Milesight

# Temperature Sensor

## TS201

User Guide

# Contents

# Chapter 1. Preface

## Copyright Statement

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Milesight reserves the right to change this guide and the specifications without prior notice. The latest specifications and user documentation for all Milesight products are available on our official website http://www.milesight.com

## 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.

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

- The device must not be disassembled or remodeled in any way.
- To ensure the security of your device, please change the device password during the initial configuration. The default password is 123456.
- The device is not intended to be used as a reference sensor, and Milesight will not should responsibility for any damage which may result from inaccurate readings.
- 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.
- Make sure electronic components do not drop out of the enclosure while opening.
- When installing the battery, please install it accurately, and do not install the inverse or wrong model.
- The device must never be subjected to shocks or impacts.

# Revision History

| Release Date | Version | Description |
|---|---|---|
| May 30, 2024 | V1.0 | Initial version |
| Aug. 17, 2024 | V1.1 | Add DS18B20 probe ID report and enquiry command. |
| April 29, 2025 | V2.0 | Update based on hardware v2.x: Add external button and support TH Version. |

# Chapter 2. Product Introduction

## Overview

Milesight TS201 is a compact temperature and humidity sensor. It is equipped with high-precision sensors and an IP67 waterproof design, making it applicable for accurate temperature data detection in various harsh environments. With the low power consumption technology, TS201 can maintain a long operational life with its internal battery. Combining with Milesight LoRaWAN® gateway and Milesight Development Platform solution, users can manage all sensor data remotely and visually.

TS201 is widely used for temperature and humidity monitoring applications like food processing, cold chain storage of food or medicine, etc.

## Features

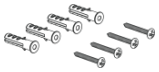
- Equipped with a DS18B20 temperature probe or a TH (temperature - humidity) probe
- Detachable probe design for self-calibration
- IP67 waterproof with specialized battery compartment design , making it suitable for harsh environment
- Flexible design for various mounting options
- EN12830 certified for cold-chain applications
- Store 4,000 historical records locally and support retransmission to prevent data loss
- Equipped with NFC for quick and easy configuration
- Function effectively with standard LoRaWAN® gateways and network servers
- Compatible with Milesight Development Platform
- Supports Milesight D2D protocol for ultra-low latency and direct control without gateways
- Support Firmware Update Over the Air (FUOTA) feature

# Chapter 3. Hardware Introduction

## Packing List

1 × TS201 Device

1× Temperature (Humidity) Probe



4 × Wall Screw Mounting Kits

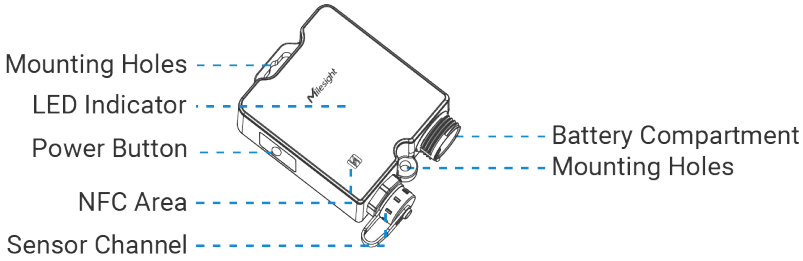
1 × Quick Guide


1 × Warranty Card

1 × Glass Bead Thermal Buffer Bottle Kit (Optional)

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

## Hardware Overview

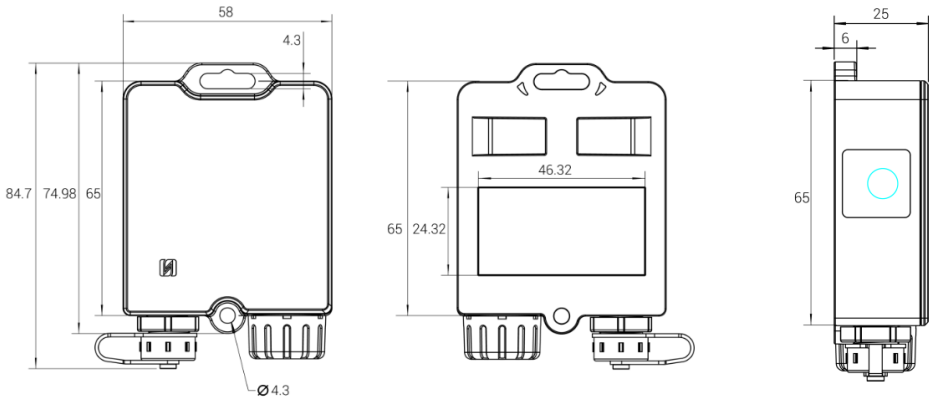



## Power Button and LED Patterns

| Function | Action | LED Indicator |
|---|---|---|
| Power On | Press and hold the button for more than 3 seconds. | Off → On |
| Power Off | | On → Off |

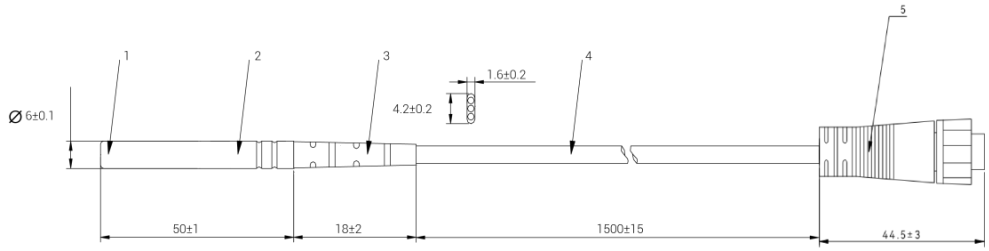
| Function | Action | LED Indicator |
|---|---|---|
| Network Status | Quick press the power button once | De-activated: Red light on<br>Activated: Green light on |
| Probe Connection Detection | Connect the temperature (humidity) probe while the device is off, then power it on after connection | Failure: Red light stays on for 3s<br>Success: Green light stays on for 3s |
| Data Collection and Reporting | Quick press the power button twice | LoRaWAN® De-activated: Red light blinks twice<br>LoRaWAN® Activated: Green light blinks twice |
| Threshold Alarm | Collected data exceeds the set threshold | Red light blinks Slowly |
| Reset to Factory Default | Create a short circuit with probe 5 and 3 for 10s | Green light blinks quickly |

## Dimensions(mm)



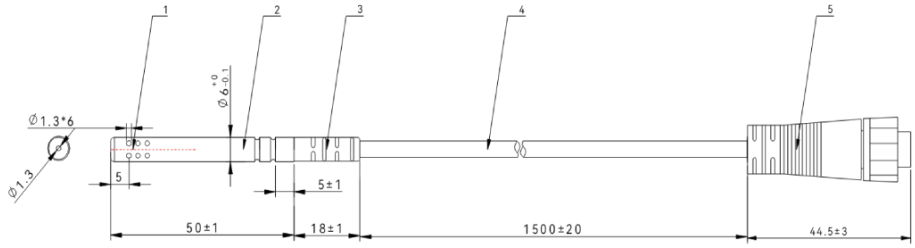

**Probe:**

Temperature Version




| | |
|---|---|
| 1 | / |
| 2 | / |
| 3 | GND |
| 4 | VCC |
| 5 | DQ |


TH Version

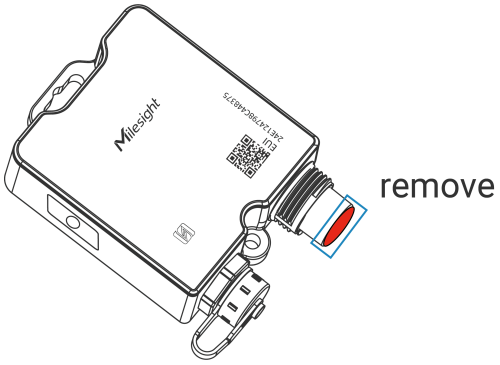



| | |
|---|---|
| 1 | / |
| 2 | / |
| 3 | GND |
| 4 | SDA |
| 5 | SCL |

# Chapter 4. Quick Start

## Power On

1. Remove the battery insulating film.




2. Tighten the battery compartment cover.
3. Connect the temperature (or humidity) probe.
4. Press and hold the power button for 3s until the indicator light turns on.

