Smart Thermostat

Featuring LoRaWAN®

WT201

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.

❖ The device is not intended to be used as a reference sensor, and Milesight should not be responsible for any damage which may result from inaccurate readings.

❖ Do not place the device where the temperature is below/above the operating range.

❖ Do not place the device close to objects with naked flames, heat source (such as oven), or exposure to sunlight, cold source, liquid, and extreme temperature changes.

❖ The device must never be subjected to shocks or impacts.

❖ Do not clean the device with detergents or solvents such as benzene or alcohol. To clean the device, wipe with a soft moistened cloth. Use another soft, dry cloth to wipe dry.
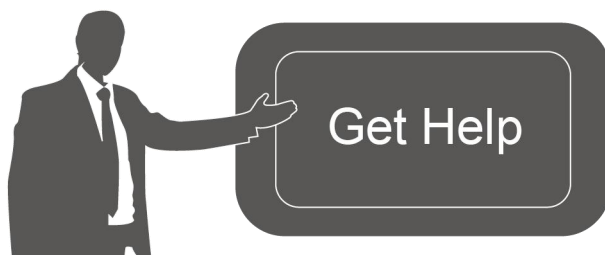
Declaration of Conformity

WT201 is in conformity with the essential requirements and other relevant provisions of the FCC and RoHS.

Get Help

For assistance, please contact Milesight technical support:

Email: iot.support@milesight.com

Support Portal: support.milesight-iot.com

Tel: 86-592-5085280

Fax: 86-592-5023065

Address: Building C09, Software Park Phase III, Xiamen 361024, China

Revision History

Date	Doc Version	Description
Jan. 17, 2025	V 2.0	Initial version based on hardware v2.x

Contents

1. Product Introduction

1.1 Overview

WT201 is a LoRaWAN® thermostat used as a HVAC controller supporting a wide range of different heating and cooling systems, including heat pumps, AC, boilers, furnaces, AHU, and PTAC devices. WT201 smart thermostat provides multiple modes including heat/cool, emergent heat, auto, and fan mode, enabling precise temperature adjustments in buildings. It allows for automatic control through scheduled programming and remote management via cloud system. Real-time monitoring ensures timely alerts for sudden temperature changes, prioritizing people's safety and protecting assets. Additionally, it has the capability to store up to 1000 pieces of data, providing ample data security.

With a 4.2" LCD screen and embedded temperature and humidity sensor, WT201 continuously displays the room status while monitoring the ambient temperature and humidity. It also accommodates to different time zones and summer/winter time, catering to users in various regions. Moreover, the thermostat seamlessly integrates with hotel room card systems, allowing for convenient remote management. Compliant with Milesight LoRaWAN® gateway and Milesight Development Platform solution, users can control the room temperature as well as trigger other sensors or appliances easily via a webpage remotely.

1.2 Key Features

- Support most 24VAC HVAC system, including furnaces and air conditioners (2H/2C), heat pumps (4H/2C or 3H/2C + 1 stage AUX heat), boilers, and PTAC
- Support intuitive 4.2-inch display, allowing for showing temperature/humidity and status of the room clearly
- Support the child lock function and anti-theft installation for safety reasons
- Support 4 temperature control modes and 3 fan modes for flexible temperature control
- Adjust the room temperature manually or automatically with 7 working modes and allow up to 16 schedules for each mode
- Enabling real-time monitoring ensures timely alerts for sudden temperature changes
- Built-in temperature and humidity sensor, enabling environmental detection and accurate control
- Store locally 1000 historical records and support retransmission to prevent data loss
- Support flexible adjustments based on time zones and summer/winter time catering to region differences

- Compatible with hotel room card systems for convenient remote management

- Equips with RTC to keep time correct for 72 hours even without power supply

- Equipped with NFC for one touch configuration

- Function well with standard LoRaWAN® gateways and network servers

- Compatible with BACnet system via Milesight LoRaWAN® gateways

- Compatible with Milesight Development Platform

- Supports Milesight D2D protocol to enable ultra-low latency control without gateway

- Supports multicast for control in bulk

- Support Firmware Update Over the Air (FUOTA) feature

2. Hardware Introduction

2.1 Packing List
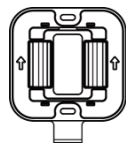
| 1 × WT201 Device | 1 × Wiring Backplate | 1 × Decorative Cover Plate | 4 × Wall Mounting Kits |

| 1 × Fixing Screw | 1 × Thermostat Wire Label Sticker | 1 × Quick Start Guide | 1 × Warranty Card |
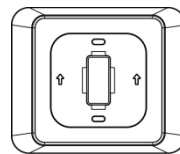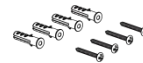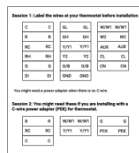
⚠ **If any of the above items are missing or damaged, please contact your sales representative.**

2.2 Hardware Overview

Button 1: System On/Off
Button 2: Temperature +
Button 3: Temperature -
Button 4: Fan Mode
Button 5: Temperature Control Mode
NFC Area

Note: the buttons only take effect when <u>control permission</u> is Thermostat.

Milesight
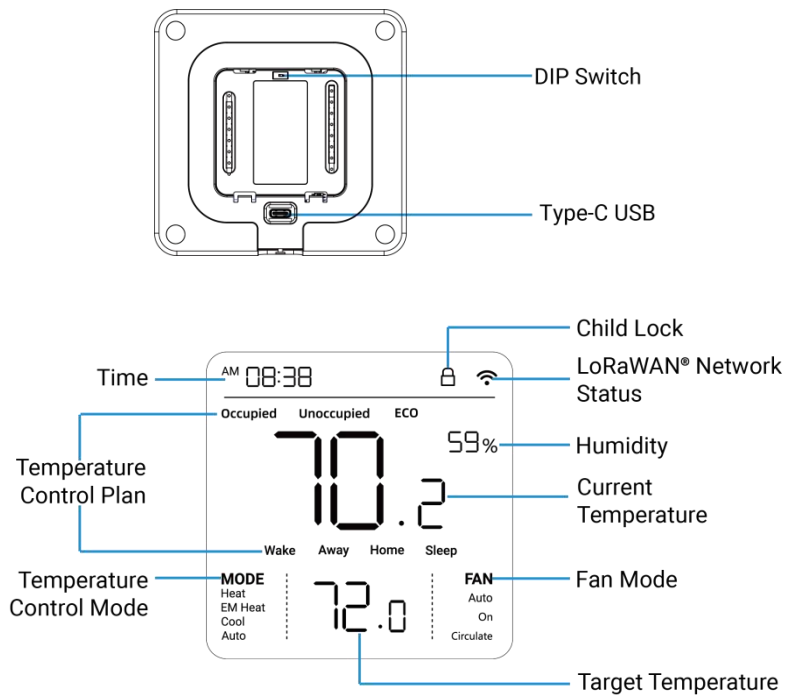
Note:

1) When system status is off, the screen will only show temperature and humidity.

2) When system status is on and control permission is Remote Control, the screen will only show temperature, humidity, time, child lock and network status.

Screen Descriptions:

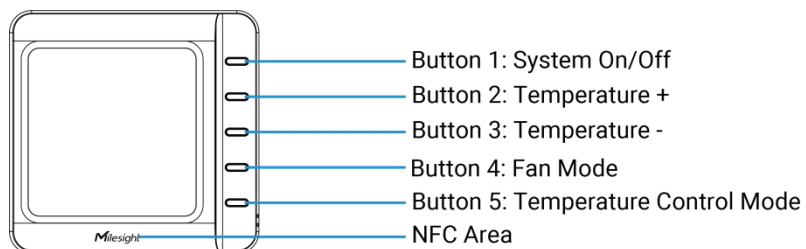| Icon	Description
Child Lock	Display only when all buttons are locked or any locked button is pressed
LoRaWAN® Network Status	Blinks: the network is de-activated
	Static On: the network is activated
	Blinks twice: send LoRaWAN® uplink packet
Temperature	WT201 will display the value of internal sensors by default. If the external sensor values are required to display, please enable D2D Data Receiving Settings or set external sensor mode via downlink commands in *WT201 Communication Protocol*.

2.3 Dimensions (mm)
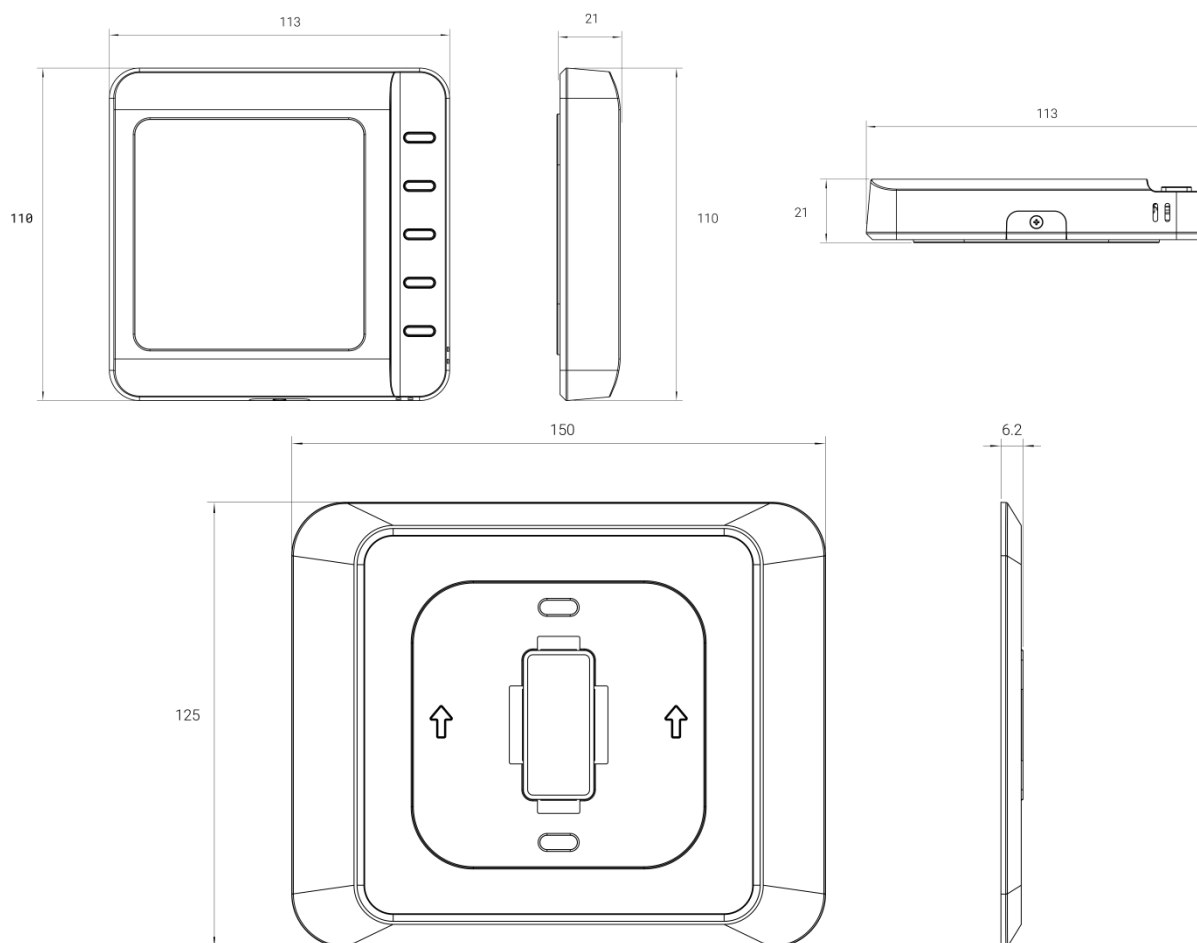
3. Wiring Diagrams

3.1 Wiring Descriptions

Wire	Description
GND	GND of Digital Input
DI	Dry contact for keycard switches, magnet switches, etc.
RC	Power of cooling system and heating system(24VAC)
RH	Power of heating system(24VAC)
W1	Heating/The first stage of heating.
W2/AUX	Either W2 or AUX can be selected. W2: The second stage of heating AUX: Auxiliary heating which supports Auxiliary Heating Duration and Compressor and Auxiliary Heating Duration
E	Emergency heating used on very cold days for freeze protection
Y1	The first stage of cooling on cooling system or compressor on heat pump system

Y2/GL	Either Y2 or GL can be selected. Y2: The second stage of cooling on cooling system or compressor on heat pump system GL: Control fan to low speed.
G/GH	G: Control fan GH: Control fan to high speed
C	Common of 24VAC power. It also might be labeled as X or B wire.
PEK	Connect Power Extender Kit when there is no C wire.
O/B	Switch between heating and cooling on the heat pump system. **Note:** If you only have O wire or B wire, please connect to O/B terminal and enable it by configuring Reversing Valve.

