



Smart Light Controller

Featuring LoRaWAN® WS558

User Guide



Safety Precautions

Milesight IoT

Milesight will not shoulder responsibility for any losses or damages resulting from not following the instructions of this operating guide.

- . 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.
- 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 power is off during the installation.
- For the LN model, do not reverse the Live Wire (L) and Neutral (N) wire.
- ❖ 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.
- 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.
- Keep the device away from water to prevent electric shock.
- ❖ 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.

Declaration of Conformity

WS558 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 |
|---------------|-------------|-----------------|
| July 20, 2022 | V 2.0 | Initial version |

Milesight IoT

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1. Product Introduction

Milesight IoT

1.1 Overview

WS558 is a LoRaWAN® Smart Light Controller for the monitoring and control of lights. With 2 circuit types and 8 switches, WS558 can fit in different rooms without the need for re-wirings and reduce the renovation costs. Besides LoRaWAN®, WS558 can be controlled whithout a gateway via Milesight D2D communication protocol, which sets up a connection quickly. WS558 can be widely used for wireless control of indoor lights, fans, heaters, machines, etc.

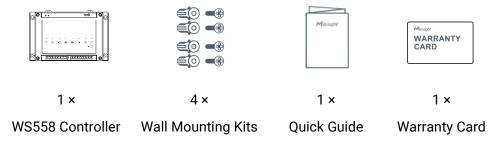
Power data and switch status are transmitted via LoRaWAN® protocol, and LoRaWAN® technology enables encrypted radio transmissions over long distances while consuming very little power. Also, users can check visualized data through Milesight IoT Cloud or the user's own Application Server.

1.2 Features

- LN type or switch type optional, controls up to 8 circuits of lights, adopts different indoor wiring
- Support local switch button control, able to test the lamp status without networking
- Collect data on current, voltage, electrical consumption
- Up to 15 km communication range
- Easy configuration via NFC
- Standard LoRaWAN® technology
- Compatible with Milesight IoT Cloud and Milesight ToolBox
- Support Milesight D2D protocol to enable ultra-low latency control without gateway
- Support multicast for control in bulk

2. Hardware Introduction

2.1 Packing List

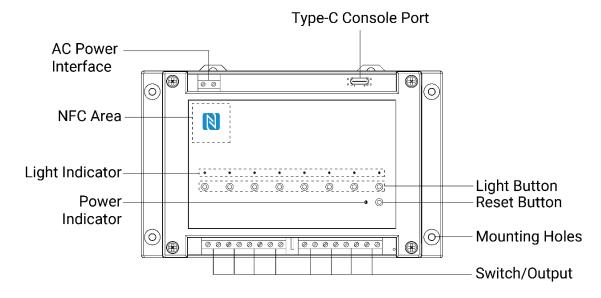


A

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



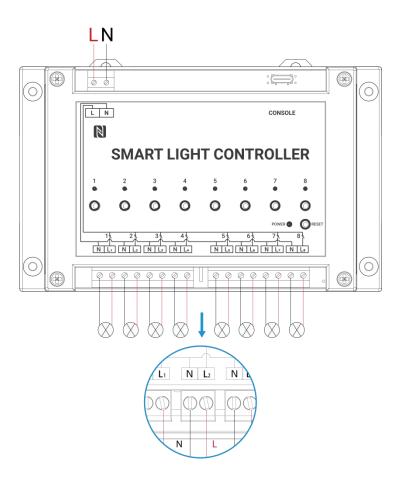
2.2 Hardware Overview



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.

