



Milesight WS101 Smart ButtonFeaturing LoRaWAN User Guide

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Milesight WS101 Smart Button Featuring LoRaWAN



Safety Precautions

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

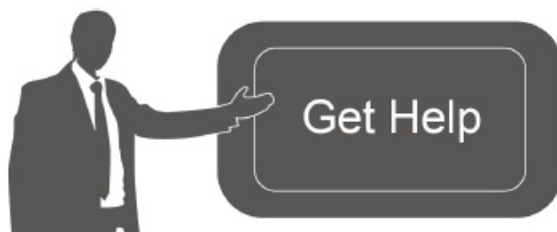
- The device must not be modified in any way.
- In order to protect the security of the device, please change device the password when first configuring. The default password is 123456.
- Do not place the device close to objects with naked flames.
- Do not place the device where the temperature is below/above the operating range.
- When installing the battery, please install it accurately, and do not install the reverse or wrong model.
- Remove the battery if the device will not be used for a period of time. Otherwise, the battery will leak and damage the device.
- The device must never be subjected to shocks or impacts.

Declaration of Conformity

WS101 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 12, 2021	V 1.0	Initial version
Dec. 7, 2021	V 1.1	1. Add LoRa D2D controller feature; 2. Delete low power alarm interval, device only uplinks once when battery level is lower than 10%.

Product Introduction

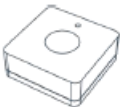



Overview

WS101 is a LoRaWAN® based smart button for wireless controls, triggers and alarms. WS101 supports multiple press actions, all of which can be defined by the user to control devices or trigger scenes. Besides, Milesight also provides a red button version that is primarily used for emergency situation. Compact and battery-powered, WS101 is easy to install and carry everywhere. WS101 can be widely used in smart homes, smart offices, hotels, schools, etc. Sensor data are transmitted in real-time using the standard LoRaWAN® protocol. LoRaWAN® enables encrypted radio transmissions over long distances while consuming very little power. The user can get alarm through Milesight IoT Cloud or through the user's own Application Server.

Features

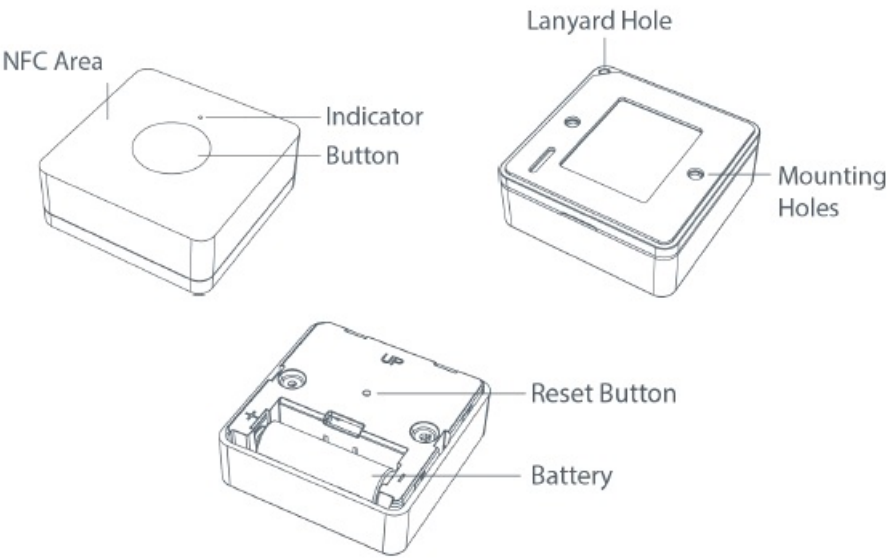
- Up to 15 km communication range
- Easy configuration via NFC
- Standard LoRaWAN® support
- Milesight IoT Cloud compliant
- Support multiple press actions to control devices, trigger a scene or send emergency alarms
- Compact design, easy to install or carry
- Built-in LED indicator and buzzer for press actions, network status, and low battery indication

Hardware Introduction Packing List

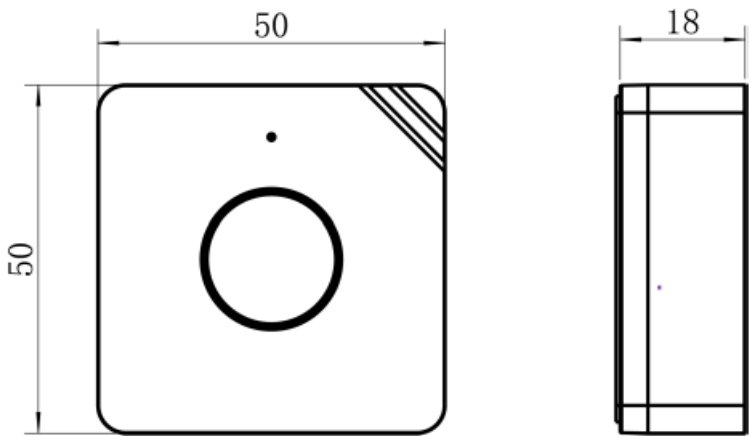
			
1 ×	2 ×	1 ×	1 ×
WS101 Sensor	Wall Mounting Kits	3M Tape	Quick Guide

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

Hardware Overview



Dimensions (mm)