3.2 Wiring Examples

1. Furnace + Air Conditioner
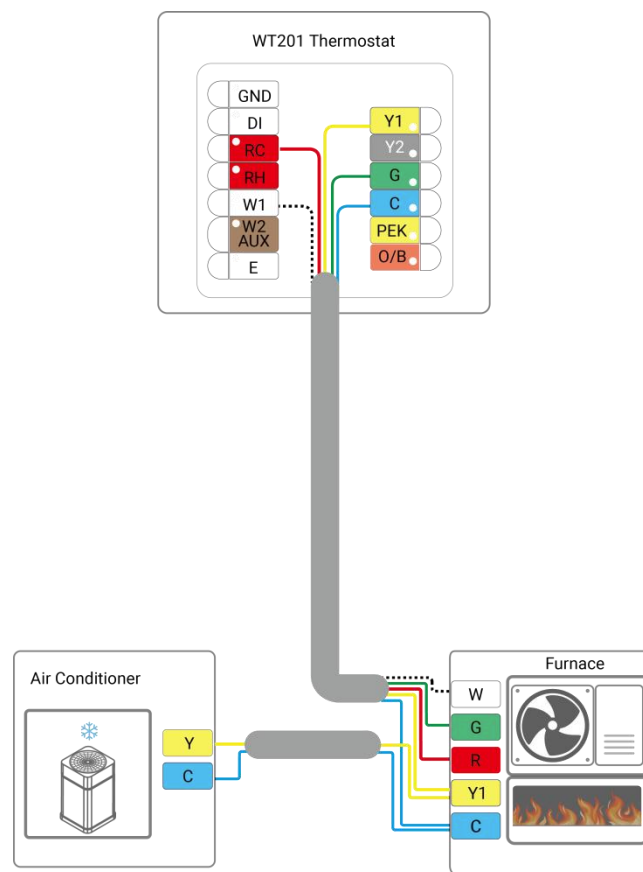
2. Furnace (2-stage) + Air Conditioner (2-stage)
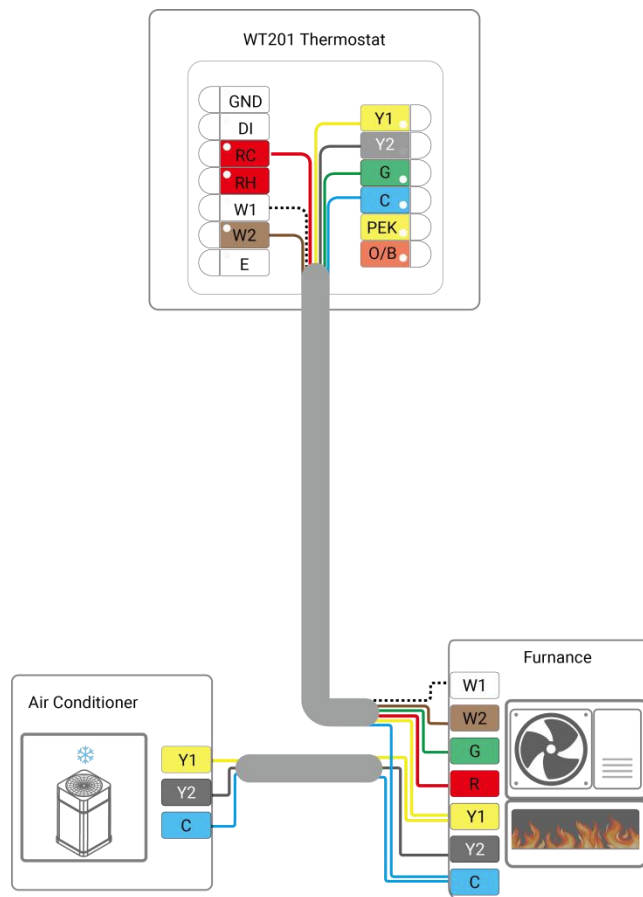
3. Heat Pump with Auxiliary Heat
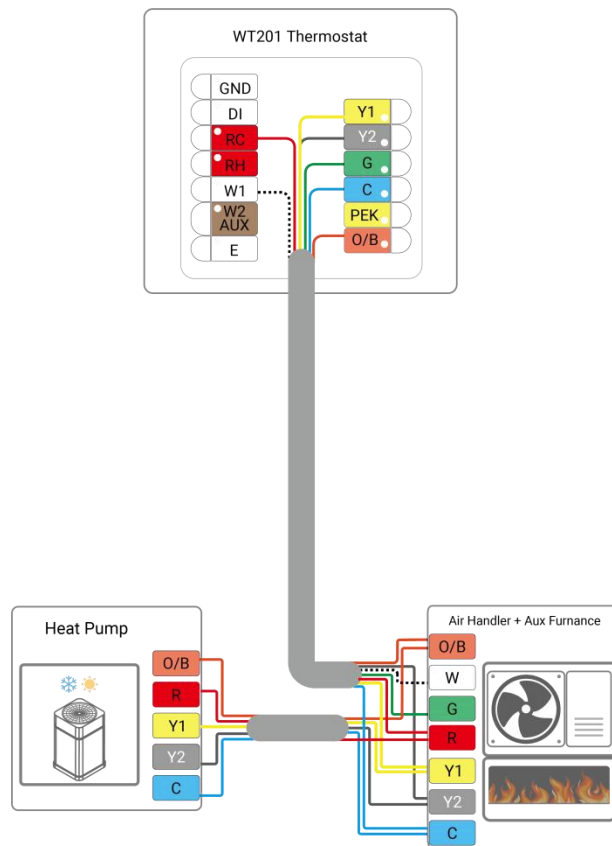
4. Boiler + Air Conditioner
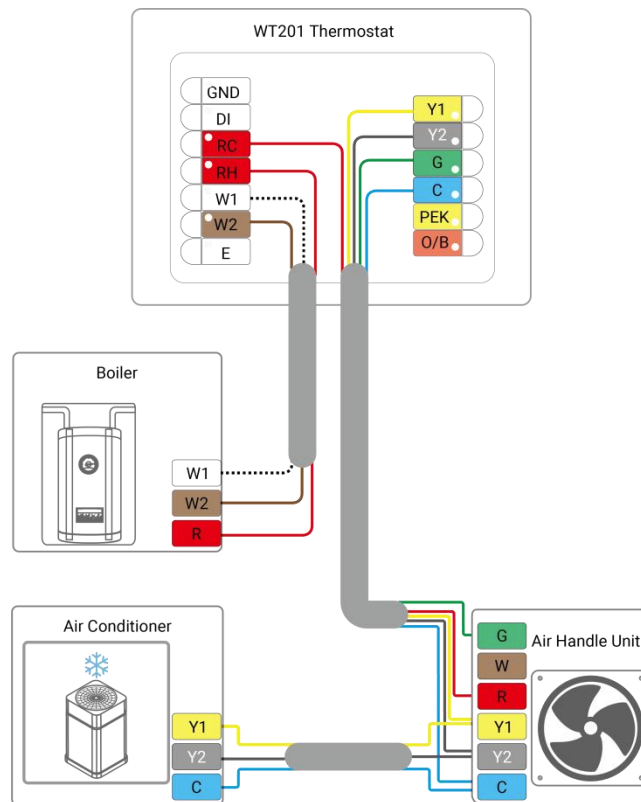
5. PTAC
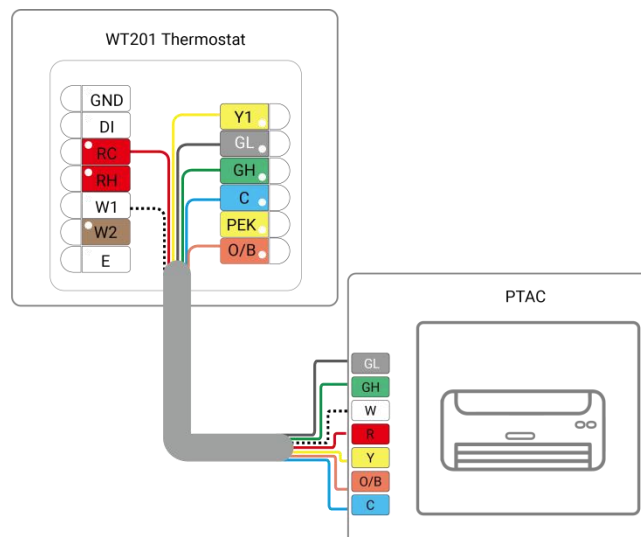
3.3 Power Extension Kit (PEK)

If there is no C or common wire and at least 4 wires are used on the old thermostat, it is necessary to add a Power Extension Kit (PEK), which is able to create a C wire using the existed thermostat wiring by combining the functions of Y and G to one wire Y.

