Milesight WS202 LoRaWAN PIR and Light Sensor User Guide

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Contents

Safety Precautions

Milesight will not shoulder responsibility for any losses or damages resulting fromnot followingthe instructions of this operating guide.

- The device must not be modified in any way.
- Do not expose the PIR lens to direct sunlight.
- Do not paint or clean the PIR lens, or it will affect the detection of the device.
- 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.
- The device is not intended to be used as a reference sensor, and Milesight will not takeresponsibility for any damages which may result from inaccurate readings.
- When installing the battery, please install it accurately, and do not install the reverseor wrong model.
- Remove the battery if the device will not be used for a long time. Otherwise, the batterywill leak and damage the device.
- The device must never be subjected to shocks or impacts

Declaration of Conformity

WS202 conforms 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 15, 2021	V 1.0	Initial version
Sept. 10, 2021	V 1.1	1. Add Mile sight D2D feature;2. Support light collection enabled/disabled;3. Delete low power alarm interval, device only uplinks once when battery level is lower than 10%.
Jan. 16, 2023	V 1.2	1. Add Single-Channel mode;2. Add Mile sight D2D LoRa Uplink feature.3. Add reboot downlink command.
May 15, 2023	V 1.3	Add blocking stickers

Product Introduction

Overview

WS202 is a PIR sensor based on passive infrared technology to detect a motion or occupancy. WS202 can detect whether there is a movement within the range of 6-8 m. Besides, WS202equips with a light sensor which can link PIR detection results to trigger scenes. WS202 canbewidely used in smart homes, smart offices, schools, warehouses, etc.

Sensor data are transmitted in real-time using the standard LoRa WAN® protocol. Lora WAN ®enables encrypted radio transmissions over long distances while consuming very little power. The user can get an alarm through Mile sight IoT Cloud or through the user'sown Application Server.

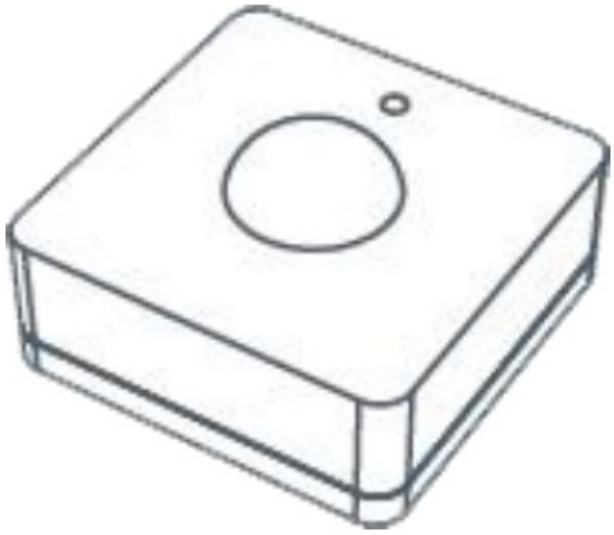
Features

- Built-in light sensor, combine PIR sensor to achieve triggers
- Up to 15 km communication range
- Easy configuration via NFC
- Standard Lora WAN ® support
- Compatible with Mile sight Iota Cloud

