Milesight

# WS558

## Smart Light Controller

User Guide

# Contents

# 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.
- To protect the security of the device, please change device the password when first configuration. The default password is 123456.
- For the LN model, do not reverse the Live Wire (L) and Neutral (N) wire.
- Do not overload the maximum capacity to avoid damage to the device.
- The device is intended only for indoor use. Do not place the device where the temperature is below/above the operating range.

- Do not place the device close to objects with naked flames, heat source (oven or sunlight), cold source, liquid and extreme temperature changes.
- Use the device only in a clean environment. Dusty or dirty environments may prevent the proper operation of this device.
- Do not drop the device or subject it to physical shocks and strong vibration.

## Revision History

| Release Date | Version | Description |
|---|---|---|
| July 20, 2022 | V 2.0 | Initial version |

# Chapter 2. Product Introduction

## Overview

WS558 is a LoRaWAN® Smart Light Controller for monitoring and controlling lights locally or remotely. With 2 circuit types and 8 switches, it fits different rooms without the need of re-wiring,reducing the renovation costs. Compliant with Milesight LoRaWAN® gateway and Milesight IoT Cloud solution, WS558 can be monitored and controlled via webpage or mobile App remotely and triggered by other Milesight sensors. Besides, WS558 supports Milesight D2D communication protocol, which can set up connection quickly and be controlled without gateway.

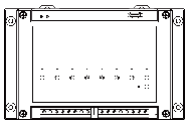
WS558 can be widely used for wireless control of indoor lights, fans, heaters, machines, etc.

## Features

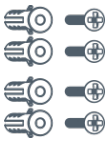
- LN type or switch type optional, capable of controlling up to 8 circuits of lights, adopts different indoor wiring
- Supports local switch button control, able to test the lamp status without networking after the wiring is completed
- Collects data of current, voltage, power, electrical consumption for smart management
- Ultra-wide-distance wireless transmission up to line of sight of 15 km
- Equipped with NFC for one-touch configuration, supports card emulation mode
- Compliant with standard LoRaWAN® gateways and network servers
- Compliant with Milesight IoT Cloud
- Supports Milesight D2D protocol to enable ultra-low latency control without gateway
- Supports multicast for control in bulk