Installation Steps

1. Ensure the circuit of all related systems are shut off before installation.

2. Remove the wires W, Y, G, R from HVAC system and the old thermostat and label these wires with stickers.

3. Connect one side (W, Y, G, C, R) of PEK to the HVAC system with PEK matched wires.

4. Connect the other side (W, Y, G, R) of PEK to the WT201 device with the wires removed from Step 2.

Wiring Examples

1. Furnace + Air Conditioner
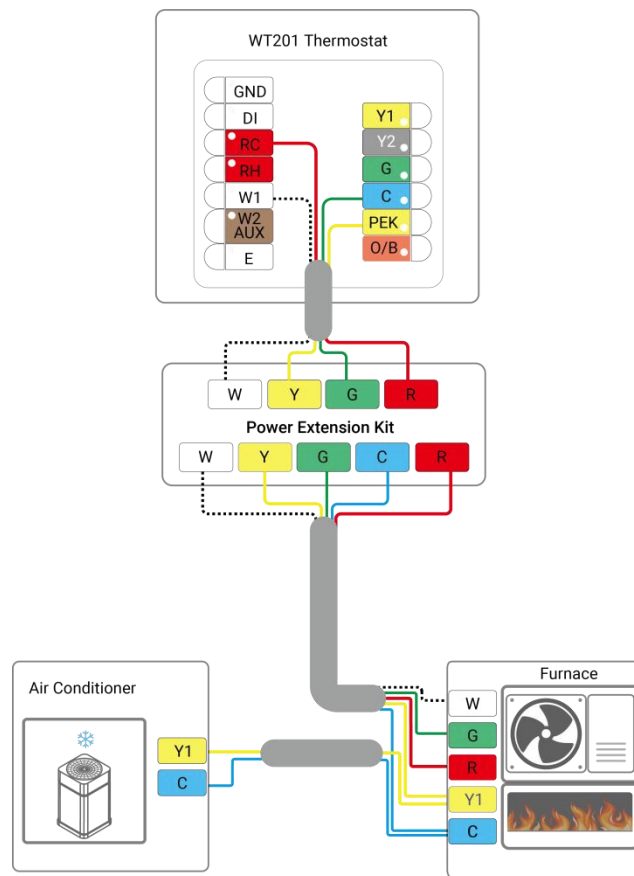
2. Furnace (2-stage) + Air Conditioner (2-stage)
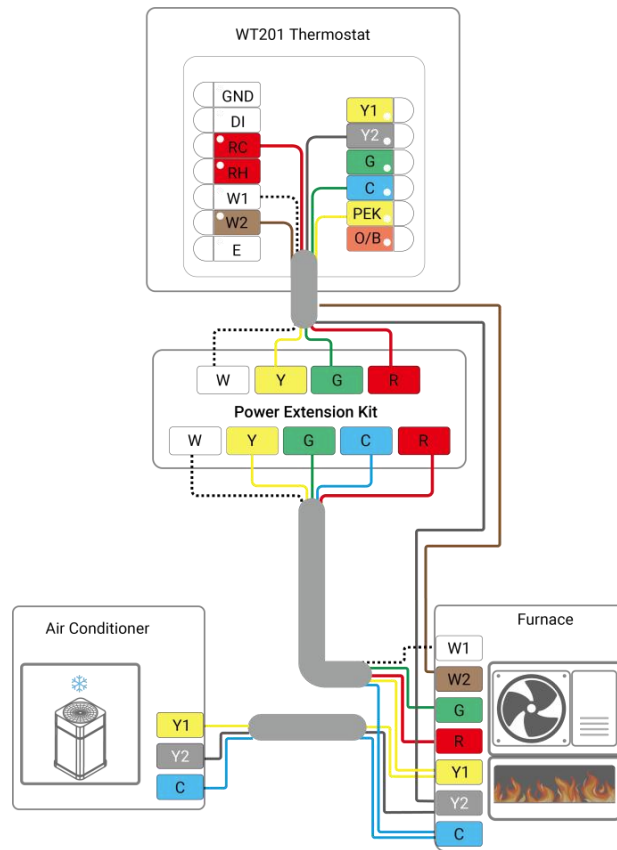
3. Heat Pump with Auxiliary Heat
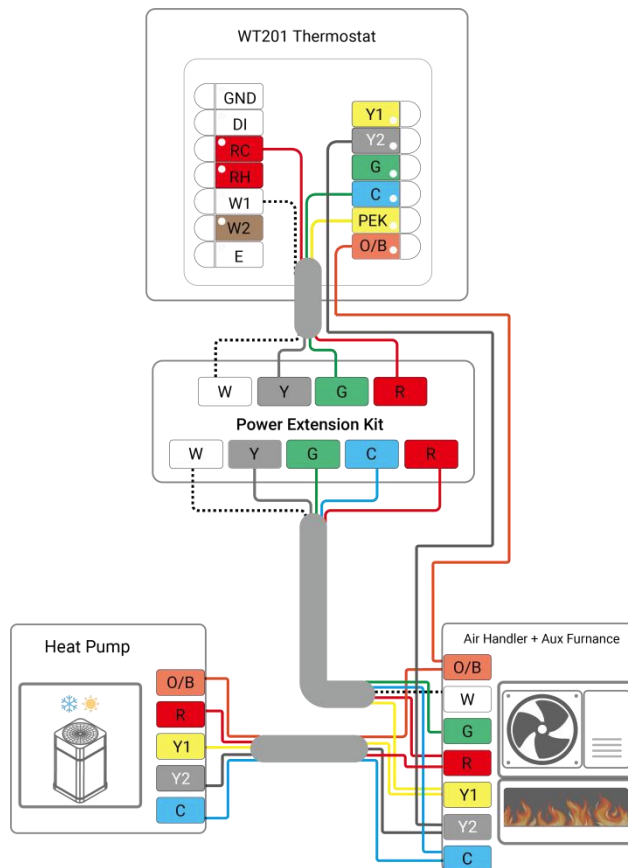
3.4 DI Wiring

Low level: DI and GND is closed;
High level: DI and GND is open.
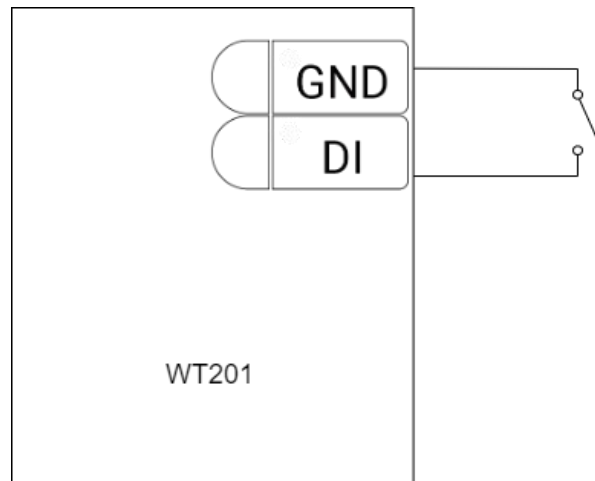
4. Installation

Installation Locations

When using built-in temperature sensor, it is suggested to install the WT201 thermostat about 5 ft. (1.5m) above the floor in an area with good air circulation at average temperature.
Note: if installation in an appropriate location is not possible, please send downlink commands to enable to receive external sensor data from network server or other Milesight D2D devices.
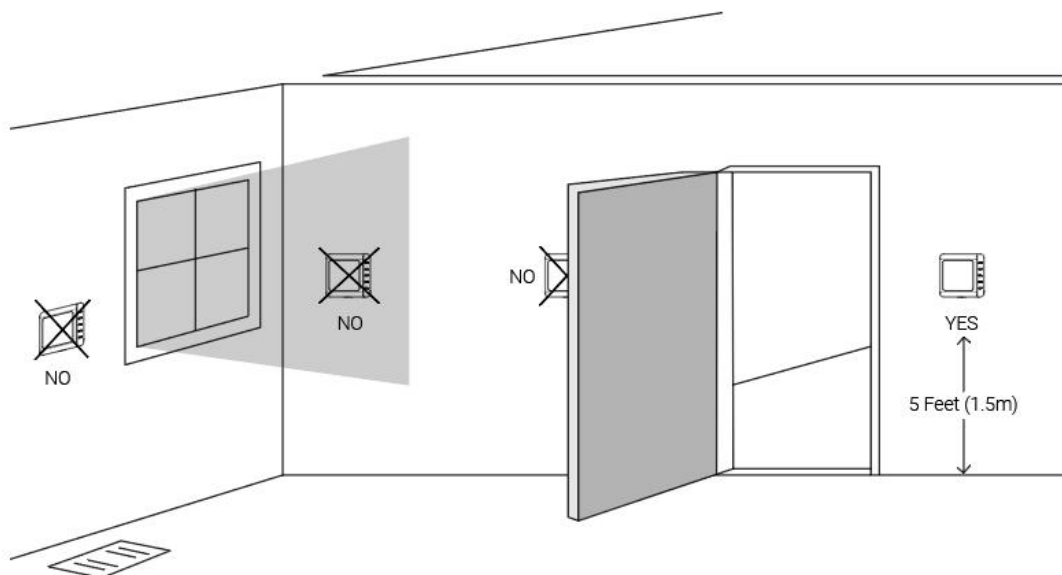
Do not install the device where:
● Close to hot or cold sources like hot or cold air ducts;
● The place in direct sunlight;

- Dead spots or drafts (behind the doors and in corners);
- In areas that do not require conditioning;
- Close to concealed chimneys or pipes;
- Close to metal objects and obstacles which affect the LoRaWAN® transmission;
- The place with lots of electromagnetic interfaces;
- The place where strong vibration may happen or easy to be subjected to physical shock.

Installation Steps

1. Ensure the circuit of all related systems are shut off before installation.

2. Remove the old thermostat from the wall, check if the power supply is 24 VAC with less than 2A maximum current.

Note: do not power the WT201 device with maximum current (150mA) for long time, which will damage the device.
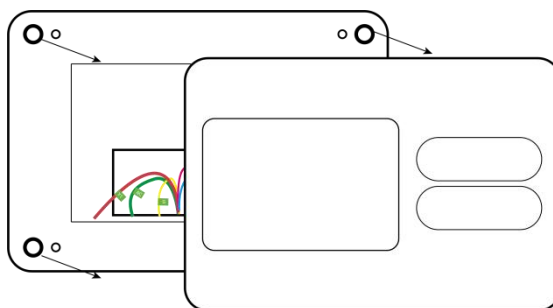
3. Disconnect the wires from old thermostat and label the wires with stickers. It is suggested to take a photo of the connected wires on the old thermostat for reference.
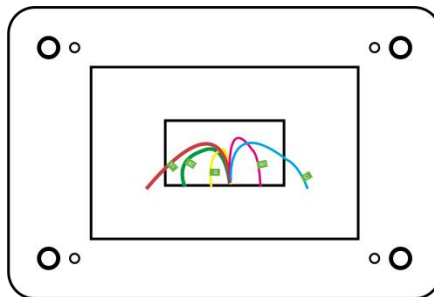
4. Remove the mounting plate of old thermostat. When removing, ensure that the wires do not fall into the holes.

5. Press the wiring backplate to decorative cover plate to fix them together. Ignore this step if you are not using a decorative cover plate.