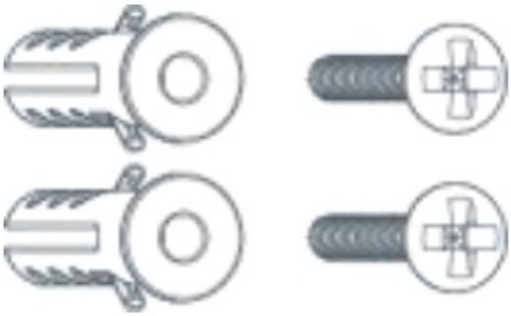
Hardware Introduction

Packing List

- 1 × WS202 Sensor



- 2 × Wall Mounting Kits



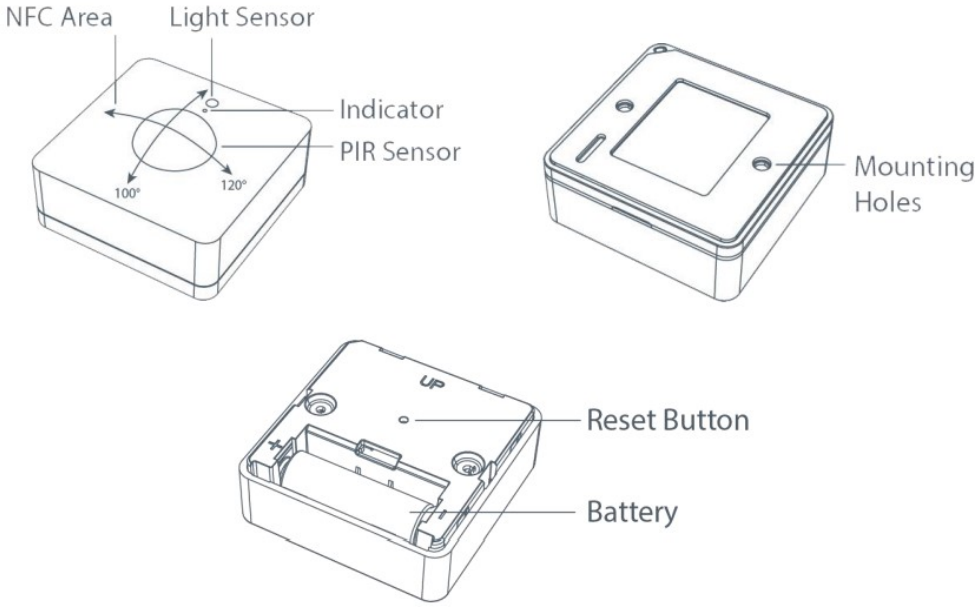
- 1 × 3M Tape

- 3 × Blocking Stickers

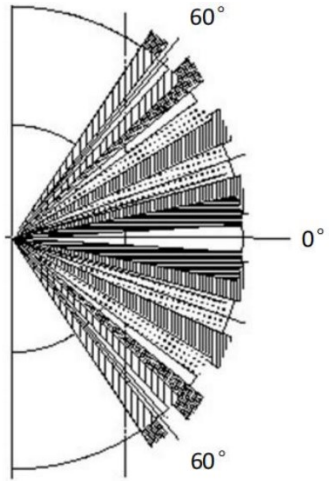
- 1× Quick Guide

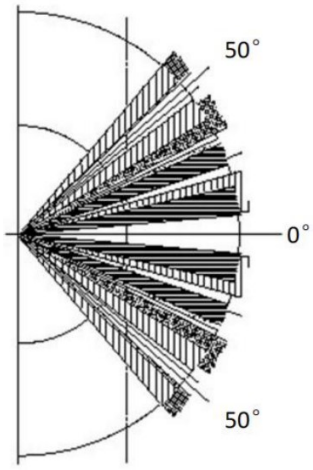
If any of the above items is missing or damaged, please contact your sales representative.

Hardware Overview

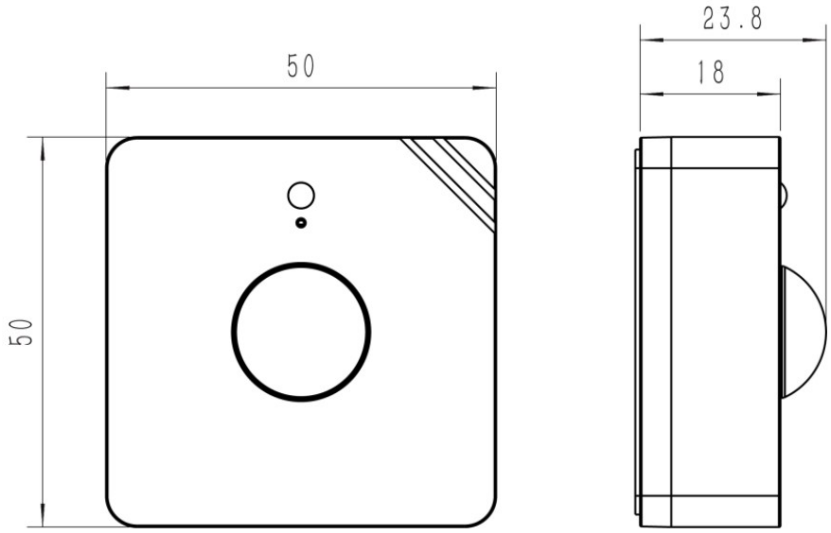


PIR Area





Dimensions (mm)