LED Patterns

WS101 equips with a LED indicator to indicate the network status and reset button features. Besides, when button is pressed, the indicator will light up at the same time. Red indicator means network is unregistered, while green indicator means device has registered on the network.

Function	Action	LED Indicator
Network Status	Send join network requests	Red, blinks once
	Joined the network successfully	Green, blinks twice
Reboot	Press and hold the reset button for more than 3s	Slowly blinks
Reset to Factory Default	Press and hold the reset button for more than 10s	Quickly blinks

Operation Guide

Button Mode

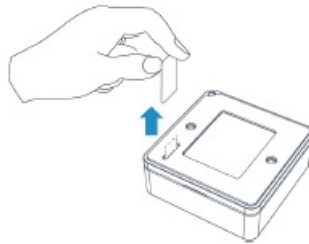
WS101 provides 3 kinds of pressing actions allowing users to define different alarms. Please refer to chapter 5.1 for detailed message of every action.

Mode	Action
Mode 1	Short press the button (≤ 3 seconds).
Mode 2	Long press the button (> 3 seconds).
Mode 3	Double press the button.

NFC Configuration

WS101 can be configured via an NFC-enabled smartphone.

1. Pull out the battery insulating sheet to power on the device. The indicator will light up in green for 3 seconds when device turns on.



2. Download and install the “Milesight ToolBox” App from Google Play or App Store.
3. Enable NFC on the smartphone and open Milesight ToolBox.
4. Attach the smartphone with NFC area to the device to read device information.



5. Basic information and settings of devices will be shown on ToolBox if it's recognized successfully. You can read and configure the device by tapping the Read/Write button on the App. In order to protect the security of devices, password validation is required when first configuring. The default password is 123456.

Note:

1. Ensure the location of the smartphone NFC area and it's recommended to take off the phone case.
2. If the smartphone fails to read/write configurations via NFC, move the phone away and back to try again.
3. WS101 can also be configured by ToolBox software via a dedicated NFC reader provided by Milesight IoT, you can also configure it via TTL interface inside the device.

LoRaWAN Settings

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

Basic LoRaWAN Settings:

Go to Device -> 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	<input type="text" value="24E124127A270222"/>
App EUI	<input type="text" value="24E124C0002A0001"/>
Application Port	<input type="text" value="85"/>
Join Type	<input type="text" value="OTAA"/>
Application Key	<input type="text" value="*****"/>
Spread Factor	<input type="text" value="SF10-DR2"/>
Confirmed Mode	<input type="checkbox"/>
Rejoin Mode	<input checked="" type="checkbox"/>
Set the number of packets sent	<input type="text" value="32"/> packets
ADR Mode	<input checked="" type="checkbox"/>

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 5th to 12th 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.
Rejoin Mode	Reporting interval ≤ 30 mins: device will send specific mounts of LoRaMAC packets to check connection status every 30 mins; If no reply after specific packets are being sent, the device will re-join. Reporting interval > 30 mins: device will send specific mounts of LoRaMAC packets to check connection status at every reporting interval; If no reply after specific packets are being sent, the device will re-join.
ADR Mode	Allow network server to adjust datarate of the device.
Tx Power	Transmit power of device.

Note:

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

LoRaWAN Frequency Settings:

Go to Setting->LoRaWAN Settings of ToolBox App to select supported frequency and select channels to send uplinks. Make sure the channels match the LoRaWAN® gateway.

* Support Frequency

AS923

<input checked="" type="checkbox"/>	-	923.2	+
<input checked="" type="checkbox"/>	-	923.4	+
<input type="checkbox"/>	-	922.2	+
<input type="checkbox"/>	-	922.4	+
<input type="checkbox"/>	-	922.6	+

If 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

* Support Frequency

AU915

Enable Channel Index

i

0-71

Index	Frequency/MHz <div>i</div>
0 - 15	915.2 - 918.2
16 - 31	918.4 - 921.4
32 - 47	921.6 - 924.6
48 - 63	924.8 - 927.8

Note:

- For -868M model, the default frequency is EU868;
- For -915M model, the default frequency is AU915.

General Settings

Go to Device->Setting->General Settings of ToolBox App to change the reporting interval, etc.