Note: it is suggested to use a decorative cover plate to cover the holes on the wall left by old thermostat, and to reduce the airflow from the hole that will affect temperature measurement.
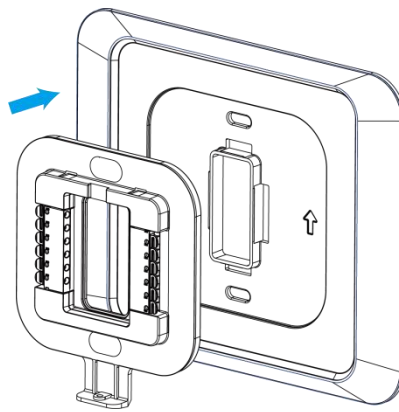
6. Pass the wires through the hole in the middle of the wiring backplate, then fix the wiring backplate (and decorative cover plate) to the wall using wall plugs and wall mounting screws.
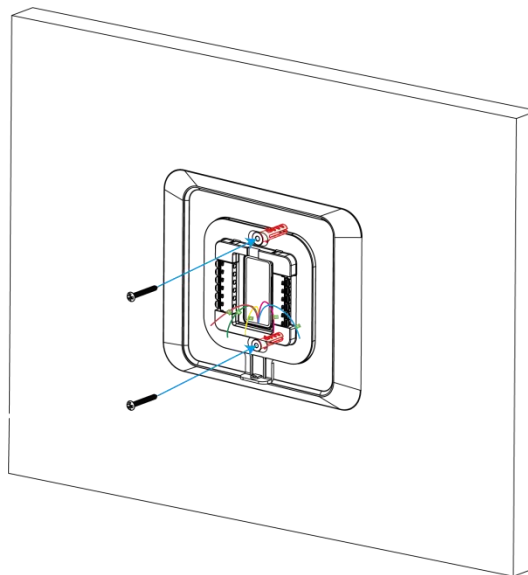
7. Hold the tabs and insert the wires into the holes of the corresponding terminals on the wiring backplate until they are firmly in place. Gently tug the wires to ensure that they are securely connected. If you need to release the wires again, take off the terminal tabs.

8. Push the remaining wires back into the hole on the wall.

Note: Unused cables must be insulated and secured.
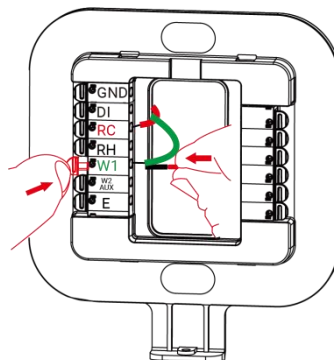
9. Adjust the DIP switch on the WT201 device. If there is only the RC wire connected, switch to Only RC; If both the RC and RH wires are connected, switch to RC & RH.
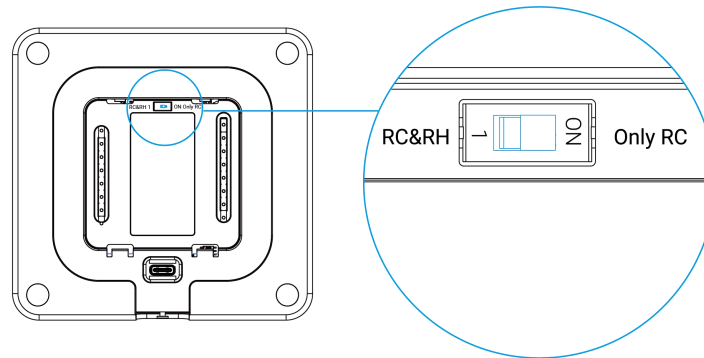
10. Push the WT201 device into the wiring backplate gently and ensure that both parts are securely fixed.
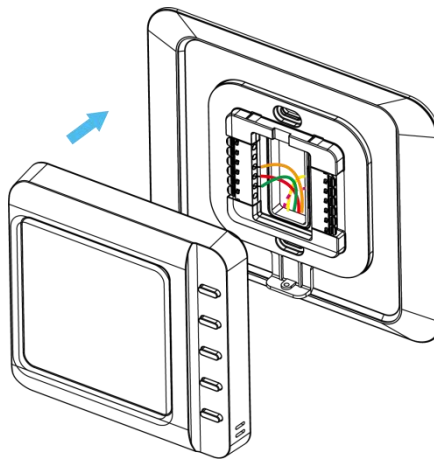
11. Turn on the systems to check if the WT201 device is on. Configure the device and ensure that it can function well.
12. Fix the bottom of WT201 device to the wiring backplate with the fixing screw.
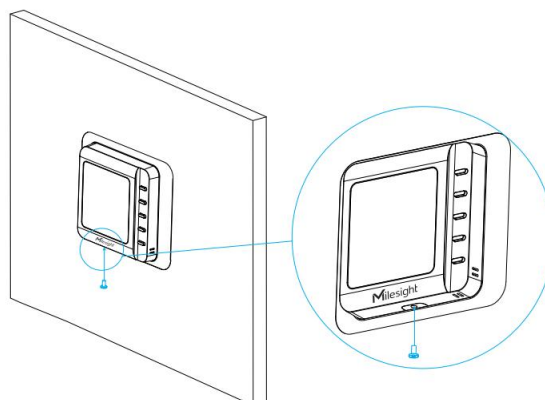
5. Operation Guide

5.1 ToolBox Login

WT201 can be configured via NFC.

1. Remove the WT201 device from the backplate, connect the device to a computer or other power supply via the Type-C port.
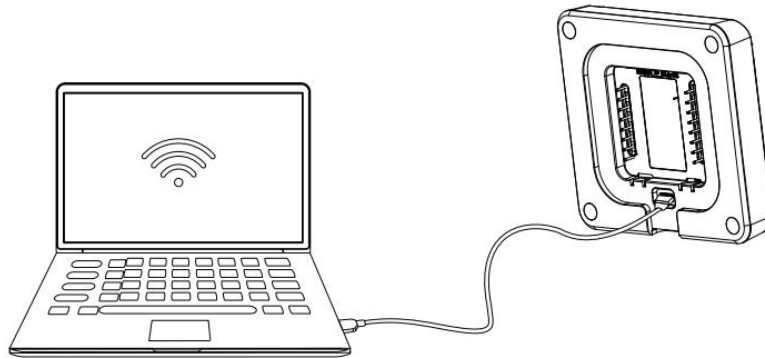
2. Download and install the Milesight ToolBox App from Google Play or Apple App Store.

3. Enable NFC on the smartphone and launch Milesight ToolBox.

4. Select the reading mode as NFC and attach the NFC area of a smartphone to the device. Click **NFC Read** to read device information. The basic information and settings of the device will be shown on ToolBox App if it's recognized successfully. You can read and configure the device by tapping the Read/Write device on the App. In order to protect the security of the device, please change the password when first configuring. The default password is **123456**.
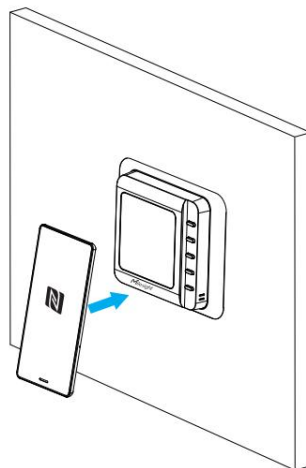
Note:

1) Ensure that you get the right location of NFC area of the smartphone and it's recommended to take off phone case.

2) If the smartphone fails to read/write configurations via NFC, remove the phone and try again.

5.2 LoRaWAN® Settings

5.2.1 Basic Settings

WT201 supports to configure AppEUI, Join Type, Application Key, and other basic LoRaWAN® information. You can also keep all settings by default.

Parameters	Description
Device EUI	Unique ID of the device which can also be found on the label.
App EUI	The default App EUI is 24E124C0002A0001.
Application Port	The port is used for sending and receiving data, the default port is 85.
LoRaWAN® Version	V1.0.2 and V1.0.3 are available.
Work Mode	It's fixed as Class C.
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 **Note:** The default value of earlier devices is 5572404C696E6B4C6F52613230313823.
Network Session	Nwkskey for ABP mode, the default is

Key	5572404C696E6B4C6F52613230313823.
Application Session Key	Appskey for ABP mode, the default is 5572404C696E6B4C6F52613230313823.
Device Address	DevAddr for ABP mode, the default is the 5th to 12th digits of the SN.
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. 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. **Note:** Only OTAA mode supports rejoin mode.
Set the number of packets sent	When the rejoin mode is enabled, set the number of LinkCheckReq packets to send. Note: the actual sending number is **Set the number of packet sent** + 1.
Support Frequency	Select the channel plan and the frequency to send uplinks. If frequency is one of AU915/US915, enter the index of the channel that you want to enable and make them separated by commas. **Examples:** 1, 40: Enabling Channel 1 and Channel 40 1-40: Enabling Channel 1 to Channel 40 1-40, 60: Enabling Channel 1 to Channel 40 and Channel 60 All: Enabling all channels

Null: Indicates that all channels are disabled

* Support Frequency

US915

Enable Channel Index ⓘ

0-71

Index	Frequency/MHz ⓘ
0 - 15	902.3 - 905.3
16 - 31	905.5 - 908.5
32 - 47	908.7 - 911.7
48 - 63	911.9 - 914.9
64 - 71	903 - 914.2

ADR Mode	Allow network server to adjust data rate of the device.
Spread Factor	If ADR is disabled, the device will send data via this spread factor.
Tx Power	Transmit power of the device.
RX2 Data Rate	RX2 data rate to receive downlinks or Milesight D2D commands.
RX2 Frequency	RX2 frequency to receive downlinks or Milesight D2D commands. Unit: Hz

Note:

1) Please contact sales for 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 Development Platform to manage devices.

5.2.2 Multicast Settings

WT201 supports setting up several multicast groups to receive multicast commands from the network server, then users can use this feature to control devices in bulk.

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

Parameters	Description
Multicast Address	Unique 8-digit address to distinguish different multicast groups.
Multicast McNetSkey	32-digit key. Default values: Multicast Group 1: 5572404C696E6B4C6F52613230313823 Multicast Group 2: 5572404C696E6B4C6F52613230313824 Multicast Group 3: 5572404C696E6B4C6F52613230313825 Multicast Group 4: 5572404C696E6B4C6F52613230313826
Multicast McAppSkey	32-digit key. Default values: Multicast Group 1: 5572404C696E6B4C6F52613230313823 Multicast Group 2: 5572404C696E6B4C6F52613230313824 Multicast Group 3: 5572404C696E6B4C6F52613230313825 Multicast Group 4: 5572404C696E6B4C6F52613230313826

2. Add a multicast group on the network server. Take Milesight UG6x gateway as example, go to **Network Server > Multicast Groups**, click **Add** to add a multicast group.

Fill in the multicast group information the same as WT201 settings, and select the devices which you need to control, then click **Save**.

3. Go to **Network Server > Packets**, select the multicast group and fill in the downlink command, click **Send**. The network server will broadcast the command to devices that belong to this multicast group.

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

5.3 General Settings

Reporting Interval(min)

10

Temperature Unit

℃

Control Permissions

Thermostat

System On/Off 🟢

Child Locks ⚪

Time Mode

12-Hour Clock

Time Zone

UTC (WET: Western European Time,..

