Smart Wall Socket

WS51x

User Guide

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Contents

Chapter 1. Preface 4

Chapter 2. Product Introduction 6

Overview 6

Features 6

Chapter 3. Hardware Introduction 7

Packing List 7

Hardware Overview 7

Power Button and LED Patterns 8

Dimensions(mm) 8

Chapter 4. Installation 10

Installation Note 10

Installation Step 10

Chapter 5. Quick Start 12

Access the Sensor via NFC 12

Configure the Network Setting 12

Chapter 6. Operation Guide 14

LoRaWAN® Settings 14

Multicast Setting 16

General Settings 18

Milesight D2D Setting 20

Milesight D2D Agent 20

Maintenance 21

Upgrade 21

Backup and Restore 22

Reset to Factory Default 24

Chapter 7. Uplink and Downlink 26

Overview 26

Uplink Data....26
Basic Information....26
Periodic Report....27
Socket Change Report....28
Downlink Command....29
Socket Control....29
General Settings....29
Task Settings....31
Chapter 8. Services....32

Chapter 1. Preface

Copyright Statement

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Safety Instruction

These instructions are intended to ensure that user can use the product correctly to avoid danger or property loss. Milesight will not shoulder responsibility for any loss or damage resulting from not following the instructions of this operating guide.

Warning:

Serious injury or death may be caused if any of these warnings is neglected.

- The installation and maintenance must be conducted by a qualified service person and should strictly comply with the electrical safety regulations of the local region.
- Ensure the breaker is powered out during the installation.
- To avoid risk of fire and electric shock, do keep the product away from rain and moisture before installed.

CAUTION:

Injury or equipment damage may be caused if any of these cautions are neglected.

- The device must not be modified in any way.
- In order to protect the security of the device, please change the device password when first configuration. The default password is 123456.
- The device is intended for indoor use only. Do not place the device where the temperature is below/above the operating range.
- Do not overload the maximum capacity to avoid damaging the device.

- Do not place the device close to naked flames, heat sources (such as oven or sunlight), cold sources, liquid, and objects with extreme temperature changes.
- Use the device in a clean environment only. Dusty or dirty environments may prevent the proper operation of this device.
- The device must never be subjected to physical shocks or strong vibration.

Revision History

Release Date	Version	Description
July 15, 2023	V 1.0	Initial version
July 30, 2024	V 1.1	Support reporting TSL version

Chapter 2. Product Introduction

Overview

WS51x is an 86-type in-wall smart socket panel with a stylish and minimalist design that combines power control and electricity consumption statistics features. It can intelligently manage appliances and promote the scientific use of electricity. The product offers various power control methods, such as local button control and remote control through wireless LoRaWAN® network communication. WS51x is compatible with Milesight's LoRaWAN® gateway and Milesight Development Platform, which allows for remote monitoring, control, and triggered by other Milesight sensors.

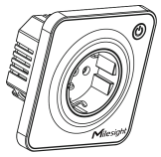
Designed for in-wall installation, WS51x has broad applications in smart homes, smart offices, smart campuses, and other scenarios.

Features

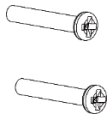
- Turn on/off devices and create delay switch-on/off schedules remotely
- Collect current, voltage, power, electrical consumption and support overload protection
- Elaborate structural and safety door design for both safe usage and convenient installation
- Ultra-wide-distance wireless transmission up to a line of sight distance of 15 km
- Equipped with NFC for one-touch configuration and support card emulation mode
- Function well with standard LoRaWAN® gateways and network servers
- Compliant with Milesight IoT Cloud and Milesight Development Platform
- Support Milesight D2D protocol to enable ultra-low latency control without a gateway
- Support multicast feature to control switches in bulk

Chapter 3. Hardware Introduction

Packing List



1 × WS51x Wall Socket



2 × Mounting Screws

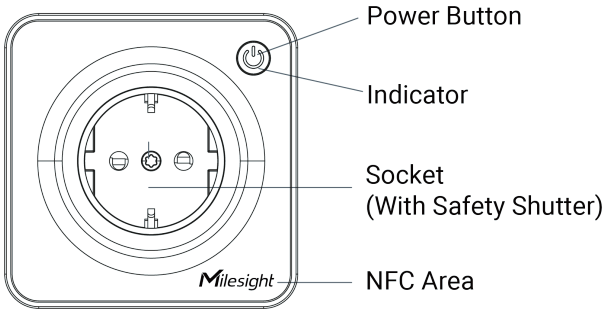
1 × Quick Guide

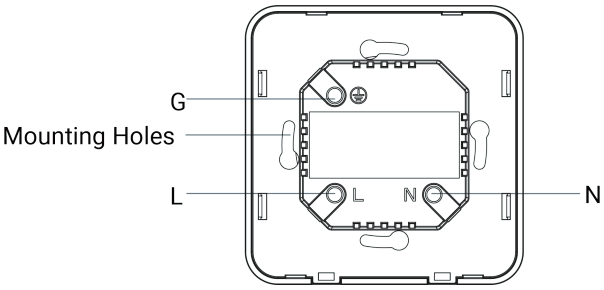
1 × Warranty Card

Note:

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

Hardware Overview





Note:

Product appearance will differ according to socket types.

