



# Temperature Sensor

Featuring LoRaWAN®

**TS201**

User Guide



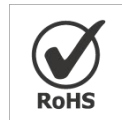
## Safety Precautions

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 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.

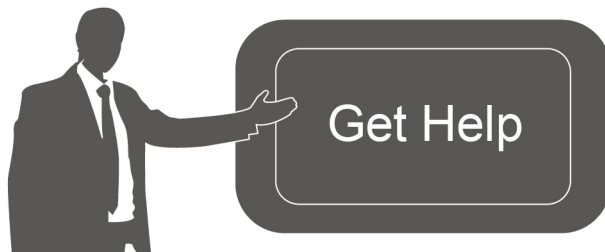
## Declaration of Conformity

TS201 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                                      |
|----------------|-------------|--------------------------------------------------|
| May 30, 2024   | V1.0        | Initial version                                  |
| Aug. 17, 2024  | V1.1        | Add DS18B20 probe ID report and enquiry command. |
| April 29, 2025 | V1.2        | Add TH Version.                                  |

# Contents

|                                                           |    |
|-----------------------------------------------------------|----|
| 1. Product Introduction .....                             | 5  |
| 1.1 Overview .....                                        | 5  |
| 1.2 Features .....                                        | 5  |
| 2. Hardware Introduction .....                            | 5  |
| 2.1 Packing List .....                                    | 5  |
| 2.2 Hardware Overview .....                               | 6  |
| 2.3 Power Button and LED Patterns (TH Version Only) ..... | 6  |
| 2.4 Dimensions (mm) .....                                 | 7  |
| 3. Battery Installation .....                             | 8  |
| 4. Access the Sensor .....                                | 9  |
| 5. Operation Guide .....                                  | 9  |
| 5.1 LoRaWAN Settings .....                                | 9  |
| 5.2 General Settings .....                                | 12 |
| 5.3 Advanced Settings .....                               | 13 |
| 5.3.1 Calibration Settings .....                          | 13 |
| 5.3.2 Threshold Settings .....                            | 14 |
| 5.3.3 Data Storage .....                                  | 15 |
| 5.3.4 Data Retransmission .....                           | 16 |
| 5.4 Milesight D2D Settings (TH Version Only) .....        | 18 |
| 5.4.1 Sensor Data Transmission Settings .....             | 18 |
| 5.4.2 Milesight D2D Controller .....                      | 19 |
| 5.5 Maintenance .....                                     | 21 |
| 5.5.1 Upgrade .....                                       | 21 |
| 5.5.2 Backup .....                                        | 21 |
| 5.5.3 Reset .....                                         | 23 |
| 6. Installation .....                                     | 24 |
| 6.1 Device Installation .....                             | 24 |
| 6.2 Thermal Buffer Bottle .....                           | 25 |
| 7. Communication Protocol .....                           | 25 |
| 7.1 Basic Information .....                               | 25 |
| 7.2 Sensor Data .....                                     | 26 |
| 7.3 Downlink Commands .....                               | 28 |
| 7.4 Device Configuration Enquiry (TH Version Only) .....  | 32 |
| 7.5 Historical Data Enquiry .....                         | 33 |

# 1. Product Introduction

## 1.1 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.

## 1.2 Features

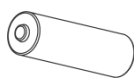
- Equipped with a DS18B20 temperature probe or a TH (temperature - humidity) probe
- Detachable probe design for self-calibration
- IP67 waterproof with specialized battery compartment design , making it suitable for harsh environment
- Flexible design for various mounting options
- EN12830 certified for cold-chain applications
- Store 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 (TH Version Only)
- Support Firmware Update Over the Air (FUOTA) feature (TH Version Only)

# 2. Hardware Introduction

## 2.1 Packing List



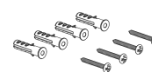
1 x TS201 Device



1 x ER14505 Li-SOCl<sub>2</sub>  
Battery



1 x Temperature  
(Humidity) Probe



4 x Wall Screw  
Mounting Kits



1 x Warranty Card



1 x Quick Start Guide

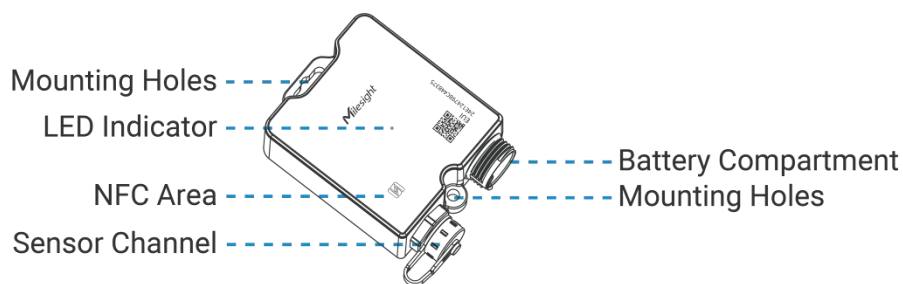


1 x Glass Bead Thermal  
Buffer Bottle Kit (Optional)

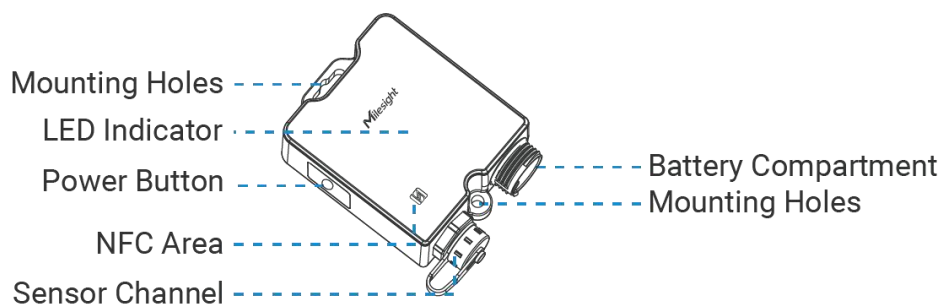


If any of the above items is missing or damaged, please contact your sales representative.

## 2.2 Hardware Overview



**Temperature Version**



**TH Version**

## 2.3 Power Button and LED Patterns (TH Version Only)

| Function                      | Action                                                                                              | LED Indicator                                                                         |
|-------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Power On/Off                  | Press and hold the power button for 3s                                                              | Power On: Off → On                                                                    |
|                               |                                                                                                     | Power Off: On → Off                                                                   |
| Network Status                | Quick press the power button once                                                                   | De-activated: <b>On</b><br>Activated: <b>On</b>                                       |
| Probe Connection Detection    | Connect the temperature (humidity) probe while the device is off, then power it on after connection | Failure: <b>Light stays on for 3s</b><br>Success: <b>Light stays on for 3s</b>        |
| Data Collection and Reporting | Quick press the power button twice                                                                  | LoRaWAN® De-activated: <b>Blinks twice</b><br>LoRaWAN® Activated: <b>Blinks twice</b> |
| Threshold Alarm               | Collected data exceeds the set threshold                                                            | <b>Blinks Slowly</b>                                                                  |