Daylight Saving Time 🟢

Start Time   Oct. | 1st | Sun. | 02:00AM 🕐

End Time   Apr. | 1st | Sun. | 02:00AM 🕐

DST Bias ⓘ   [−] 60 [+] min

Data Storage ⓘ 🟢
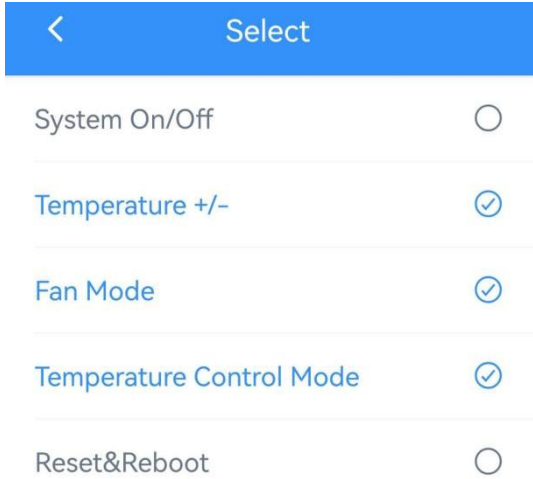
Data Retransmission ⓘ ⚪

Change Password ⚪

Parameters	Description
Reporting Interval	The interval of reporting data to network server. Default: 10 min, Range: 1 - 1440 min
Temperature Unit	Set the unit of temperature displayed on the screen and configuration page. **Note:** reported unit is fixed as °C.
Control Permissions	Select the control permission as **Thermostat** or **Remote Control.** **Thermostat**: control the temperature according to the settings and programs of WT201. **Remote Control**: control the temperature by controlling the relay output

	statuses directly.
System On/Off	Turn on or off the temperature control system, it can also be controlled by button. When the system is off, the screen will only show current temperature and humidity.
Child Lock	Enable to lock the button features. After enabled, the device can only control these features via ToolBox or downlink commands.
Time Mode	Set the time display mode as 24-Hour Clock or 12-Hour Clock.
Time Zone	Set the time zone to display on the screen. When you click **Sync** button of ToolBox App to sync time, the device will also sync the time zone from smartphone automatically.
Daylight Saving Time	Enable or disable Daylight Saving Time (DST). **Start Time:** the start time of DST time range. **End Time:** the end time of DST time range. **DST Bias:** the DST time will be faster according to this bias setting.
Data Storage	Disable or enable data storage locally.
Data Retransmission	Disable or enable data retransmission.
Change Password	Change the password for ToolBox App to write this device.

5.3.1 Thermostat Settings

WT201 provides detailed settings to achieve the temperature control via the algorithm developed by Milesight. Before configuration, ensure the corresponding wires are connected, and correct wires are selected in the Installation Settings.

Temperature Control Mode Enable

Heat, EM Heat, Cool, Auto ▼

Temperature Control Mode

Auto ▼

Target Temperature Mode

Single Target Temperature ▼

Target Temperature Resolution

0.5 ▼

Target Temperature(℃)

23

Target Temperature Tolerance(℃)

1

Temperature Control Tolerance(℃)

2

Target Temperature Regulation
Range(℃)

10   –   35

Target Humidity Range(%)

40   –   80

Temp. Control and Dehumidify ⬤

Temp. Tolerance for   ⓘ
Dehumidification(℃)

Fan Mode

Auto

Fan Delay ⓘ

The Duration of Delay(s)

60

Regulate Humidity ⓘ

Regulate Interval(min/h)

30

Parameters	Description
Temperature Control Mode Enable	Select the control mode range for the button, ToolBox or downlink command to switches. These mode options are supported according to connected and selected wires.
Temperature Control Mode	Select the current mode from the control mode range, this mode can also be switched by button or downlink command. The working condition of every mode depends on the target temperature and tolerance settings of below parameters.
Target Temperature Mode	When Temperature Control Mode is Auto, set the target temperature mode. **Single Target Temperature:** Heat and Cool modes use the same target temperature and tolerance. **Dual Target Temperature:** Heat and Cool modes use different target temperatures and tolerances.
Target Temperature Resolution	Set the resolution of target temperature displayed on the screen and configuration page.
Target Temperature	Set target environment temperature. Under Dual Target Temperature mode, it requires to set cool and heat target temperatures. About the setting rule please refer to configuration examples below.
Target Temperature Tolerance	Set the tolerance value between target temperature and current temperature.

	Under Dual Target Temperature mode, it requires to set cool and heat target temperature tolerances.
Temperature Control Tolerance	When temperature control mode is Auto and under Single Target Temperature mode, set the tolerance value between target temperature range and current temperature.
Target Temperature Regulation Range	Set the range for buttons to adjust the target temperature. Range: 5-35°C (41-95°F) **Note:** the maximum range value should be larger than the minimum range value.
Target Humidity Range	Set target environment humidity range.
Temp. Control and Dehumidify	When reaching the target temperature range but not reaching the target humidity range, the device will keep cooling or heating to dehumidify.
Temp. Tolerance for Dehumidification	When reaching this tolerance over target temperature range, the device will stop heating or cooling even it is not reaching the target humidity range.
Fan Mode	Select from Auto, On and Circulate. Fan mode is only supported when G wire is connected and can also be switched by button or downlink commands. **Auto:** open when the system is cooling or heating. **On:** the fan is normally open. **Circulate:** open the fan to circulate when the system stops working. This mode supports to set the operation time hourly.
Fan Delay	Enable to delay the close of fan after the heating or cooling control stops. **The Duration of Delay:** Set the duration of the fan's deferred closing after the heating or cooling control stops.
Regulate Humidity	This feature supports to work with dehumidifier or humidifier. When not reaching target humidity range, the device will turn on the fan for some times. This feature only works when fan mode is Auto. **Regulate Interval (min/h):** set the interval to turn on the fan per hour.

Configuration Examples:

(1) Temperature control mode is Heat or Cool.

Target temperature (T) = 23,

target temperature tolerance(ΔT)=1,

temp. Tolerance for dehumidification(ΔTd)=1.

The expected start and stop cooling or heating temperature is:

Temperature Control Mode	Start Temperature	Stop Temperature	Stop Temperature (Temp. Control and Dehumidify Enabled)
Heat	22 (T - ΔT)	24 (T + ΔT)	25 (T + ΔT + ΔTd)
Cool	24 (T + ΔT)	22 (T - ΔT)	21 (T - ΔT - ΔTd)

(2) Temperature control mode is Auto (Single Target).

Target temperature(T) = 23,

target temperature tolerance(ΔT)=1,

temperature control tolerance(ΔTa)=2,

temp. Tolerance for dehumidification(ΔTd)=1.

The expected start and stop cooling or heating temperature is:

Mode	Start Temperature	Stop Temperature	Stop Temperature (Temp. Control and Dehumidify Enabled)
Heat	20 (T- ΔT - ΔTa)	24 (T + ΔT)	25 (T + ΔT + ΔTd)
Cool	26 (T + ΔT + ΔTa)	22 (T - ΔT)	21 (T - ΔT - ΔTd)

(3) Temperature control mode is Auto (Dual Target).

Cool target temperature(Tac) = 23,

cool target temperature tolerance (ΔTac)=1,

heat target temperature(Tah) = 19,

heat target temperature tolerance (ΔTah)=2,

temp. Tolerance for dehumidification(ΔTd)=1.

The expected start and stop cooling or heating temperature is:

Mode	Start Temperature	Stop Temperature	Stop Temperature (Temp. Control and Dehumidify Enabled)
Heat	17 (Tah - ΔTah)	21 (Tah + ΔTah)	22 (Tah + ΔTah + ΔTd)
Cool	24 (Tac + ΔTac)	22 (Tac - ΔTac)	21 (Tac - ΔTac - ΔTd)

Note: the heat start temperature should be less than the cool stop temperatures; the heat stop temperatures should be less than the cool start temperature.

5.3.2 Remote Control Settings

WT201 supports to receive downlink commands to control the relay outputs directly to achieve the temperature control. This permission mode is applicable to users which have its own

temperature control programs. Under this permission, the screen will only show temperature, humidity, time, child lock, and network status.

Parameters	Description
Room Card Settings	Enable or disable the DI control feature.
Control Objects	When a room key card switch is connected to DI and GND of WT201, set the triggering action when DI and GND is closed or open. Default: insert card (DI and GND closed) - system on, remove card (DI and GND open) - system off

5.4 Installation Settings

Note: Below settings only take effect when <u>control permission</u> is Thermostat.
If it is the first time configuration, please click the boxes of wires to complete the wiring settings according to your installation. About the wiring description please refer to <u>Wiring Description</u>.

Parameters	Wire	Description

Power Settings	/	Select RC Only or RC & RH. This setting should be the same as the DIP switch setting on the WT201 device.
Reversing Valve	O/B	Switch the O/B mode of a heat pump or PTAC. Energize on Cool: cooling when O/B is closed Energize on Heat: heating when O/B is closed
Heating System	W1/W2/AUX/E + G	Select a furnace or boiler.
Fan Control during Heating		Select a thermostat or furnace/boiler to control the fan during heat.
Auxiliary Heating Duration	AUX	When current temperature does not reach the target temperature even heating for auxiliary heating duration, report an Auxiliary Heating Timeout Alarm packet and switch back to lower stage heating mode.
Compressor and Auxiliary Heat Linkage	Y1/Y2+O/B +AUX	When the highest heating level of compressor (Y) is not able to reach the target temperature, open the AUX heat.
Emergency Heating Duration	E	When the emergency heating time reaches this duration, report an Emergency Heating Timeout Alarm packet and switch back to Heat mode.
Freeze Protection		When current temperature is lower than the protection temperature, switch control mode to EM Heat to adjust to protection temperature, then change back to the original control mode. If the control system is off, this feature will turn on the system EM Heat mode temporarily and only System On/Off button can work.
System Protection	Y1/Y2/W1/ W2/AUX/E/ G	Only when the minimum running duration passes, the heating or cooling system can start or stop working. **Note:** 1) The minimum running duration will not take effect when switching between Y1 and Y2, or GH and GL. 2) The minimum running duration will not take effect when the system on/off or any schedule executes.
Room Card Settings	DI	When a key card switch is connected to DI and GND of WT201, set the triggering action when DI and GND is closed or open. The detailed settings can be changed via downlink

		commands.
		Default:
		System On/Off: insert card (DI and GND closed) - system on, remove card (DI and GND open) - system off;
		Insert an Event: insert card (DI and GND closed) - Home plan, remove card (DI and GND open) - Away plan.

5.5 Advanced Settings

5.5.1 Calibration Settings

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)	Final Value(°C)
17.6	**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(%)	Final Value(%)
19.5	**37.5**

Calibration Value(%)

18

5.5.2 Threshold Settings

WT201 supports 2 types of temperature threshold alarms:

Temperature threshold: when current temperature is over or below the threshold value, the device will report the threshold alarm packet instantly. Only when the threshold is released and re-triggered, will the device report the alarm again.

Persistent low/high temperature threshold: when current temperature is lower or higher than

the target temperature for difference value and specific duration, the device will report the threshold alarm packet instantly. When the threshold is released, it will also report the alarm release packet.

5.5.3 Schedule Settings
Note: Below settings only take effect when <u>control permission</u> is Thermostat.

WT201 supports to set 7 kinds of schedule plan: Wake, Away, Home, Sleep, Occupied, Unoccupied and ECO.

1. Select the required plan and click **Edit** to configure the temperature mode, fan mode, target temperature and target temperature tolerance, click **Confirm**.

2. Click **Add** to add the time period to execute this schedule plan. Every schedule plan supports to add 16 time periods at most.

Note: if the repeat date is not selected, the schedule plan will only execute once.

3. Click **Write** to save the schedule settings.

5.5.4 Data Storage

WT201 supports storing 1000 data records locally and exporting data via ToolBox. The device will record the data according to the reporting interval even if it is disconnected from the network.

Note: When control permission is set to Remote control, the device will stop storing data.

