

LoRaWAN[®] Solenoid Valve Controller

UC51x Series

User Guide



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.
- 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.



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Revision History

Date	Doc Version	Description
Feb. 20, 2021	V 1.0	Initial version
Nov.26, 2021	V 1.1	Description Update
Dec. 9, 2021	V 2.0	Update based on 2.0 hardware

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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 1 pulse interface, 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 pulse water meter interfaces for flow 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 battery
- Quick wireless configuration via NFC
- Time and flow control via Milesight IoT Cloud

2. Hardware Introduction

2.1 Packing List



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

2.2 Hardware Overview



Interface 1&2:

Pin	Description
1	DC+/OUT1(Red)
2	DC-/OUT2 (Black)
3	GND
4	INSERT BOOT*
5	GND
6	GPIO



* Please refer to "Solenoid Valve Wiring Switch" item in section 3.4.

2.3 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		Light On: Device is on.
On/Off Status	Quickly press the power button.	Light Off: Device is off.

2.4 Dimensions (mm)



3. Operation Guide

3.1 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.

3.1.1 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 turn on/off 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**.



- 5. Tap "Read" button to check current status of device.
- 6. Tap "Write" button to write all your settings to the device.

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.

3.1.2 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**)

T	/pe	General	•
	erial port	COM4	-
L	ogin password		
В	aud rate	115200	-
D	ata bits	8	<u>-</u>
Р	arity bits	None	<u>•</u>
S	top 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.

	Status >	1	Power On
Status	Model: Serial Number:	UC512-DI-868M 6415A51585070020	
	Device EUI: Firmware Version:	24e124415a515850 01.08	
((0))	Hardware Version: Device Status:	1.0 Of	
LoRaWAN Settings	Join Status: RSSI/SNR:		
ŝ	Valve1 Status:		
کت Device Settings	Counter1: Valve2 Status:		
	Counter2: Battery:		
습 Maintenance	Channel Mask: Uplink Frame-counter:		

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3.2 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 >	Power Off
Model:	UC512-DI-868M
Serial Number:	6415A51585070020
Device EUI:	24e124415a515850
Firmware Version:	01.08
Hardware Version:	1.0
Device Status:	On
Join Status:	Activate
RSSI/SNR:	-42/6
Valve1 Status:	Close Open
Counter1:	
Valve2 Status:	Open Close
Counter2:	-
Battery:	100%
Channel Mask:	0007
Uplink Frame-counter:	189

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.

Status		
Hardware Versio	on	V1.0
Device Status	01	N 🔴
Join Status	,	Activated
RSSI/SNR		-35/15
Device Time	2021-02-04 10:35	Sync
Valve 1 Status	01	ff 🌑
Counter 1		0
Valve 2 Status	0	n 💶
Counter 2		0
Battery		100 %

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

Step 1: Go to "LoRaWAN -> Basic" of ToolBox software or "Setting -> LoRaWAN Settings" of ToolBox App to configure join type, App EUI, App Key and other information. You can also keep all settings by default.

Device EUI	24E124415A515850
App EUI	24E124C0002A0001
Application Port	85
Join Type	OTAA
LoRaWAN Version	V1.1.0
Application Key	*****
Spread Factor	⑦ SF10-DR2
Comfirmed Mode	⑦□
Rejoin Mode	⊘⊠
Set the number of packets	sent 32 packets
ADR Mode	?⊻
TXPower	TXPower0-16 dBm

Parameters	Description
Device EUI	Unique ID of the device which can also be found on the label.
App EUI	Default App EUI is 24E124C0002A001.
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, 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 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.
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.
	Reporting interval \leq 30 mins: the device will send specific mounts of
	LoRaMAC packets to check connection status every 30 mins; If no reply after
Deisis Mada	specific packets, the device will re-join.
Rejoin Mode	Reporting interval > 30 mins: the 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	Tx 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.

