

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 will not should responsibility 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.



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Revision History

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Date	Doc Version	Description
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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 4.2" LCD screen and embedded temperature sensor, the WT201 continuously displays the room status while monitoring the ambient temperature. It also accomodatas 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 IoT Cloud solution, users can control the room temperature as well as triggering other sensors or appliances easily via webpage or mobile App remotely and D2D protocol.

1.2 Key Features

- Support most 24VAC HVAC system, including furnaces and air conditioners (2H/2C), heat pumps (4H/2C + 1 stage AUX heat), boilers, and PTAC
- Support intuitive 4.2-inch display, allowing for showing temperature 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 4 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 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

- Equipped with NFC for one-touch configuration
- Function well with standard LoRaWAN[®] gateways and network servers
- Supports Milesight D2D protocol to enable ultra-low latency control without gateway
- Supports multicast for control in bulk

2. Hardware Introduction

2.1 Packing List



1 × WT201 Device



1 × Wiring Backplate



1 × Fixing Screw

Δ



1 × Thermostat Wire Label Sticker



1 × Decorative

Cover Plate



2 × Wall





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





Screen Descriptions:

lcon	Description
Child Lock	Display only when all buttons are locked
(î-	Blinks: the network is de-activated
LoRaWAN [®] Network Status	Static On: the network is activated

2.4 Dimensions (mm)





3. Wiring Diagrams

3.1 Wiring Descriptions

Wire	Description
CL	Live line out of room card switch
CN	Neutral line of room card switch
RC	Power of cooling system and heating system(24VAC)
RH	Power of heating system(24VAC)
W1	Heating/The first stage of heating.
W2/AUX	The second stage of heating/Auxiliary heating
E	Emergency heating used on very cold days
V1	The first stage of cooling on cooling system or compressor on heat pump
T I	system
	Y2: The second stage of cooling on cooling system or compressor on heat
Y2/GL	pump system
	GL: control fan to low speed for PTAC
	G: control fan
G/GH	GH: control fan to high speed for PTAC
С	Common of 24VAC power. It also might be labelled as X or B wire.
PEK	Connect Power Extender Kit when there is no C wire.
O/B	Switch between heating and cooling on heat pump system.

3.2 Wiring Examples

1. Furnace + Air Conditioner



If there is no C wire, it is necessary to add a Power Extension Kit.



2. Furnace (2-stage) + Air Conditioner (2-stage)

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If there is no C wire, it is necessary to add a Power Extension Kit.



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3. Heat Pump with Auxiliary Heat

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If there is no C wire, it is necessary to add a Power Extension Kit.



4. Boiler + Air Conditioner

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5. PTAC



4. Installation

Installation Locations

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.



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 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.

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4. Remove the mounting plate of old thermostat. When removing, ensure 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 by old thermostat, and to reduce the airflow from the hole that will affect temperature measurement.



6. Press 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.



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7. Hold on the tabs to insert the wires into the holes of the corresponding terminals on the wirng backplate until they are firmly in place. Gently tug the wires to ensure they are securely connected. If you need to release the wires again, hold down the terminal tabs.

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



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 both parts are securely fixed.



11. Turn on the systems to check if WT201 device is on. Configure the device and ensure 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 or Type-C port. Please select one of them to complete the configuration.

5.1.1 NFC Configuration

1. Download and install the Milesight ToolBox App from Google Play or Apple App Store.

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

3. Attach the NFC area of a smartphone to the device, and 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 the 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.

5.1.2 USB Configuration

1. Download ToolBox software from Milesight's official website.

2. Remove the WT201 device from the backplate, connect the device to a computer via the Type-C port.



3. Open the ToolBox and select type as "General", then click password to log into the ToolBox. (Default password: **123456**)

FoolBox Settings		×
Туре	General	<u> </u>
Serial port	COM4	<u>•</u>
Login password		
Baud rate	115200	<u> </u>
Data bits	8	-
Parity bits	None	<u>-</u>
Stop bits	1	•
Save	Can	cel

4. After logging into the ToolBox, you can check device status and change device settings.

	Model:	WT201-915M
Status	Serial Number:	6715D32404360003
	Device EUI:	24e124715d324043
	Firmware Version:	01.01-r1
((0))	Hardware Version:	1.0
LoRaWAN Settings	Join Status:	De-Activate
	Device Status:	On
	RSSI/SNR:	0/0
~~	Device Time:	2023-10-13 17:10:57 Sync
{Q}	Temperature Control Status:	Standby
Device Settings	Fan Status:	High Speed
	Temperature:	27.3°C
	Channel Mask:	mmmmmm
Ŷ	Uplink Frame-counter:	0
Maintenance	Downlink Frame-counter:	0

5.2 Installation Settings

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 section 3.1.