1. Ensure the device time is correct, go to **Device > Basic Information**, click ↻ to sync the time.
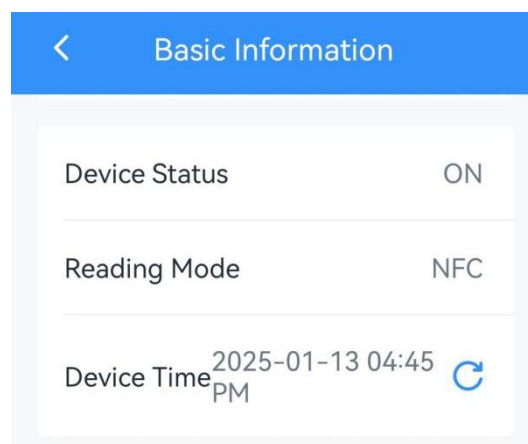
Besides, when device LoRaWAN® version is set as 1.0.3, the device will send MAC commands to ask the network server everytime when it joins the network.

2. Enable the data storage feature.

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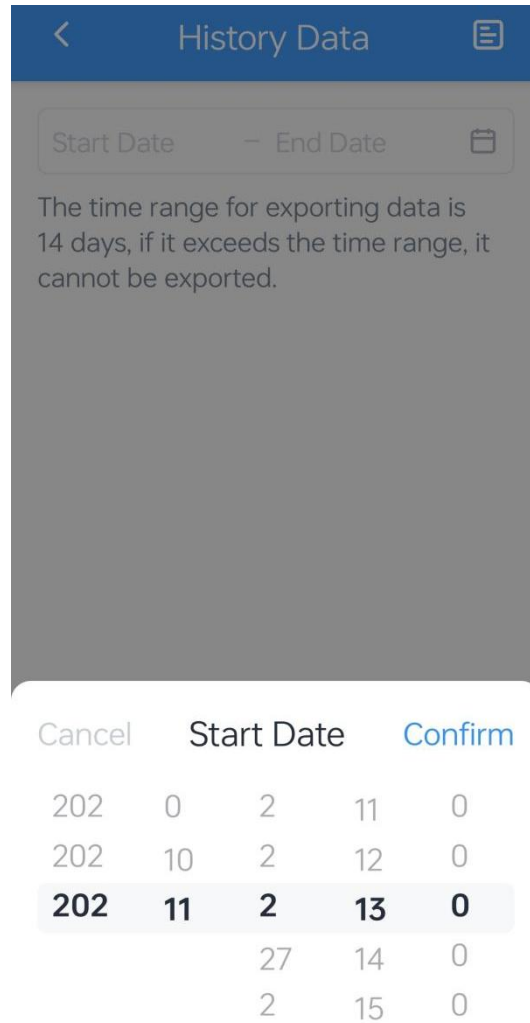
5.5.5 Data Retransmission

WT201 supports data retransmission to ensure that the network server can receive all data even if the network is down for some time. There are two ways to receive the lost data:

- Network server sends downlink commands to enquire the historical data for a specified time range, refer to **WT201 Communication Protocol;**

- When network is down and the device receives no response of LinkCheckReq MAC packets for a period of time, the device will record during the disconnection period and retransmit the lost data after the device is reconnected to the network.

Here are the steps of data retransmission:

1. Enable the data storage feature and data retransmission feature.

2. Enable rejoin mode feature and set the number of packets sent in LoRaWAN® settings. 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 8+1 times, the join status will change to de-active and the device will record a data lost time point (the time it reconnected to the network).
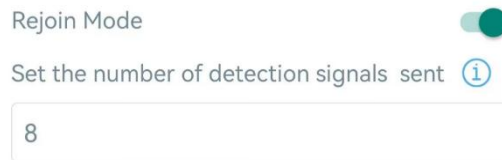
3. After reconnecting to the network, the device will send the lost data from the point of time when the data was lost according to the data re-transmission reporting interval.

Note:

1) If the device is rebooted or re-powered during the data retransmission process, the device will re-send interrupted retransmission data again after the device is reconnected back to the network.

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

3) The retransmission data format starts with "20ce", please refer to **WT201 Communication Protocol.**

5.6 Milesight D2D Settings

Milesight D2D protocol is developed by Milesight and used for connection among Milesight devices without gateway, which is able to reduce the latency and achieve the quick control.

5.6.1 Sensor Data Receive Settings

WT201 supports to receive temperature and humidity sensor data from Milesight sensors directly via Milesight D2D to display on the screen and achieve the accurate temperature control.

Note:

1) **Below settings only take effect when** <u>control permission</u> **is Thermostat.**

2) **It is necessary for Milesight sensors to upgrade to corresponding firmwares to support this feature.**

1. Ensure the RX2 datarate and RX2 frequency in LoRaWAN settings are the same as the data sending devices.

2. Enable **D2D Data Receiving Settings**, and set the D2D key to be the same as data sending devices. (Default D2D Key: 5572404C696E6B4C6F52613230313823)

3. Click **Add**, then attach the smartphone to NFC areas of data sending devices (not WT201) to add the devices. If you require to replace the devices, click **Replace** then attach the smartphone to another data sending device. One WT201 device supports to add 5 devices at most.

4. Click **Write**, then attach the smartphone to WT201 device to save the settings. When the WT201 receives the D2D data from Milesight sensors, it will display the data on the screen and use it for temperature control.

Note:

1) Ensure the Milesight sensors also enable the D2D data sending settings.

2) If a WT201 receives the data from multiple sensors, it will use the average values of multiple sensors.

3) When this feature is enabled, WT201 will use the data from Milesight sensors in priority. If it

does not receive the data for 10 minutes, it will switch to internal sensors. These settings can be changed via downlink commands.

5.6.2 Milesight D2D Controller

WT201 supports to work as Milesight D2D controller device to send commands to trigger D2D agent devices when switching to the preset schedule plan.

Note: Below settings only take effect when <u>control permission</u> is Thermostat.

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.

2. Enable **D2D Controller Settings**, and define a unique D2D key to be the same as D2D agent devices. (Default D2D Key: 5572404C696E6B4C6F52613230313823)

3. Select the required plan to define a 2-byte hexadecimal control command (0x0000 to 0xffff). When the WT201 switches to the schedule, it will send the control command to corresponding D2D agent devices.

Note: If **LoRa Uplink** is enabled, a LoRa Uplink packet that contains the schedule switch status will be sent to the network server after sending the D2D control command packet.

5.6.3 Milesight D2D Agent

WT201 supports to work as the Milesight D2D agent device to receive commands from Milesight D2D controller devices to trigger the system on/off or switch the schedule plans.

1. Ensure the RX2 datarate and RX2 frequency in LoRaWAN settings are the same as the D2D controller devices.

2. Enable **D2D Agent Settings**, and set the D2D key to be the same as the setting in D2D

controller device. (Default D2D Key: 5572404C696E6B4C6F52613230313823)

3. Define a 2-byte hexadecimal control command (0x0000 to 0xffff) and command action. For example, when WT201 receives a control command ff01, it will turn the temperature control system to off; when WT201 receives a control command ff10, it will switch the schedule as Wake. WT201 supports to add 16 control actions at most.

Note: when control permission is set to Remote Control, the action does not support to insert a plan event.

5.7 Maintenance

5.7.1 Backup and Restore

WT201 supports backup templates for easy and quick configuring devices in bulk. The backup

feature is 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.
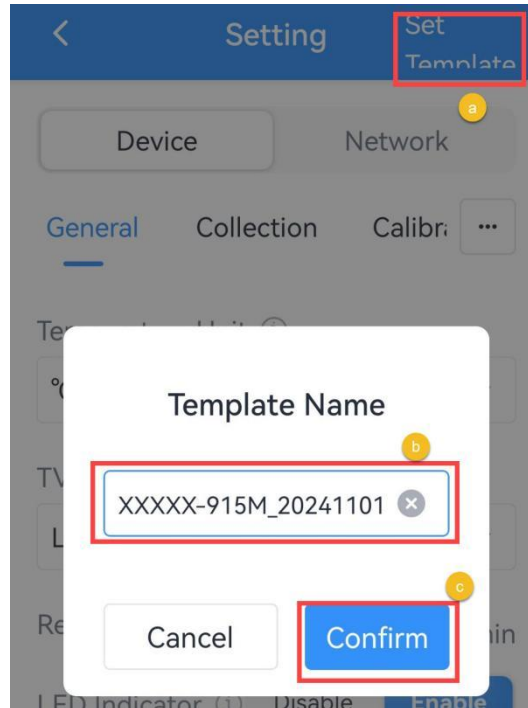
3. Go to **Template** page, select and click the target template, then click **Write** and attach the NFC area of smartphone to the target device to import the configuration.
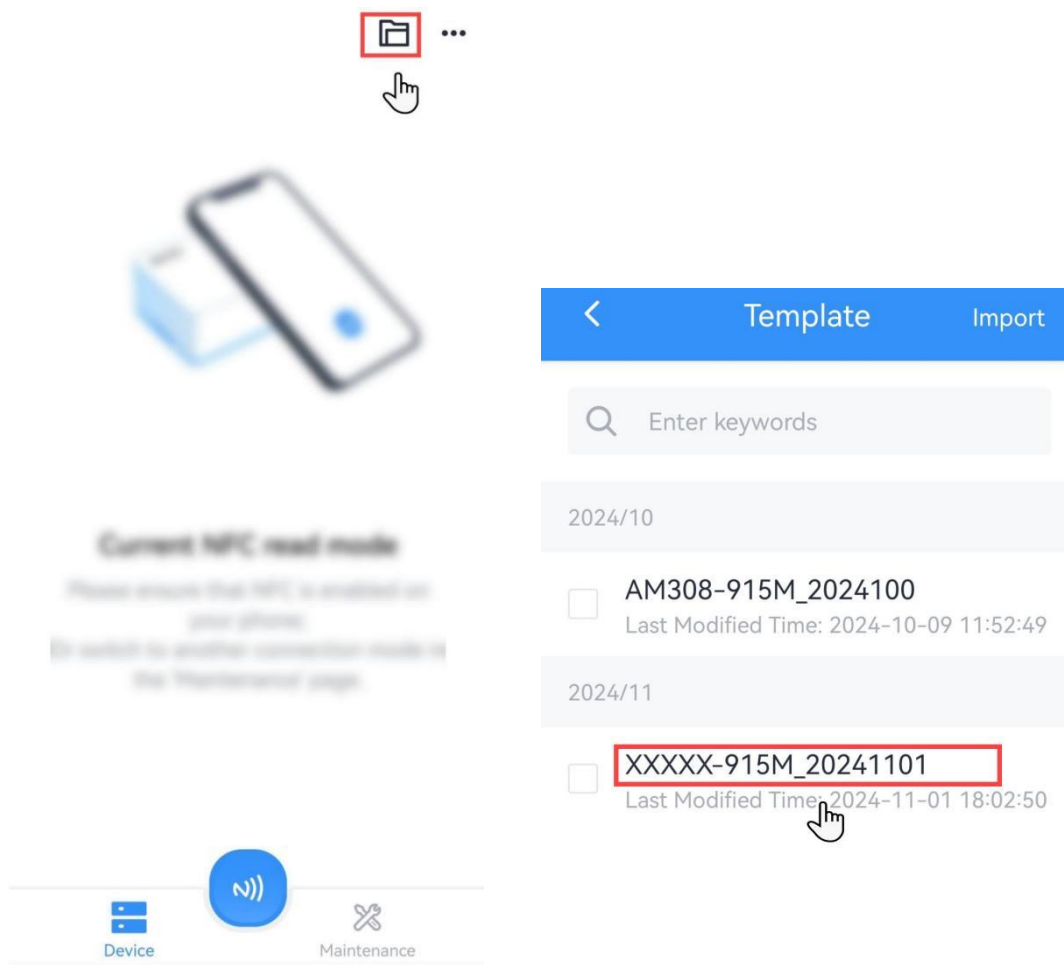
Note: Check the box of target template to delete it, or export this template as JSON format file and save it to the smartphone.
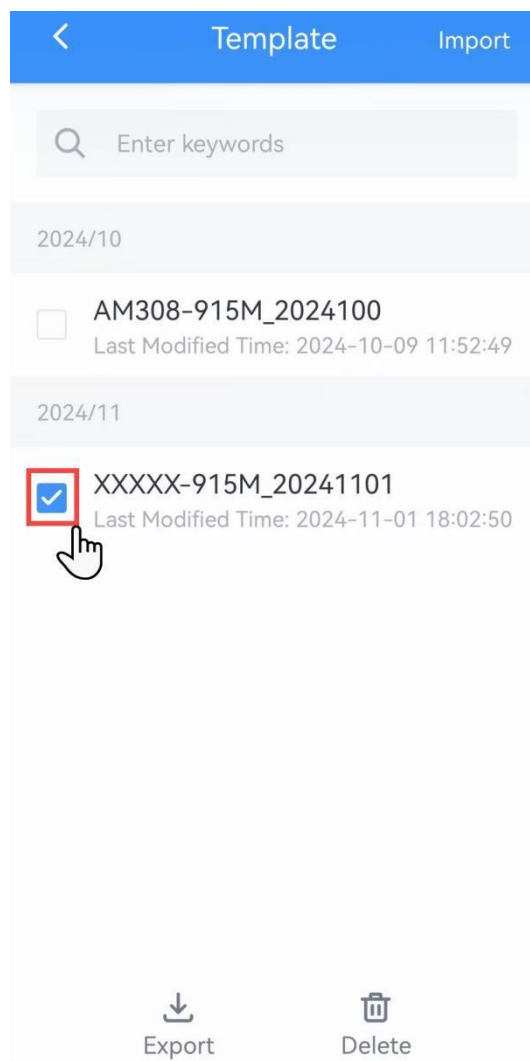
5.7.2 Upgrade