# Chapter 3. Hardware Introduction

## Packing List



1 × WS558 Controller



4 × Wall Mounting Kits

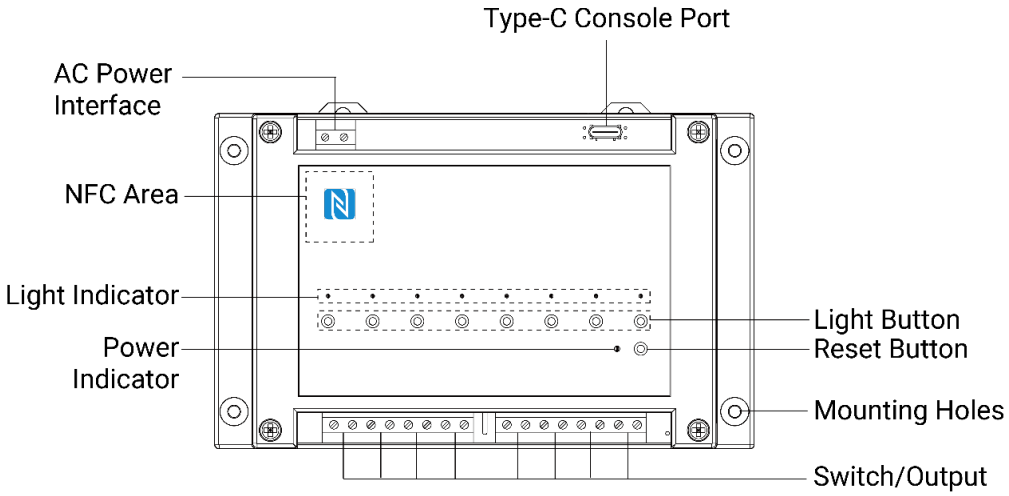
1 × Quick Guide


1 × Warranty Card

**Note:**

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

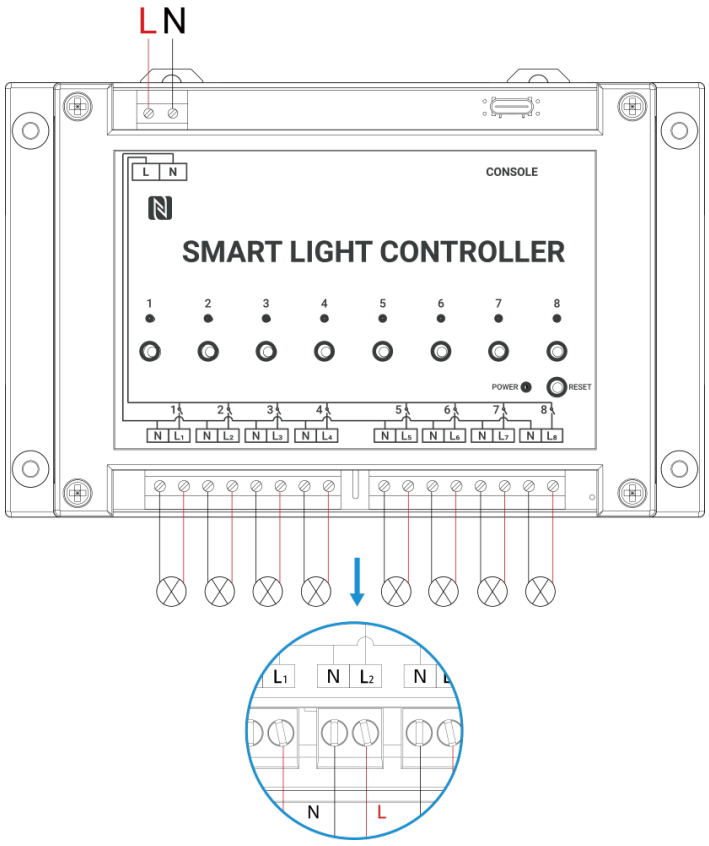
## Hardware Overview



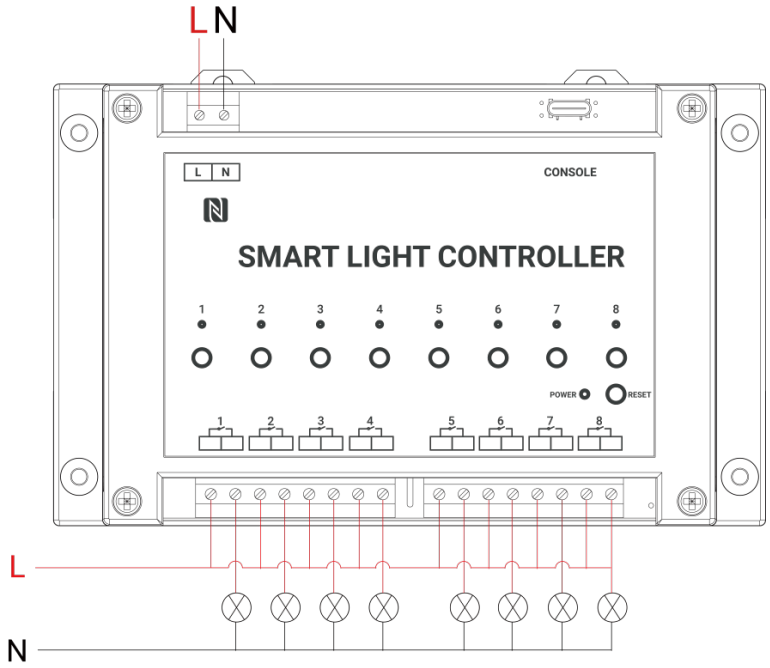

All circuits/switches are open with their LED indicator off by default. You can press the button beneath their LED indicator to close a circuit/switch, and the LED indicator will be lit on as the lamp connected to this circuit/switch.

## Wiring Diagram

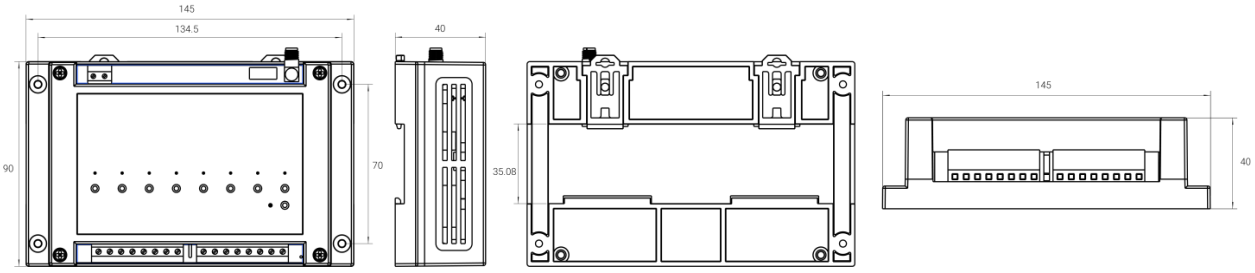
### LN Model




**Switch Model**



## Dimensions (mm)



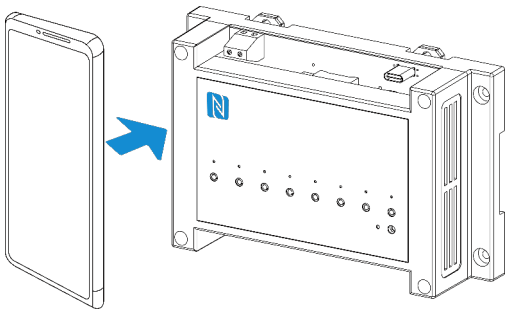
# Chapter 4. Quick Start

### 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:**

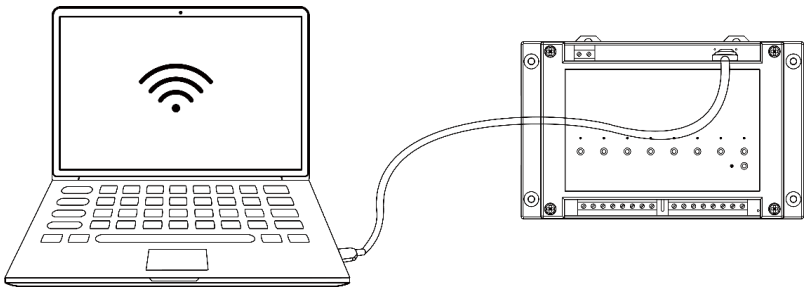
- Ensure the location of smartphone NFC area and it’s recommended to take off phone case.
- If the smart phone fails to read/write configurations via NFC, keep the phone away and back to try again.
- The default device password is 123456. Please change a new password for security.