## 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.

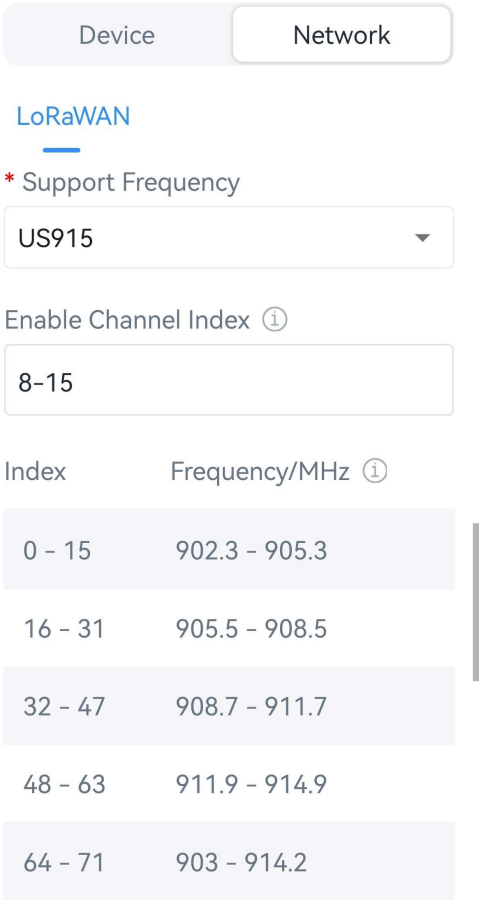

### Configure the Network Setting

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 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 A. |
| 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 Development Platform. |
| 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:** |

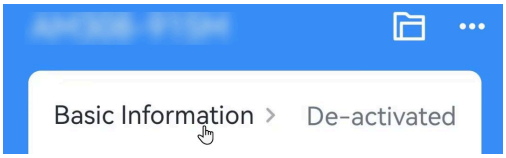
| Parameter | Description |
|---|---|
| | 1, 40: Enabling Channel 1 and Channel 40<br>1-40: Enabling Channel 1 to Channel 40<br>1-40, 60: Enabling Channel 1 to Channel 40 and Channel 60<br>All: Enabling all channels<br>Null: Indicate that all channels are disabled |
| ADR Mode | Enable or disable network 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 send D2D commands. |
| RX2 Frequency | RX2 frequency to receive downlinks or send D2D commands. Unit: Hz |

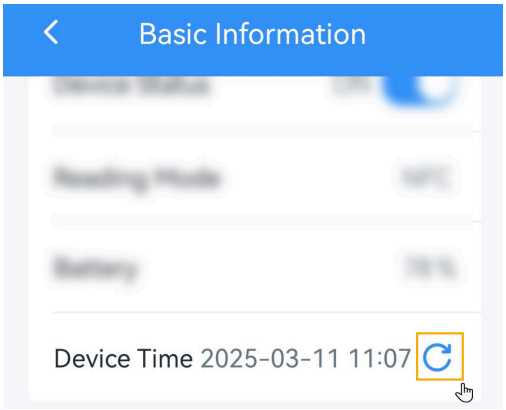
# Time Synchronization

This section describes how to sync the time of the device.

**Sync via ToolBox App**

After reading the device via Milesight ToolBox App, sync the device time with time zone from the smart phone.






**Sync via Network Server**

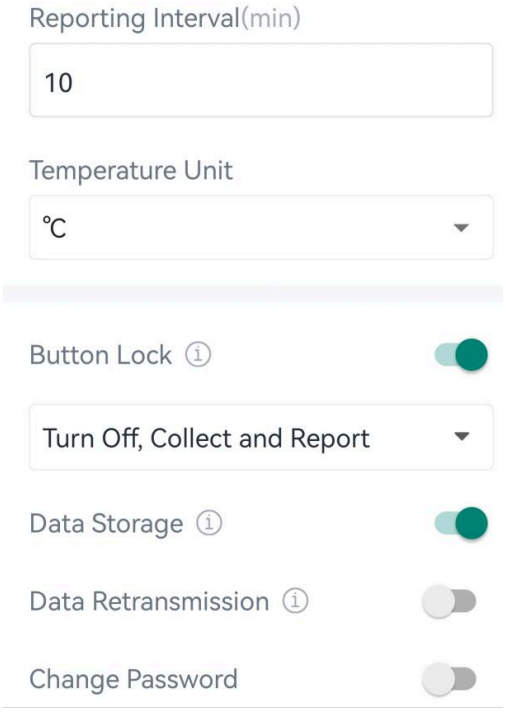
This requires to ensure the LoRaWAN® network server supports device time synchronization feature. Example: Milesight gateway embedded NS.

1. Set the LoRaWAN® version of the device to V1.0.3.
2. Connect the device to the network server. After joining the network, the device will send a DeviceTimeReq MAC command to enquire the time from network server.

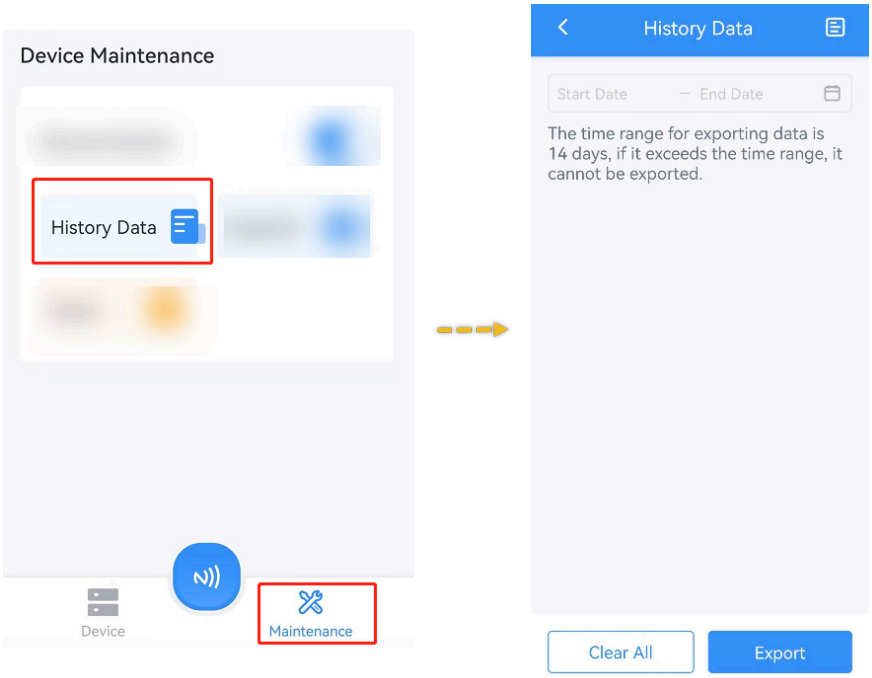
**Note:**

- This only supports to get the time but not time zone. The time zone can be configured by ToolBox App or downlink command.
- The device will send the DeviceTimeReq command every 5 days since the last sync.