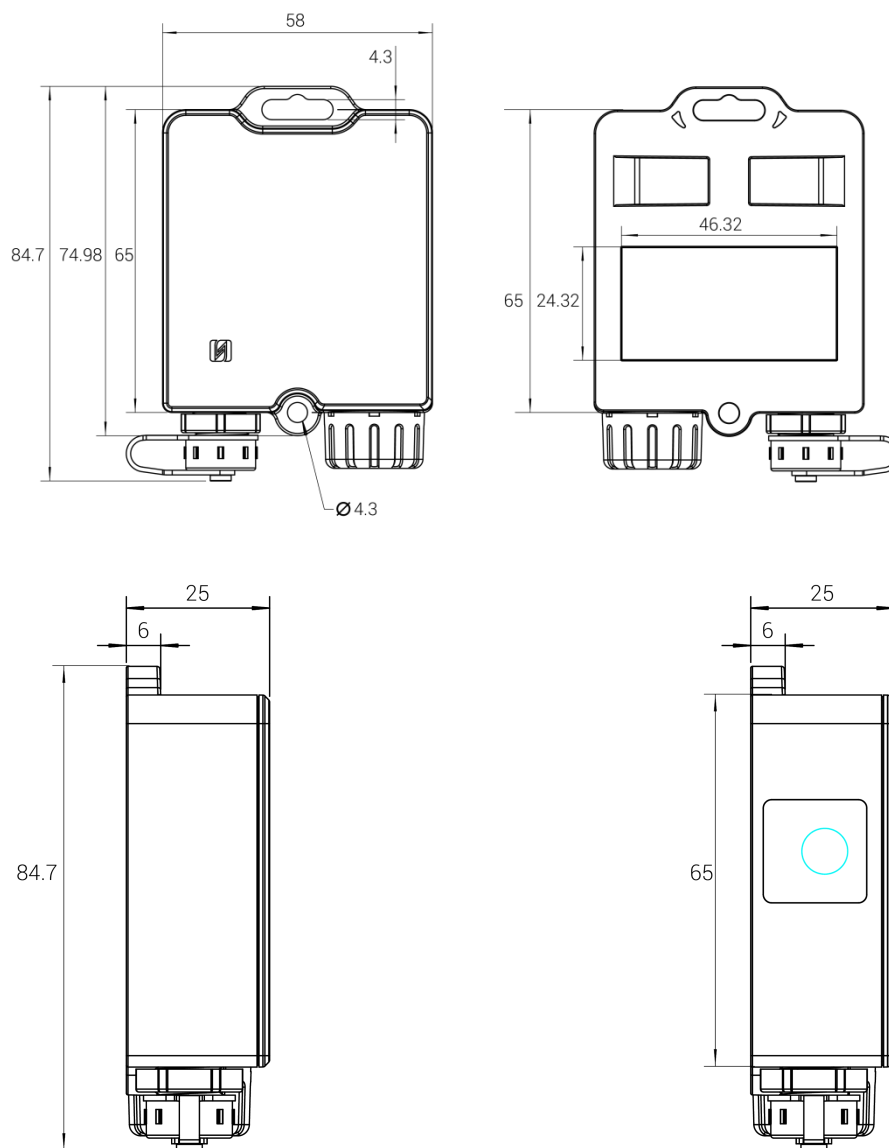
Reset to  
Factory Default

Create a short circuit with  
probe 5 and 3 for 10s

Blinks Quickly

## 2.4 Dimensions (mm)

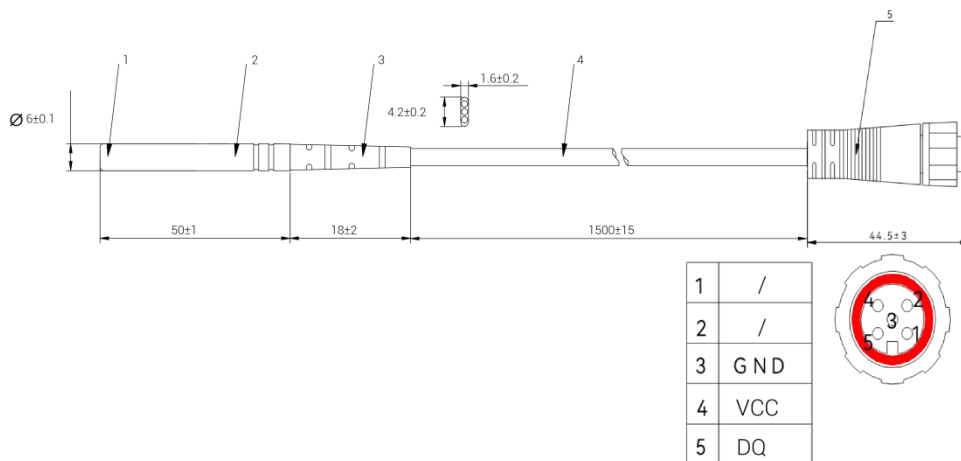
- Device



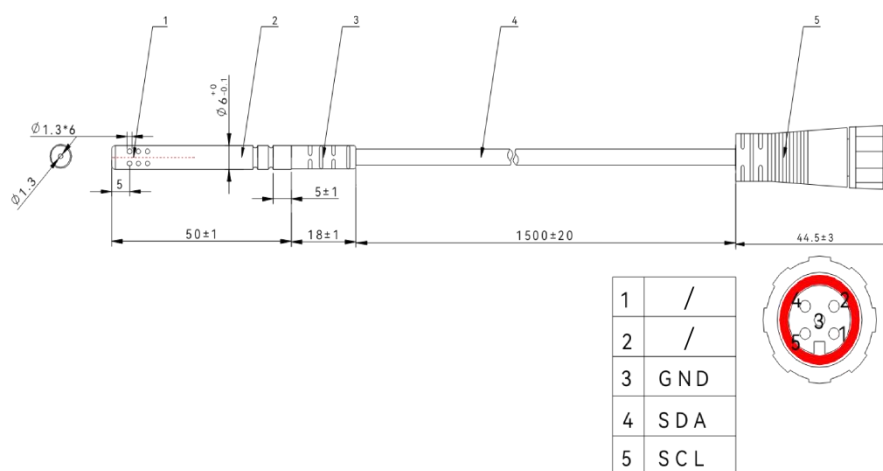
Temperature Version

TH Version

- Probe



### Temperature Version

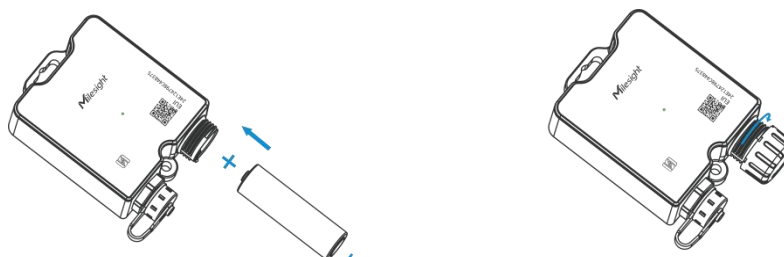


### TH Version

## 3. Battery Installation

**Step1:** Install the temperature (humidity) probe to the device before inserting the battery.

**Step2:** Insert the battery and tighten the battery compartment cover.



**Step3:** For temperature version, the device will turn on automatically and the LED indicator will turn on for 3s; for TH version, please press and hold the side button for 3s to power on the device.

### Note:

- The device can only be powered by Li-SoCl<sub>2</sub> 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.

## 4. Access the Sensor

TS201 supports to be read and configured via NFC.

1. Download and install “Milesight ToolBox” App on an NFC-supported smart phone.
2. Open “Milesight ToolBox” App and attach the NFC area of the smart phone to the device. Click “NFC Read” to read the device and click “Write” to configure the device settings. It’s suggested to change the default password for security reasons. (Default password: 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 it away and try again later.

## 5. Operation Guide

### 5.1 LoRaWAN Settings

Go to **Device > Settings > LoRaWAN® Settings** of ToolBox App to configure AppEUI, Join Type, Application Key and other information. You can also keep all settings by default.

Device EUI

24E124809E080562

\* APP EUI

24e124c0002a0001

\* Application Port

85

LoRaWAN Version

V1.0.3

Work Mode

Class A

Confirmed Mode ⓘ



| Parameters       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Device EUI       | The device's unique ID that can be found on the label.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| App EUI          | The default App 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 is fixed as Class A.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Confirmed Mode   | If the device does not receive an ACK packet from the network server, it will resend data once.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Join Type        | OTAA and ABP modes are available.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Application Key  | Appkey for OTAA mode, default value: "Device EUI" + "Device EUI" (since Q4 of 2025). Example: 24e124123456789024e1241234567890<br><b>Note:</b> The default value of earlier devices is 5572404C696E6B4C6F52613230313823.                                                                                                                                                                                                                                                                                              |
| Rejoin Mode      | Reporting interval ≤ 35 mins: the device will send a specific number of LinkCheckReq 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 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. |

