.8.3 Reset to Factory Default

Please select one of following methods to reset device:

Via Hardware: Open the case of UC51x and hold on power button more than 10s.

Via ToolBox Software: Go to Maintenance > Backup and Reset to click Reset.

Upgrade	Backup and Reset			
	N			
Config Backup	Exp	ort		
Config File			Browse	Import
Restore Factor	y Defaults Res	et		

Via ToolBox App: Go to Device > Maintenance to click Reset, then attach smart phone with NFC area to UC51x to complete reset.

	512-DI-8	68M
		Maintenance
SN	641	5A51585070020
Model		UC512-DI-868M
Firmware Versi	ion	V1.12
Hardware Vers	ion	V1.0
Manual Upgrad	е	
	Browse	
Restore Factory	/ Default	
	Reset	

5. Milesight IoT Cloud Management

UC51x 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.

5.1 Add UC51x to Cloud

1. Ensure Milesight LoRaWAN[®] gateway is online in Milesight IoT Cloud. For more info about connecting gateway to cloud please refer to gateway's user guide.

Milesight IoT Cloud							Milesight IoT 🧶
② Dashboard	Devices		Gateways	+			
My Devices	Search		٩		⊘ Normal 1 🔊 Offline 1 ⊗ Ina	ctive 0	+ New Devices
🖄 Мар		Status	Name		Associated Devices	Last Updated	
Ifo Triggers			UG Gateway		0 / 0 / 0 Detail	a few seconds and	() v ()
Reports			621793129987				
Event Center 56)HG	6222A3243835		0 / <u>1</u> / <u>0</u> <u>Detail</u>	2021-02-03 09:41	
Sharing Center							
R Me							< 1 >

2. Go to "My Devices" page and click "+New Devices". Fill in the SN of UC51x and select

Milesight

associated	gateway.
	<u> </u>

* SN:	6415A51585070020		
* Name :	UC511		
* Associated Gateway:	UG Gateway	\sim	
* Device EUI:	24e124415A515850		
* Application Key:	5572404c696e6b4c6f52613230313823		

3. Click and go to "Basic Settings" to change class type the same as device settings.

Basic Settings	Interface Settings	Maintenance	Log			Refresh	Shar
	* Nan	ne: UC511					
	* Application K	ey: 5572404c69	96e6b4c6f52613230313823				
	LoRaWAN Class ((): classA			\sim		
		Class A: Down any other time	link communications (configu will have to wait until the next	ation changes) from the Clo it scheduled uplink from dev	ices.		
	Descriptio	on:					

Besides, configure the unit of per pulse if you connect the water meter.

Devices / UC511 / Basic	: Settings						
Basic Settings	Interface Settings	Maintenance	Log			Refresh	Share
				2			
	Desc	ription :					
					11		
	* Unit Pe	r Pulse: 1			gal		
	* Reporting Inter	val (): 20			min		
	Device Offline	Alarm: 🔽					

4. Click of and go to "Interface Settings" to select used interfaces and customize the name and thresholds.

Milesight IoT Cloue	d								Milesight IoT 🧕
② Dashboard	Devices / UC511	/ Interface Setting	s						· · · · · · · · · · · · · · · · · · ·
My Devices	Basic Setting	js Inte	erface Settings	Maintenance	Log				Refresh Share
🖄 Мар	Enable ①	Name	Туре		Cust	tom Name		Current Value	Alarm Threshold
If Triggers		Valve 1	Valve	Closed	Closed	Open	Open	Closed	= Disable V
Reports		Valve 2	Valve	Closed	Closed	Open	Open	Open	= Disable \lor
Event Center 58	Enable ①	N	ame	Curre	ent Value		Unit		Alarm Threshold
Я _{Me}		Valve 1 - Last flo	w volume		0		gal	2	
		Valve 1 - Total fle	ow volume		0		gal	<u>ح</u> ک	
		Valve 2 - Last flo	w volume		0		gal	5	
Ξ•		Valve 2 - Total fl	ow volume		0		gal	<u>ح</u> ک	

5.2 Solenoid Valve Control

Solenoid valve can be controlled by Milesight IoT cloud webpage or App. Before control, ensure all schedule plans on device are disabled.

1. Click to open the solenoid valve and configure the duration. Note that if you enable any local plan on UC51x device, this control will not work.

② Dashboard	Devices Gateways +	
My Devices	Search Q Sorral 1 🕱 Alarm 0 🕅 Offline 3 💿 Inactive 0	+ New Devices
🖄 Мар	Status Name Interface Status Update Time	
Triggers Reports Sector Control 50	UC511 Closed Valve 1 Ogal Ogal 6415A51585070020 Open Valve 2 Open Valve 2 Ogal Ogal Valve 2 - Last flow volume Valve 2 - Last flow volume Valve 2 - Total flow volume	<u>۵ א</u> @
Sharing Center	UC501 6412A5196409 GPIO_1 GPIO_2 Temperature	© <u>M</u> ©
	OpenValve 1 × * Please set the duration of operating: min	
	Cancel Open	

You can also add a switch on the dashboard to control the status of solenoid valves.

Milesight IoT Cloud				Milesight IoT 🧶
🕜 Dashboard	Dashboard_1 ··· +			Add Edit 🔲
My Devices	UC511-Valve 1	UC511-Valve 2		
🖄 Map	Closed	Open		
(fr) Triggers	_	OpenValve 1	×	
Reports	UC511-Valve 1 - Last flow volui	* Please set the duration of operating:	min	
Event Center 58	(O gal		_	
🛆 Sharing Center		Cancel	Open	
Q Me				

Note: If the working mode of UC51x is LoRaWAN[®] Class A, control commands will delay until the time icon disappear.

Devices		Gateways	+				
Search		Q	⊘ Normal	1 🛱 Alarm 0 🕅 Offline	e 3 🛞 Inactive 0		+ New Device:
	Status	Name		Interface Status		Update Time	
		UC511	Closed Valve 1	Ogal Valve 1 - Last flow volume	Ogal Valve 1 - Total flow volume		01.0
	all	6415A51585070020	Closed Valve 2	Ogal Valve 2 - Last flow volume	Ogal Valve 2 - Total flow volume	2 minutes ago	
	-98[UC501	- GPIO_1	GPIO_2 Temperature			© M (0)

2. Go to "Triggers" page to add actions to trigger the solenoid valve to open for a period of time or a specific volume of water.

Note: Water volume control is only worked when you connect water meter to UC51x device.

② Dashboard	<			
My Devices	Title			
🖄 Map				
ifu Triggers	Conditions Relationship : A			
Reports	Condition A	When the time is	\sim	\oplus
Event Center 58		00:00 ③		
🛆 Sharing Center		Sun. Mon. Tues. Wed. Thur. Fri. Sat.		
8 Me	Actions			
	Action A	Trigger device(s) to	\vee	(e)
		UC511 (6415A51585070020)	\sim	
		Valve 1	\sim	
		Open	\sim	
		and the duration is	\sim	
		min		
		Cancel Save		

6. Device Payload

UC51x Series use the standard Milesight IoT payload format based on IPSO. Please refer to the *UC51x Series Communication Protocol*, for decoders of Milesight IoT products please click <u>here</u>.

-END-