# General Settings




| Parameter | Description |
|---|---|
| Reporting Interval | Reporting interval of transmitting data to the network server. Range: 1~1440min; Default: 10mins |
| Temperature Unit | Change the temperature unit displayed on the ToolBox.<br>**Note:**<br>1. The temperature unit in the reporting package is fixed as Celsius(°C).<br>2. Please modify the threshold settings if the unit is changed. |
| Button Lock | Enable to lock the power button feature: Turn Off, Collect and Report. |
| Data Storage | Disable or enable to store data locally. The stored data can be exported as CSV format file and saved to smartphone via ToolBox. |

| Parameter | Description |
| --- | --- |
| |  <br>**Note:**<br>1. It is necessary to sync the time to ensure the data is stored in correct time.<br>2. The device will still store the data even the network status is de-activated.<br>3. ToolBox App can only export the last 14 days' data at most. |
| Data Retransmission | Disable or enable data retransmssion. When the device detects the network status is de-activated via Rejoin Mode, the device will record a data lost time point and re-transmit the lost data after device re-connects to the network. |

| Parameter | Description |
| --- | --- |
| | **Note:**<br>1. This setting only takes effect when Data Storage is enabled.<br>2. If the device is rebooted or re-power when data retransmission is not completed, the device will re-send all retransmission data again after device is reconnected to the network.<br>3. If the network is disconnected again during data retransmission, it will only send the latest disconnected data.<br>4. The default report data retransmission interval is 600s, this can be changed via downlink command.<br>5. The reported format of retransmission data will include timestamps and is different from periodic report data.<br>6. This setting will increase the uplink frequencies and shorten the battery life. |
| Change Password | Change the password for ToolBox App to write this device. |

# Calibration Settings

**Temperature Calibration**

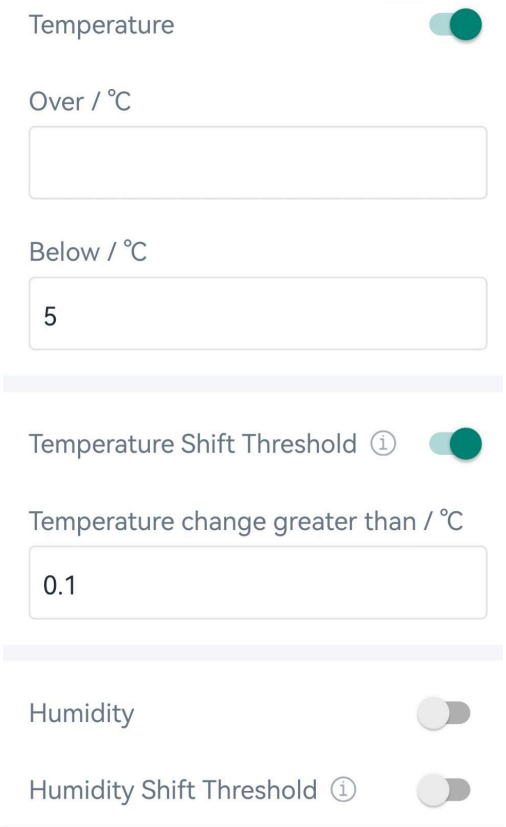
Set the calibration value, the device will add calibration value to the current temperature value, then display and report the final value.

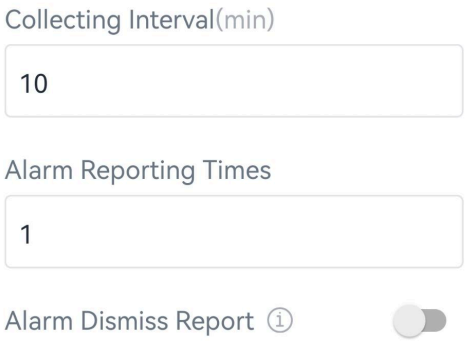

**Humidity Calibration**

Set the calibration value, the device will add calibration value to the current humidity value and report the final value.


## Threshold Settings

The device supports threshold alarms and shift threshold (change) alarms.






| Parameters | Description |
|---|---|
| Temperature | When the temperature is over or below the threshold value, the device will report an alarm packet.<br>**Note:**<br>when you change the temperature unit, please re-configure the threshold. |
| Temperature Shift (Change) Threshold | When this function is enabled, the device will report an alarm packet when the absolute value of the difference between the two collected values exceeds the set threshold. |
| Humidity | When the humidity is over or below the threshold value, the device will report alarm packets. |
| Humidity Shift(Change) Threshold | When this function is enabled, the device will report an alarm packet if the absolute difference between two consecutive readings exceeds the set threshold. |
| Collecting Interval | Set the interval of collecting data, the default interval is 1min. |
| Alarm Reporting Times | Set the times of threshold alarm report, the default is 1. |
| Alarm Dismiss Report | After it is enabled, when the collected value changes from exceeding the threshold range to not exceeding the threshold range, an alarm dismiss packet will be reported. |

# Milesight D2D Settings

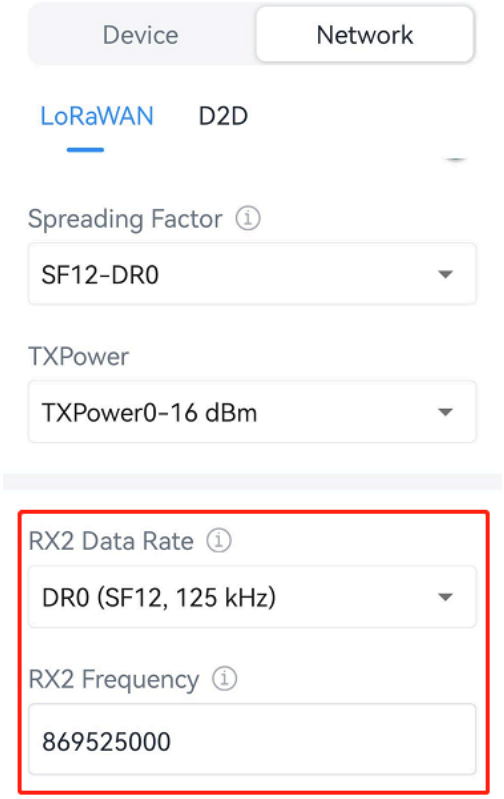
Milesight D2D protocol is developed by Milesight and used for setting up transmission among Milesight devices without gateway.