Power Button and LED Patterns

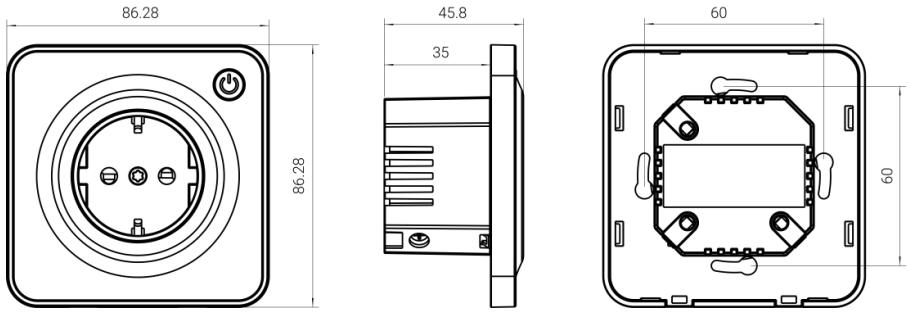
Function	Action	LED Indicator
Open the socket to supply power	Press the power button once.	Off → On
Close the socket to supply power		On → Off
Network Status	Send join network requests.	Blinks once
	Join the network successfully.	Blinks twice
Reset to Factory Default	Press and hold the power but-ton for more than 10 seconds.	Quickly Blinks

Note:

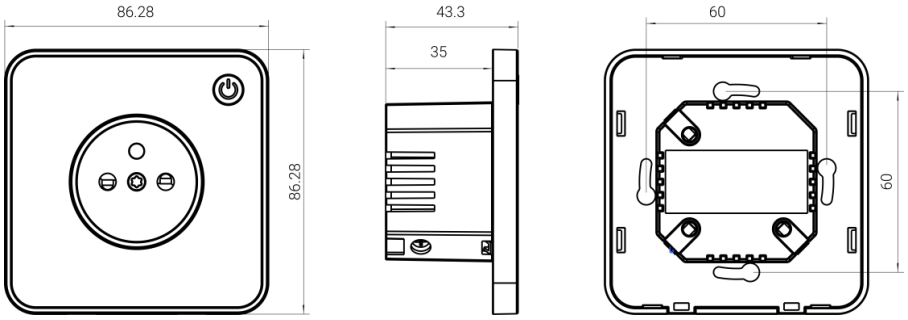
1. Network status will only display when LED is enabled and on.
2. If the device still fails to join the network after 32 join requests, the LED will stop blinking.
3. Reset operation is not affected even if the button lock is enabled or the LED indicator is disabled.

Dimensions(mm)

EU Type



FR Type


86.28
86.28
43.3
35
60
60

Chapter 4. Installation

Installation Note

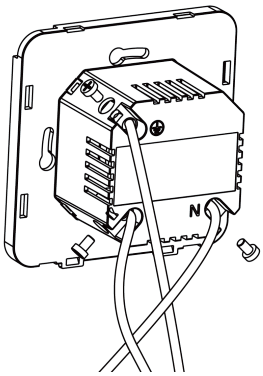
- The installation and maintenance must be conducted by a qualified service person and should strictly comply with the electrical safety regulations of the local region.
- In order to realize the best data transmission, ensure the device is within the signal range of the LoRaWAN® gateway and keep it away from metal objects and obstacles.
- Ensure the breaker is powered off during the installation.
- Do not dig the screw holes on the enclosure of this device, otherwise it will break this device.
- The nominal cross-sectional area of electrical wires should be not more than 2.5 mm^2, otherwise the wires will be easy to drop from the device.
- It is suggested to mount the socket with default mounting screws. If using other screws, ensure the width of screw head is not more than 9mm, otherwise it will break the device.
- Ensure the width of socket box is more than 40mm.
- Do not leave any object inside the socket box during installation.

Installation Step

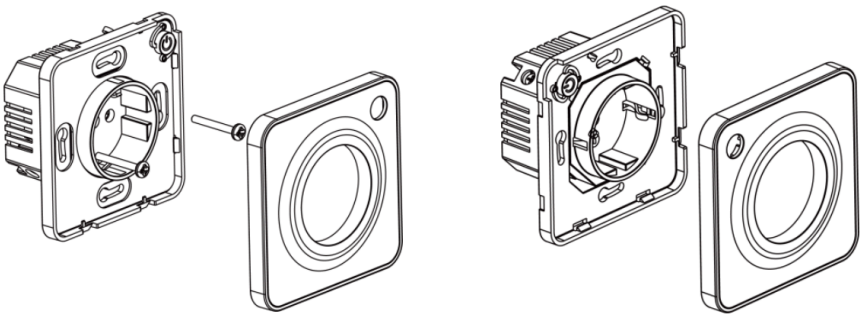
Step 1: Ensure the circuit has been turned off and the old socket has been removed.