LED Patterns

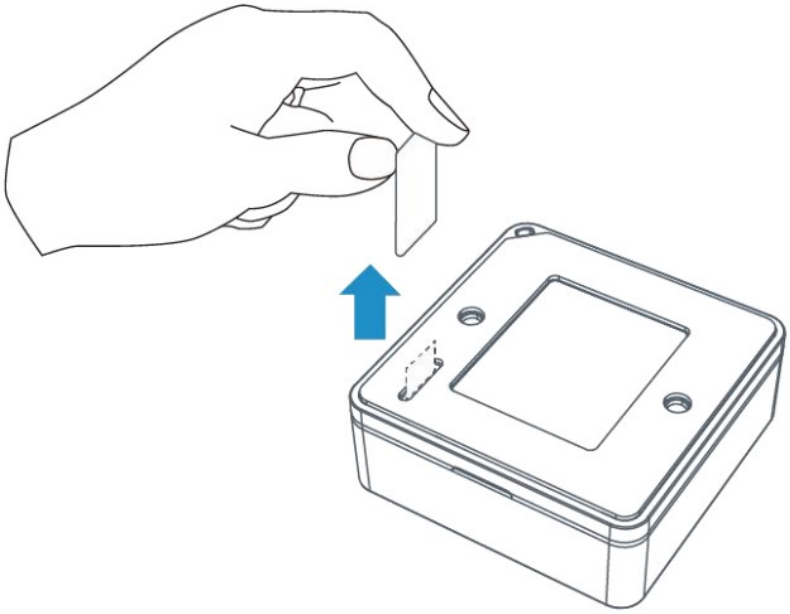
Function	Action	LED Indicator
PIR Detection	PIR is triggered (network unregistered)	Red, blink once
	PIR is triggered (network registered)	Green, blink once
Network Status	Send join network requests	Red, blinks once
	Joined the network successfully	Green, blinks twice
Reboot	Press and hold the reset button for more than 3s	Slowly blinks
Reset to FactoryDefault	Press and hold the reset button for more than 10s	Quickly blinks

Operation Guide

NFC Configuration

WS202 can be configured via an NFC-enabled smartphone

1. Pull out the battery insulating sheet to power on the device. The indicator will light upingreenfor3seconds when the device turns on.



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

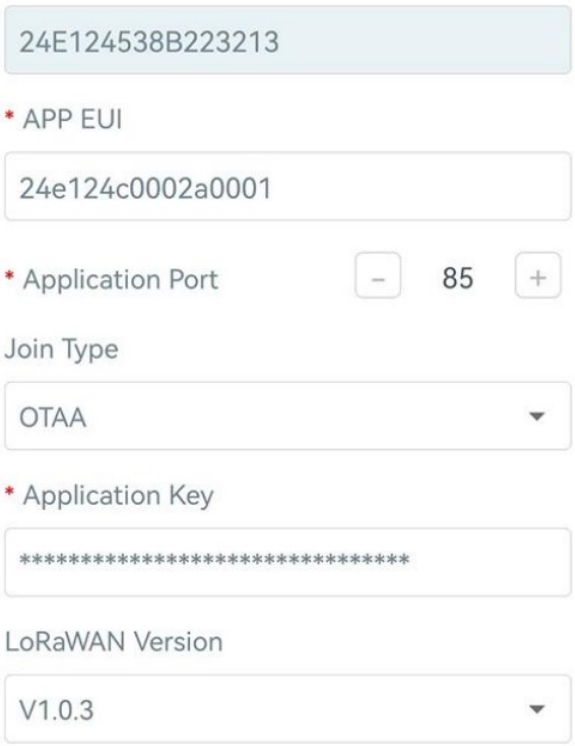
5. Basic information and settings of the device will be shown on Toolbox if it’s recognized successfully. You can read and configure the device by tapping the Read/Write device on the App. In order to protect the security of the device, password validation is requiredwhenconfiguring via a new smartphone. The default password is 123456.