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |       |                                     |       |                                     |       |                                     |       |                          |       |                          |       |                          |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------|-------|-------------------------------------|-------|-------------------------------------|-------|--------------------------|-------|--------------------------|-------|--------------------------|
|                                | <p><b>Note:</b> Only OTAA mode supports rejoin mode.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                                     |       |                                     |       |                                     |       |                          |       |                          |       |                          |
| Set the number of packets sent | <p>When rejoin mode is enabled, set the number of LinkCheckReq packets will be sent.</p> <p><b>Note:</b> The actual sending number is <b>Set the number of packet sent + 1</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |                                     |       |                                     |       |                                     |       |                          |       |                          |       |                          |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |                                     |       |                                     |       |                                     |       |                          |       |                          |       |                          |
| Supported Frequency            | Select supported frequency to send uplinks.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       |                                     |       |                                     |       |                                     |       |                          |       |                          |       |                          |
| Frequency/MHz                  | <p>Enable or disable the frequency channels to send uplinks.</p> <p><b>Note:</b> Make sure the channels match the LoRaWAN® gateway.</p> <p>* Support Frequency</p> <div> <input type="text" value="EU868"/> </div> <p>Frequency/MHz</p> <table> <tr> <td>868.1</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>868.3</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>868.5</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>867.1</td> <td><input type="checkbox"/></td> </tr> <tr> <td>867.3</td> <td><input type="checkbox"/></td> </tr> <tr> <td>867.5</td> <td><input type="checkbox"/></td> </tr> </table> <p>If frequency is set to CN470, AU915 or US915, you can enter the index of the channel you wish to enable in the input box, and separate them separated with commas.</p> <p><b>Examples:</b></p> <p>1, 40: Enabling Channel 1 and Channel 40</p> <p>1-40: Enabling Channel 1 to Channel 40</p> <p>1-40, 60: Enabling Channel 1 to Channel 40 and Channel 60</p> <p>All: Enabling all channels</p> <p>Null: Indicates that all channels are disabled</p> | 868.1 | <input checked="" type="checkbox"/> | 868.3 | <input checked="" type="checkbox"/> | 868.5 | <input checked="" type="checkbox"/> | 867.1 | <input type="checkbox"/> | 867.3 | <input type="checkbox"/> | 867.5 | <input type="checkbox"/> |
| 868.1                          | <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |                                     |       |                                     |       |                                     |       |                          |       |                          |       |                          |
| 868.3                          | <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |                                     |       |                                     |       |                                     |       |                          |       |                          |       |                          |
| 868.5                          | <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |                                     |       |                                     |       |                                     |       |                          |       |                          |       |                          |
| 867.1                          | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                                     |       |                                     |       |                                     |       |                          |       |                          |       |                          |
| 867.3                          | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                                     |       |                                     |       |                                     |       |                          |       |                          |       |                          |
| 867.5                          | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                                     |       |                                     |       |                                     |       |                          |       |                          |       |                          |

|               | <p>* Support Frequency</p> <p>AU915 ▼</p> <p>Enable Channel Index ⓘ</p> <p>0-71</p> <table> <tr> <th>Index</th><th>Frequency/MHz ⓘ</th></tr> <tr> <td>0 - 15</td><td>915.2 - 918.2</td></tr> <tr> <td>16 - 31</td><td>918.4 - 921.4</td></tr> <tr> <td>32 - 47</td><td>921.6 - 924.6</td></tr> <tr> <td>48 - 63</td><td>924.8 - 927.8</td></tr> <tr> <td>64 - 71</td><td>915.9 - 927.1</td></tr> </table> | Index | Frequency/MHz ⓘ | 0 - 15 | 915.2 - 918.2 | 16 - 31 | 918.4 - 921.4 | 32 - 47 | 921.6 - 924.6 | 48 - 63 | 924.8 - 927.8 | 64 - 71 | 915.9 - 927.1 |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------|--------|---------------|---------|---------------|---------|---------------|---------|---------------|---------|---------------|
| Index         | Frequency/MHz ⓘ                                                                                                                                                                                                                                                                                                                                                                                           |       |                 |        |               |         |               |         |               |         |               |         |               |
| 0 - 15        | 915.2 - 918.2                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |        |               |         |               |         |               |         |               |         |               |
| 16 - 31       | 918.4 - 921.4                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |        |               |         |               |         |               |         |               |         |               |
| 32 - 47       | 921.6 - 924.6                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |        |               |         |               |         |               |         |               |         |               |
| 48 - 63       | 924.8 - 927.8                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |        |               |         |               |         |               |         |               |         |               |
| 64 - 71       | 915.9 - 927.1                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |        |               |         |               |         |               |         |               |         |               |
| ADR Mode      | Allow the network server to adjust data rate of the device. This only works with Standard Channel Mode.                                                                                                                                                                                                                                                                                                   |       |                 |        |               |         |               |         |               |         |               |         |               |
| Spread Factor | If ADR is disabled, the device will send data via this spread factor.                                                                                                                                                                                                                                                                                                                                     |       |                 |        |               |         |               |         |               |         |               |         |               |
| TXPower       | Transmit power of the device.                                                                                                                                                                                                                                                                                                                                                                             |       |                 |        |               |         |               |         |               |         |               |         |               |
| 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                                                                                                                                                                                                                                                                                                                                         |       |                 |        |               |         |               |         |               |         |               |         |               |

**Note:**

- 1) Please contact sales for the device EUI list if there are many units.
- 2) Please contact sales if you need random App keys before purchase.
- 3) Select OTAA mode if you use Milesight IoT Cloud or Milesight Development Platform to manage devices.

## 5.2 General Settings

Reporting Interval(min)

10

Temperature Unit

°C

Button Lock ⓘ



Turn Off, Collect and Report

Data Storage ⓘ



Data Retransmission ⓘ



Change Password



| Parameters                          | Description                                                                                                                                                                                                                                                  |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reporting Interval                  | Reporting interval of transmitting data to the network server. Range: 1~1440min; Default: 10min                                                                                                                                                              |
| Temperature Unit                    | Change the temperature unit displayed on the ToolBox.<br><b>Note:</b><br>1) The temperature reported by the device is mainly the value of °C.<br>2) After changing the temperature unit, it is necessary to modify the value of relevant threshold settings. |
| Button Lock<br>(TH Version Only)    | Enable to lock the power button feature: Turn Off, Collect and Report.                                                                                                                                                                                       |
| <a href="#">Data Storage</a>        | Start or stop reporting data storage locally.                                                                                                                                                                                                                |
| <a href="#">Data Retransmission</a> | Start or stop data retransmission.                                                                                                                                                                                                                           |
| Change Password                     | Change the password for ToolBox app to write this device.                                                                                                                                                                                                    |

## 5.3 Advanced Settings

### 5.3.1 Calibration Settings

The device supports temperature and humidity numerical calibration.

**Temperature Calibration:** set the calibration value, the device will add calibration value to the current temperature value and report the final value.

Temperature



Current Value(°C)

17.6

Final Value(°C)

27.6

Calibration Value(°C)

10

**Humidity Calibration:** set the calibration value, the device will add calibration value to the current humidity value and report the final value.

Humidity



Current Value(%)

19.5

Final Value(%)

37.5

Calibration Value(%)

18

### 5.3.2 Threshold Settings

TS201 supports threshold alarms and shift threshold (change) alarms.

Temperature



Over / °C

Below / °C

5

Temperature Shift Threshold ⓘ



Temperature change greater than / °C

0.1

Humidity



Humidity Shift Threshold ⓘ



Collecting Interval(min)

10

Alarm Reporting Times

1

Alarm Dismiss Report ⓘ



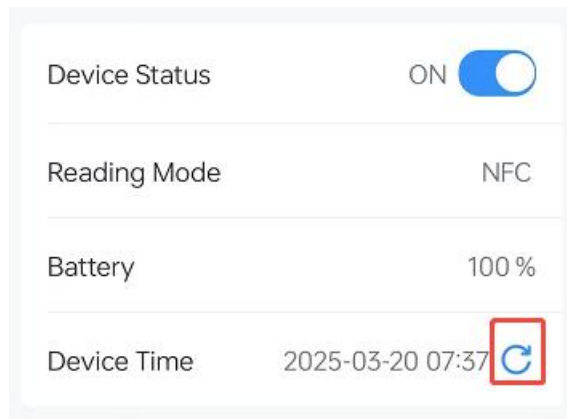
| Parameters                                         | Description                                                                                                                                                                                      |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature                                        | When the temperature is over or below the threshold value, the device will report alarm packets.<br><b>Note:</b> When you change the temperature unit, please re-configure the threshold values. |
| 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 (TH Version Only)                         | When the humidity is over or below the threshold value, the device will report alarm packets.                                                                                                    |
| Humidity Shift(Change) Threshold (TH Version Only) | 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.                         |

### 5.3.3 Data Storage

TS201 sensor supports storing more than 2,800 (Temperature Version) or 4,000 (TH Version) data records locally and exporting data via ToolBox App. The device will record the data according to the reporting interval even not joining to network.