Step 2: Open the face plate of WS51x wall socket.

Step 3: Loose the screws next to the holes and connect corresponding wires to the WS51x socket.



Step 4: Fix the socket to the socket box with mounting screws, then attach the face plate back onto the socket.



Chapter 5. Quick Start

Access the Sensor via NFC

1. Download and install “Milesight ToolBox” App from Google Play or Apple Store on an NFC-supported smartphone.
2. Enable NFC function on the smartphone.
3. Launch Milesight ToolBox, and select the default mode as NFC.
4. Attach the smart phone with NFC area to the device and click to read device information. Basic information, data, and settings of the device will be shown on the Milesight ToolBox App if it’s recognized successfully.
5. Adjust the settings on the App, then attach the smartphone with NFC area to the device and click **Write** to write the settings. After writing, reread the device to check if the configuration is written well.

Note:

- Ensure the location of smartphone NFC area and it’s recommended to take off phone case.
- If the smart phone fails to read/write configurations via NFC, keep the phone away and back to try again.
- The default device password is 123456. Please change a new password for security.

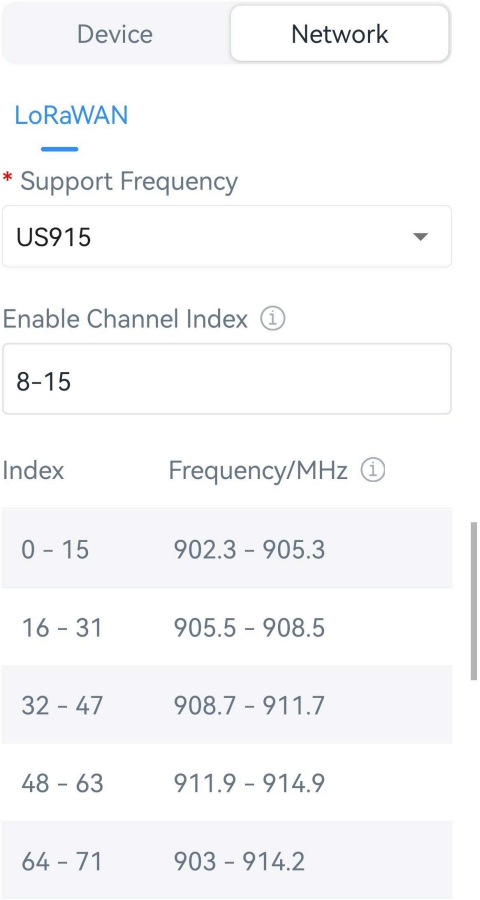
Configure the Network Setting

1. Go to **Network** settings page, select the join type as OTAA or ABP as required.

Note:
OTAA mode is required if you connect device to Milesight IoT Cloud or Milesight Development Platform.

2. Select supported frequency the same as LoRaWAN® gateway.

Note:
Set the channel index as 8-15 for US915 or AU915 if using default settings of Milesight gateways.



3. Keep other settings by default and click **Write** to save the settings.

Chapter 6. Operation Guide

LoRaWAN® Settings

This chapter describes the LoRaWAN® network settings of device.

Parameter	Description
Device EUI	Unique ID of the device which can be found on the device. **Note:** please contact sales for device EUI list if you have many units.
App EUI	The default App EUI (join EUI) is 24E124C0002A0001.
Application Port	The port used for sending and receiving data, the default port is 85.
LoRaWAN® Version	V1.0.2 and V1.0.3 are available.
Work Mode	It is fixed as Class C.
Confirmed Mode	If the device does not receive ACK packet from network server, it will resend data once.
Join Type	OTAA and ABP mode are available. **Note:** it's necessary to select OTAA mode if connecting device to Milesight IoT Cloud or Milesight Development Platform.
Application Key	Appkey for OTAA mode, default value: "Device EUI" + "Device EUI" (since Q4 of 2025). Example: 24e124123456789024e1241234567890