### Sensor Data Transmission Settings

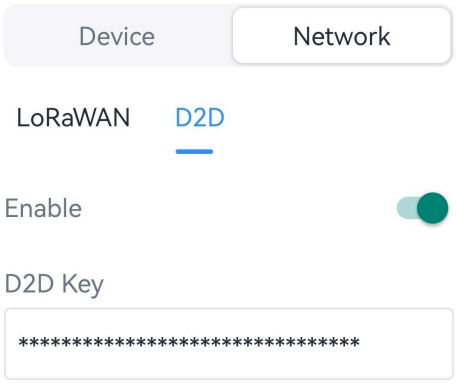
TS201 supports sending temperature and humidity sensor data to other Milesight devices directly.

1. Configure the RX2 datarate and RX2 frequency.

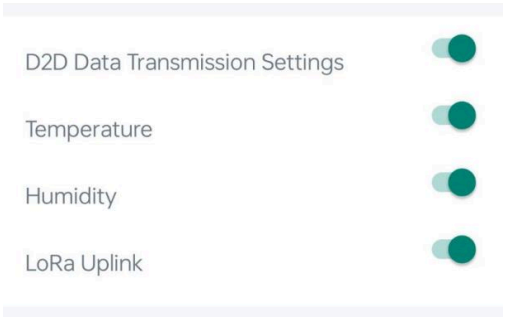
**Note:**
It is suggested to change the default values if there are many LoRaWAN® devices around.




2. Enable Milesight D2D feature and define a unique D2D key that is the same as Milesight D2D agent devices. (Default D2D key: 5572404C696E6B4C6F52613230313823)




3. Enable **D2D Data Transmission Settings** and configure the settings.



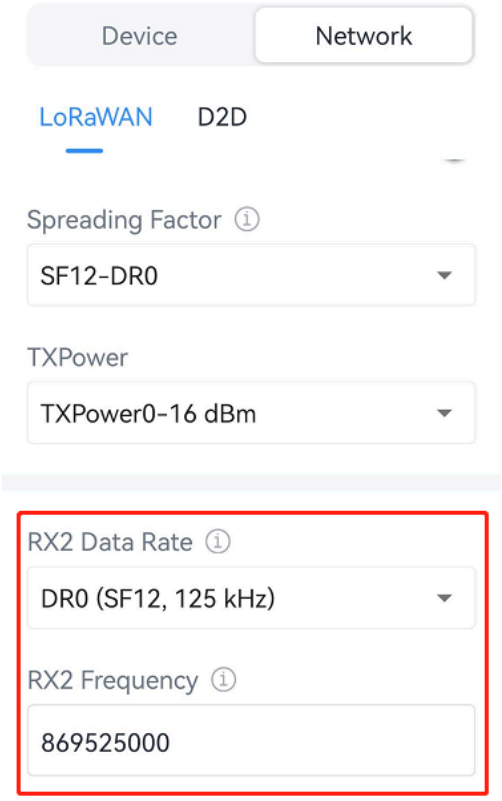

| Parameters | Description |
|---|---|
| Tempera-ture/Humidity | Enable to send temperature or humidity data periodically to Milesight devices that support Milesight D2D Receiving Settings. |
| LoRa Uplink | If disabled, the device will not send the temperature and humidity periodic packets to gateway. |

## Milesight D2D Controller

TS201 supports working as a Milesight D2D controller device to send commands to trigger Milesight D2D agent 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.



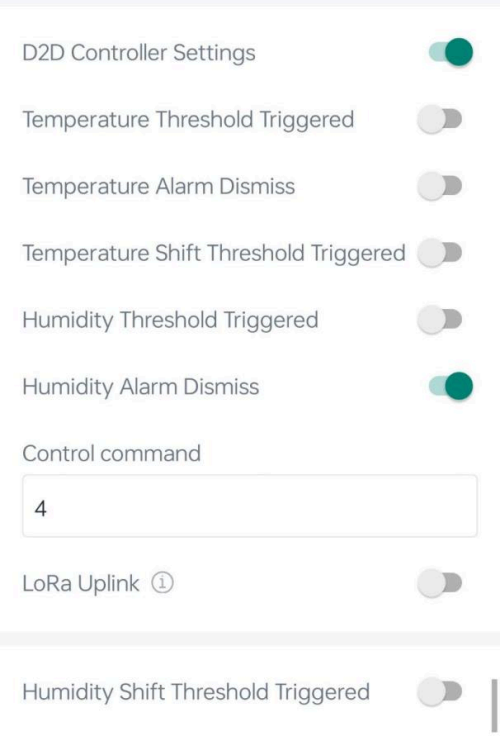

2. Enable and configure the threshold alarm settings.

3. Enable **D2D Controller Settings**, and define a unique D2D key that is the same as that of the D2D agent devices. (Default D2D Key: 5572404C696E6B4C6F52613230313823)

4. Enable one of statuses and configure 2-byte hexadecimal Milesight D2D command.

**Note:**
If you enable **LoRa Uplink**, a LoRaWAN® uplink packet that contains corresponding alarm status will be sent to gateway after the Milesight D2D command packet. Otherwise, the alarm packet will not send to LoRaWAN® gateway.

**Example:** When humidity threshold alarm is dismissed, the device will send a D2D command 0004 to Milesight D2D agent devices.