Note:

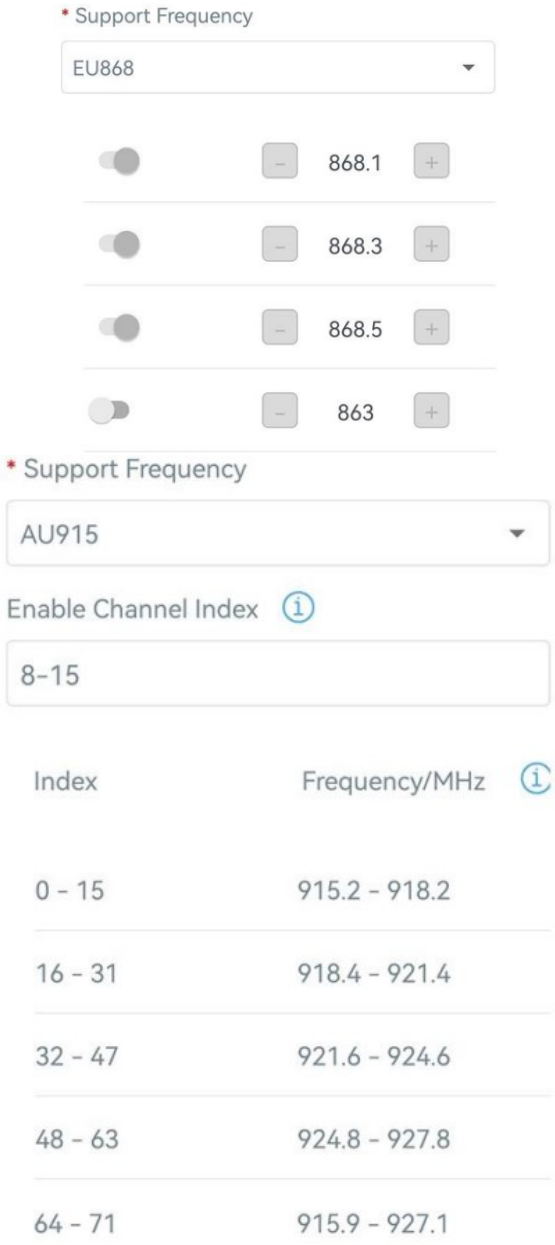
1. Check the location of the smartphone NFC area and it’s recommended to take off the phone case.
2. If the smartphone fails to read/write configurations via NFC, move the phone away andbackto try again.
3. WS202 can also be configured by Tool Box software via a dedicated NFC reader provided by Mile sight Iota, you can also configure it via TTL interface inside the device.

LoRa WAN Settings

Go to Device > Setting > LoRa WAN Settings of ToolBox App to configure join type, App EUI, AppKey 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. The default port is 85.
Join Type	OTAA and ABP modes are available.
LoRaWAN Version	V1.0.2, V1.0.3 are available.
Work Mode	It’s fixed as Class A.
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 SessionKey	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 send D2D commands.
RX2 Frequency	RX2 frequency to receive downlinks or send D2D commands. Unit: Hz
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. Pleaseenable Single-Channel mode if you connect device to DS7610.