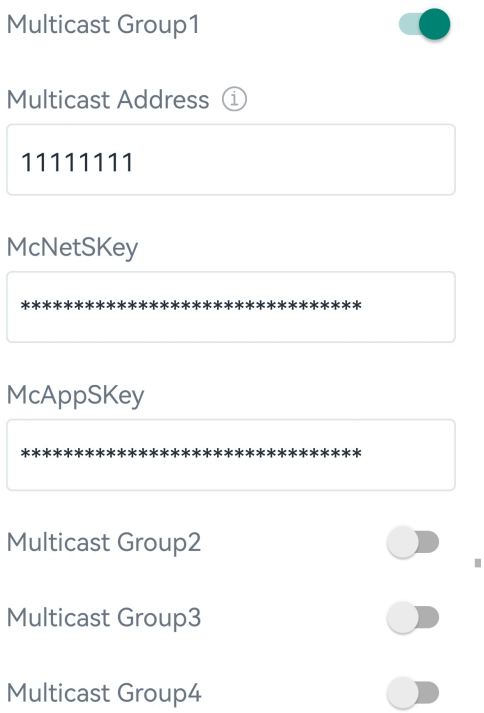
Parameter	Description
	Note: • The default value of earlier devices is 5572404C696E6B4C6F52613230313823. • Please contact sales before purchase if you require random App Keys.
Network Session Key	Nwkskey for ABP mode, the default is 5572404C696E6B4C6F52613230313823.
Application Session Key	Appskey for ABP mode, the default is 5572404C696E6B4C6F52613230313823.
Device Address	DevAddr for ABP mode, default is the 5th to 12th digits of SN.
Rejoin Mode	Reporting interval≤35 mins: the device will send a specific number of LinkCheckReq MAC packets to the network server every reporting interval or every double reporting interval to validate connectivity; If there is no response, the device will re-join the network. Reporting interval > 35 mins: the device will send a specific number of LinkCheckReq MAC packets to the network server every reporting interval to validate connectivity; If there is no response, the device will re-join the network. **Note:** 1. Only OTAA mode supports rejoin mode. 2. The actual sending number is **Set the number of packets sent** +1.
Channel Mode	Select **Standard-Channel** mode or **Single-Channel** mode. When **Single-Channel** mode is enabled, only one channel can be selected to send uplinks.
Supported Frequency	Enable or disable the frequency to send uplinks. If frequency is one of CN470/AU915/US915, enter the index of the channel to enable in the input box, making them separated by commas.

Parameter	Description
	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: Indicate that all channels are disabled
ADR Mode	Enable or disable network server to adjust Spreading Factor, Bandwidth an Tx Power to optimize data rates, airtime and energy consumption in the network.
Spreading Factor	If ADR mode is disabled, the device will send uplink data following this SF parameter. The higher the spreading factor, the longer the transmission distance, the slower the transmission speed and the more the consumption.
Tx Power	Tx power (transmit power) refers to the strength of the outgoing signal transmitted by the device. This is defined by LoRa alliance.
RX2 Data Rate	RX2 data rate to receive downlinks or D2D messages.
RX2 Frequency	RX2 frequency to receive downlinks or D2D messages. Unit: Hz
Multicast Group	Enable or disable the multicast groups to receive the multicast commands.

Multicast Setting

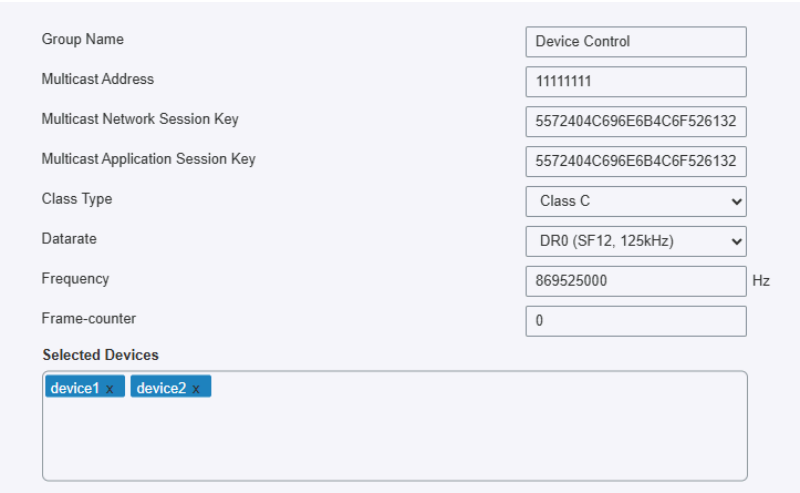
The device supports setting up several multicast groups to receive multicast commands from the network server, then users can use this feature to control devices in bulk.

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



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

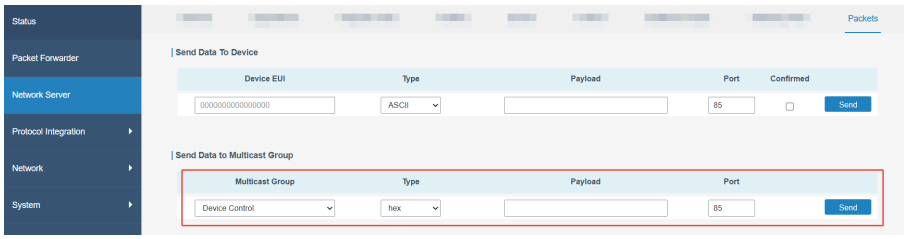
2. Add a multicast group on the LoRaWAN® network server. Take Milesight gateway as example, go to **Network Server > Multicast Groups** to add a multicast group and configure the group according to the device settings.