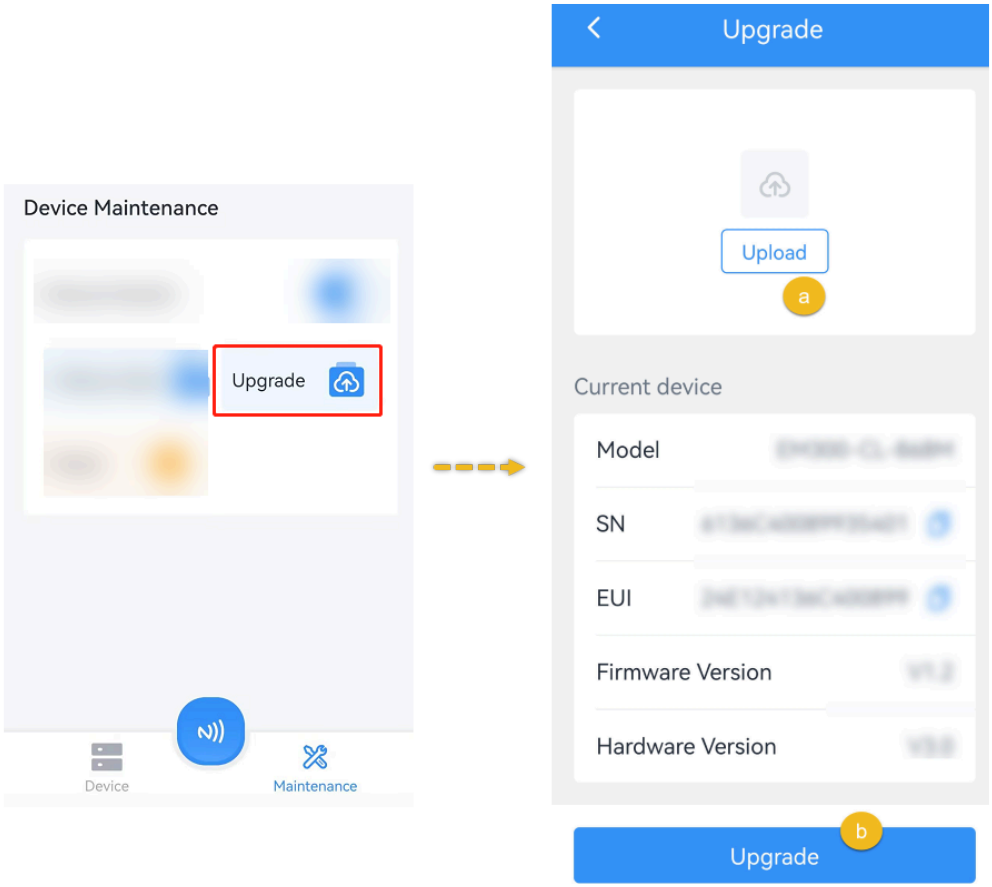

# Maintenance

## 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.



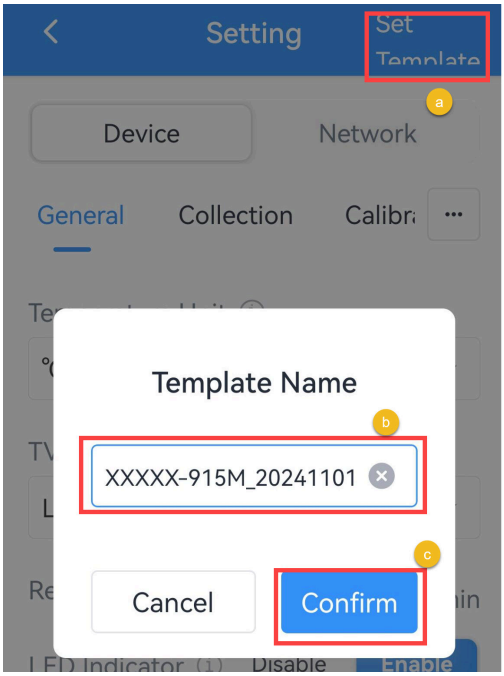

## Backup and Restore

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.

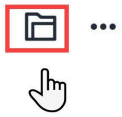
**Backup and Restore**

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

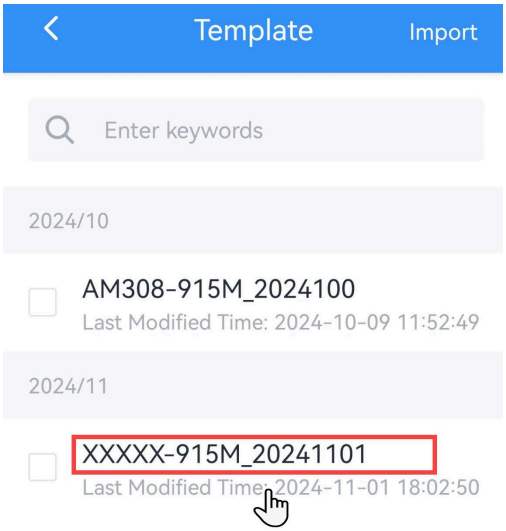
2. Edit the configuration as required, click **Set Template** to save current configuration as a template to the ToolBox App.




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



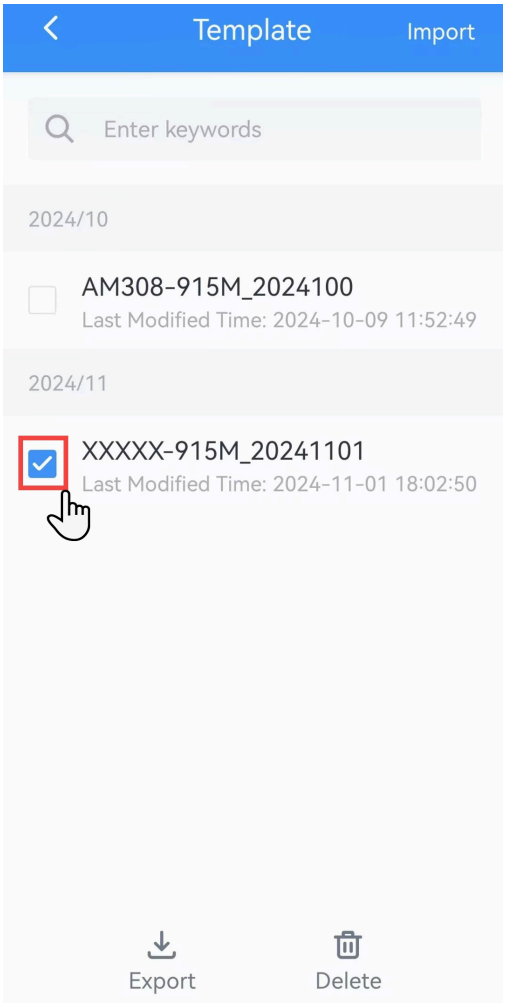
4. Select and click the target template, click **Write** to import the configuration to target devices.




**Export and Delete Template**

1. Check the box of the target template.

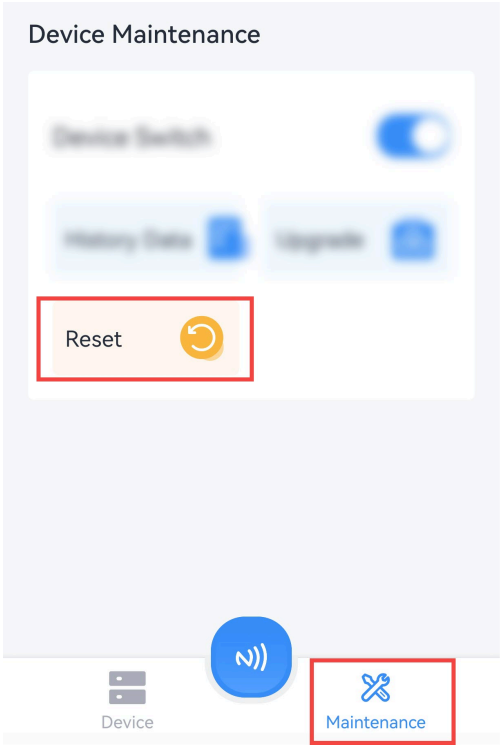
2. Click **Export** to export this template as JSON format file and save it to the smartphone, click **Delete** to delete this template from your ToolBox App.




## Reset to Factory Default

**Via Hardware:** Hold on the 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.

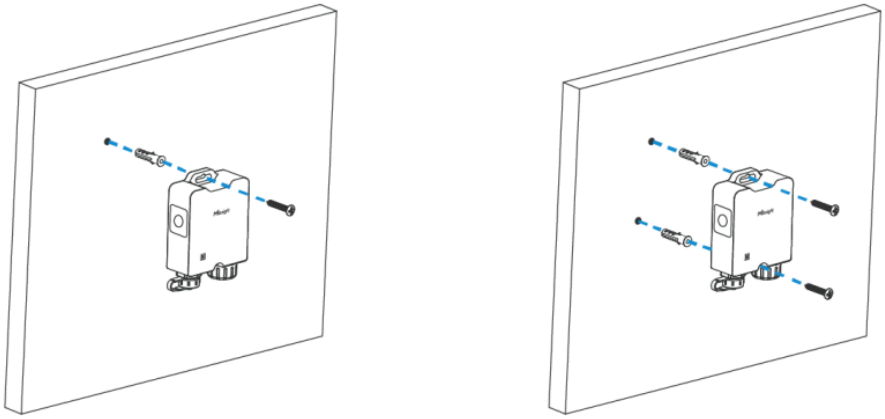

Device Maintenance
Reset
Device
Maintenance

# Chapter 6. Installation

## Device Installation

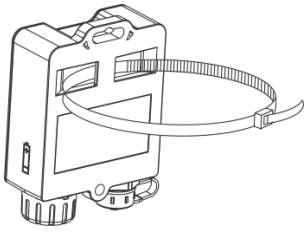
### Wall Screw Mounting

1. Fix the wall plugs to a flat surface according to the device mounting holes, then secure the device to the wall plugs using screws.
2. Cover the screws with cover caps.