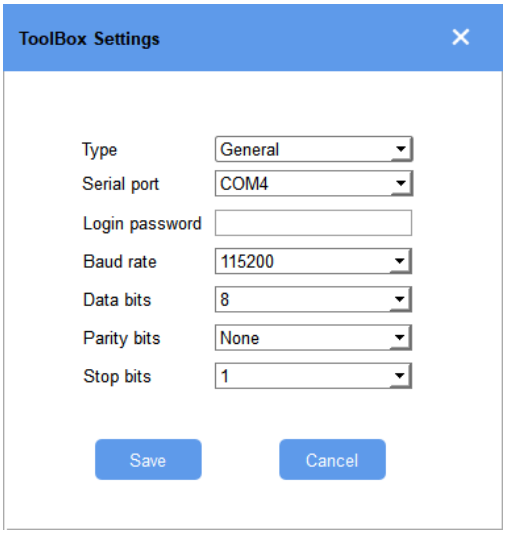
### Access the Sensor via USB

1. Download ToolBox software from Milesight website.

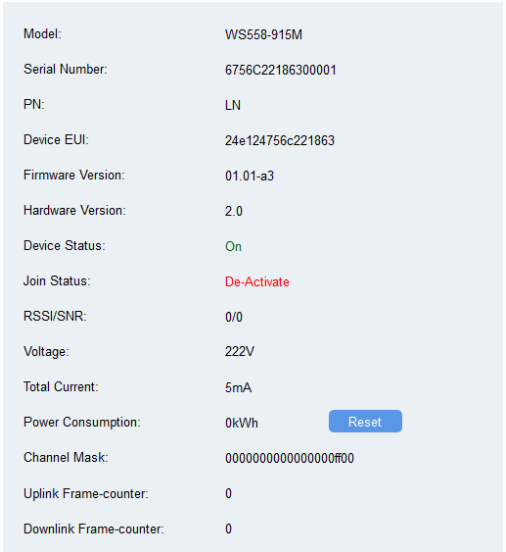
2. Connect the device to a computer via the Type-C port. Please note that do not touch the power interface, switches and other wirings to avoid electric shock.



3. Open ToolBox software, select type as “General” and select the serial port as USB port, then type the login password (Default password: 123456) to log in in to the device to check or configuring the device. It’s suggested to change the default password for security reasons.




4. After logging into the ToolBox, you can check device status and change device settings.



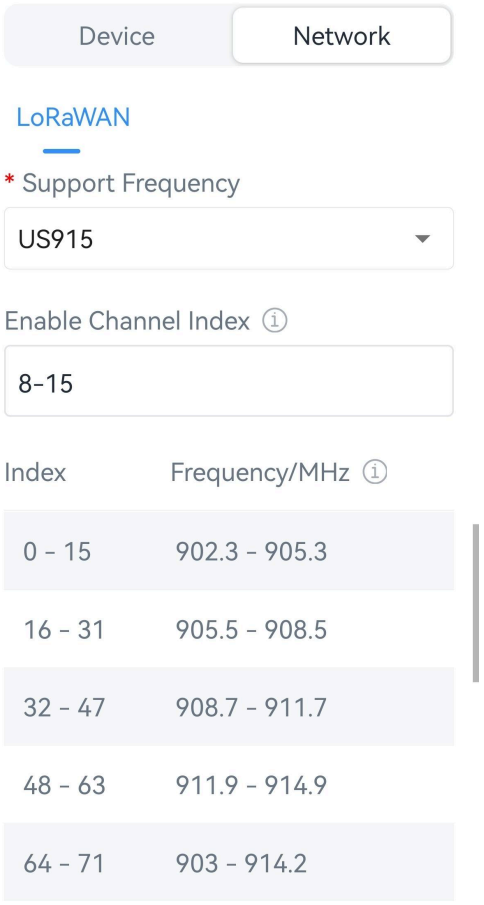
### Configure the Network Setting

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.

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 5. 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.<br>**Note:**<br>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's 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.<br>**Note:**<br>it's necessary to select OTAA mode if connecting device to Milesight IoT Cloud. |
| Application Key | Appkey for OTAA mode, default value: "Device EUI" + "Device EUI" (since Q4 of 2025). Example: 24e124123456789024e1241234567890 |

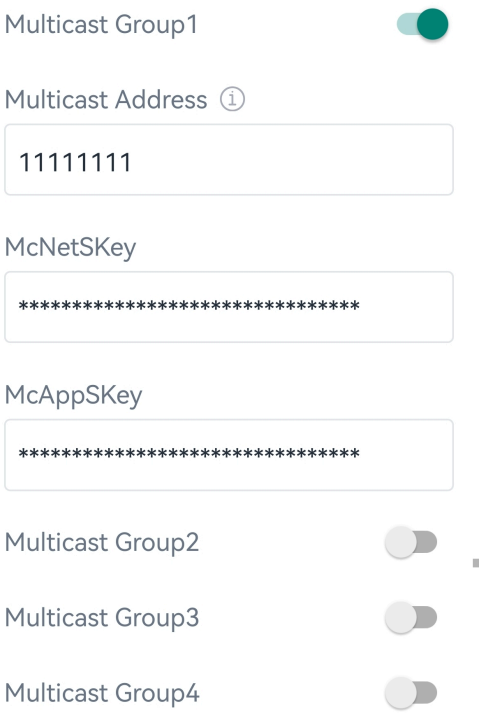
| Parameter | Description |
|---|---|
| | **Note:**<br>• The default value of earlier devices is 5572404C696E6B4C6F52613230313823.<br>• Please contact sales before purchase if you require random App Keys. |
| Network Session Key | Nwkskey for ABP mode, the default is 5572404C696E6B4C6F52613230313823. |
| Application Session Key | Appskey for ABP mode, the default is 5572404C696E6B4C6F52613230313823. |
| Device Address | DevAddr for ABP mode, default is the 5$^{th}$ to 12$^{th}$ digits of SN. |
| Rejoin Mode | Reporting interval≤35 mins: the device will send a specific number of Link-CheckReq 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.<br>Reporting interval > 35 mins: the device will send a specific number of Link-CheckReq MAC packets to the network server every reporting interval to validate connectivity; If there is no response, the device will re-join the network.<br>**Note:**<br>1. Only OTAA mode supports rejoin mode.<br>2. The actual sending number is **Set the number of packets sent** +1. |
| 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.<br>**Examples:** |