Channel	Enable or disable the frequency to send uplinks. If frequency is one of CN470/AU915/US915, enter the index of the channel that you want to enable and make them separated by commas.Examples:1, 40: Enabling Channel 1 and Channel 401-40: Enabling Channel 1 to Channel 401-40, 60: Enabling Channel 1 to Channel 40 and Channel 60 All: Enabling all channelsNull: Indicates that all channels are disabled 
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 resenddata once.
Rejoin Mode	Reporting interval ≤ 30 mins: the device will send a specific number of LinkCheckReq MAC packets to the network server with periodic or threshold uplinks every time more than 25~35 mins passes 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 Link Check Req MAC packets to the network server every reporting interval to validate connectivity; If there is no response, the device will re-join the network.
Set the number of packets sent	When join mode is enabled, set the number of LinkCheckReq packets sent.Note: the actual sending number is Set the number of packet sent + 1.

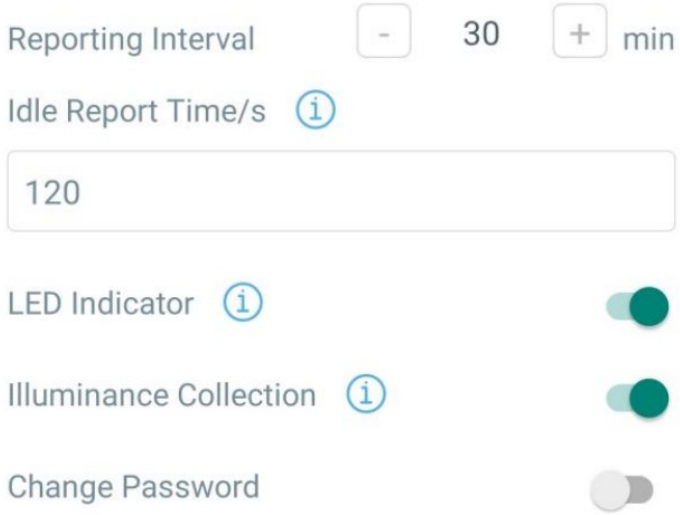
ADR Mode	Allow network server to adjust data rate of the device. This only works with Standard C hannel Mode.
Tx Power	Transmit power of device.

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 Mile sight IoT Cloud to manage devices.
4. Only OTAA mode supports rejoin mode.

General Settings

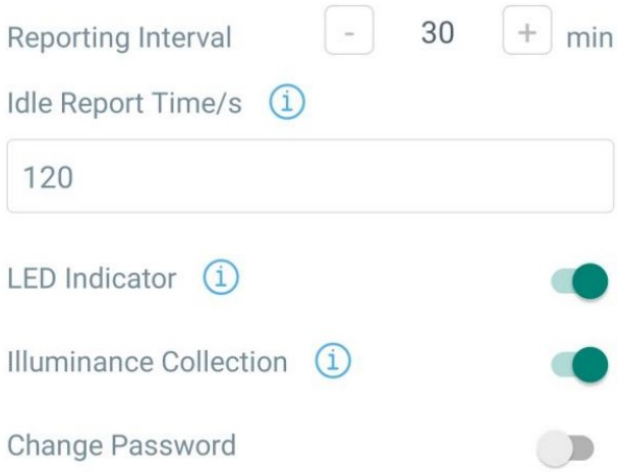
Go to **Device** > **Setting** > **General Settings** of Tool Box App to change the reporting interval, etc.



Parameters	Description
Reporting Interval	The interval of reporting PIR, light status and battery level to network server. Default: 30 mins, Range: 1 – 1080 minsNote: WS202 will also report “Occupied” status immediately when itdetects motions.
Idle TimeReporting/s	When the PIR sensor does not detect motion for a period of Idle Time,device will report “Vacant” status. Default: 120 s
LED Indicator	Enable or disable the light indicating in chapter 2.4.Note: The indicator of reset button i s not allowed to disable.
IlluminanceCollection	Enable or disable illuminance collection. When this is disabled, reportinginterval will be changed to 1080 mins automatically.
Change Password	Change the password for ToolBox App to write this device.