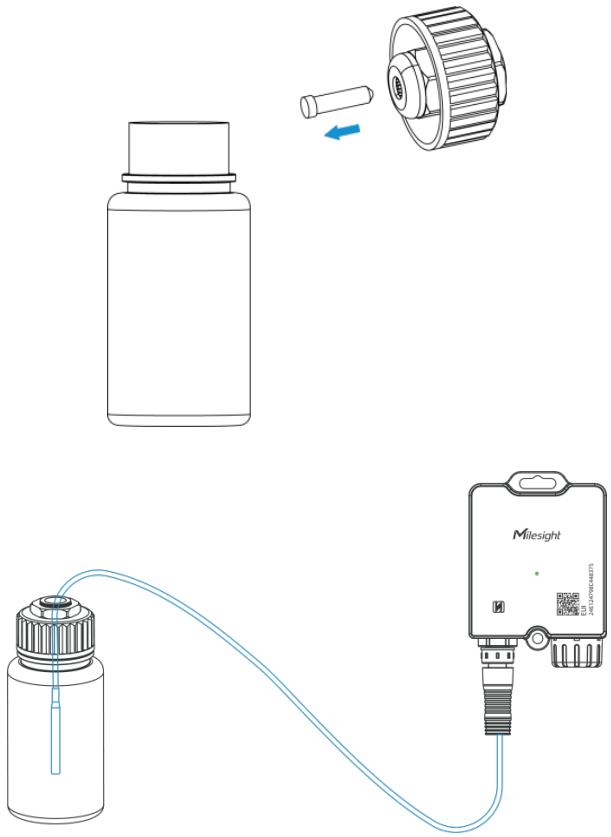
### Cable-tie Mounting

1. Pass a cable tie through the gap behind the device and wrap it to the pole.



## Thermal Buffer Bottle (Alternative)

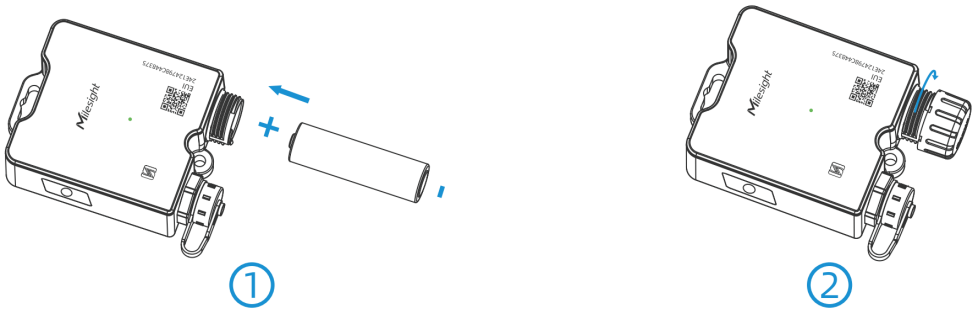
It is necessary to unplug the stopper inside the bottle cap, then restore the cap and insert the temperature probe into the bottle. When using, it can be placed to places like freezers and refrigerators to ensure more accurate temperature measurement.


Milesight

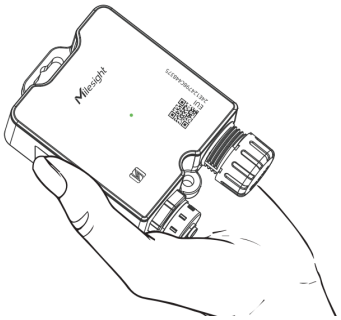
# Chapter 7. Battery Replacing

**Steps:**

1. Insert the battery and tighten the battery compartment cover.




2. Connect the temperature (or humidity) probe.
3. Press and hold the power button for 3s until the indicator light turns on.



**Note:**

- The device can only be powered by Li-SoCl$_2$ battery. The alkaline battery is not supported.
- Ensure the replacing battery is newest; otherwise it may shorten the battery life or cause inaccurate power calculation.
- The battery should be removed from the device if it is not used for an expended period.

# Chapter 8. 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

| 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 |
| TSL Version | ff | ff | 2 | Example: 01 00=>V1.0 |
| Reset Report | ff | fe | 1 | ff, report after reset to factory default |
| Probe ID | ff | a0 | 9 | Temperature Version: 11+DS18B20 Probe ID<br>TH Version: 1200000000+Probe ID<br>**Note:** When probe ID is reported as all “F”, it means acquisition failure. |

**Example:**

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

| f0bff ff0101 ffff0101 fffeff ff166809e08056200001 ff090100 ff0a0102 ff0f00 ffa0112883c2b50f000043 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| ff | 0b | ff |
| ff | 01 | 01=V1 |
| ff | ff | TSL Version: 0101=V1.1 |
| ff | fe | ff |
| ff | 16 | Serial Number: 6809e08056200001 |
| ff | 09 | Hardware version: 0100=V1.0 |
| ff | 0a | Software version: 0102=V1.2 |
| ff | 0f | 00 = Class A |
| ff | a0 | DS18B20 Probe ID: 284fa8b50f00000d |

2. The device will report a probe ID packet when the probe is removed or changed.

| ffa011284fa8b50f00000d | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| ff | a0 | DS18B20 Probe ID: 284fa8b50f00000d |

## Periodic Report

The device supports the sensor data according to reporting interval.

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| Battery Level | 01 | 75 | 1 | UINT8, Unit: % |
| Temperature | 03 | 67 | 2 | INT16*0.1, Unit: °C, Resolution: 0.1°C |
| Relative Humidity | 04 | 68 | 1 | UINT8*0.5, Unit: %RH |

**Example:**

1. Temperature version.

| 017564 03671101 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| 01 | 75 | Battery Level: 64 => 100% |
| 03 | 67 | Temperature: 1101 => 0111 =>273*0.1 =27.3°C |

2. TH version.

| 017564 03671101 046850 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| 01 | 75 | Battery Level: 64 => 100% |
| 03 | 67 | Temperature: 1101 => 0111 =>273*0.1 =27.3°C |
| 04 | 68 | Relative Humidity: 50=80*0.5=40%RH |

### Alarm Report

The device supports to report below types of alarm report packets.