Reporting Interval

-

1080

+

min

LED Indicator

i

Buzzer

Change Password

Parameters	Description
Reporting Interval	Reporting interval of battery level to network server. Default: 1080min, Range: 1-1080 mins
LED Indicator	Enable or disable the light indicating in chapter 2.4 . Note: The indicator of reset button is not allowed to disable.
Buzzer	The buzzer will be triggering together with indicator if the device is

	registered to network.
Change Password	Change the password for ToolBox App to write this device.

Lora D2D Settings

Lora D2D protocol is developed by Milesight and used for setting up transmission among Milesight devices without gateway. When the LoRa D2D setting is enabled, WS101 can work as a LoRa D2D controller to send control commands to trigger LoRa D2D agent devices.

1. Enable LoRa D2D feature.
2. Define a unique LoRa D2D key that is the same as LoRa D2D agent devices, then select the frequency and spreading factor. (Default LoRa D2D Key: 5572404C696E6B4C6F5 2613230313823)

LoRa D2D Settings

Enable

☒

LoRa D2D Key

Spread Factor

SF12-DR0

Frequency/MHz

- 9.525 +

3. Enable one of the WS101 button modes and configure a 2-byte hexadecimal command (This command is pre-defined in LoRa D2D agent device). When you press as this button mode, WS101 will send the control command to corresponding LoRa D2D agent devices.

Note:

When this feature is enabled, the device will not send uplinks to the LoRaWAN® network server.

Short Press

Control command

0001

Long Press

Control command

ff01

Double Press

Maintenance

Upgrade

1. Download firmware from the Milesight website 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.
Only Android version ToolBox supports the upgrade feature.

Status	Setting	Maintenance
SN	6535B1712972	
Model	WS101-915M	
Firmware Version	V1.1-a01	
Hardware Version	V1.0	
Manual Upgrade		
Browse		

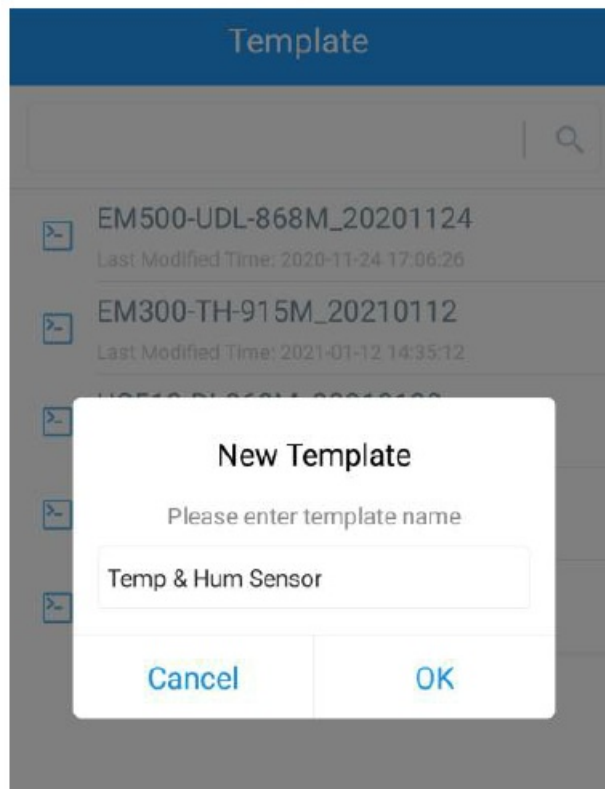
backup

WS101 supports configuration backup for easy and quick device configuration in bulk. Backup is allowed only for devices with the same model and LoRa frequency band.

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

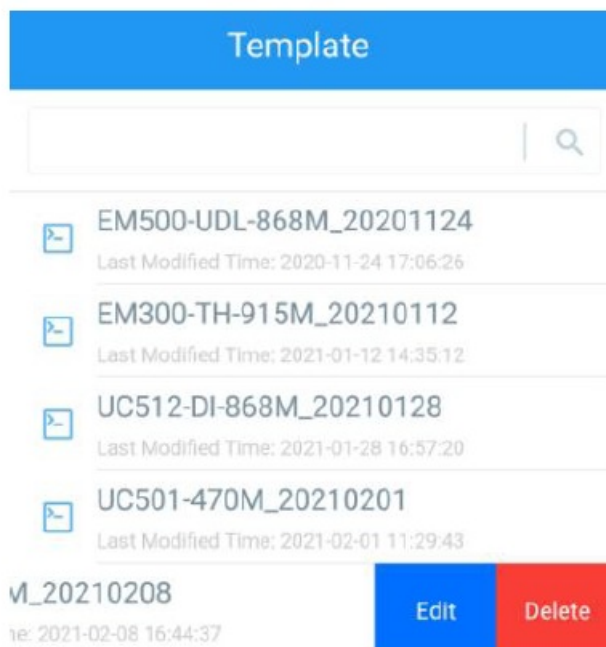
file.