2.3 Wiring Diagram

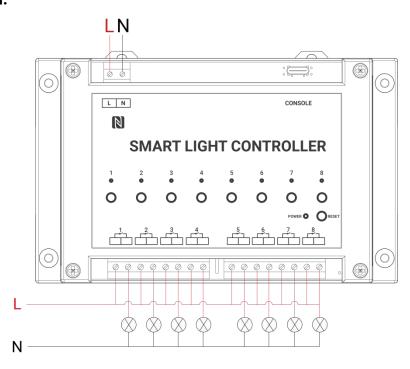
LN Model:



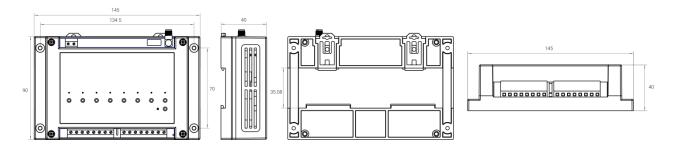
www.milesight-iot.com



Switch Model:



2.4 Dimensions (mm)



3. Operation Guide

3.1 ToolBox Login

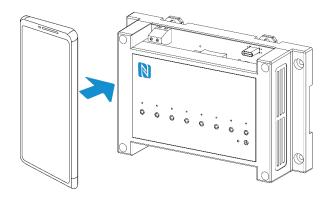
WS558 can be configured via NFC or Type-C port. Please select one of them to complete the configuration.

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 the NFC area to the device to read device information. Basic



information and settings of the device will be shown on ToolBox App if it's recognized successfully. You can read and configure the device by tapping the Read/Write device on the App. To protect the security of the device, password validation is required when first configuration. The default password is **123456**.

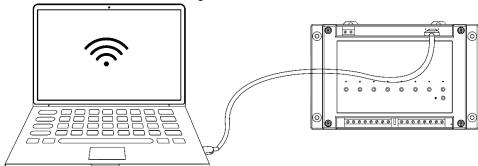


Note:

- 1) Check the NFC area of your smartphone and it's recommended to remove the phone case.
- 2) If the smartphone fails to read/write configurations via NFC, move the phone away and back to try again.
- 3) WS558 can also be configured on ToolBox via a dedicated NFC reader provided by Milesight IoT.

3.1.2 USB Configuration

- 1. Download ToolBox software from www.milesight-iot.com.
- 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 the ToolBox and select type as "General", then click password to log into the ToolBox. (Default password: **123456**)





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



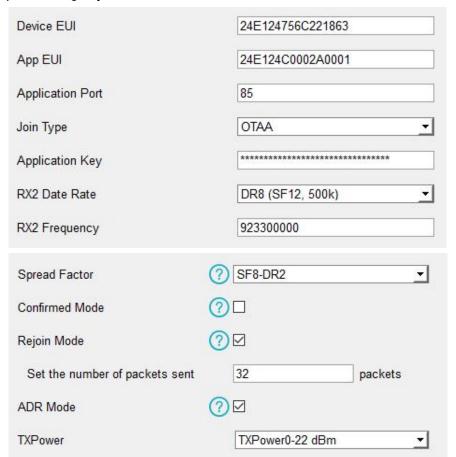
3.2 LoRaWAN Settings

LoRaWAN settings are used to configure the data transmission parameters in the LoRaWAN® network.



3.2.1 Basic Settings

WS558 supports basic configurations like join type, App EUI, App Key and other information. You can also keep all settings by default.



| Parameters | Description |
|----------------------------|--|
| Device EUI | Unique ID of the device which can also be found on the label. |
| App EUI | Default App EUI is 24E124C0002A0001. |
| Application Port | The port used for sending and receiving data, default port is 85. |
| Join Type | OTAA and ABP modes 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 or Milesight D2D commands. |
| RX2 Frequency/MHz | RX2 frequency to receive downlinks or Milesight D2D commands. |
| Spread Factor | If ADR is disabled, the device will send data via this spread factor. |



| Confirmed Mode | If the device does not receive the ACK packet from network server, it will resend data once. |
|----------------|---|
| Rejoin Mode | Reporting interval ≤ 30 mins: 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. Reporting interval > 30 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. |
| ADR Mode | Allow the network server to adjust the data rate of the device. |
| Tx Power | Transmit power of the device. |

Note:

- 1) Please contact your sales representative for device EUI list if there are many units.
- 2) Please contact your sales representative 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.