| Parameter | Description |
|---|---|
| | 1, 40: Enabling Channel 1 and Channel 40<br>1-40: Enabling Channel 1 to Channel 40<br>1-40, 60: Enabling Channel 1 to Channel 40 and Channel 60<br>All: Enabling all channels<br>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 commands. |
| RX2 Frequency | RX2 frequency to receive downlinks or D2D commands. Unit: Hz |
| Multicast Group | Enable or disable the multicast groups to receive the multicast commands. |

## Multicast Setting

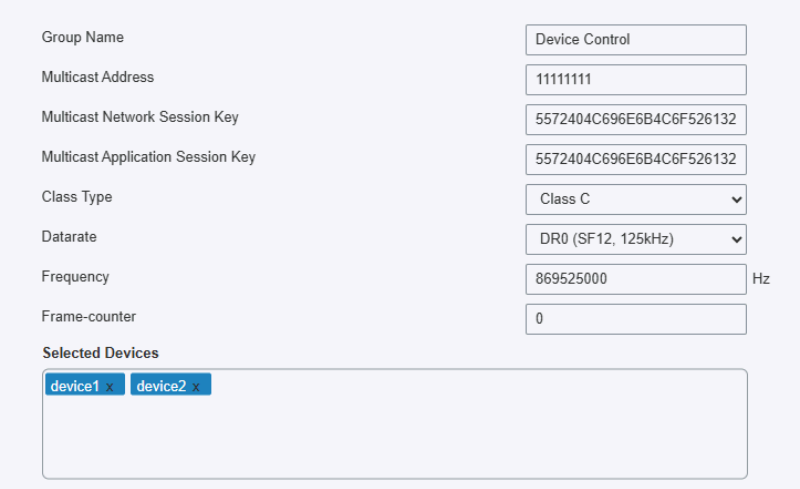
The device supports setting up several multicast groups to receive multicast commands from the network server, then users can use this feature to control devices in bulk.

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:<br>Multicast Group 1: 5572404C696E6B4C6F52613230313823<br>Multicast Group 2: 5572404C696E6B4C6F52613230313824<br>Multicast Group 3: 5572404C696E6B4C6F52613230313825<br>Multicast Group 4: 5572404C696E6B4C6F52613230313826 |
| Multicast McAppSkey | |

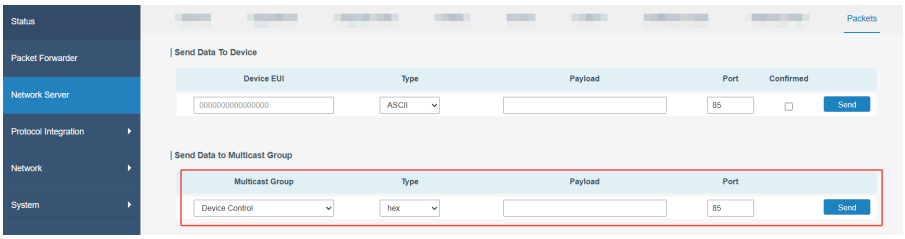
2. Add a multicast group on the LoRaWAN® network server. Take Milesight gateway as example, go to **Network Server > Multicast Groups** to add a multicast group and configure the group according to the device settings.




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.

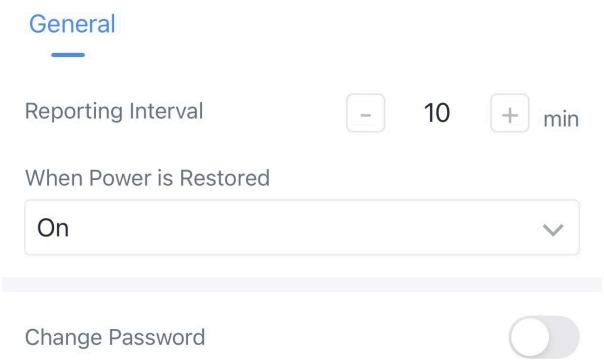
**Note:**

Ensure all devices' application ports are the same.




# General Settings

General settings include the basic parameters of the device.