÷	Installatio	n Sett	
Wiring Se	ttings		
¥1	G(GH)	O/B	W1
E	CL&CN	PEK	
W2	AUX	Y2	GL
Please confirm	n G wiring		
Power Se	ettings (1)		
RC Only	<i>'</i>		•
Compres	sor Protectio	on (i)	

Parameters	Description
Dower Cottingo	Select RC Only or RC & RH. This setting should be the same as DIP
Power Settings	switch setting on the WT201 device.
Reversing Valve	Switch the O/B mode of heat pump or PTAC. This can also be changed

	via downlink command.
Heating System	Select furnace or boiler.
Fan Control during Heating	Select thermostat or furnace/boiler.
Auxiliary Heating Duration	When current temperature does not reach target temperature for auxiliary heating duration, report an Auxiliary Heating Timeout Alarm packet and switch back to lower stage heating mode.
Emergency Heating Duration	When emergency heating time reaches this duration, report an Emergency Heating Timeout Alarm packet and switch back to Heat mode.
Freeze Protection	When the device detects the temperature is lower than the protection temperature, switch control mode to EM Heat to adjust to protection temperature, then change back to 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.
Compressor Protection	Only when the minimum running duration passes, the compressor can start or stop working.
Room Card Settings	When a key card switch is connected to CL and CN of WT201, set the triggering action when a room card is inserted.

5.3 LoRaWAN® Settings

5.3.1 Basic Settings

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

Device EUI			
24E124791D196040			
* APP EUI			
24e124c0002a0001			
* Application Port	_	85	+
Join Type			
ABP			•
* Network Session Key			
*****	*****		
* Application Session Key			
*****	*****		

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.	
Join Type	OTAA and ABP modes are available.	
Appkey for OTAA mode, the default is		
Network Session	Nwkskey for ARP mode the default is	
Кеу	5572404C696E6B4C6F52613230313823.	
Application	Appskey for ABP mode, the default is	
Session Key	5572404C696E6B4C6F52613230313823.	
Device Address	DevAddr for ABP mode, the default is the 5th to 12th digits of the SN.	
LoRaWAN [®] Version	V1.0.2 and V1.0.3 are available.	
Work Mode	It's fixed as Class C.	
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	
Confirmed Mode	If the device does not receive an ACK packet from the network server, it will resend data once.	
Rejoin Mode	Reporting interval \leq 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.
Sat the number of	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.
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.

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 IoT cloud to manage devices.
- 4) Only OTAA mode supports rejoin mode.

5.3.2 Frequency Settings

Select supported frequency and channels to send uplinks. Make sure the channels match the LoRaWAN[®] gateway.



If device frequency is one of AU915/US915, you can enter the index of the channel that you want to enable in the input box, making them separated by commas.

Examples:

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- 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 Frequence	CY	
US915		•
Enable Channel Ind	ex (i)	
0-71		
Index	Frequency/MHz	<u>(</u>)
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	

5.3.3 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 bulks.

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

Multicast Group1	
Multicast Address (1)	
1111111	
McNetSKey	

McAppSKey	

Multicast Group2	
Multicast Group3	
Multicast Group4	

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

Status	General	Applications	Profiles	Device	Multicast Groups	Gateway Fleet	Packets	
Packet Forwarder	Multicast Gro	ups						
Network Server	Add						Search	Q
Notice A		Multicast Address		Group Name		Number of Devices	Ope	ration
Network				No	matching records found			

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

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(Group Name						Room Control		
1	Multicast Addr	ess					1111111		
1	Multicast Netv	vork Session H	Key				5572404C696E6B4C6F	526132	
1	Multicast Appl	ication Sessio	n Key				5572404C696E6B4C6F	526132	
(Class Type						Class C	~	
(Datarate						DR8(SF12, 500kHz)	~	
I	Frequency						923300000		Hz
ł	Frame-counte	r					0		
	Selected Dev	ices							
	WT201 ×	WT201_2 ×							
General	Applications	Payload Codec	Profiles	Device	Multicast Groups	Gateway Fleet	Packets		
Multicast Gr Add	oups							Search	Q
	Multicast Ad	ldress		Group Nar	me	N	umber of Devices	Operat	ion
	111111	1		Room Cont	trol		2	2	K

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.