Threshold Settings

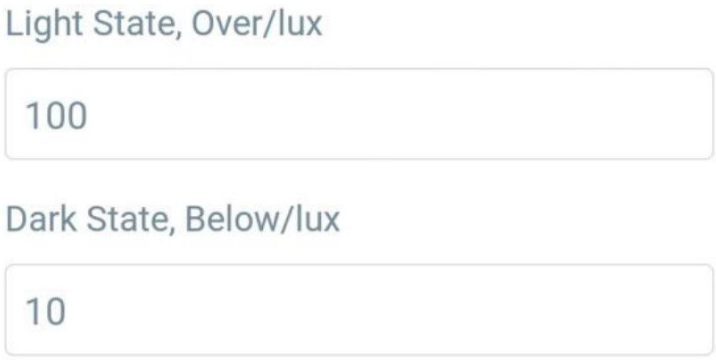
When illuminance collection is enabled, users can define the Bright or Dark state via detection data of light sensor in threshold settings. Besides, when the PIR sensor is triggered and light status meets the threshold, WS202 will send alarms immediately. Otherwise, it will not senddataright away.



Milesight D2D Settings

Milesight D2D protocol is developed by Milesight and used for setting up transmissionamongMilesight devices without gateway. When the Milesight D2D setting is enabled, WS202 canworkas a Milesight D2D controller to send control commands to trigger Milesight D2D agent devices.

1. Configure RX2 datarate and RX2 frequency in LoRaWAN® settings, it is suggested tochangethe default value if there are many LoRaWAN® devices around.
2. Go to Device > Settings > D2D Settings to enable D2D function, and define an uniqueMilesight D2D key which is the same as Milesight D2D agent devices, then select the frequencyand spreading factor. (Default Milesight D2D Key: 5572404C696E6B4C6F52613230313823)



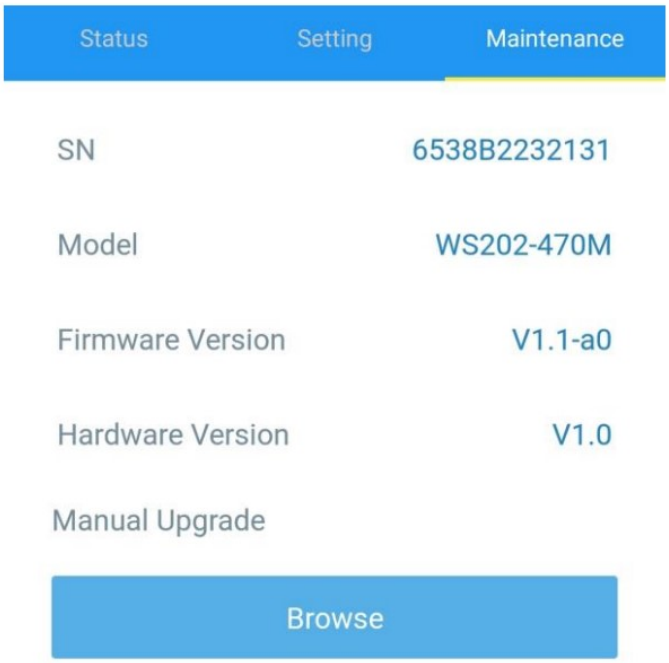
3. Enable one of WS202 status and configure a 2-byte hexadecimal command (This commandis pre-defined in Milesight D2D agent device). When WS202 detects this status, it will sendthecontrol command to corresponding Milesight D2D agent devices.

Note: If you enabled LoRa Uplink feature, LoRaWAN® uplink that contains the PIR statusandlight status will be sent to gateway after Milesight D2D control command is sent