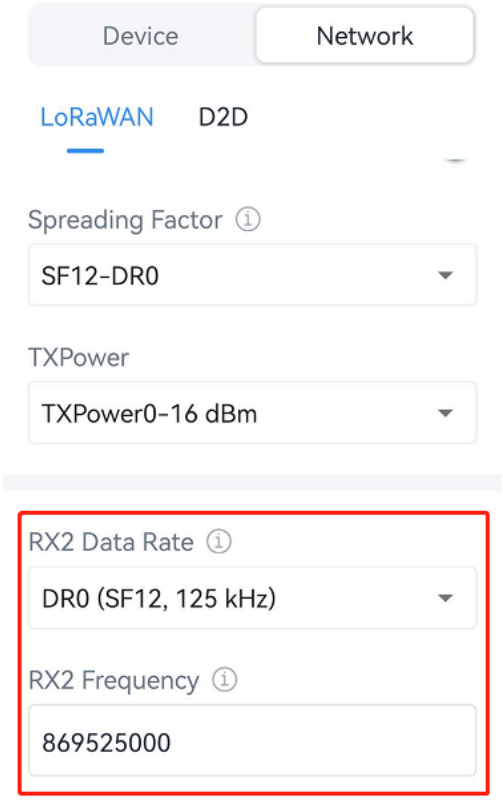
| Parameters | Description |
|---|---|
| Reporting Interval | The interval of reporting switch status and electrical parameters.<br>Default: 20 mins, Range: 1 - 1080 mins |
| The device returns to the power supply state | If the device loses power and returns to power supply, all switches or outputs status will change according to this parameter. |
| Change Password | Change the password of the device for ToolBox App or software configuration. |

## Milesight D2D Setting

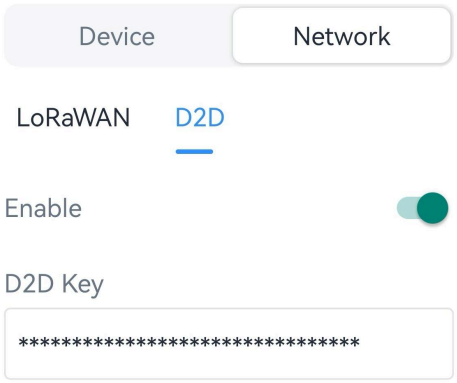
Milesight D2D protocol is developed by Milesight and used for setting up transmission among Milesight devices without gateway. When the Milesight D2D setting is enabled, the device can work as Milesight D2D agent device to receive commands from Milesight D2D controller devices.

1. Configure the RX2 datarate and RX2 frequency.

**Note:**
It is suggested to change the default values if there are many LoRaWAN® devices around.

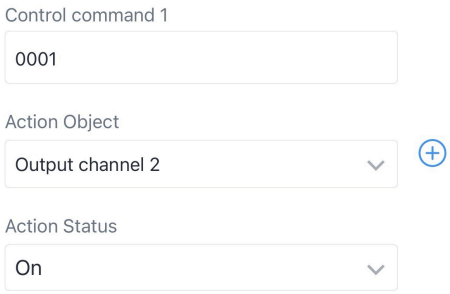



2. Enable Milesight D2D feature and define an unique D2D key which is the same as Milesight D2D controller devices. (Default D2D key: 5572404C696E6B4C6F52613230313823)




3. Define a 2-byte hexadecimal control command (0x0000 to 0xffff) and command action. These control commands can be configured in D2D controller device. When D2D controller device is triggered, it will send the pre-defined control command to control the circuits/switches of WS558 to on, off or inverse status. WS558 supports at most 16 control commands.

**Example:** When the device receiving command 0001 from Milesight D2D controller devices, it will open Output channel 2 as below.