seneral	Applications	Payload Codec	Profiles	Device	Multicast Groups	Gateway Fleet	Packets			
end Data To	Device									
	Device EUI		Туре			Payload		Port	Confirmed	
				12						-
000000	000000000		ASCII	~				85		Send
000000	000000000		ASCII	~				85		Send
000000	Multicast Group		ASCII	~		Payload		85 Port		Send

5.4 General Settings

Reporting Interval		_	10	+ min
Temperature Unit				
°C				-
Sustan On 10ff				
System On/Oπ	ol Mod	0		
Heat	011100	C		•
- No I				
Fan Mode				
Circulate				•
Operation Time			30	+ min/h
Target Temperature	9			
28				°C
Target Temperature	e Tolera	ince		
1				°C
Target Temperature	e Regul	ation	Range	9
10 °C	-	28		°C
Button Lock				
SYSTEM ON/OFF, R	RESET			~
Time Mode				
12-Hour Clock				•
Time Zone				
UTC (WET: Weste	rn Eurc	pean	Time,	·· · ·
Daylight Saving Tir	ne			
Start Time	Mar. 2	nd Su	n. 12:	00am 🕓
End Time	Nov. 1	st Moi	n. 12:	00AM 🕓
DST Bias (1)		-	60	+ min
Data Storage 🧻				
Data Retransmissic	on (1)			
Change Password				

Parameters	Description
Poporting 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.
	Turn on or off the temperature control system, it can also be controlled
System On/Off	by button. When the system is off, the screen will only show current
	temperature.
	Select from Auto, Cool or Heat or EM (emergency) Heat. This mode can
	also be switched by button. These options only display when
	corresponding wires are connected and selected.
	Cool: start working when current temperature > (target temperature +
Temperature Control	target temperature tolerance).
Mode	Heat: start working when current temperature < (target temperature -
Wode	target temperature tolerance).
	Auto: start cooling when current temperature > (target temperature +
	target temperature tolerance + temperature control tolerance); start
	heating when current temperature < (target temperature - target
	temperature tolerance - temperature control tolerance).
	Select from Auto, On or Circulate. This mode is only supported when G
	wire is connected and can also be switched by button.
	Auto: open when the system is cooling or heating. This mode supports
Ean Modo	to set the duration of delay to open the fan after the system stops
Fair Mode	working.
	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 of per hour.
Target Temperature	Set target environment temperature.
Target Temperature	Set the tolerance value between target temperature and current
Tolerance	temperature.
Temperature Control	When temperature control mode is Auto, set the tolerance value
Tolerance	between target temperature range and current temperature.
Target Temperature	Set the range for buttons to adjust the target temperature. Max range:
Regulation Range	16 - 35 °C (60 - 95 °F), min range: 5 - 15 °C(41 - 59 °F).

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	Enable to lock the button features. After enabled, the device can only
	control these features via ToolBox App or ToolBox software or
	downlink commands.
Child Locks	System On/Off Temperature +/- Temperature +/-
	Temperature Control Mode Reset
Time Mode	Set the time display mode as 24-Hour Clock or 12-Hour Clock.
	Set the time zone to display on the screen. When you click Sync button
Time Zone	of ToolBox App or ToolBox software to sync time, the device will also
	sync the time zone from smartphone or computer automatically.
	Enable or disable Daylight Saving Time (DST).
Doulight Coving Times	Start Time: the start time of DST time range.
Daylight Saving Time	End Time: the end time of DST time range.
	DST Bias: the DST time will be faster according to this bias setting.
	Disable or enable data storage locally. (see section $5.5.4$ to export
Data Storage	data)
Data Retransmission	Disable or enable data retransmission. (see section $5.5.5$)
	Change the password for ToolBox App to write this device or ToolBox
Change Password	software to login the device.

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	•
Numerical Calibration	
Current Value: 25.7 °C	
Calibration Value	
0.0	°C
Final Value: 25.7 °C	

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 once instantly. Only when the threshold is released and re-triggered, the device will report the alarm again.

Persistent low/high temperature threshold: when current temperature is lower or higher than target temperature for difference value and specific duration, the device will report the threshold alarm packet once. When the threshold is released, it will also report the alarm release packet.

Temperature			
Over / °C			
Below / °C			
Devoictont low town or	41.150		
Persistent low tempera	ture		
Difference in Temperat	ure / °C		
Duration	_	0	+ min
Persistent high temper	ature		
Difference in Temperat	ure / °C		
Duration	-	0	+ min

5.5.3 Schedule Settings

WT201 supports to set 4 kinds of schedule: Wake, Away, Home and Sleep.

1. Click **Edit** to set the target temperature range of every schedule, then add the time period to execute this schedule. Every schedule supports to add 16 time periods at most.