1. Download firmware from the Milesight website to your smartphone or computer.

2. Click **Browse** to import firmware and upgrade the device.

Note: Operation on ToolBox is not supported during the upgrade.
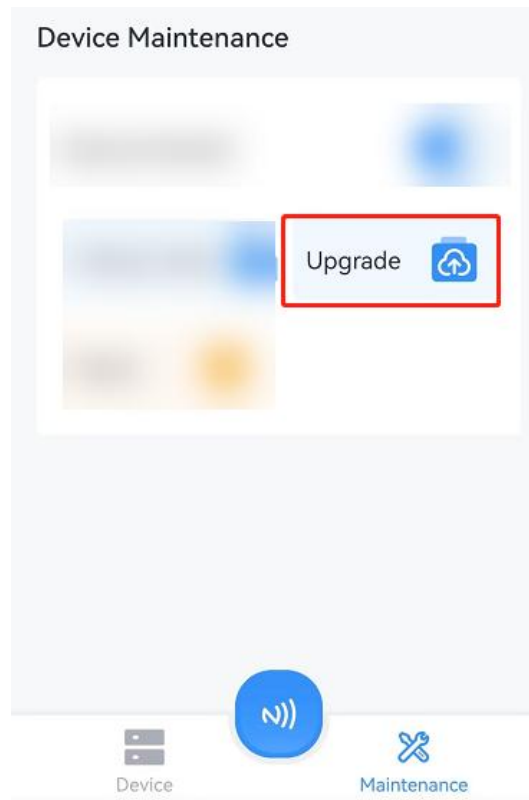
5.7.3 Reboot and Reset

WT201 supports below methods to reboot or reset the device which are as following:

Via Hardware:

Reboot: Press and hold the Button 1: system on/off and Button 5: temperature control mode for more than 3s until the screen blinks slowly to reboot.

Reset: Press and hold the system on/off and temperature control mode button for more than 10s until the screen blinks quickly to reset.

This can be disabled via child lock settings.

Via ToolBox App: Go to **Device > Maintenance** to tap **Reboot** or **Restart**, then attach the smartphone to the device via NFC to complete the operation.
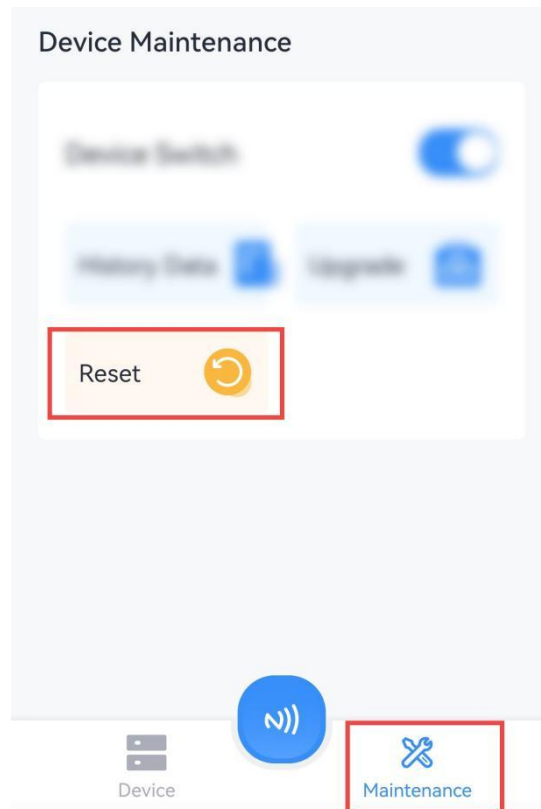
6. Communication Protocol

WT201 uses the standard Milesight IoT payload format based on IPSO. Please refer to the **WT201 Communication Protocol**; for decoder and encoders of Milesight IoT products please click here.

7. BACnet Control Point List

When WT201 is integrated to BACnet system via Milesight gateway or Milesight default decoder and encoder, please refer to below list to read and write BACnet objects.

Note:

1) **The reference parameters points the objects to be written together, otherwise the parameters will be failed to change. When users write multiple reference parameters via Milesight gateway, ensure these values are sent within 60s.**

2) ●=Read only, ●=Read and Write, ●=Write Only.

7.1 Uplink Data

Parameter	LoRa Object	Object Type	Description

Protocol Version	ipso_version	characterString Value	
Hardware Version	hardware_version	characterString Value	
Firmware Version	firmware_version	characterString Value	
TSL Version	tsl_version	characterString Value	
Power On Status	device_status	Binary Input	1: Power on
Class Type	lorawan_class	Multistate Value	1: Class A 2: Class B 3: Class C 4: Class C to B
Device SN	sn	characterString Value	
Reset Event	reset_event	Binary Input	1: Reset
Temperature	temperature	Analog Value	Unit: °C(62)
(Heating) Target Temperature	target_temperature	Analog Value	Unit: °C(62)
Cooling Target Temperature	target_temperature_2	Analog Input	Unit: °C(62)
Humidity	humidity	Analog Value	Unit: %r.h(29)
Temperature Exception	temperature_sensor_status	Multistate Value	1: Read failed 2: Out of range
Humidity Exception	humidity_sensor_status	Multistate Value	1: Read failed 2: Out of range
Temperature Control Mode	temperature_control_mode	Multistate Value	1: Heat 2: Emergency Heat 3: Cool 4: Auto 5: Auto Heat 6: Auto Cool
Temperature Control Status	temperature_control_status	Multistate Value	1: Standby 2:1-stage heat 3: 2-stage heat

			4: 3-stage heat
			5: 4-stage heat
			6: emergency heat
			7: 1-stage cool
			8: 2-stage cool
			9: 5-stage heat
Fan Mode	fan_mode	Multistate Value	1: Auto
			2: Always on
			3: Circulate
			4: Disable
Fan Status	fan_status	Multistate Value	1: Off
			2: High speed
			3: Low speed
			4: On
Schedule Plan	plan_type	Multistate Value	1: Wake
			2: Away
			3: Home
			4: Sleep
			5: Occupied
			6: Unoccupied
			7: ECO
			255: Not executed
System Status	system_status	Binary Value	0: Off, 1: On
Control Permission	control_permission	Multistate Value	1: Thermostat
			2: Remote Control
Temperature Alarm	temperature_alarm	Multistate Value	1: Emergency Heating Timeout Alarm
			2: Auxiliary Heating Timeout Alarm
			3: Persistent Low Temperature Alarm
			4 : Persistent Low Temperature Alarm Release
			5: Persistent High Temperature Alarm
			6: Persistent High Temperature Alarm Release
			7: Freeze Protection Alarm

			8: Freeze Protection Alarm Release 9: Temperature Threshold Alarm 10: Temperature Threshold Alarm Release
Relay Status	wires_relay.y1	Binary Input	0: Off, 1: On
	wires_relay.y2_gl		
	wires_relay.w1		
	wires_relay.w2_aux		
	wires_relay.e		
	wires_relay.g		
	wires_relay.ob		
Supported Temperature Control Mode	temperature_control_support_mode.heat	Binary Input	0: Disable, 1: Enable
	temperature_control_support_mode.cool	Binary Input	0: Disable, 1: Enable
	temperature_control_support_mode.auto	Binary Input	0: Disable, 1: Enable
Supported Temperature Control Status	temperature_control_support_status.stage_1_heat	Binary Input	0: Disable, 1: Enable
	temperature_control_support_status.stage_2_heat	Binary Input	0: Disable, 1: Enable
	temperature_control_support_status.stage_3_heat	Binary Input	0: Disable, 1: Enable
	temperature_control_support_status.stage_4_heat	Binary Input	0: Disable, 1: Enable
	temperature_control_support_status.stage_5_heat	Binary Input	0: Disable, 1: Enable
	temperature_control_support_status.stage	Binary Input	0: Disable, 1: Enable

	_1_cool		
	temperature_control_ support_status.stage _2_cool	Binary Input	0: Disable, 1: Enable