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

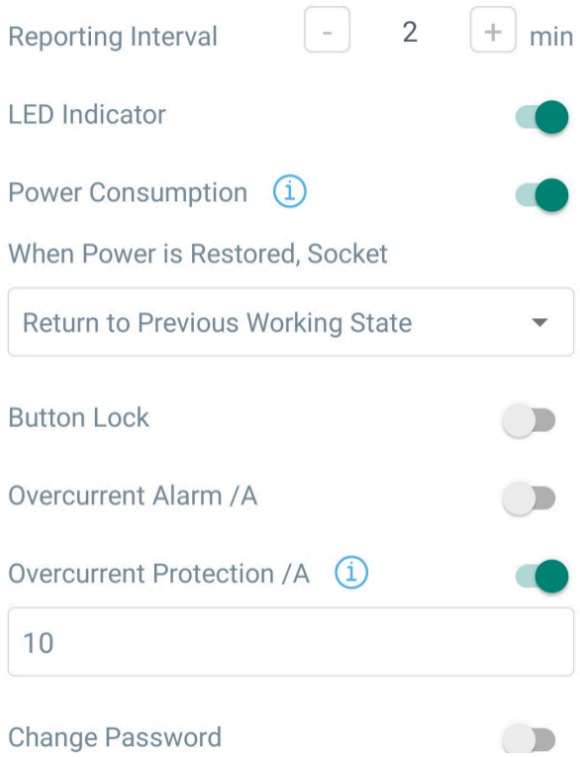
Note:

Ensure all devices' application ports are the same.



General Settings

General settings include the basic parameters of the device.



Parameter	Description
Reporting Interval	Reporting interval of transmitting current sensor values to network server. Default: 20 mins, Range: 1-1080 mins.
LED Indicator	Enable or disable the light indicating. This will not affect the blinks when you hold on the button to reset the device.
Power Consumption	Record the power consumption. If disabled, the device will stop recording and the power consumption value will stop updating.
When Power is Restored	If the device is powered off and restored, the device will switch on or off according to this parameter.
Button Lock	If enabled, the power button will not be allowed to turn on/off the socket.
Overcurrent Alarm	When current reaches the threshold, the device will send socket status and device electrical parameters.
Overcurrent Protection	When current reaches the threshold, the device will stop supplying power.
Change Password	Change the password for ToolBox App to write this device.

Note:
even overcurrent alarm or overcurrent protection is disabled, the device will also stop supplying power when the current is over rated current by 30%, then send out an alarm packet.

Milesight D2D Setting

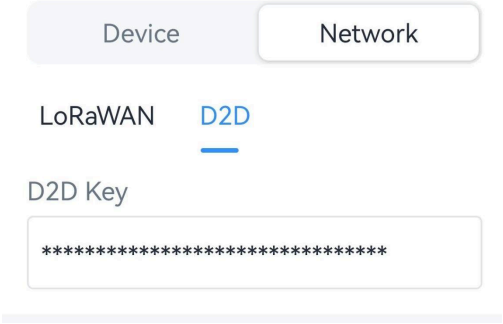
Milesight D2D protocol is developed by Milesight and used for setting up transmission among Milesight devices without gateway, which is able to reduce the latency and achieve the quick control.

Milesight D2D Agent

The device is able to work as a Milesight D2D agent device to receive commands from Milesight D2D controller devices.

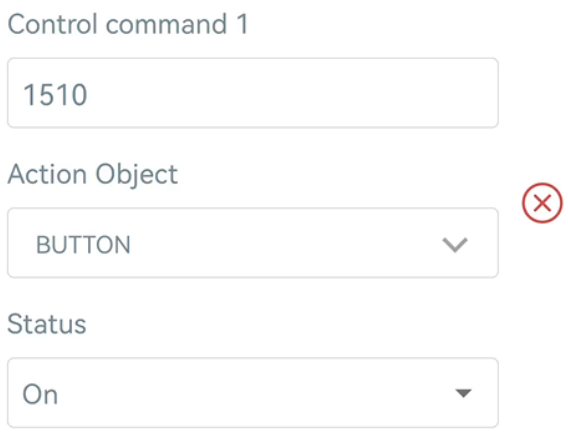
1. Ensure the RX2 datarate and RX2 frequency are the same as the D2D controller devices.

2. Set the D2D key to be the same as the D2D controller devices. (Default D2D Key: 5572404C696E6B4C6F52613230313823)



3. Enable **D2D Agent Settings**, then add a rule to select the action object to trigger and configure a 2-byte hexadecimal Milesight D2D command. One device supports 16 control commands at most.

Example: When receiving the command 1510 from Milesight D2D controller devices, turn on the button (socket).