Maintenance

Upgrade

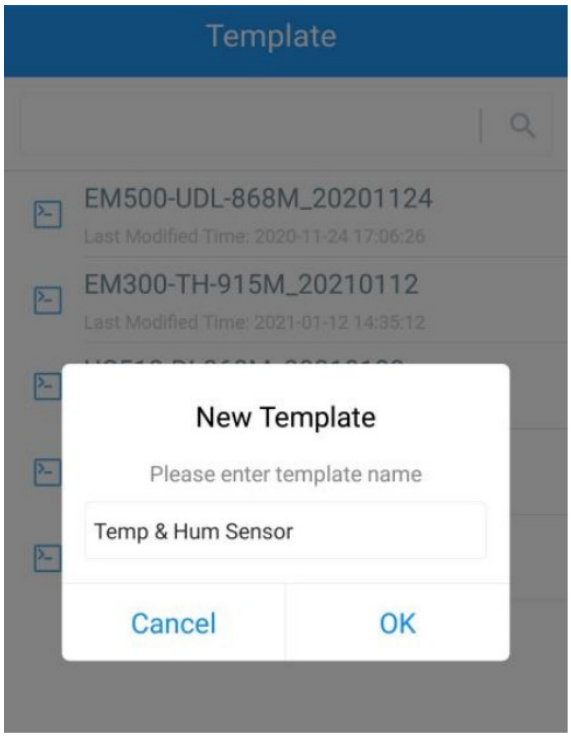
1. Download firmware from Mile sight website to your smartphone.
2. Open Tool Box App and click “Browse” to import firmware and upgrade the device.



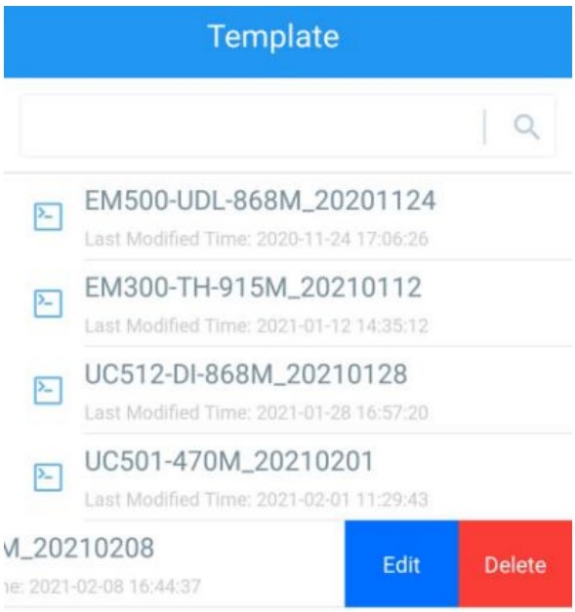
Backup

WS202 supports configuration backup for easy and quick device configuration in bulk. only for devices with the same model and Lo Ra WAN® frequency band

1. Go to **Template** page on the App and save current settings as a template. You can alsoedit the template file.
2. Select one template file that 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 toedit the configurations.



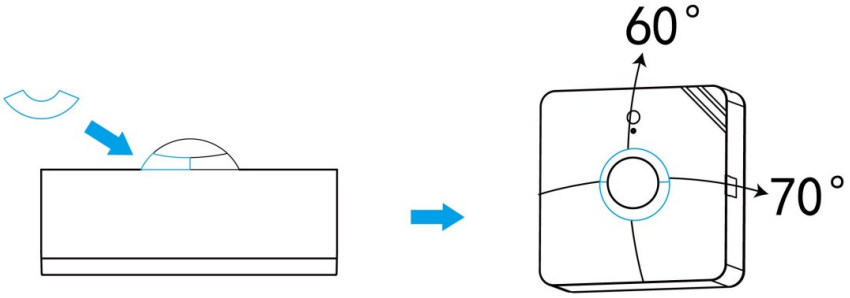
Reset to Factory Default

Please select one of the following methods to reset device:

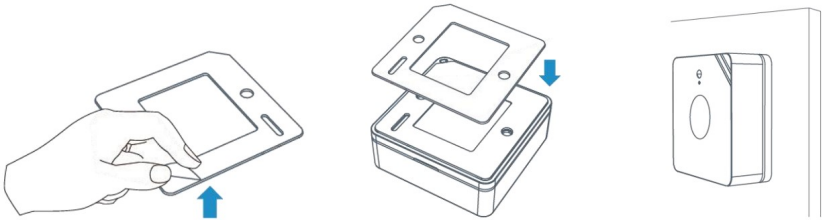
Via Hardware: Hold on the reset button for more than 10s. After reset complete, the indicator will blink in green twice, then device will reboot.
Via ToolBox App: Go to Device > Maintenance to tap Reset, then attach smartphone withNFCarea to device to complete reset.