# Maintenance

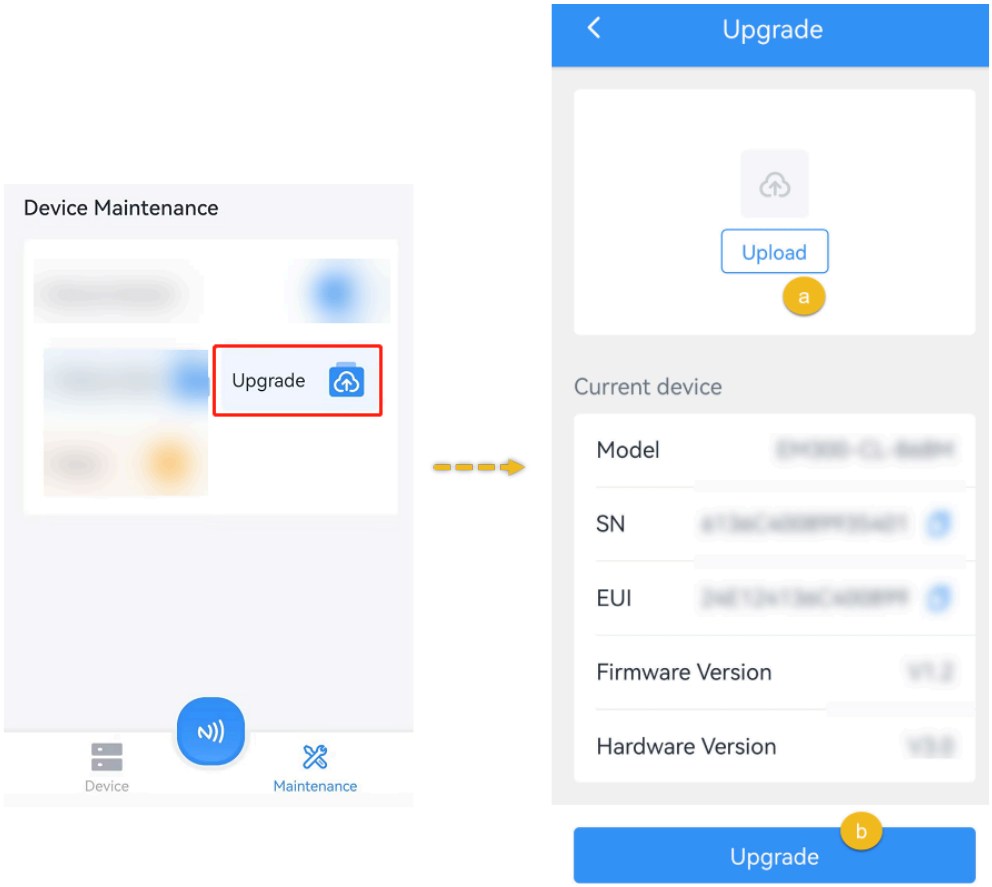
## Upgrade

### Upgrade 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.

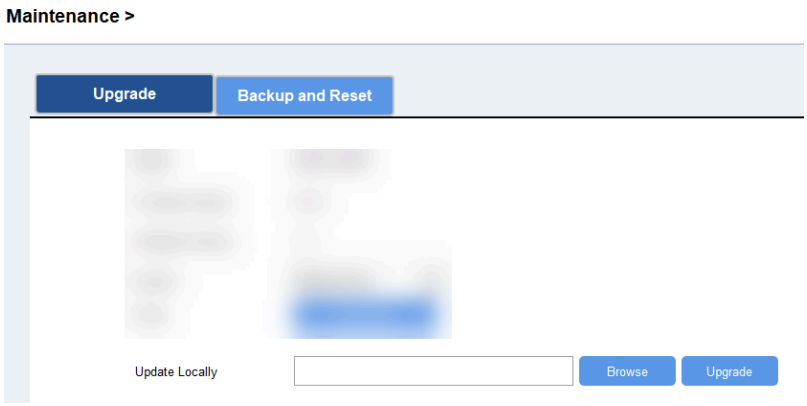
**Note:**

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




**Upgrade via ToolBox Software**

1. Download firmware from Milesight official website to your computer.
2. Connect the device to computer via USB port, then log in to the device via ToolBox software.
3. Go to **Maintenance > Upgrade** page, click **Browse** to upload the firmware file and click **Upgrade** to upgrade the device.



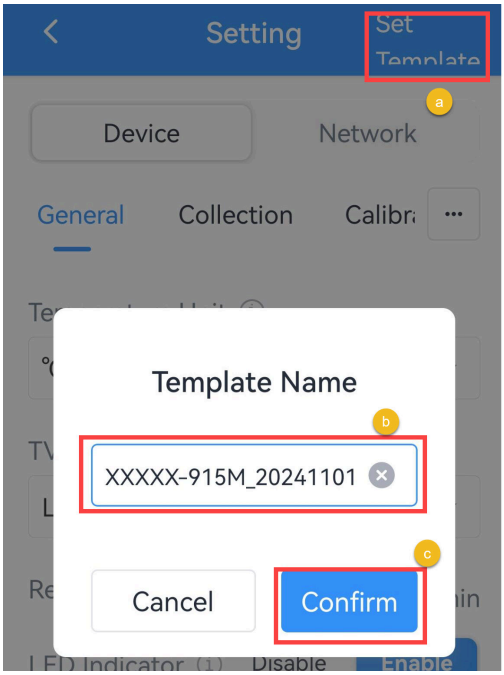
## Backup and Restore

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.

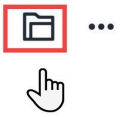
**Backup and Restore via ToolBox App**

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

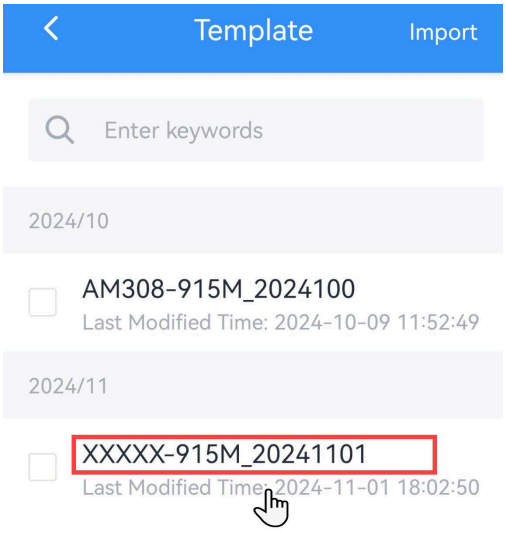
2. Edit the configuration as required, click **Set Template** to save current configuration as a template to the ToolBox App.




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



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




5 (Optional). Check the box of the target template, 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.

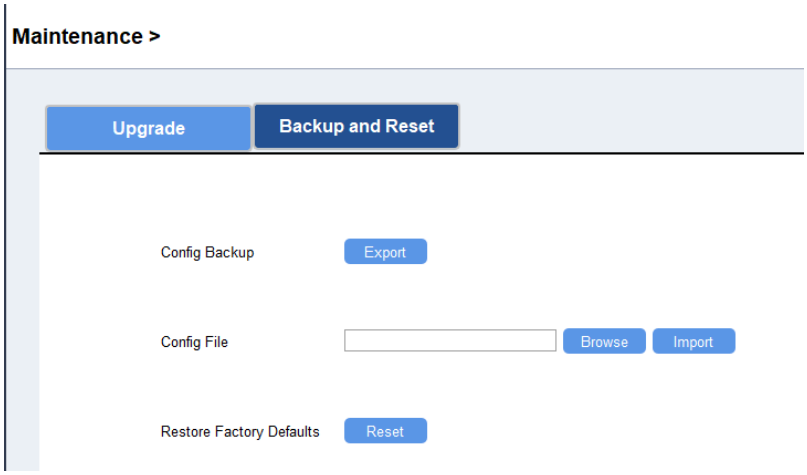
**Backup and Restore via ToolBox Software**