Step 2: Go to "LoRaWAN -> Channel" of ToolBox software or "Setting -> LoRaWAN Settings" of ToolBox APP to select supported frequency and select channels to send uplinks. Make sure the channels match the LoRaWAN[®] gateway.

Basic		Channel				
	Index	Support Frequency : Frequency/MHz	EU868 Max Datarate	¥	Min Datarate	
	0	868.1	5-SF7BW125	<u>×</u>	0-SF12BW125	<u>_</u>
	1	868.3	5-SF7BW125	<u>*</u>	0-SF12BW125	<u>*</u>
	2	868.5	5-SF7BW125	<u> </u>	0-SF12BW125	<u> </u>
	3	0	5-SF7BW125	Ŧ	0-SF12BW125	Ŧ
	4	0	5-SF7BW125	<u>_</u>	0-SF12BW125	<u>_</u>
	5	0	5-SF7BW125	Ŧ	0-SF12BW125	¥
	6	0	5-SF7BW125	<u> </u>	0-SF12BW125	<u>_</u>
_	7	0	C OF7DWWAG	-1	0.0540004405	-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	
Channel Index: 0-7 Channel Index	1 Frequency/MHz	Channel Spacing/MHz	BW/kHz
0 - 15	915.2 - 918. <mark>2</mark>	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

Note:

For -868M model, default frequency is EU868;

For -915M model, default frequency is AU915.

3.4 Solenoid Settings

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

Device Type	UC512	
Reporting Interval	20	min
Solenoid Valve Wiring Switch		
Data Reporting	All	•
Device Return to Power Supply State	Return to previous working state	•
Class Type	Class A	
Response Time	600	s
Change Password		

Parameters	Description
Reporting Interval	Reporting interval of transmitting data to network server. Default: 20min, Range: 1-1080 mins.
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 the contents to report to network server.
	All: Report all interface status;
Data Reporting	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.
Device returns to	If the device loses power and return to power supply, the device will be on
the power supply	or off according to this parameter.
state	
	Working mode of LoRaWAN [®] device.
Class Type	UC511: Class A, Class B and Class C are available;
	UC512: Class A and Class B are available.
	When the device works under Class A mode, it only receives control
	commands every reporting interval comes. In order to shorten the delay
Response Time	time of control, the device will send blank package to allow to receive the
Response rime	control commands every Response Time interval.
	Note:
	The shorter the response time, the shorter the battery life.
Ping Slot	When the device works under Class B mode, set the interval to open the
Periodicity	reception window.
Change Password	Change the password for ToolBox App or software to read/write this
Change Fasswold	device.

Note:

1) When device connects to 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.

3.5 Maintenance

3.5.1 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. You can also click "Up to Date" to search for the latest firmware of the device and upgrade.

Maintenance >

Upgrade	Backup and Reset			
Model:	UC512-DI-868M			
Firmware Versi	on: 01.08			
Hardware Versi	ion: 1.0			
Domain:	Beijing Server	•		
FOTA:	Up to da	te Your device is 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.



3.5.2 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 LoRa frequency band. 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 R	eset		
Config Back	up	Export		
Config File			Browse	Import
Restore Fac	tory Defaults	Reset		

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.

2-	EM500-UDL-868M_20201 Last Modified Time: 2020-11-24 17:0	
>-	EM300-TH-915M_202101 Last Modified Time: 2021-01-12 14:3	
2	New Template	
۶	Please enter template na	ime
I	UC512-DI-868M_20210204	
	Cancel 0	ок

3.5.3 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			
Config Backup	Exp	ort		
Config File			Browse	Import
coning the				
Restore Factor	ry 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.



4. 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.



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.