3.2.2 Frequency Settings

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





If the device 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:

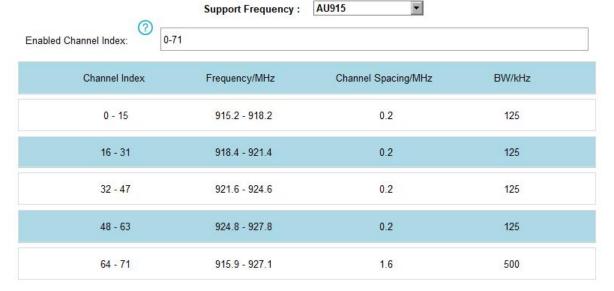
1, 40: Enabling Channel 1 and Channel 40

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



Note:

For -868M model, the default frequency is EU868;

For -915M model, the default frequency is AU915.

3.2.3 Multicast Settings

WS558 supports setting up several multicast groups to receive multicast commands from network servers and users can use this feature to control devices in bulks.

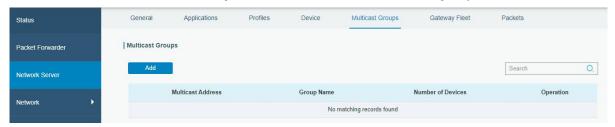
1. Enable Multicast Group on WS558, set a unique multicast address and keys to distinguish other groups. You can also keep these settings by default.





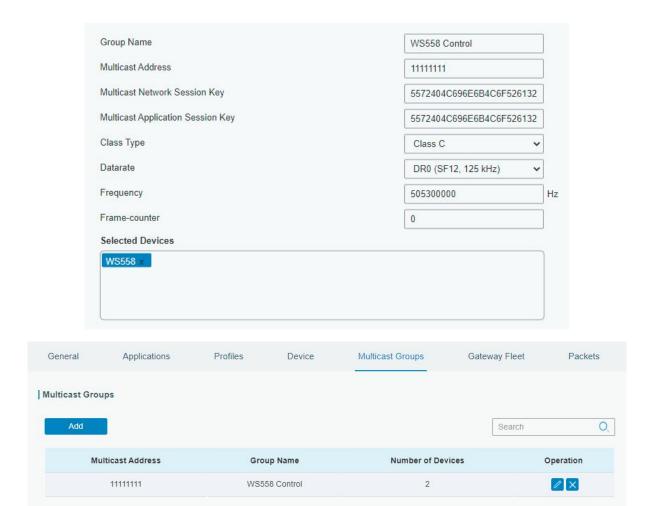
| Parameters | Description | |
|-------------------|---|--|
| Multicast Address | Unique 8-digit address to distinguish different multicast groups. | |
| | 32-digit key. Default values: | |
| A.A. Ist | Multicast Group 1: 5572404C696E6B4C6F52613230313823 | |
| Multicast | Multicast Group 2: 5572404C696E6B4C6F52613230313824 | |
| McAppSkey | 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 example, go to "Network Server -> Multicast Groups", click "Add" to add a multicast group.



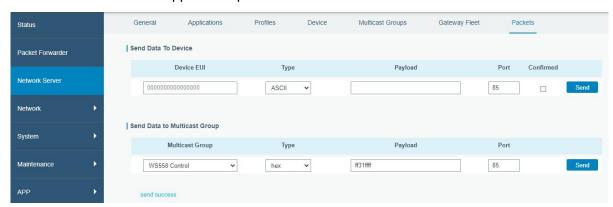
Fill in the multicast group information the same as WS558 settings, and select the devices which you need to control, then click "Save".





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 which belong to this multicast group.