Here are the steps for storage:

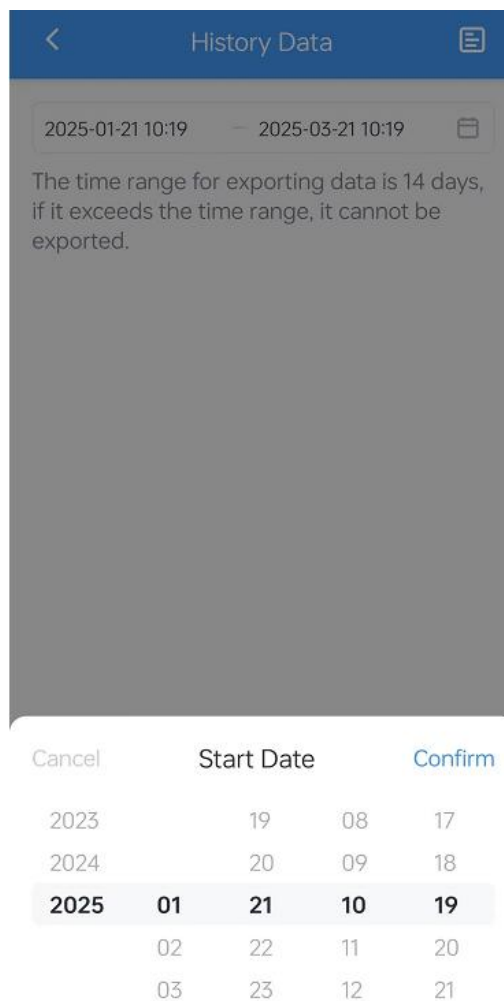
1. Ensure the device time is correct, go to **Basic Information**, click  to sync the time.



2. Enable **Data Storage** feature.



3. Go to **Maintenance** to click **History Data**, then select the data period and click **Export** to export data. The maximum export data period on ToolBox App is 14 days.



### 5.3.4 Data Retransmission

TS201 sensor supports data retransmission to ensure the network server can get all data even if

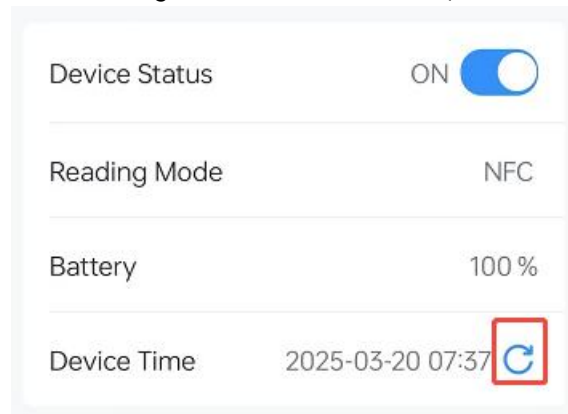


the network is down for some time. There are two ways to get the lost data:

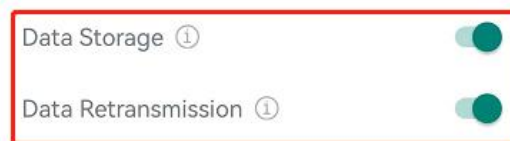
- Network server sends downlink commands to enquire the historical data for specifying time range, refer to section [Historical Data Enquiry](#).
- When the network is down if no response from LinkCheckReq MAC packets for a period of time, the device will record the network disconnected time and re-transmit the lost data after the device re-connects the network.

Here are the steps for retransmission:

1. Ensure the device time is correct, go to **Basic Information**, click  to sync the time.



2. Enable **Data Storage** and **Data Retransmission** feature.



3. Go to **Device > Setting > LoRaWAN Settings** to enable rejoin mode and set the number of packets sent. For example, the device will send LinkCheckReq MAC packets to the network server regularly to check any network disconnection; if there is no response for 32+1 times, the join status will change to de-activated and the device will record a data lost time point (the time it reconnected to the network).



4. After the network connection is restored, the device will send the lost data from the point in time when the data was lost according to the data retransmission interval (600s by default).

**Note:**

- 1) If the device is rebooted or re-powered when data retransmission is not completed, the interrupted retransmission data will be retransmitted first after the network is reconnected to the

network, and then the newly triggered retransmission data will be transmitted.

2) If the network is disconnected again during data retransmission, it will only send the latest disconnection data.

3) The retransmission data format is started with “20ce”, please refer to section [Historical Data Enquiry](#).

4) Data retransmission will increase the uplinks and shorten the battery life.

## 5.4 Milesight D2D Settings (TH Version Only)

Milesight D2D protocol is developed by Milesight to enable direct communication among Milesight devices without a gateway.

### 5.4.1 Sensor Data Transmission Settings

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

1. Configure the RX2 data rate and RX2 frequency in LoRaWAN® settings. It is suggested to change the default RX2 frequency to avoid conflicts with other D2D devices.

LoRaWAN

D2D

RX2 Data Rate ⓘ

DR8(SF12, 500 kHz) ▼

RX2 Frequency ⓘ

923300000

2. Enable D2D Data Transmission Settings and configure the settings.

LoRaWAN **D2D**

D2D Key

\*\*\*\*\*

D2D Data Transmission Settings

Temperature

Humidity

LoRa Uplink

| Parameters                     | Description                                                                                                                              |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| D2D Key                        | Define a unique D2D key which is the same as the setting in D2D Data Receiving devices. Default value: 5572404C696E6B4C6F52613230313823. |
| D2D Data Transmission Settings | Enable to send temperature or humidity data periodically to Milesight devices which have enabled D2D Data Receiving Settings.            |
| LoRa Uplink                    | If disabled, the device will not send the temperature and humidity periodic packets to gateway.                                          |

#### 5.4.2 Milesight D2D Controller

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

1. Configure RX2 datarate and RX2 frequency in LoRaWAN® settings. It is suggested to change the default RX2 frequency to avoid conflicts with other D2D devices.

LoRaWAN **D2D**

RX2 Data Rate ⓘ

DR8(SF12, 500 kHz)

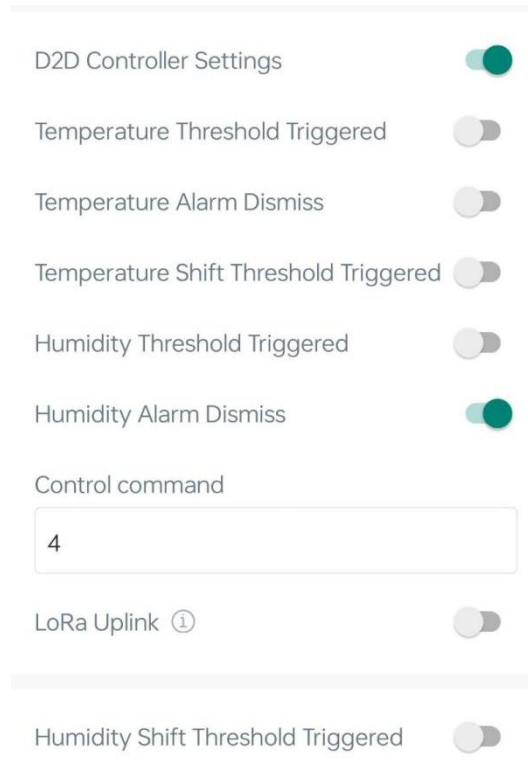
RX2 Frequency ⓘ

923300000

2. 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)

3. Enable the trigger conditions to define a 2-byte hexadecimal control command (0x0000 to 0xffff). When the TS201 encounters any of the defined situations, it will send the control command to the corresponding D2D agent devices.

**Example:** When humidity threshold alarm is dismissed, TS201 will send a D2D command 0004 to Milesight D2D agent devices.