2. Select one template file that is 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 the template. Click the template to edit the configurations.



Reset to Factory Default

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

Via Hardware: Hold on the reset button for more than 10s. After reset is complete, the indicator will blink in green twice and the device will reboot.

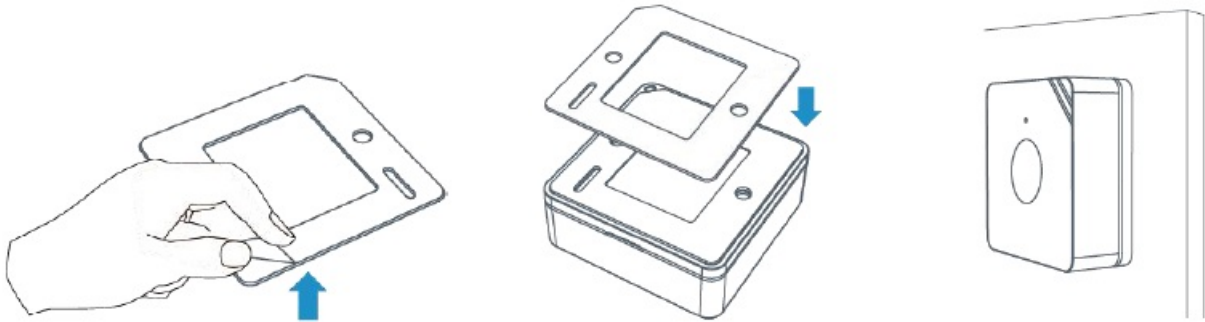
Via Toolbox App:

Go to Device -> Maintenance to tap “Reset”, then attach smartphone with NFC area to device to complete reset.

Installation

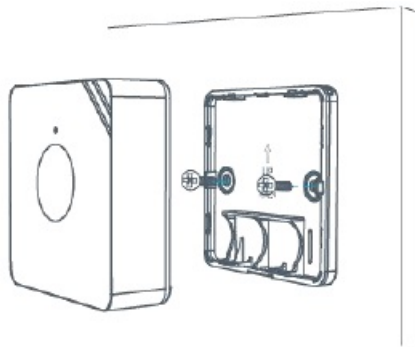
3M Tapes Fix:

Paste 3M tape to the back of the button, then tear the other side and place it on a flat surface



Screw Fix:

Remove the back cover of the button, screw the wall plugs into the wall and fix the cover with screws on it, then install back the device.



Lanyard:

Pass the lanyard through the aperture near the edge of the button, then you can hang the button onto keychains and the like.

Device Payload

All data are based on the following format(HEX):

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>.

Basic Information

WS101 reports basic information of button whenever joining the network.

Channel	Type	Description
ff	01(Protocol Version)	01=> V1
	08 (Device SN)	12 digits
	09 (Hardware Version)	01 40 => V1.4
	0a (Software Version)	01 14 => V1.14
	0b (Power On)	Device is on
	0f (Device Type)	00: Class A, 01: Class B, 02: Class C

Example:

ff0bff ff0101 ff086538b2232131 ff090100 ff0a0102 ff0f00					
Channel	Type	Value	Channel	Type	Value
ff	0b (Power On)	ff (Reserved)	ff	01 (Protocol Version)	01 (V1)
Channel	Type	Value	Channel	Type	Value
ff	08(Device	6538b22321	ff	09	0100
	SN)	31		(Hardware version)	(V1.0)
Channel	Type	Value	Channel	Type	Value
ff	0a (Software version)	0102 (V1.2)	ff	0f (Device Type)	00 (Class A)

Button Message

WS101 reports battery level according to reporting interval (1080 mins by default) and button message when button is pressed. Besides, when battery level is lower than 10%, it will upload battery package once.

Channel	Type	Description
01	75(Battery Level)	UINT8, Unit: %
ff	2e(Button Message)	01: Mode 1(short press) 02: Mode 2 (long press) 03: Mode 3 (double press)

Example:

01 75 64		
Channel	Type	Value
01	75 (Battery)	64 => 100%

ff 2e 01		
Channel	Type	Value
ff	2e(Button Message)	01 => short press

Downlink Commands



WS101 supports downlink commands to configure the device. The application port is 85 by default.

Channel	Type	Description
ff	03 (Set Reporting Interval)	2 Bytes, unit: s

Example: Set reporting interval as 20 minutes.

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

Documents / Resources

 Smart Button Featuring LoRaWAN® WS101 User Guide 	Milesight WS101 Smart ButtonFeaturing LoRaWAN [pdf] User Guide WS101, Smart ButtonFeaturing LoRaWAN
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References

-  [GitHub - Milesight-IoT/SensorDecoders](#)