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





3.3 General Settings

| Reporting Interval | 20 | min |
|--|---------------------|-----|
| The device returns to the power supply state | Last working status | • |
| Change Password | | |

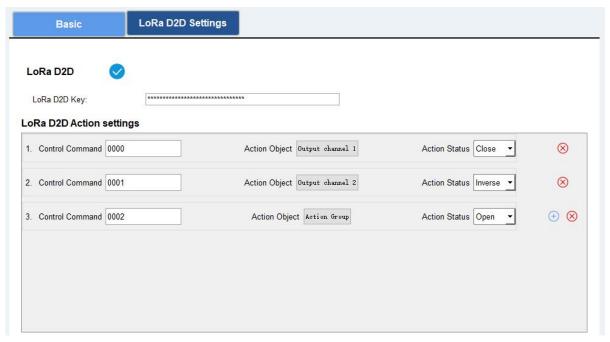
| Parameters | Description | | | |
|--|--|--|--|--|
| Reporting Interval | The interval of reporting switch status and electrical parameters. Default: 20 mins, Range: 1 - 1080 mins | | | |
| The device returns to the power supply state | If the device loses power and returns to power supply, all switches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

3.4 Milesight D2D Settings

Milesight D2D protocol is developed by Milesight and used for setting up transmission among Milesight devices without a gateway. When the Milesight D2D setting is enabled, WS558 can work as Milesight D2D agent device to receive commands from Milesight D2D controller devices.

- 1. Ensure the RX2 datarate and RX2 frequency in LoRaWAN settings are the same as the Milesight D2D controller device.
- 2. Enable the Milesight D2D feature, and define a unique Milesight D2D key to be the same as the setting in Milesight D2D controller device. (Default Milesight D2D Key: 5572404C696E 6B4C6F52613230313823)
- 3. Define a 2-byte hexadecimal control command (0x0000 to 0xffff) and command action. For example, you can configure a control command 0001 to inverse Output channel 2 as below. WS558 supports at most 16 control commands.





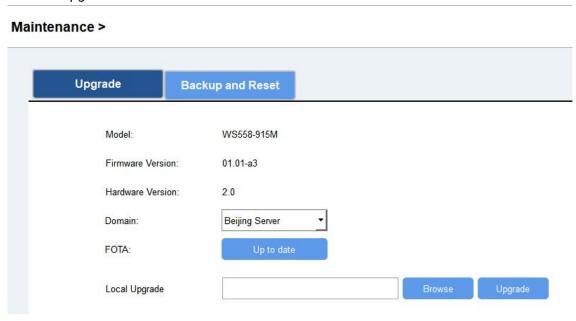
4. These control commands can be configured in Milesight D2D controller device. When Milesight D2D controller device is triggered, it will send the pre-defined control command to control the circuits/switches of WS558 to on, off or inverse status.

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.





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 the Android version ToolBox supports the upgrade feature.



3.5.2 Backup

WS558 supports configuration backup for easy and quick device configuration in bulk. Backup is allowed only for devices with the same model and LoRaWAN® frequency band.

ToolBox Software:

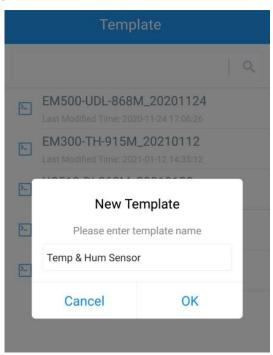
- 1. Go to "Maintenance -> Backup and Reset" of ToolBox software, click "Export" to backup the device configuration.
- 2. Click "Browse" to import the backup file, then click "Import" to load the configuration.



| Mainte | nance > | | |
|--------|----------------|------------------|---------------|
| | Upgrade | Backup and Reset | |
| | | | |
| | Config Backup | Export | |
| | Config File | | Browse Import |
| | Restore Factor | y 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 one template file saved in the smartphone and click "Write", then attach it to another device to write configuration.



Note: Slide the template item to the left to edit or delete it. Click the template to edit the configurations.





3.5.3 Reset to Factory Default

Please select one of the following methods to reset the device:

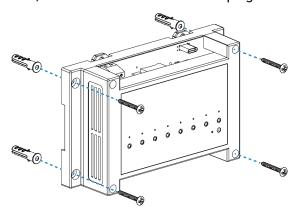
Via ToolBox Software: Go to "Maintenance -> Backup and Reset" of ToolBox software, click "Reset" to complete.

Via ToolBox App: Go to "Device -> Maintenance" to tap "Reset", then attach smartphone with NFC area to the device to complete.