1. Connect the device to a computer via USB port, then log in to the device via ToolBox software.

2. Configure the device and save the settings.

3. Go to **Maintenance > Upgrade** page, click **Export** to save the template file to the computer.

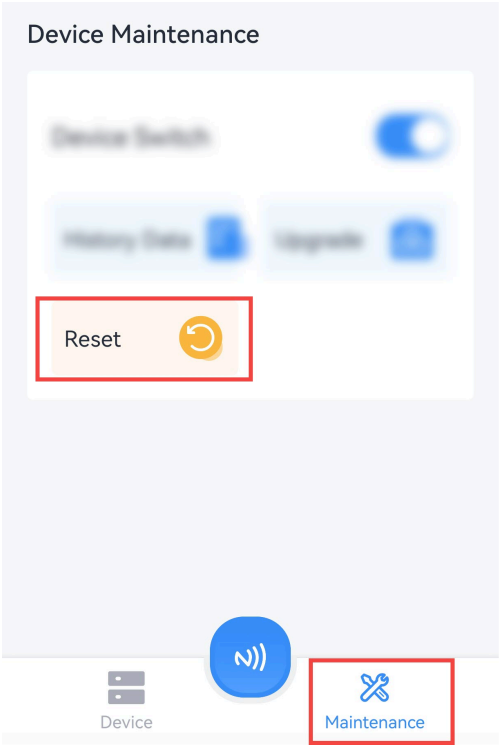
4. Connect another target device to the same computer, go to **Maintenance > Upgrade** page to import the template file.



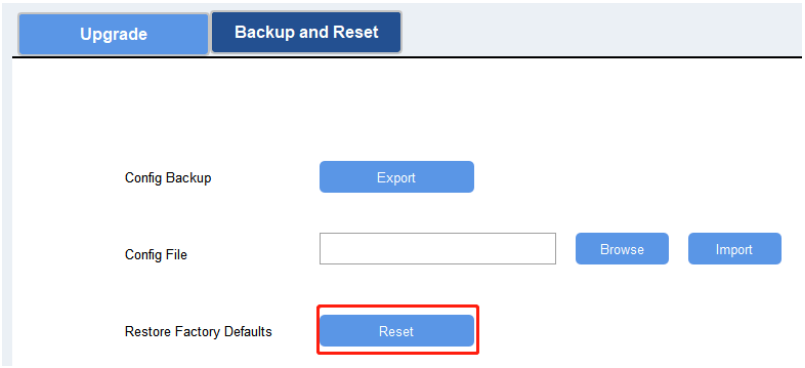
## Reset to Factory Default

**Via Hardware**: Hold on the reset 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.




**Via ToolBox Software**: Go to **Maintenance > Backup and Reset** page, click **Reset** to reset the device.

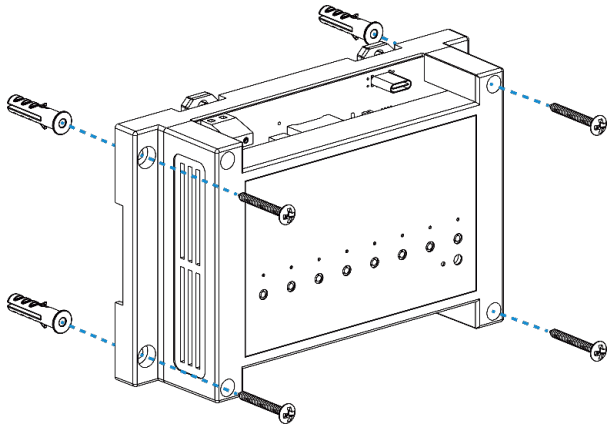


# Chapter 6. Installation

To get 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.

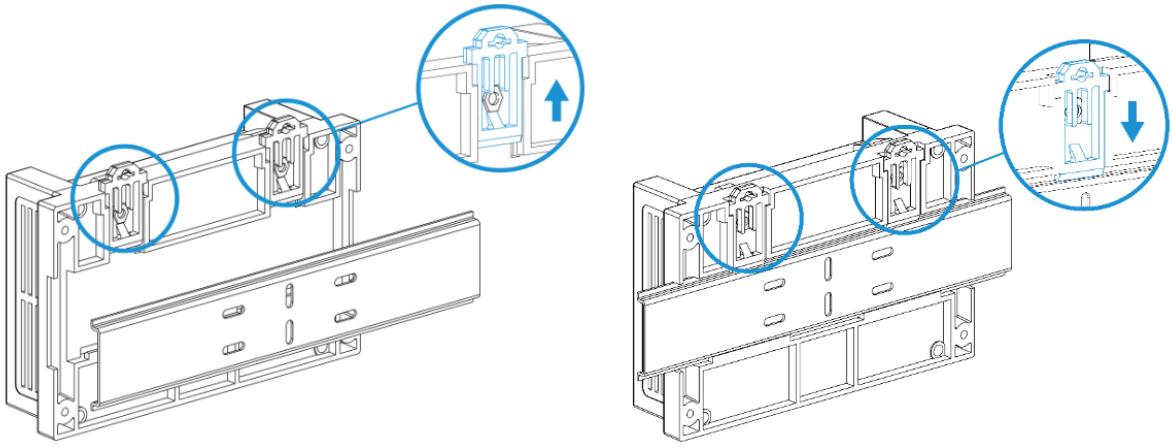
**Wall Mounting**

Fix the wall plugs into the wall, then fix the device to the wall plugs with screws.