D2D Controller Settings ☒

Temperature Threshold Triggered ☐

Temperature Alarm Dismiss ☐

Temperature Shift Threshold Triggered ☐

Humidity Threshold Triggered ☐

Humidity Alarm Dismiss ☒

Control command

4

LoRa Uplink ⓘ ☐

Humidity Shift Threshold Triggered ☐

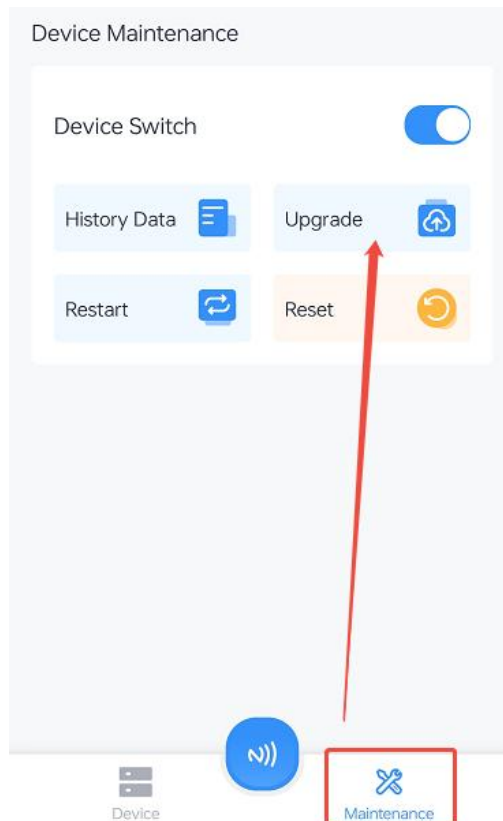
| Parameters              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D2D Controller Settings | <p>When the device detects one or more of the below statuses, it will send the control command to the corresponding Milesight D2D agent devices:</p> <ul style="list-style-type: none"> <li>● Temperature Threshold Triggered</li> <li>● Temperature Alarm Dismiss</li> <li>● Temperature Shift Threshold Triggered</li> <li>● Humidity Threshold Triggered</li> <li>● Humidity Alarm Dismiss</li> <li>● Humidity Shift Threshold Triggered</li> </ul> |
| Control command         | Define a 2-byte hexadecimal control command (0x0000 to 0xffff).                                                                                                                                                                                                                                                                                                                                                                                        |
| LoRa Uplink             | If enabled, a LoRaWAN® uplink packet containing the alarm information will be sent to gateway after the Milesight D2D control command is sent.                                                                                                                                                                                                                                                                                                         |

## 5.5 Maintenance

### 5.5.1 Upgrade

1. Download firmware from Milesight website to your smartphone.
2. Go to the **Maintenance** page of ToolBox App, and tap **Upgrade** to import firmware and upgrade the device.

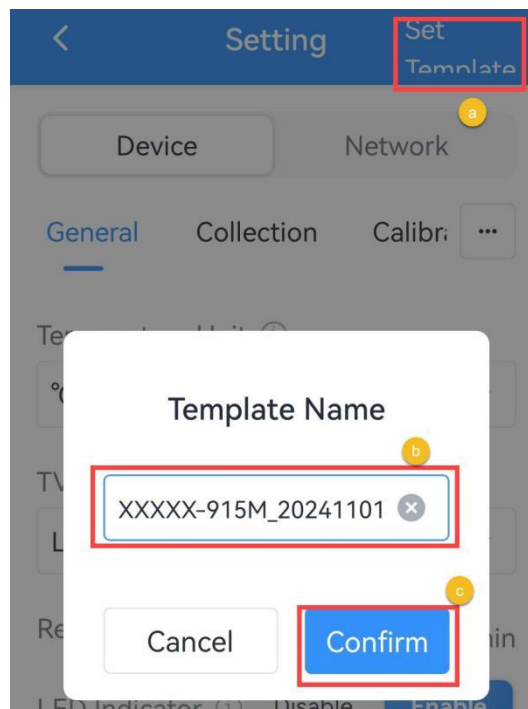
**Note:** Operation on ToolBox is not supported during a firmware upgrade.



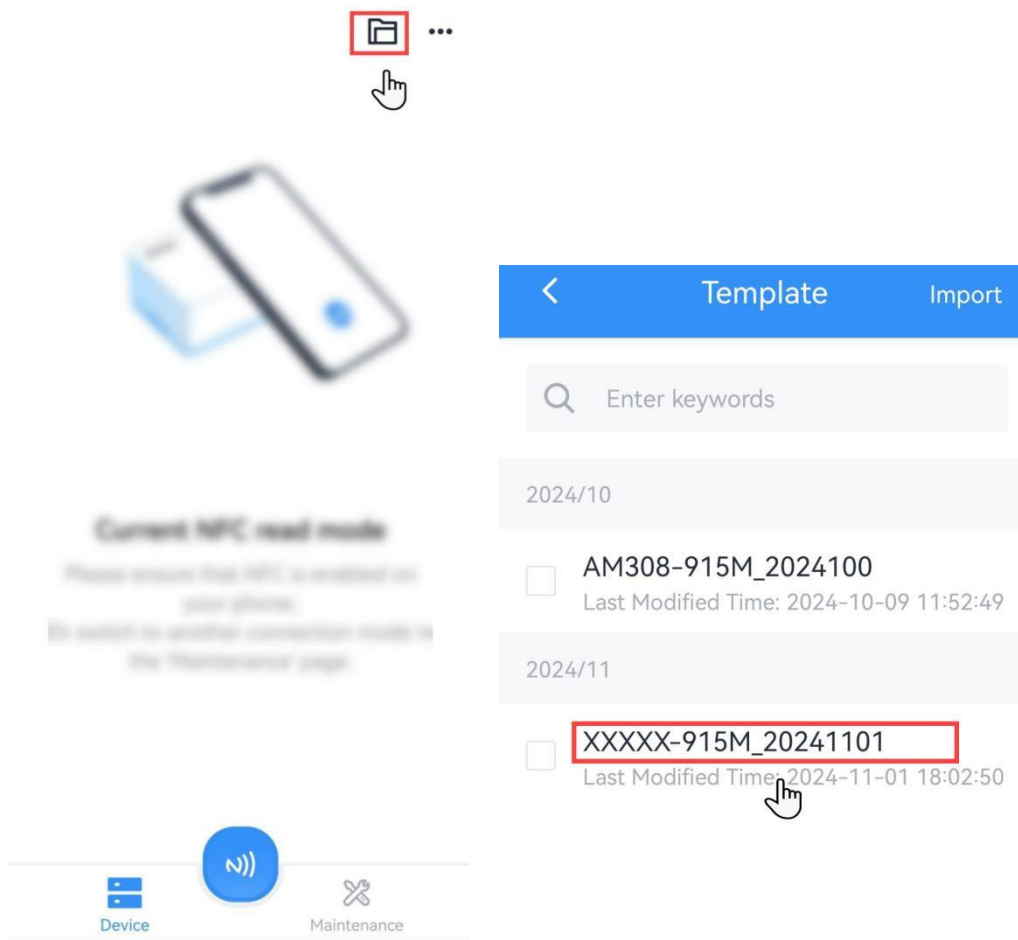
### 5.5.2 Backup

TS201 supports configuring backup setting for easy and quick device configuration in bulk. Backup is allowed only for devices with the same model and LoRaWAN® frequency band.

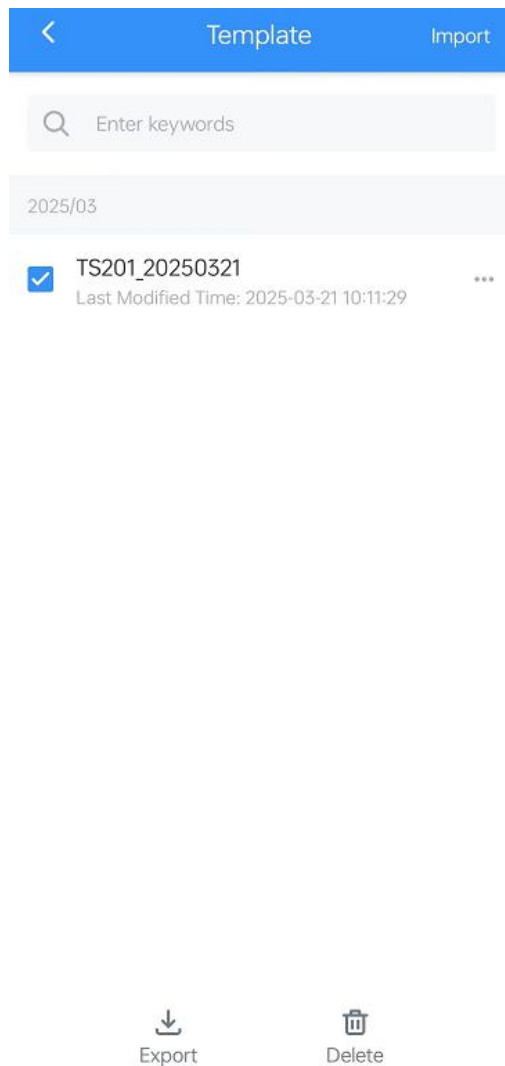
1. Attach the NFC area of smartphone to the device to read the device.
2. Go to **Settings** page on the App to edit the configuration as required, click **Set Template** to save current configuration as the template in the ToolBox App.