4. Installation

Wall Mounting

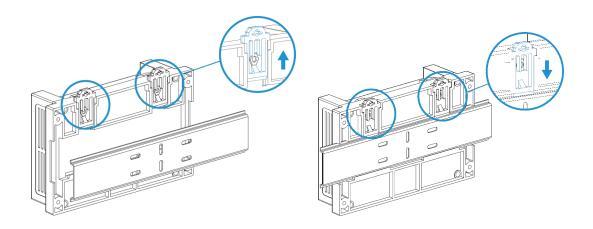
Fix the wall plugs into the wall, then fix the device to the wall plugs with screws.



DIN Rail Mounting

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





5. Device Payload

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

| Channel1 | Type1 | Data1 | Channel2 | Type2 | Data2 | Channel 3 | |
|----------|--------|---------|----------|--------|---------|-----------|--|
| 1 Byte | 1 Byte | N Bytes | 1 Byte | 1 Byte | M Bytes | 1 Byte | |

For decoder examples you can find at https://github.com/Milesight-IoT/SensorDecoders.

5.1 Basic Information

WS558 reports basic information of the device whenever it joins the network.

| Channel | Туре | Description | | |
|---|------------------------|---------------------------------------|--|--|
| 0a (Software Version) 01 14 => V 0b (Power On) Device is o | 01(Protocol Version) | 01 => V1 | | |
| | 09 (Hardware Version) | 01 40 => V1.4 | | |
| | 01 14 => V1.14 | | | |
| | 0b (Power On) | Device is on | | |
| | Of (Device Type) | 00: Class A, 01: Class B, 02: Class C | | |
| | 16 (Device SN) | 16 digits | | |
| | 26 (Power Consumption) | 00-disabled, 01-enabled | | |

Example:

| ff0bff ff0101 ff166756c22186300001 ff090200 ff0a0101 ff0f02 ff2601 | | | | | | | | | |
|--|---------------------------------------|---------------|---------|--------------------|----------|--|--|--|--|
| Channel | Channel Type Value Channel Type Value | | | | | | | | |
| ff | 0b | ff (Reserved) | ff | 01 | 01(V1.0) | | | | |
| 11 | (Power On) | ii (Neserveu) | | (Protocol Version) | 01(01.0) | | | | |
| Channel | Туре | Value | Channel | Туре | Value | | | | |
| ff | 16(Davias SN) | 6756c22186 | ff | 09 | 0200 | | | | |
| | 16(Device SN) | 300001 | | (Hardware Version) | (V2.0) | | | | |



| Channel | Туре | Value | Channel | Туре | Value |
|---------|-----------------------------|----------------|---------|------------------|-----------------|
| ff | 0a (Software Version) | 0101 (V1.1) | ff | 0f (Device Type) | 02=>Clas s C |
| Channel | Туре | Value | | | |
| ff | 26 (Power Consumption) | 01=>Enabled | | | |
| | Consumption) | 01->Ellabled | | | |

5.2 Sensor Data

WS558 reports switch status and electrical data according to reporting interval (20 mins by default). For Switch model, it only uploads switch status.

| Channel | Туре | Description |
|---------|------------------------|--|
| 03 | 74 (Valtaria) | UINT16, Unit: V |
| 03 | 74 (Voltage) | Resolution: 0.1V |
| 04 | 80 (Active Power) | UINT32, Unit: W |
| 05 | 81 (Power Factor) | UINT8, Unit: % |
| 06 | 83 (Power Consumption) | UINT32, Unit: Wh |
| 07 | c9 (Total Current) | UINT16, Unit: mA |
| | | Byte 1: 00 |
| 08 | 31 (Switch Status) | Byte 2: indicate every switch status per |
| | | bit, 0=close, 1=open |

Example:

1. Periodic package:

| 08310001 058164 07c90200 0374b208 068301000000 048001000000 | | | | | |
|---|--------------------------|---|---------|----------------------|---|
| Channel | Type Value | | Channel | Туре | Value |
| 08 | 31 (Switch Status) | Byte 1: 00 Byte 2: 01= 00000001 => L1 open and others close | 05 | 81 (Power Factor) | 64=> 100% |
| Channel | Туре | Value | Channel | Туре | Value |
| 07 | c9 (Current) | 02 00=>00 02=2mA | 03 | 74(Voltage) | b2 08=>08 b2=2226 Voltage=2226 *0.1=222.6V |
| Channel | Туре | Value | Channel | Туре | Value |
| 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 |



2. When any switch changes status:

| 08310060 | | | |
|----------|--------------------|---------------------------------|--|
| Channel | Туре | Value | |
| | | Byte 1: 00 | |
| 08 | 31 (Switch Status) | Byte 2: 60= 0110 0000 | |
| | | => L6, L7 open and others close | |

3. 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 Channel Type Value | | | | | |
| 07 | c9 (Current) | 41 3f=>3f | | 31 (Switch Status) | Byte 1: 00 |
| | | 41=16193 | 08 | | Byte 2: 00 |
| | | mA=16.193A | | Status) | =>All close |

5.3 Downlink Commands

WS558 supports downlink commands to configure the device. The application port is 85 by default.

| Channel | Туре | Description |
|---------|-----------------------------|---|
| | | Byte 1: every switch control status per bit, |
| 08 | | 0=not allow control, 1=allow control |
| 08 | - | Byte 2: every switch status per bit, 0=close, |
| | | 1=open |
| | 03 (Set Reporting Interval) | 2 Bytes, unit: s |
| | 10 (Reboot Device) | ff |
| | 32 (Add Delay Task) | Byte 1: 00 |
| | | Byte 2-3: delay time, unit: s |
| | | Byte 4: every switch control status per bit, |
| ff | | 0=not allow control, 1=allow control |
| II | | Byte 5: every switch status per bit, 0=close, |
| | | 1=open |
| | | Note: WS558 supports adding only one task. |
| | | Later command will cover previous command. |
| | 23 (Delete Delay Task) | 00 ff |
| | 26 (Power Consumption) | 00-disable, 01-enable |



| 27 (Reset Power Consumption) | ff |
|--------------------------------|----|
| 28 (Enquire Electrical Status) | ff |

Example:

1. Close L1 and open L6.

| 082120 | | |
|---------|------|--|
| Channel | Туре | Command |
| 08 | | Byte 1: 21=0010 0001 =>L1 and L6 allow control |
| - | - | Byte 2: 20 = 0010 0000 => L1 close, L6 open |

2. Close all switches.

| 08ff00 | | |
|---------|---|---|
| Channel | Туре | Command |
| 08 - | Byte 1: ff=1111 1111 =>All switches allow control | |
| | - | Byte 2: 00 = 0000 0000 =>All switches close |

3. Set reporting interval as 20 minutes.

| ff03b004 | | | |
|--------------------|-------------------|--------------------|--|
| Channel Type Value | | | |
| ff | 03 (Set Reporting | b0 04=>04 b0=1200s | |
| | Interval) | =20 minutes | |

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

| ff32003c002000 | | | |
|----------------|---------------------------|--|--|
| Channel | Туре | Value | |
| ff | 32 (Add Delay Task) | Byte 1:00 Byte 2-3: 3c 00=>00 3c=60s=1min | |
| | | Byte 4: 20=>Bit6=1=>Control L6 | |
| | , | Byte 5: 00=>Bit6=0=>L6 close | |

5. Delete the delay task

| ff2300ff | | | |
|--------------------|-----------------------|------|--|
| Channel Type Value | | | |
| ff | 23(Delete Delay Task) | 00ff | |

6. Disable the collection and upload of power consumption.

| ff2600 | |
|--------|--|
|--------|--|



| Channel | Туре | Value |
|---------|--------------|--------------|
| ff | 26 (Power | 00 = disable |
| | Consumption) | |

7. Reset power consumption

| ff27ff | | |
|---------|----------------|---------------|
| Channel | Туре | Value |
| ff | 27(Reset Power | ff (Reserved) |
| | Consumption) | |

-END-