For applications requiring detection angle control, such as work station, in order to prevent accidental detection of people around the station, please paste the blocking stickers on the sensor along the bottom of the PIR lens for range shielding. Each sticker can cover about a180°range. After paste the stickers along the bottom of the lens and wrapping the sensor 360°, the detection area has changed to 70° Horizontal, 60° Vertical.

Note: The detection area may be affected by manual pasting, potentially introducing errors.

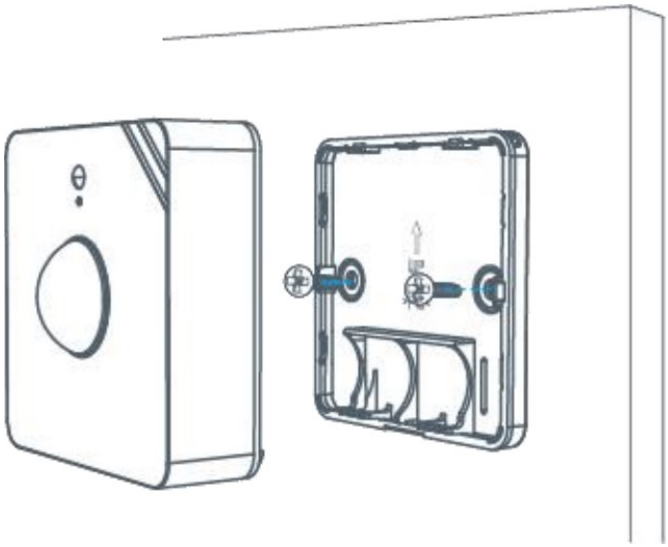


3M Tapes Fix:
Paste 3M tape to the back of the device, then tear the other side and place it on a flat surface



Screw Fix:
Remove the back cover of the device, screw the wall plugs into the wall and fix the cover withscr ews on it, then

install back the device.



Note:

1. Adjust the installation direction according to detection area requirement.
2. WS202 can be mounted on a wall or ceiling. It's recommended to install at 1.5~2.5mfromthefloor.
3. Ensure the detection area does not have moving objects like waving trees and fans.
4. Ensure the detection area is not blocked by

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 them at **https://github.com/Milesight-IoT/SensorDecoders**

Basic Information

WS202 reports basic information of the device whenever it joins 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 ff0a0101 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(DeviceSN)	6538b2232131	ff	09(Hardware version)	0100(V1.0)
Channel	Type	Value	Channel	Type	Value
ff	0a (Softwareversion)	0101 (V1.1)	ff	0f (Device Type)	00(Class A)

Sensor Data

WS202 reports sensor data and battery level according to reporting interval (30 mins by default)
or when PIR/light status changes. Besides, when battery level is lower than 10%, it will uploadbattery packet once.

Channel	Type	Description
01	75 (Battery Level)	UINT8, Unit: %
03	00 (PIR Status)	01: Occupied00: Vacant
04	00 (Light Status)	01: Bright00: Dark

Example:

Channel	Type	Value	Channel	Type	Value
01	75 (Battery)	64 => 100%	03	00 (PIR Status)	01=> Occupied
Channel	Type	Value			
04	00 (LightStatus)	01=> Bright			

Downlink Commands

WS202 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
	10 (Reboot)	ff (Reserved)

Example:

1. Set reporting interval as 20 minutes

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

2. Reboot the device

ff10ff		
Channel	**Type**	**Value**
ff	10 (Reboot)	ff (Reserved)

Documents / Resources

	Milesight WS202 LoRaWAN PIR and Light Sensor [pdf] User Guide WS202, WS202 LoRaWAN PIR and Light Sensor, LoRaWAN PIR and Light Sensor, PIR and Light Sensor, Light Sensor, Sensor

References

- GitHub - Milesight-IoT/SensorDecoders

Manuals+,