7.2 Downlink Command

Basic Settings

Parameter	LoRa Object	Object Type	Description	Reference
Reboot	reboot	Binary Output	1: reboot	
System Status	system_status	Binary Value	0: Off, 1: On	
Control Permission	control_permission	Multistate Value	1: Thermostat 2: Remote Control	
Enquiry Status	report_status	Multistate Value	1: Plan 2: Periodic Report 3: Target Temperature Range	
Report Interval	report_interval	Analog Value	Unit: min(72)	
Collection Interval	collection_interval	Analog Value	Unit: s(73)	
UTC Time Zone	timezone	Multistate Value	Time zone*60	
Daylight Saving Time	dst_config.enable	Binary Value	0: Disable, 1: Enable	These objects should be written together
	dst_config.offset	Analog Value	Unit: min(72)	
	dst_config.start_month	Multistate Value	1-12	
	dst_config.start_week_num	Analog Value		
	dst_config.start_week_day	Multistate Value	1-7	
	dst_config.start_time	Analog Value	Unit: min(72)	
	dst_config.end_month	Multistate Value	1-12	
	dst_config.end_week_	Analog Value		

	num			
	dst_config.end_week_day	Multistate Value	1-7	
	dst_config.end_time	Analog Value	Unit: min(72)	
Temperature Unit	temperature_unit	Multistate Value	1: °C 2: °F	
Child Lock-System On/Off	child_lock_config.power_button	Binary Value	0: Disable, 1: Enable	These objects should be written together
Child Lock-Temperature +	child_lock_config.up_button	Binary Value	0: Disable, 1: Enable	
Child Lock-Temperature-	child_lock_config.down_button	Binary Value	0: Disable, 1: Enable	
Child Lock-Fan Mode	child_lock_config.fan_button	Binary Value	0: Disable, 1: Enable	
Child Lock-Temperature Control Mode	child_lock_config.mode_button	Binary Value	0: Disable, 1: Enable	
Child Lock-Reset and Reboot	child_lock_config.reset_button	Binary Value	0: Disable, 1: Enable	
Temporary Child Lock Release Time	unlock_config.time	Analog Value	Unit: s(73)	These objects should be written together
Temporary Child Lock Release	unlock_config.power_button	Binary Value	0: Disable, 1: Enable	
	unlock_config.temperature_up_button			
	unlock_config.temperature_down_button			
	unlock_config.fan_mode_button			
	unlock_config.temperature_control_mode_button			
	temperature_control_f			

	orbidden_config.em_heat_enable			
	"temperature_control_forbidden_config.cool_enable			
	temperature_control_forbidden_config.auto_enable			
Screen Display	screen_display_mode	Multistate Value	1: Enable 2: Disable plan display 3: Disable	
Multicast Group Enable	multicast_group_config.group1_enable	Binary Value	0: Disable, 1: Enable	These objects should be written together
	multicast_group_config.group2_enable			
	multicast_group_config.group3_enable			
	multicast_group_config.group4_enable			
D2D Controller	d2d_master_enable	Binary Value	0: Disable, 1: Enable	Both objects should be written together
D2D Agent	d2d_slave_enable	Binary Value	0: Disable, 1: Enable	

Calibration & Threshold Settings

Parameter	LoRa Object	Object Type	Description	Reference
Temperature Calibration	temperature_calibration.enable	Binary Value	0: Disable, 1: Enable	Both objects should be written together
	temperature_calibration.temperature	Analog Value	Unit: °C(62)	
Humidity Calibration	humidity_calibration.enable	Binary Value	0: Disable, 1: Enable	Both objects should be written together
	humidity_calibration.humidity	Analog Value	Unit: %r.h(29)	
Temperature	temperature_alarm	Multistate	1: Threshold	These objects should

Alarm Type	_config.alarm_type	Value	2: Persistent Low 3: Persistent High	be written together
Temperature Alarm Condition	temperature_alarm _config.condition	Multistate Value	1: Disable 2: Below 3: Over 4: Within 5: Below or Over	
Below Threshold/Persistent Low Difference	temperature_alarm _config.min	Analog Value	Unit: °C(62)	
Over Threshold/Persistent High Difference	temperature_alarm _config.max	Analog Value	Unit: °C(62)	
Lock Time	temperature_alarm _config.lock_time	Analog Value	Any value (Invalid)	
Duration	temperature_alarm _config.continue_time	Analog Value	Unit: s(73)	

External Sensor Setting

Parameter	LoRa Object	Object Type	Description	Reference
Sensor Mode	temperature_source_config.source	Multistate Value	1: Internal Sensors 2: From LNS 3: From D2D Device	Both objects should be written together
	temperature_source_config.timeout	Analog Value	Unit: min(72)	
Temperature	temperature	Analog Value	Unit: °C(62)	
Humidity	humidity	Analog Value	Unit: %r.h(29)	
Offline Control Mode	offline_control_mode	Multistate Value	1: Keep (current status) 2: Use internal sensors 3: All off	

Remote Control Settings

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Parameter	LoRa Object	Object Type	Description	Reference
Room Card Setting	card_config.enable	Binary Value	0: Disable, 1: Enable	These objects should be written together
	card_config.action_type	Multistate Value	1: System On/Off	
	card_config.in_plan_type	Multistate Value	Any Value (Invalid)	
	card_config.out_plan_type			
	card_config.invert	Binary Value	0: DI Low=Insert 1: DI High=Insert	
Wire Relay Y1	wires_relay_config.y1	Binary Value	0: Disable, 1: Enable	These objects should be written together
Wire Relay Y2/GL	wires_relay_config.y2_gl	Binary Value	0: Disable, 1: Enable	
Wire Relay W2	wires_relay_config.w1	Binary Value	0: Disable, 1: Enable	
Wire Relay AUX	wires_relay_config.w2_aux	Binary Value	0: Disable, 1: Enable	
Wire Relay E	wires_relay_config.e	Binary Value	0: Disable, 1: Enable	
Wire Relay G	wires_relay_config.g	Binary Value	0: Disable, 1: Enable	
Wire Relay OB	wires_relay_config.ob	Binary Value	0: Disable, 1: Enable	
Offline Control Mode	offline_control_mode	Multistate Value	1: Keep (current status) 2: Thermostat control 3: All off	

Thermostat Settings

Parameter	LoRa Object	Object Type	Description	Reference
Temperature Control Mode Enable	temperature_control_forbidden_config.heat_enable	Binary Value	0: Disable, 1: Enable	These objects should be written together

	temperature_control _forbidden_config.e m_heat_enable			
	"temperature_contr ol_forbidden_config. cool_enable			
	temperature_control _forbidden_config.a uto_enable			
Temperature Control Mode	temperature_control _mode	Multistate Value	1: Heat 2: Emergency Heat 3: Cool 4: Auto 5: Auto Heat 6: Auto Cool	
Target Temperature Mode	target_temperature_ dual_enable	Binary Value	0: Single Target 1: Dual Target	
Target Temperature	target_temperature	Analog Value	Unit: °C(62)	temperature_control_ mode
Target Temperature Resolution	target_temperature_ resolution	Multistate Value	1: 0.5 2: 1	
Target Temperature Tolerance	temperature_toleran ce.target_temperatu re_tolerance	Analog Value	Unit: °C(62)	Both objects should be written together
Temperature Control Tolerance	temperature_toleran ce.auto_temperatu re_tolerance	Analog Value	Unit: °C(62)	
Dual Target Temperature Heat Tolerance	dual_temperature_t olerance.heat_tolera nce	Analog Value	Unit: °C(62)	Both objects should be written together
Dual Target Temperature Cool Tolerance	dual_temperature_t olerance.cool_tolera nce	Analog Value	Unit: °C(62)	

Target Temperature Regulation Range	target_temperature_range_config.temperature_control_mode	Multistate Value	1: Heat 2: Emergency Heat 3: Cool 4: Auto	These objects should be written together
	target_temperature_range_config.min	Analog Value	Unit: °C(62)	
	target_temperature_range_config.max	Analog Value	Unit: °C(62)	
Target Humidity Range	humidity_range.min	Analog Value	Unit: %r.h(29)	Both objects should be written together
	humidity_range.max	Analog Value	Unit: %r.h(29)	
Temperature Control and Dehumidify	temperature_dehumidify.enable	Binary Value	0: Disable, 1: Enable	Both objects should be written together
	temperature_dehumidify.temperature_tolerance	Analog Value	Unit: °C(62)	
Fan Mode	fan_mode	Multistate Value	1: Auto 2: Always on 3: Circulate	
Fan Delay Enable	fan_delay_config.enable	Binary Value	0: Disable, 1: Enable	Both objects should be written together
Fan Delay Duration	fan_delay_config.delay_time	Analog Value	Unit: s(73)	
Fan Circulate Operation Time	fan_execute_time	Analog Value	Unit: min(72)	
Fan Regulate Humidity Enable	fan_dehumidify.enable	Binary Value	0: Disable, 1: Enable	Both objects should be written together
Fan Regulate Humidity Interval	fan_dehumidify.execute_time	Analog Value	Unit: min(72)	
Cool/Heat High Level Switch	temperature_level_up_condition.type	Multistate Value	1: Heat 2: Cool	These objects should be written together
	temperature_level_up_condition.time	Analog Value	Unit: min(72)	
	temperature_level_up_condition.temper	Analog Value	Unit: °C(62)	

Parameter	LoRa Object	Object Type	Description	Reference
	ature_control_tolerance			
Set Forward	temperature_up_down_enable.forward_enable	Binary Value	0: Disable, 1: Enable	Both objects should be written together
Set Backward	temperature_up_down_enable.backward_enable	Binary Value	0: Disable, 1: Enable	
Setback/Setforward Threshold	temperature_level_up_down_delta.delta_1	Analog Value	Unit: °C(62)	Both objects should be written together
	temperature_level_up_down_delta.delta_2	Analog Value	Unit: °C(62)	
Switch Schedule Plan	plan_type	Multistate Value	1: Wake 2: Away 3: Home 4: Sleep 5: Occupied 6: Unoccupied 7: ECO	

Installation Settings

Parameter	LoRa Object	Object Type	Description	Reference
Wire Settings	wires.y1	Binary Value	0: Disable, 1: Enable	These objects should be written together
	wires.gh			
	wires.ob			
	wires.w1			
	wires.e			
	wires.di			
	wires.pek			
	wires.aux			

	wires.y2			
	wires.gl			
Reversing Valve	ob_mode	Multistate Value	1: O/B on cool 2: O/B on heat 3: keep original setting	
Freeze Protection Enable	freeze_protection_ config.enable	Binary Value	0: Disable, 1: Enable	Both objects should be written together
Freeze Protection Temperature	freeze_protection_ config.temperature	Analog Value	Unit: °C(62)	
Compressor and Auxiliary Heat Linkage	compressor_aux_c ombine_enable	Binary Value	0: Disable, 1: Enable	
System Protection	system_protect_co nfig.enable	Binary Value	0: Disable, 1: Enable	Both objects should be written together
	system_protect_co nfig.duration	Analog Value	Unit: min(72)	
Fan Control During Heating	fan_control_during _heating	Multistate Value	1: Furnace or Boiler 2: Thermostat	
Room Card Setting	card_config.enable	Binary Value	0: Disable, 1: Enable	These objects should be written together
	card_config.action_ type	Multistate Value	1: System On/Off 2: Insert Event	
	card_config.in_plan _type	Multistate Value	1: Wake 2: Away 3: Home 4: Sleep 5: Occupied 6: Unoccupied 7: ECO	
	card_config.out_pl an_type			
	card_config.invert	Binary Value	0: DI Low=Insert 1: DI High=Insert	
Relay Change Report	wires_relay_change _report_enable	Binary Value	0: Disable, 1: Enable	

Y2 Auxiliary Mode	aux_control_config. y2_enable	Binary Value	0: Disable, 1: Enable	Both objects should be written together
W2 Auxiliary Mode	aux_control_config. w2_enable	Binary Value	0: Disable, 1: Enable	

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