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| Temperature Abnormal Report | b3 | 67 | 1 | 00 - Abnormal collection report<br>01 - Temperature overrange report |
| Humidity Abnormal Report | b4 | 68 | 1 | 00 - Abnormal collection report<br>01 - Humidity overrange report |
| Temperature Threshold Alarm | 83 | 67 | 3 | **Byte 1-2:** Temperature, INT16*0.1, Unit: °C<br>**Byte 3:** 00 -Alarm dismiss, 01 -Alarm |
| Temperature Shift Threshold (Change) Alarm | 93 | 67 | 5 | **Byte 1-2:** Temperature, INT16*0.1, Unit: °C<br>**Byte 3-4:**Temperature_change, INT16*0.1, Unit: °C<br>**Byte 5:** 02 |

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| Humidity Threshold Alarm | 84 | 68 | 2 | **Byte 1:** Relative Humidity, UINT8*0.5, Unit: %RH<br>**Byte 2:** 00 -Alarm dismiss, 01 -Alarm |
| Humidity Shift Threshold(Change) Alarm | 94 | 68 | 3 | **Byte 1:** Relative Humidity, UINT8*0.5, Unit: %RH<br>**Byte 2:** Relative Humidity_change, UINT8*0.5, Unit: %RH<br>**Byte 3:** 02 |

**Example:**

1. Temperature abnormal alarm: report when the temperature is overrange.

| b367 01 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| b3 | 67 | 01 => Temperature overrange |

2. Temperature and humidity threshold alarm: report when threshold alarm is enabled.

| 8367 340101 8468 4e01 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| 83 | 67 | 34 01 => 01 34 => 308*0.1 = 30.8°C<br>01 => Temperature threshold alarm |
| 84 | 68 | 4e=>78*0.5=39%RH<br>01 => Relative humidity threshold alarm |

3. Temperature shift threshold (change) alarm: report when shift threshold (change) alarm is enabled.

| 93d7 fa00 0700 02 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| 93 | 67 | Temperature: fa 00 => 00 fa => 250*0.1= 25°C<br><br>Temperature change: 07<br>00 => 00 07 => 7*0.1=0.7°C<br><br>02 => Temperature change alarm |

## Historical Data

The device will report retransmission data or stored data as below format.

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| Historical Data | 20 | ce | 9 | **Byte 1-4:** Data time stamp, UINT32, Unit: s<br><br>**Byte 5:**<br><br>01: Temperature sensor<br><br>02: TH sensor<br><br>**Byte 6-7:** Temperature, INT16*0.1, Unit: °C<br><br>**Byte 8:** Relative Humidity, UINT8*0.5, Unit: %RH<br><br>**Byte 9:**<br><br>Bit3~Bit0: Abnormal Type<br><br>• 0001: Periodic report<br>• 0010: Temperature Alarm report<br>• 0011: Temperature Alarm dismiss report<br>• 0100: Humidity Alarm report<br>• 0101: Humidity Alarm dismiss report<br>• 0110: Collect and report immediately<br><br>Bit5~Bit4: |

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| | | | | • 00: Normal<br>• 01: Humidity Collection abnormal<br>• 10: Humidity Overrange report<br><br>Bit7~Bit6:<br><br>• 00:Normal<br>• 01: Temperature Collection abnormal<br>• 10: Temperature Overrange report |

**Example:**

| 20ce 0d 75 5b 63 02 bdff 2e 01 | | | |
|---|---|---|---|
| **Channel** | **Type** | **Time Stamp** | **Value** |
| 20 | ce | 0d 75 5b 63 => 63 5b 75 0d=1666938125s | 02: TH sensor<br><br>Temperature: bdff = ff<br>bd => -67*0.1=-6.7°C<br><br>Humility: 2e => 46*0.5=23%RH<br><br>01 => Normal +Periodic Report |

# Downlink Command

## Device Configuration 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 |
| Collect Interval | ff | 02 | 2 | UINT16, Unit: s |

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| Report Interval | ff | 8e | 3 | **Byte 1**: 00<br>**Byte 2-3**: UINT16, Unit: minute |
| Data Storage | ff | 68 | 1 | 00: Disable, 01: Enable |
| Data Retransmission | f9 | 0d | 3 | **Byte 1:** 01-enable; 00-disable<br>**Byte 2-3:** interval time, Unit:s,Range: 30~1200s, default: 600s |
| UTC Time Zone | ff | bd | 2 | INT16/60 |
| Temperature Unit | ff | eb | 1 | 00-°C, 01-°F<br>**Note:**<br>the reported unit is fixed as °C. |
| Button Lock | f9 | 69 | 1 | 00-Disable button lock<br>01-Enable Turn Off lock<br>02-Enable Collect and Report lock<br>03-Enable both lock |

**Example:**

1. Set report interval as 20 minutes.

| ff8e001400 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| ff | 8e | 1400=>0014=20minutes |

2. Set time zone as UTC-4.

| ffbd10ff | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| ff | bd | 10 ff => ff 10 = -240/60=-4 |

3. Set data retransmission interval as 100s.

| f90d 01 6400 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| f9 | 0d | 01 => enable Data Retransmission<br>6400 => 00 64 => 100s |

### Enquiry Probe ID

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| Enquiry Probe ID | f9 | 31 | 1 | 00 |
| ACK Packet Resend Times | f9 | 32 | 3 | **Byte 1-2:** 0000<br>**Byte 3:** Resend Times, Range:0 ~ 10, Default: 1<br>**Note:** If a periodic packet is combined with a probe ID packet, the ACK packet resend times will be determined according to this downlink command; however, if a periodic packet is not combined with a probe ID packet, the ACK packet will be resent only once. |

**Example:**

Get Probe ID.

| f931 00 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| f9 | 31 | 00 => Get Probe ID |

## Calibration Settings

| Channel | Type | Byte | Description |
|---|---|---|---|
| ff | ea | 3 | **Byte 1:**<br>80-Temperature enable<br>00-Temperature disable<br>81-Humudity enable<br>01-Humudity disable<br>**Byte 2-3:**<br>Temperature calibration value, INT16*0.1, Unit: °C, Range: -200~1000 (or Humidity calibration value, INT16*0.5, Unit: %RH, Range: -100~100) |

**Example:**

Enable temperature calibration and set the calibration value.

| ffea 80 6400 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| ff | ea | 80 => enable temperature calibration<br>6400 => 00 64 => 100*0.1 = 10°C |

## Alarm Settings

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| Alarm Reporting Times | ff | f2 | 2 | Range: 1~1000 |

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| Alarm Dismiss Report | ff | f5 | 1 | 01-enable; 00-disable |
| Threshold Alarm | f9 | 0b | 7 | **Byte 1:**<br>01-Temperature, 03-Humidity<br>**Byte 2:**<br>01 - below; 02 - over;<br>03 - within; 04 - below or over<br>**Byte 3-4:** Max. Temperature, INT16*0.1, Unit: °C (or Max. Humidity, UINT16*0.5, Unit: %RH)<br>**Byte 5-6:** Min. Temperature, INT16*0.1, Unit: °C (or Min. Humidity, UINT16*0.5, Unit: %RH)<br>**Byte 7:** 01-enable; 00-disable |
| Shift Threshold(Change) Alarm | f9 | 0c | 4 | **Byte 1:**<br>02-Temperature, 04-Humidity<br>**Byte 2-3:** Max. Temperature, INT16*0.1, Unit: °C, range: 0.1 ~ 100 (or Max. Humidity, UINT8*0.5, Unit: %RH)<br>**Byte 4:** 01-enable; 00-disable |
| LED Threshold Alarm Indicator | f9 | 6a | 1 | 01-enable; 00-disable |

**Example:**

Set a temperature threshold alarm as above 37°C.

| f90b 01 02 7201 0000 01 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| f9 | 0b | 01 => set threshold alarm |

| f90b 01 02 7201 0000 01 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| | | 02 => above<br>72 01=> 01 72 => 370*0.1=37°C<br>01 => enable threshold alarm |