Maintenance

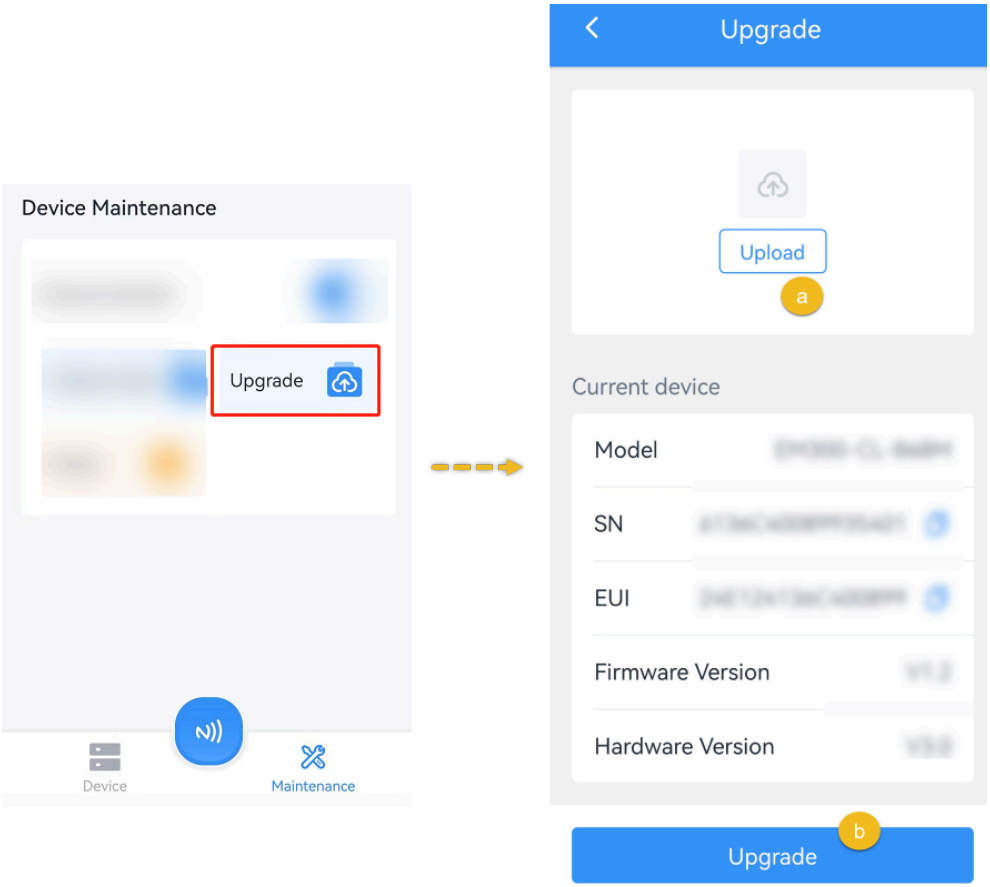
Upgrade

This chapter describes the steps to upgrade the device via ToolBox App.

1. Download firmware from Milesight official website to your smartphone.
2. Read the target device via ToolBox App, click **Upgrade** to upload the firmware file.
3. Click **Upgrade** to upgrade the device.

Note:

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



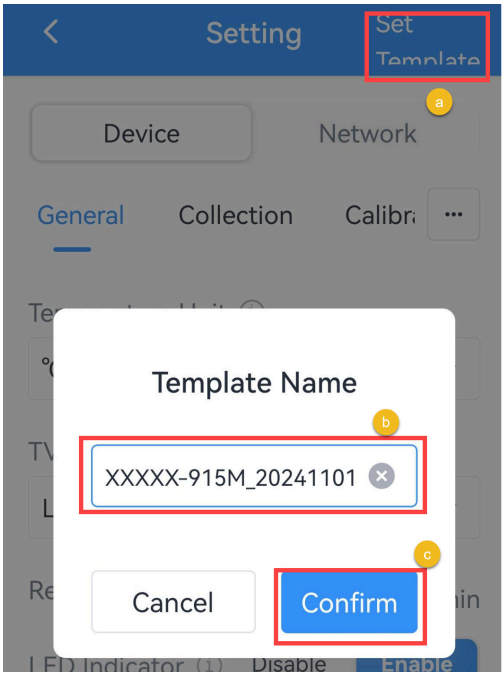
Backup and Restore

This device supports configuration backup for easy and quick device configuration in bulks. Backup and restore is allowed only for devices with the same model and frequency band.

Backup and Restore

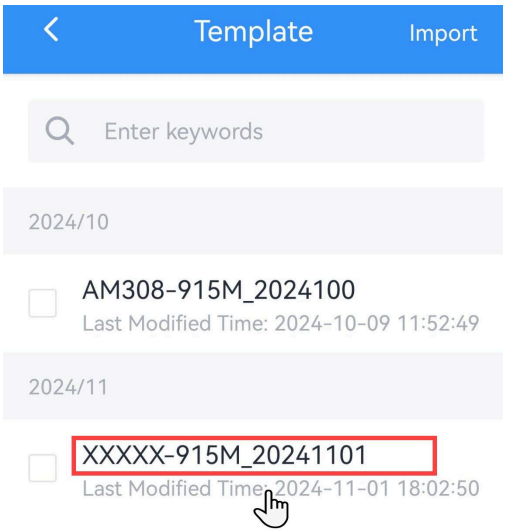
1. Launch ToolBox App, attach the NFC area of smartphone to the device to read the configuration.