3. Go to **Template** page, select and click the target template, then click **Write** and attach the NFC area of smartphone to the target device to import the configuration.



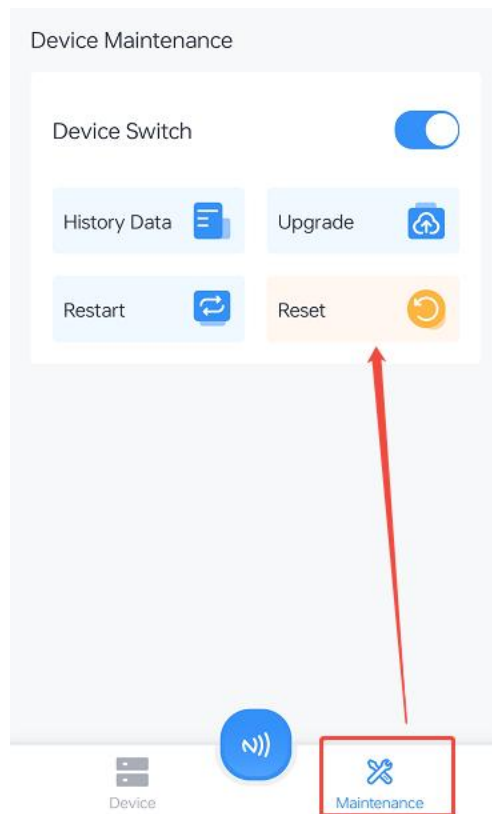
**Note:** Check the box of target template to delete it, or export this template as JSON format file and save it to the smartphone.



### 5.5.3 Reset

Go to **Maintenance** to click **Reset** button, then attach the smartphone with NFC area to the device to complete the reset.

**Note:** Reset operation will not clean the stored data, please go to **History Data**, click **Clear All** to clear data if necessary.

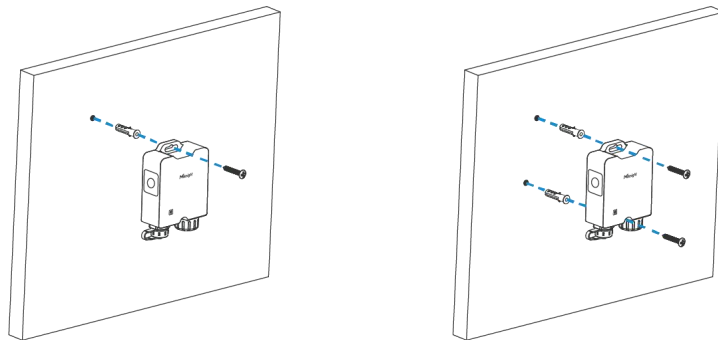


## 6. Installation

### 6.1 Device Installation

#### ● Wall Screw Mounting:

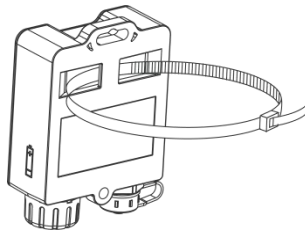
1. Fix the wall plugs to a flat surface according to the device mounting holes, then secure the device to the wall plugs using screws.
2. Cover the screws with cover caps.



#### ● Cable-tie Mounting:

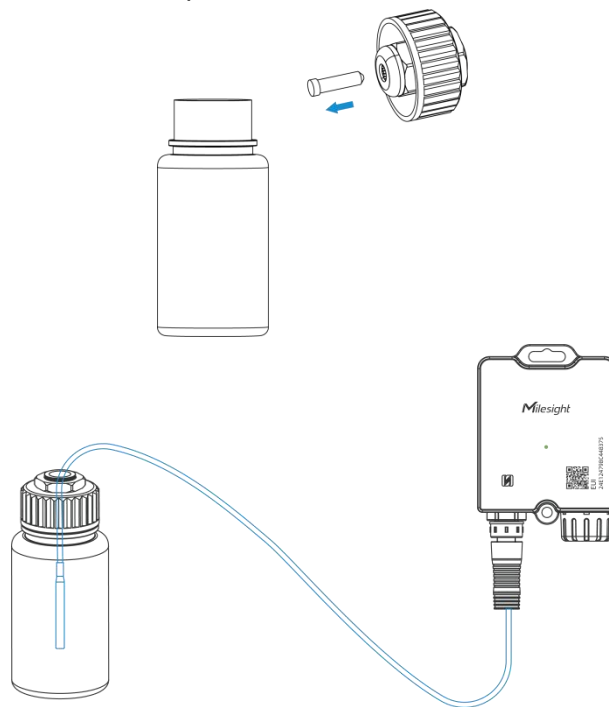
Pass a cable tie through the gap behind the device and wrap it to the pole.





## 6.2 Thermal Buffer Bottle

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.



## 7. Communication Protocol

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 please find files on <https://github.com/Milesight-IoT/SensorDecoders>.

### 7.1 Basic Information

TS201 reports basic information about the sensor every time it joins the network.

| Item             | Channel | Type | Byte | Value      |
|------------------|---------|------|------|------------|
| Power On         | ff      | 0b   | 1    | ff         |
| Protocol Version |         | 01   | 1    | 11 => V1.1 |

|                  |  |    |   |                                                                                                                                                           |
|------------------|--|----|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL Version      |  | ff | 2 | 0101 => V1.1                                                                                                                                              |
| Reset Report     |  | fe | 1 | ff, report after reset to factory default                                                                                                                 |
| Device SN        |  | 16 | 8 | 16 digits                                                                                                                                                 |
| Hardware Version |  | 09 | 2 | 0110 => V1.1                                                                                                                                              |
| Firmware Version |  | 0a | 2 | 0101 => V1.1                                                                                                                                              |
| Device Type      |  | 0f | 1 | 00: Class A                                                                                                                                               |
| Probe ID         |  | a0 | 9 | Temp. Version: 11+DS18B20 Probe ID<br>TH Version: 1200000000+Probe ID<br><b>Note:</b> When probe ID is reported as all "F", it means acquisition failure. |

**Example:**

| ff0bff ff0101 ffff0101 fffe ff166809e08056200001 ff090100 ff0a0102 ff0f00 ffa0112883c2b50f000043 |                          |                        |         |                          |                 |
|--------------------------------------------------------------------------------------------------|--------------------------|------------------------|---------|--------------------------|-----------------|
| Channel                                                                                          | Type                     | Value                  | Channel | Type                     | Value           |
| ff                                                                                               | 0b<br>(Power On)         | ff<br>(Reserved)       | ff      | 01<br>(Protocol Version) | 01 (V1)         |
| Channel                                                                                          | Type                     | Value                  | Channel | Type                     | Value           |
| ff                                                                                               | ff<br>(TSL Version)      | 0100 (V1.0)            | ff      | fe<br>(Reset Report)     | ff              |
| Channel                                                                                          | Type                     | Value                  | Channel | Type                     | Value           |
| ff                                                                                               | 16<br>(Device SN)        | 6809e08056<br>200001   | ff      | 09<br>(Hardware Version) | 0100 (V1.0)     |
| Channel                                                                                          | Type                     | Value                  | Channel | Type                     | Value           |
| ff                                                                                               | 0a<br>(Firmware Version) | 0101<br>(V1.1)         | ff      | 0f<br>(Device Type)      | 00<br>(Class A) |
| Channel                                                                                          | Type                     | Value                  |         |                          |                 |
| ff                                                                                               | a0 (Probe ID)            | 11284fa8b5<br>0f00000d |         |                          |                 |