### D2D Settings

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| D2D Sensor Data Transmission Setting | f9 | 63 | 4 | **Byte 1:** 01-enable, 00-disable<br>**Byte 2:** 01-enable LoRa Uplink, 00-disable LoRa Uplink<br>**Byte 3:**<br>00-Temperature and humidity disable<br>01-Temperature enable<br>02-Humidity enable<br>03-Temperature and humidity disable<br>**Byte 4:** 00 |
| Milesight D2D Controller | f9 | 66 | 1 | 01-enable; 00-disable |
| D2D Key | ff | 35 | 8 | The first 16 digits of D2D key, and the last 16 digits are fixed as 0. |
| D2D Controller Settings | ff | 96 | 8 | First 16 digits, last 16 digits are fixed as 0<br>**Byte 1:**<br>01-Temperature Threshold Triggered<br>02-Temperature Alarm Dismiss<br>03-Temperature Shift Threshold Triggered |

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| | | | | 04-Humidity Threshold Triggered<br>05-Humidity Alarm Dismiss<br>06-Humidity Shift Threshold Triggered<br>**Byte 2:** 01-enable, 00-disable<br>**Byte 3:** 01-enable LoRa Uplink, 00-disable LoRa Uplink<br>**Byte 4-5:** D2D control command<br>**Byte 6-8:** 000000 |

**Example:**

1. Set D2D Key as 12345678123456780000000000000000.

| ff35 1234567812345678 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| ff | 35 | 1234567812345678 |

2. When temperature reaches the threshold, send D2D command 0001.

| ff96 010101 0100 000000 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| ff | 96 | 01=Temperature Threshold Triggered. 01=enable, 01=enable LoRa Uplink, D2D Command: 0100=>0001 |

## Device Configuration Enquiry

The device supports enquiring the device configuration via f96f command. The device will send the replies with the same format as downlink commands.

| Item | Channel | Type | Byte | Command |
|---|---|---|---|---|
| Temperature Unit | f9 | 6f | 1 | 01 |
| Button Lock | f9 | 6f | 1 | 02 |
| Milesight D2D Data Transmission | f9 | 6f | 1 | 03 |
| Milesight D2D Controller | f9 | 6f | 1 | 04 |
| D2D Controller: Temperature Alarm | f9 | 6f | 1 | 05 |
| D2D Controller: Temperature Alarm Dismiss | f9 | 6f | 1 | 06 |
| D2D Controller: Temperature Shift Alarm Dismiss | f9 | 6f | 1 | 07 |
| D2D Controller: Humidity Threshold Triggered | f9 | 6f | 1 | 08 |
| D2D Controller: Humidity Alarm Dismiss | f9 | 6f | 1 | 09 |
| D2D Controller: Humidity Shift Threshold Triggered | f9 | 6f | 1 | 0a |
| Temperature Calibration | f9 | 6f | 1 | 0b |
| Humidity Calibration | f9 | 6f | 1 | 0c |
| Temperature Threshold | f9 | 6f | 1 | 0d |
| Temperature Shift Threshold | f9 | 6f | 1 | 0e |
| Humidity Threshold | f9 | 6f | 1 | 0f |
| Humidity Shift Threshold | f9 | 6f | 1 | 10 |
| LED Threshold Alarm Indicator | f9 | 6f | 1 | 11 |
| Collecting Interval | f9 | 6f | 1 | 12 |
| Reporting Interval | f9 | 6f | 1 | 13 |
| Alarm Dismiss Report | f9 | 6f | 1 | 14 |

| Item | Channel | Type | Byte | Command |
|---|---|---|---|---|
| Alarm Reporting Times | f9 | 6f | 1 | 15 |
| Data Retransmission | f9 | 6f | 1 | 16 |
| Data Storage | f9 | 6f | 1 | 17 |
| Data Retrievability | f9 | 6f | 1 | 18 |
| ACK Packet Resend Times | f9 | 6f | 1 | 19 |

**Example:**

1. Query the current humidity threshold setting.

| f9 6f 0f | | |
|---|---|---|
| **Channel** | **Type** | **Description** |
| f9 | 6f | 0f => Humidity threshold |

Reply:

| f9 0b 03 02 1e00 0000 01 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| f9 | 0b | 03=>Humidity<br>02=>over<br>1e00=> 001e=>30*0.5=15%<br>01=>enable Threshold Alarm |

2. Query the current report interval.

| f9 6f 13 | | |
|---|---|---|
| **Channel** | **Type** | **Description** |
| f9 | 6f | 0f => Humidity threshold |

Reply:

| ff 8e 00 0100 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| f9 | 8e | 0100=>0001=1 min |

## Historical Data Enquiry

The device supports data retrievability feature to send downlink command to enquire the historical data stored in the device. Before that, ensure the device time is correct and data storage feature was enabled to store data.

**Command Format:**

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| Enquire Data in Time Point | fd | 6b | 4 | Unix timestamp, Unit: s |
| Enquire Data in Time Range | fd | 6c | 8 | Byte 1-4: Start timestamp, Unit: s<br>Byte 5-8: End timestamp, Unit: s |
| Stop Query Data Report | fd | 6d | 1 | ff |
| Data Retrievability Interval | ff | 6a | 3 | Byte 1: 01<br>Byte 2-3: UINT16, Unit: s, Range: 30~1200, Default: 60 |

**Reply Format:**

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| Enquiry Result | fc | 6b/6c | 1 | 00: Enquiry success. The device will report the historical data according to data retrievability interval.<br>01: Time point or time range invalid |

| Item | Channel | Type | Byte | Description |
|---|---|---|---|---|
| | | | | 02: No data in this time or time range |

**Note:**

1. Use Unix Timestamp Converter to calculate the time.
2. The device only uploads no more than 300 data records per range enquiry.
3. When enquiring the data in time point, it will upload the data which is closest to the search point within the reporting interval range. For example, if the device's reporting interval is 10 minutes and users send command to search for 17:00's data, if the device find there is data stored in 17:00, it will upload this data; if not, it will search for data between 16:50 to 17:10 and upload the data which is closest to 17:00.

**Example:**

Enquire the historical data in a time range.

| fd6c 64735b63 7c885b63 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| fd | 6c | Start time: 64 73 5b 63 => 63 5b 73 64 = 1666937700s<br>End time: 7c 88 5b 63 => 63 5b 88 7c = 1666943100s |

Reply:

| fc6c00 | | |
|---|---|---|
| **Channel** | **Type** | **Value** |
| fc | 6c | 00: Enquiry success |

| 20ce 0d 75 5b 63 02 bdff 2e 01 | | | |
|---|---|---|---|
| **Channel** | **Type** | **Time Stamp** | **Value** |
| 20 | ce | 0d 75 5b 63 => 63 5b 75 0d=1666938125s | 02: TH sensor<br>Temperature: bdff = ff bd => -67*0.1=-6.7°C |

| 20ce 0d 75 5b 63 02 bdff 2e 01 | | | |
|---|---|---|---|
| **Channel** | **Type** | **Time Stamp** | **Value** |
| | | | Humility: 2e => 46*0.5=23%RH<br><br>01 => Normal +Periodic Report |

# Chapter 9. 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.

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

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