2. Edit the configuration as required, click **Set Template** to save current configuration as a template to the ToolBox App.



3. Go to **Device >Template** page.

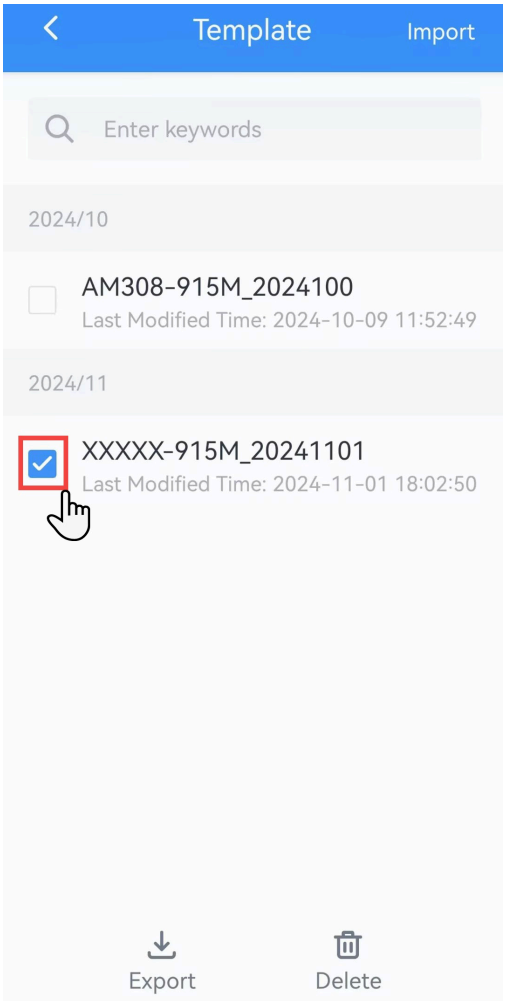
4. Select and click the target template, click **Write** to import the configuration to target devices.



Export and Delete Template

1. Check the box of the target template.

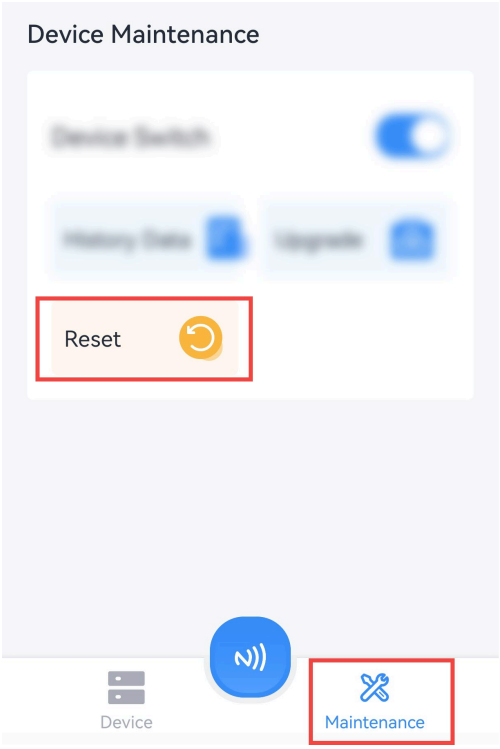
2. Click **Export** to export this template as JSON format file and save it to the smartphone, click **Delete** to delete this template from your ToolBox App.



Reset to Factory Default

Via Hardware: Hold on the power button for more than 10s until the LED indicator quickly blinks.

Via ToolBox App: Click **Reset** and attach the smartphone to device to reset the device.


Device Maintenance
Reset
Device
Maintenance

Chapter 7. Uplink and Downlink

Overview

All messages are based on following format (HEX), the Data field should follow little-endian:

Channel1	Type1	Data1	Channel2	Type2	Data2	Channel3	...
1 Byte	1 Byte	N Bytes	1 Byte	1 Byte	N Bytes	1 Byte	...

For decoder examples please find files on https://github.com/Milesight-IoT/SensorDecoders.

Uplink Data

This chapter describes the reported data of the device.

Basic Information

The device will report a basic information packet whenever joining the network.

Item	Channel	Type	Byte	Description
Power On	ff	0b	1	Device is on
Protocol Version	ff	01	1	Example: 01=V1
Hardware Version	ff	09	2	Example: 03 10 = V3.1
Software Version	ff	0a	2	Example: 03 01 = V3.1
Serial Number	ff	16	8	16 digits
TSL Version	ff	ff	2	Example: 01 00=>V1.0
Overcurrent Alarm	ff	24	2	Byte 1: 00-disabled, 01-enabled Byte 2: current threshold, unit: A
Button Lock	ff	25	2	0000-disabled, 0080-enabled
Power Consumption	ff	26	1	00-disabled, 01-enabled
Overcurrent Protection	ff	30	2	Byte 1: 00-disabled, 01-enabled