**7.2 Sensor Data**

| Item                        | Channel | Type | Byte | Description                                                        |
|-----------------------------|---------|------|------|--------------------------------------------------------------------|
| Battery Level               | 01      | 75   | 1    | UINT8, Unit: %, [1-100]                                            |
| Temperature                 | 03      | 67   | 2    | INT16*0.1, Unit: °C                                                |
| Relative Humidity           | 04      | 68   | 1    | UINT8*0.5, Unit: %RH                                               |
| Temperature Abnormal Report | b3      | 67   | 1    | 00 - Abnormal collection report<br>01-Temperature overrange report |
| Humidity Abnormal           | b4      | 68   | 1    | 00 - Abnormal collection report                                    |

| Report                                     |    |    |   | 01-Humidity overrange report                                                                                                                                                                         |
|--------------------------------------------|----|----|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature Threshold Alarm                | 83 | 67 | 3 | <ul style="list-style-type: none"> <li>Byte 1-2: Temperature, INT16*0.1, Unit: °C</li> <li>Byte 3: Alarm Status, 00 -Alarm dismiss, 01 -Alarm</li> </ul>                                             |
| Temperature Shift Threshold (Change) Alarm | 93 | 67 | 5 | <ul style="list-style-type: none"> <li>Byte 1-2: Temperature, INT16*0.1, Unit: °C</li> <li>Byte 3-4: Temperature_change, INT16*0.1, Unit: °C</li> <li>Byte 5: 02</li> </ul>                          |
| Humidity Threshold Alarm                   | 84 | 68 | 2 | <ul style="list-style-type: none"> <li>Byte 1: Relative Humidity, UINT8*0.5, Unit: %RH</li> <li>Byte 2: Alarm Status, 00 -Alarm dismiss, 01 -Alarm</li> </ul>                                        |
| Humidity Shift Threshold(Change) Alarm     | 94 | 68 | 3 | <ul style="list-style-type: none"> <li>Byte 1: Relative Humidity, UINT8*0.5, Unit: %RH</li> <li>Byte 2: Relative Humidity_change, UINT8*0.5, Unit: %RH</li> <li>Byte 3: 02</li> </ul>                |
| Probe ID                                   | ff | a0 | 9 | Temperature version: <ul style="list-style-type: none"> <li>Byte 1: 11</li> <li>Byte 2-9: DS18B20 Probe ID</li> </ul> <b>Note:</b><br>11FFFFFFFFFFFFFFFF means ID acquisition failure.               |
|                                            |    |    |   | TH version: <ul style="list-style-type: none"> <li>Byte 1: 12</li> <li>Byte 2-5: 00000000</li> <li>Byte 6-9: TH Probe ID</li> </ul> <b>Note:</b><br>1200000000FFFFFFFF means ID acquisition failure. |

**Example:**

## 1. Periodic Packet

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

## 2. Temperature Abnormal Report Packet

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

## 3. Threshold Alarm Packet

| 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%<br>01 => Relative Humidity Threshold Alarm               |

## 4. Temperature Shift Threshold (Change) Alarm Packet

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

## 5. Temperature Probe ID: report once when the probe is removed or changed.

| ffa0 11 284fa8b50f00000d |      |                                     |
|--------------------------|------|-------------------------------------|
| Channel                  | Type | Value                               |
| ff                       | a0   | 284fa8b50f00000d = DS18B20 Probe ID |

## 7.3 Downlink Commands

TS201 supports downlink commands to configure the device. The application port is 85 by default.

| Item               | Channel | Type | Byte | Description                                                                                                      |
|--------------------|---------|------|------|------------------------------------------------------------------------------------------------------------------|
| Reboot             | ff      | 10   | 1    | ff                                                                                                               |
| Reporting Interval |         | 8e   | 3    | <ul style="list-style-type: none"> <li>Byte 1: 00</li> <li>Byte 2-3: reporting interval, INT16, Unit:</li> </ul> |

|                         |    |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------|----|----|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                         |    |    |   | min                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Collecting Interval     |    | 02 | 2 | Unit: s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| UTC Time Zone           |    | bd | 2 | INT16/60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Alarm Reporting Times   |    | f2 | 2 | range: 1~1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Alarm Dismiss Report    |    | f5 | 1 | 01-enable; 00-disable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Calibration             |    | ea | 3 | <ul style="list-style-type: none"> <li>Byte 1:               <ul style="list-style-type: none"> <li>80-Temperature enable 00-Temperature disable</li> <li>81-Humidity enable</li> <li>01-Humidity disable</li> </ul> </li> <li>Byte 2-3: Temperature calibration value, INT16*0.1, Unit: °C, Range: -200~1000 (or Humidity calibration value, INT16*0.5, Unit: %RH, Range: -100~100)</li> </ul>                                                                                                                                                       |
| Data Storage            |    | 68 | 1 | 01-enable; 00-disable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Data Retransmission     |    | 0d | 3 | <ul style="list-style-type: none"> <li>Byte 1: 01-enable; 00-disable</li> <li>Byte 2-3: interval time, Unit:s, Range: 30~1200s (600s by default)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                           |
| Threshold Alarm         | f9 | 0b | 7 | <ul style="list-style-type: none"> <li>Byte 1:               <ul style="list-style-type: none"> <li>01-Temperature, 03-Humidity</li> </ul> </li> <li>Byte 2:               <ul style="list-style-type: none"> <li>01 - below; 02 - over;</li> <li>03 - within; 04 - below or over</li> </ul> </li> <li>Byte 3-4: Max. Temperature, INT16*0.1, Unit: °C (or Max. Humidity, UINT16*0.5, Unit: %RH)</li> <li>Byte 5-6: Min. Temperature, INT16*0.1, Unit: °C (or Min. Humidity, UINT16*0.5, Unit: %RH)</li> <li>Byte 7: 01-enable; 00-disable</li> </ul> |
| Shift Threshold(Change) |    | 0c | 4 | <ul style="list-style-type: none"> <li>Byte 1:               <ul style="list-style-type: none"> <li>02-Temperature, 04-Humidity</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                |

|                         |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------|--|----|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm                   |  |    |   | <ul style="list-style-type: none"> <li>Byte 2-3: Max. Temperature, INT16*0.1, Unit: °C, range: 0.1 ~ 100 (or Max. Humidity, UINT8*0.5, Unit: %RH)</li> <li>Byte 4: 01-enable; 00-disable</li> </ul>                                                                                                                                                                                                      |
| Enquiry Probe ID        |  | 31 | 1 | 00                                                                                                                                                                                                                                                                                                                                                                                                       |
| ACK Packet Resend Times |  | 32 | 3 | <ul style="list-style-type: none"> <li>Byte 1-2: 0000</li> <li>Byte 3: Resend Times, Range: 0 ~ 10, Default: 1</li> </ul> <p><b>Note:</b> 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.</p> |

**TH Version Only:**

| Item                                 | Channel | Type | Byte | Description                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------|---------|------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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                                                                                                                                                                                                                                                                                    |
| LED Threshold Alarm Indicator        |         | 6a   | 1    | 01-enable; 00-disable                                                                                                                                                                                                                                                                                                                                                                            |
| D2D Sensor Data Transmission Setting |         | 63   | 4    | <ul style="list-style-type: none"> <li>Byte 1: 01-enable, 00-disable</li> <li>Byte 2: 01-enable LoRa Uplink, 00-disable LoRa Uplink</li> <li>Byte 3:               <ul style="list-style-type: none"> <li>00-Temperature and humidity disable</li> <li>01-Temperature enable</li> <li>02-Humidity enable</li> <li>03-Temperature and humidity disable</li> </ul> </li> <li>Byte 4: 00</li> </ul> |
| Milesight D2D Controller             |         | 66   | 1    | 01-enable, 00-disable                                                                                                                                                                                                                                                                                                                                                                            |
| Milesight D2D Key                    | ff      | 35   | 8    | First 16 digits, last 16 digits are fixed as 0                                                                                                                                                                                                                                                                                                                                                   |

|                         |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------|--|----|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D2D Controller Settings |  | 96 | 8 | <ul style="list-style-type: none"> <li>Byte 1:               <ul style="list-style-type: none"> <li>01-Temperature Threshold Triggered</li> <li>02-Temperature Alarm Dismiss</li> <li>03-Temperature Shift Threshold Triggered</li> <li>04-Humidity Threshold Triggered</li> <li>05-Humidity Alarm Dismiss</li> <li>06-Humidity Shift Threshold Triggered</li> </ul> </li> <li>Byte 2: 01-enable, 00-disable</li> <li>Byte 3: 01-enable LoRa Uplink, 00-disable LoRa Uplink</li> <li>Byte 4-5: D2D control command</li> <li>Byte 6-8: 00000000</li> </ul> |
| Temperature Unit        |  | eb | 1 | 00-°C, 01-°F<br><b>Note:</b> the reported unit is fixed as °C.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