**DIN Rail Mounting**

Fix the device to DIN rail via the groove on the back of the device.



# 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

### 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 |
| Device Type | ff | 0f | 1 | 00: Class A, 01: Class B, 02: Class C, 03: Class C to B |
| Serial Number | ff | 16 | 8 | 16 digits |
| Power Consumption | ff | 26 | 1 | 00-disabled, 01-enabled |

**Example:**

| ff0bff ff0101 ff166756c22186300001 ff090200 ff0a0101 ff0f02 ff2601 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| ff | 0b | Power On: ff |
| ff | 01 | Protocol Version: 01=V1 |
| ff | 16 | SN: 6756c22186300001 |

| ff0bff ff0101 ff166756c22186300001 ff090200 ff0a0101 ff0f02 ff2601 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| ff | 09 | Hardware Version: 0200=V2.0 |
| ff | 0a | Software Version: 0101=V1.1 |
| ff | 0f | 02: Class C |
| ff | 26 | Power Consumption: 01=>Enabled |

### Sensor Data Report

The device supports the sensor data according to reporting interval (20 mins by default). For Switch model, it only uploads switch status.

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| Voltage | 03 | 74 | 2 | UINT16/10, Unit: V |
| Active Power | 04 | 80 | 4 | UINT32, Unit: W |
| Power Factor | 05 | 81 | 1 | UINT8, Unit: % |
| Power Consumption | 06 | 83 | 4 | UINT32, Unit: Wh |
| Total Current | 07 | c9 | 2 | UINT16, Unit: mA |
| Switch Status | 08 | 31 | 2 | **Byte 1:** 00<br>**Byte 2:** indicate every switch status per bit, 0=close, 1=open |

**Example:**

1. WS558-LN Periodic package.

| 08310001 058164 07c90200 0374b208 068301000000 048001000000 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| 08 | 31 | Byte 1: 00<br>Byte 2: 01= 00000001 => L1 open and others close |

| 08310001 058164 07c90200 0374b208 068301000000 048001000000 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| 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<br>00=>00 00 00 01=1 Wh=0.001 kWh |
| 04 | 80 | Active Power: 01 00 00 00=>00 00 00 01=1 W |

2. WS558-Switch Periodic package.

| 08310001 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| 08 | 31 | Byte 1: 00<br>Byte 2: 01= 00000001 => L1 open and others close |

3. Status change report: report when any switch changes status.

| 08310060 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| 08 | 31 | Byte 1: 00<br>Byte 2: 60= 0110 0000 => L6, L7 open and others close |

4. When LN model device detects the current over 13A for more than 30s, all switches will close and upload alarm package.

| 07c9413f 08310000 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| 07 | c9 | Current: 41 3f=>3f 41=16193 mA=16.193A |

| 07c9413f 08310000 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| 08 | 31 | Byte 1: 00<br><br>Byte 2: 00=>All close |

# Downlink Command

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

### General Settings

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| Reboot | ff | 10 | 1 | ff |
| Report Interval | ff | 03 | 2 | UINT16, Unit: s |
| Power Consumption | ff | 26 | 1 | 00-disable, 01-enable |
| Reset Power Consumption | ff | 27 | 1 | ff |
| Enquire Electrical Status | ff | 28 | 1 | ff |

**Example:**

1. Reboot the device.

| ff10ff |
|---|

2. Set report interval as 20 minutes.

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

3. Disable the collection and upload of power consumption.

| ff2600 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| ff | 26 | 00 = disable |

4. Reset power consumption.

| ff27ff | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| ff | 27 | ff: Reserved |

### Switch Control

| Channel | Type | Byte | Description |
|---|---|---|---|
| 08 | - | 2 | **Byte 1:** every switch control status per bit, 0=not allow control, 1=allow control<br>**Byte 2:** every switch status per bit, 0=close, 1=open |

**Example:**

1. Close L1 and open L6.

| 082120 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| 08 | - | Byte 1: 21=0010 0001 =>L1 and L6 allow control<br>Byte 2: 20 = 0010 0000 => L1 close, L6 open |

2. Close all switches.

| 08ff00 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| 08 | - | Byte 1: ff=1111 1111 =>All switches allow control<br>Byte 2: 00 = 0000 0000 =>All switches close |

## Task Settings

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| Add Delay Task | ff | 32 | 5 | **Byte 1:** 00<br>**Byte 2-3:**delay time, unit: s<br>**Byte 4:** every switch control status per bit, 0=not allow control, 1=allow control<br>**Byte 5:** every switch status per bit, 0=close, 1=open<br>**Note:** WS558 supports adding only one task. Later command will cover previous command. |
| Delete Delay Task | ff | 23 | 2 | 00 ff |

**Example:**

1. Add a delay task: close L6 after 1minute.

| ff32003c002000 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| ff | 32 | Byte 1:00<br>Byte 2-3: 3c 00=>00 3c=60s=1min |

| ff32003c002000 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| | | Byte 4: 20=>Bit6=1=>Control L6<br><br>Byte 5: 00=>Bit6=0=>L6 close |

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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