Item	Channel	Type	Byte	Description
				Byte 2: current threshold, unit: A

Example:

ff0bff ff0101ff166762d21130962038 ff090100 ff0a0108 ffff0100 ff240000 ff30010a ff250000 ff2601		
Channel	**Type**	**Value**
ff	0b	ff
ff	01	Protocol Version: 01=V1
ff	16	SN: 6762d21130962038
ff	09	Hardware Version: 0100=V1.0
ff	0a	Software Version: 0108=V1.8
ff	ff	TSL version: 01 00=>V1.0
ff	24	Overcurrent Alarm: 00=disable, 00=0A
ff	30	Overcurrent Protection:01=enable, 0a=10A
ff	25	Button Lock: 00 00=disable
ff	26	Power Consumption: 01=enable

Periodic Report

Item	Channel	Type	Byte	Description
Voltage	03	74	2	UINT16/10, Unit: V
Active Power	04	80	4	UINT32, Unit: W **Note:** When the device is powered off, this parameter will be 0.
Power Factor	05	81	1	UINT8, Unit: %

Item	Channel	Type	Byte	Description
Power Consumption	06	83	4	UINT32, Unit: Wh
Total Current	07	c9	2	UINT16, Unit: mA
Socket Status	08	70	1	00: Close, 01: Open

Example:

Report data according to reporting interval (20mins by default).

087001 058164 07c90200 0374b208 068301000000 048001000000		
Channel	**Type**	**Value**
08	70	Socket status: 01 = Open
05	81	Power Factor: 64=> 100%
07	c9	Current: 02 00=>00 02=2mA
03	74	Voltage: b2 08=>08 b2=2226/10=222.6V
06	83	Power Consumption: 01 00 00 00=>00 00 00 01=1 Wh=0.001 kWh
04	80	Active Power: 01 00 00 00=>00 00 00 01=1 W

Socket Change Report

The device will report a socket status packet when the status changes.

Channel	Type	Byte	Description
08	70	1	00: Close by Command, 10: Close by button 01: Open by Command, 11: Open by button

Example:

087011		
Channel	**Type**	**Value**
08	70	11 => Open by button

Downlink Command

This device supports downlink commands for configuration and control. The downlink application port is 85 by default.

Socket Control

Item	Channel	Type	Byte	Description
Socket Status	08	-	3	0000ff-Socket close, 0100ff-Socket open
Socket Status Reverse	ff	a5	1	01

Example:

1. Open the power supply of the socket.

080100ff		
Channel	**Type**	**Value**
08	--	01 00 ff = Open

General Settings

Item	Channel	Type	Byte	Description
Reboot	ff	10	1	ff
Report Interval	ff	03	2	UINT16, Unit: s
Overcurrent Alarm	ff	24	2	Byte 1: 00-disable, 01-enable Byte 2: current threshold, unit: A
Button Lock	ff	25	2	0000-disable, 0080-enable
Power Consumption	ff	26	1	00-disable, 01-enable
Reset Power Consumption	ff	27	1	ff
Enquire Electrical Status	ff	28	1	ff
LED Indicator	ff	2f	1	00-disable, 01-enable

Item	Channel	Type	Byte	Description
Overcurrent Protection	ff	30	2	Byte 1: 00-disable, 01-enable Byte 2: current threshold, unit: A

Example:

1. Reboot the device.

ff10ff

2. Set reporting interval as 20 minutes.

ff03b004		
Channel	**Type**	**Value**
ff	03	b004=>04b0=1200s=20minutes

3. Enable overcurrent alarm and protection, and set current threshold as 10A.

ff24010a ff30010a		
Channel	**Type**	**Value**
ff	24	01=>enable overcurrent alarm, 0a=>10A
ff	30	01=>enable overcurrent protection, 0a=>10A

4. Disable the LED indicator.

ff2f00		
Channel	**Type**	**Value**
ff	2f	00=>disable

Task Settings

Item	Channel	Type	Byte	Description
Add Delay Task	ff	22	4	**Byte 1:** 00 **Byte 2-3:** delay time, unit: s **Byte 4:** 10-close, 11-open **Note:** The device supports adding only one task. Later command will cover previous command.
Delete Delay Task	ff	23	2	00ff

Example:

1. Add a delay task: open the socket after 1 minute.

ff22003c0011		
Channel	**Type**	**Value**
ff	22	Byte 1:00 Byte 2-3: 3c 00=>00 3c=60s=1min Byte 4: 11=>open

2. Delete the delay task.

ff2300ff		
Channel	**Type**	**Value**
ff	23	00ff: Delete Delay Task

Chapter 8. Services

Milesight provides customers with timely and comprehensive technical support services. End-users can contact your local dealer to obtain technical support. Distributors and resellers can contact directly with Milesight for technical support.

Technical Support Mailbox: iot.support@milesight.com

Online Support Portal: https://support.milesight-iot.com

Resource Download Center: https://www.milesight.com/iot/resources/download-center/

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