**Example:**

- Set reporting interval as 5 minutes.

| ff8e 00 0500 |                         |                                              |
|--------------|-------------------------|----------------------------------------------|
| Channel      | Type                    | Value                                        |
| ff           | 8e (Reporting Interval) | 00 => Reserved<br>05 00 => 00 05 = 5 minutes |

- Set the calibration.

| ffea 80 6400 |                  |                                                                                                |
|--------------|------------------|------------------------------------------------------------------------------------------------|
| Channel      | Type             | Value                                                                                          |
| ff           | ea (Calibration) | 80 => enable temperature calibration<br>6400 => 00 64 => $100 \times 0.1 = 10^{\circ}\text{C}$ |

- Set a temperature threshold alarm as above 37°C.

| f90b 01 02 7201 0000 01 |                      |                                                                                                                                    |
|-------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Channel                 | Type                 | Value                                                                                                                              |
| f9                      | 0b (Threshold Alarm) | 01 => set threshold alarm<br>02 => above<br>72 01=> 01 72 => $370 \times 0.1 = 37^{\circ}\text{C}$<br>01 => enable threshold alarm |

- Set data retransmission interval as 100s.

| f90d 01 6400 |  |  |
|--------------|--|--|
|--------------|--|--|

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

## 5. Get Probe ID.

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

## 6. Set time zone.

| ffbd10ff |      |                                                       |
|----------|------|-------------------------------------------------------|
| Channel  | Type | Value                                                 |
| ff       | bd   | 10 ff => ff 10 = -240/60=-4<br>the time zone is UTC-4 |

## 7.4 Device Configuration Enquiry (TH Version Only)

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

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



|  |  |  |                            |
|--|--|--|----------------------------|
|  |  |  | 13-Reporting Interval      |
|  |  |  | 14-Alarm Dismiss Report    |
|  |  |  | 15-Alarm Reporting Times   |
|  |  |  | 16-Data Retransmission     |
|  |  |  | 17-Data Storage            |
|  |  |  | 18-Data Retrievalability   |
|  |  |  | 19-ACK Packet Resend Times |

**Example:**

1. Query the current humidity threshold setting.

|                 |
|-----------------|
| <b>f9 6f 0f</b> |
|-----------------|

Reply:

| <b>f9 0b 03 02 1e00 0000 01</b> |      |                                                                                   |
|---------------------------------|------|-----------------------------------------------------------------------------------|
| 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.

|                 |
|-----------------|
| <b>f9 6f 13</b> |
|-----------------|

Reply:

| <b>ff 8e 00 0100</b> |                      |                  |
|----------------------|----------------------|------------------|
| Channel              | Type                 | Value            |
| ff                   | 8e (Report Interval) | 0100=>0001=1 min |

## 7.5 Historical Data Enquiry

TS201 supports sending downlink commands to enquire historical data for specified time point or within a certain time range. Before utilizing this feature, it is import to make sure **the device time is correct and data storage feature was enable to store the data.**

**Command format:**

| Channel | Type                            | Byte | Description                                                                            |
|---------|---------------------------------|------|----------------------------------------------------------------------------------------|
| fd      | 6b (Enquire data in time point) | 4    | unix timestamp                                                                         |
|         | 6c (Enquire data in time range) | 8    | <ul style="list-style-type: none"> <li>Byte 1-4: Start time, unix timestamp</li> </ul> |

|    |                             |   |                                                                                      |
|----|-----------------------------|---|--------------------------------------------------------------------------------------|
|    |                             |   | <ul style="list-style-type: none"> <li>Byte 5-8: End time, unix timestamp</li> </ul> |
|    | 6d (Stop query data report) | 1 | ff                                                                                   |
| f9 | 0e(Report Interval)         | 2 | Unit: s, range: 30~1200s (60s by default)                                            |

**Reply format:**

| Channel | Type                 | Byte                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------|----------------------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| fc      | 6b/6c                | 1                          | 00: data enquiry success;<br>01: time point or time range invalid;<br>02: no data in this time or time range.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 20      | ce (Historical Data) | 7<br>(Temperature Version) | <ul style="list-style-type: none"> <li>Byte 1-4: Data time stamp</li> <li>Byte 5:               <ul style="list-style-type: none"> <li>Bit3~Bit0:                   <ul style="list-style-type: none"> <li>0001: Periodic report</li> <li>0010: Alarm report</li> <li>0011: Alarm dismiss report</li> </ul> </li> <li>Bit7~Bit4:                   <ul style="list-style-type: none"> <li>0000: Normal</li> <li>0001: Collection abnormal</li> <li>0010: Overrange report</li> </ul> </li> </ul> </li> <li>Byte 6-7: Data</li> </ul>                                                                                                     |
|         |                      | 9<br>(TH Version)          | <ul style="list-style-type: none"> <li>Byte 1-4: Data time stamp</li> <li>Byte 5: 02</li> <li>Byte 6-7: Temperature, INT16*0.1, Unit: °C</li> <li>Byte 8: Relative Humidity, UINT8*0.5, Unit: %</li> <li>Byte 9:               <ul style="list-style-type: none"> <li>Bit3~Bit0: Abnormal Type                   <ul style="list-style-type: none"> <li>0001: Periodic report</li> <li>0010: Temperature Alarm report</li> <li>0011: Temperature Alarm dismiss report</li> <li>0100: Humidity Alarm report</li> <li>0101: Humidity Alarm dismiss report</li> <li>0110: Collect and report immediately</li> </ul> </li> </ul> </li> </ul> |

|  |  |  |                                                                                                                                                                                                                                                                                                                                                                                          |
|--|--|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  |  | <ul style="list-style-type: none"> <li>➤ Bit5~Bit4: <ul style="list-style-type: none"> <li>00: Normal</li> <li>01: Humidity Collection abnormal</li> <li>10: Humidity Overrange report</li> </ul> </li> <li>➤ Bit7~Bit6: <ul style="list-style-type: none"> <li>00: Normal</li> <li>01: Temperature Collection abnormal</li> <li>10: Temperature Overrange report</li> </ul> </li> </ul> |
|--|--|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Note:**

1. The device only uploads no more than 300 data records per range inquiry.
2. When enquiring about the data in time point, it will upload the data that is the closest to the search point within the reporting interval range. For example, if the device's reporting interval is 10 minutes and users send a command to search for 17:00's data, if the device finds there is data stored in 17:00, it will upload these data. If not, it will search for data between 16:50 to 17:10 and upload the data which is the closest to 17:00.

**Example:**

1. Enquire historical data of temperature version device between 2024/5/15 10:20:22 to 2024-5-20 10:20:22.

| fd6c e61b4466 66b34a66 |                                 |                                                                                                                                              |
|------------------------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Channel                | Type                            | Value                                                                                                                                        |
| fd                     | 6c (Enquire data in time range) | Start time: e61b4466 => 66441be6 = 1715739622s<br>=2024/5/15 10:20:22<br>End time: 66b34a66 => 664ab366 = 1716171622s<br>=2024-5-20 10:20:22 |

Reply:

| fc6c00  |                                 |                          |
|---------|---------------------------------|--------------------------|
| Channel | Type                            | Value                    |
| fc      | 6c (Enquire data in time range) | 00: data enquiry success |

| 20ce e81b4466 01 0a01 |                         |                                                               |                                                                              |
|-----------------------|-------------------------|---------------------------------------------------------------|------------------------------------------------------------------------------|
| Channel               | Type                    | Time Stamp                                                    | Value                                                                        |
| 20                    | ce<br>(Historical Data) | e81b4466 => 6644b1e8 =<br>1715778024s<br>= 2024-5-15 21:00:24 | 01 => 0000 0001 = Normal +Periodic Report<br>0a01 => 01 0a => 266*0.1=26.6°C |

-----END-----