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	d						Milesight IoT 🧕
🕐 Dashboard	Devices		Gateways	+			
My Devices	Search		Q		⊘ Normal 1 🕅 Offline 1 🛞 Ir	nactive 0	+ New Devices
Map		Status	Name		Associated Devices (Joined /Not Joined /Failed)	Last Updated	
Triggers		al	UG Gateway 621793129987		Q / Q / Q Detail	a few seconds ago	@ <u>M</u> @
Event Center 56		38	UG Gateway 6222A3243835		0 / 1 / 0 Detail	2021-02-03 09:41	@ <u>M</u> ()
△ Sharing Center							
Q Me							< 1 >

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

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

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

asic Settings	Interface Settings	Mainte	nance	Log			Refresh	Shar
	* Nan	ne: U	C511					
	* Application Key:		5572404c696e6b4c6f52613230313823					
LoRaWAN Class ():		D: cla	assA			\sim		
					uration changes) from the ext scheduled uplink from			
	Descriptio	on:						

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

asic Settings	Interface Settings	Maintenance	Log		Refresh	Shar
	Desci	ription:				
				le le		
	* Unit Per	Pulse: 1		gal 🗸		
				,		
	* Reporting Inter	val 🕧: 20		min		
	Device Offline	Alarm: 🔽				

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

Image: Second	ard	Devices / UC511	I / Interface Setting	IS						
rs finite constraints and the second constraints		Basic Setting	gs Inte	erface Settings	Maintenance	Log				Refresh
arts Valve 2 Valve Closed Open Open Open = Disable ing Center Image: Contract flow volume Valve 1 - Total flow volume Image: Contract flow volume Image: Contract flow volume Image: Contract flow volume Image: Contract flow volume	Jevices		Name	Туре		Cus	tom Name		Current Value	Alarm Threshold
t Center 30 ing Center Valve 1 - Last flow volume Valve 1 - Total flow volume 0 gal 1 0 0 1 0 1 1 1 1 1	gers		Valve 1	Valve	Closed	Closed	Open	Open	Closed	= Disable V
ring Center Valve 1 - Last flow volume 0 gal 4 Valve 1 - Total flow volume 0 gal 4	orts		Valve 2	Valve	Closed	Closed	Open	Open	Open	= Disable V
Valve 1 - Last flow volume 0 gal ≥ Valve 1 - Total flow volume 0 gal ≤			N	ame	Curr	ent Value		Unit		Alarm Threshold
Valve 1 - Total flow volume 0 gal			Valve 1 - Last flo	w volume		0		gal		
			Valve 1 - Total fl	ow volume		0		gal		
Valve 2 - Last flow volume 0 gal 2			Valve 2 - Last flo	w volume		0		gal		

5.2 Solenoid Valve Control

Solenoid valve can be controlled by Milesight IoT cloud webpage or App.



1. Click to open the solenoid valve and configure the duration.

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

Milesight IoT Cloud		Milesight loT 🥥
🕐 Dashboard	Dashboard_1 ··· +	Add Edit 🔲
My Devices	UC511-Valve 1 UC511-Valve 2	
🖄 Map	Closed Open	
fo Triggers	OpenValve 1	
Reports	UC511-Valve 1 - Last flow volue * Please set the duration of operating: min	
Event Center 58		
🙆 Sharing Center	Cancel Open	
R 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	1 🛱 Alarm 0 🕅 Offlin	e 3 🛞 Inactive 0		+ New Device
	Status	Name		Interface Status		Update Time	
	al	UC511 Valve 1	Closed Valve 1	Ogal Valve 1 - Last flow volume	Ogal Valve 1 - Total flow volume	2 minutes ago	<u>ن س</u> (۵)
				Ogal Valve 2 - Last flow volume	Ogal Valve 2 - Total flow volume		
	981	UC501 6412A5196409		GPIO_2 Temperatur	e	-	<u>الا</u>

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				
ifo Triggers	Conditions Relationship : A	A		
Reports	Condition A	When the time is	\sim	Ð
Event Center 58		00:00 🕓		
Sharing Center		Sun. Mon. Tues. Wed. Thur. Fri. Sat.		
8 Me	Actions			
	Action A	Trigger device(s) to	\sim	()
		UC511 (6415A51585070020)	\vee	
		Valve 1	\sim	
		Open	\sim	
		and the duration is	~	
		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-