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

Schedule Select Schedule
^
tings Edit
5 ± 2 °C
figuration 1/16
M Every Mon. Tue.
New
~
\vee
~
Save Schedule
Clear All

3. Click **Save Schedule** to export above settings as a schedule file. And click **Select Schedule** to import the schedule file to another device.

5.5.4 Data Storage

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

1. Sync the device time via ToolBox App. Besides, the device can also ask for the time from network server when setting LoRaWAN[®] version as 1.0.3.

Status		Maintenance
Hardware Vers	ion	V1.0
Device Status		ON
Join Status		Activated
Reading Mode		NFC
RSSI/SNR		-52/10
Device Time	2023-09-07 06:07	1 Sync
Current Tempe	erature	25.7 °C

2. Enable the data storage feature.

Data Storage (
Data Retransmission	í	

3. Click **Export**, then select the data time range to export data. The maximum export data period on ToolBox App is 14 days.

Status	Setting	Maintenance
папиаг оруг	auc	
	Browse	
Restore Fact	ory Default	
	Reset	
	Reboot	
Export Histo	rical Data	
	Export	

L

Upgrade	Backup and Reset	
Config Backup	Export	
Config File		Browse Import
oport Historical Data	Export	

5.5.5 Data Retransmission

WT201 supports data retransmission to ensure 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 section <u>6.4</u>;
- When network is down and receive no response from LinkCheckReq MAC packets for a period of time, the device will record the time of disconnection and retransmit the lost data after the device is reconnected to the network.

Here are the steps of data retransmission:

1. Enable data storage feature and data retransmission feature.



2. Enable rejoin mode feature and set the number of packets sent in LoRaWAN settings. Take below as an example, the device will send LinkCheckReq MAC packets to the network server regularly to check for 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).

Rejoin Mode	
Set the number of detection signals sent	<u>(</u>)
8	

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 section <u>6.4</u>.

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

5.6 Milesight D2D Settings

Milesight D2D protocol is developed by Milesight and used for connection among Milesight devices without gateway. When D2D setting is enabled, WT201 can work as the Milesight D2D agent device to receive commands from Milesight D2D controller devices or work as Milesight D2D controller devices to send commands to trigger D2D agent devices.

5.6.1 Milesight D2D Controller

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 any of button 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.

D2D Key	

D2D Controller Settings	
Wake	
Control command	
ff01	
LoRa Uplink (i)	
Away	
Home	
Sleep	

5.6.2 Milesight D2D Agent

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

2. Enable D2D Agent Settings, and define a unique 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 ff10, it will turn the temperature control system to on; when WT201 receives a control command ff02, it will switch the schedule as Wake. WT201 supports at most 16 control commands.

ff10		
Action Object		\bigotimes
System Status	•	0
Action Status		
On	-	
Control command 2		
Control command 2		
ff02		
ff02 Action Object		\otimes
ff02 Action Object Insert an Event	•	×
ff02 Action Object Insert an Event Action Status	·	×

5.7 Maintenance

5.7.1 Backup

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. Go to **Template** page on the App and save the current settings as a template. The saved templates are also editable.



2. Select one saved template and click **Write**, then attach the smartphone to another device via NFC to reuse the template.



Note: Slide the template item to the left to edit or delete the template. Click the template to edit the configurations.

	Template			
			Q	
2-	EM500-UDL-868M_2020 Last Modified Time: 2020-11-24 17	1124		
2-	EM300-TH-915M_20210112 Last Modified Time: 2021-01-12 14:35:12			
2-	UC512-DI-868M_202101 Last Modified Time: 2021-01-28 16	28		
>	UC501-470M_20210201 Last Modified Time: 2021-02-01 11	:29:43		
VI_202 1e: 2021	2 10208 -02-08 16:44:37	Edit	Delete	

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:

- 1) Operation on ToolBox is not supported during the upgrade.
- 2) Only the Android version of ToolBox App supports the upgrade feature.

	Status	Setting	Maintenance	
	SN	6715	032404360003	_
	Model		WT201-915M	
	Firmware Versi	on	V1.1-r1	
	Hardware Versi	ion	V1.0	
	Manual Upgrad	е		
		Browse		
Maintenance >				
Upgrade	Backup and Reset	E .		
Model:	WT201-915M	U		
Firmware Version				
	n: 01.01-r1			
Hardware Version	n: 01.01-r1 n: 1.0			
Hardware Version Domain:	n: 01.01-r1 n: 1.0 Beijing Serve	er 🔽		
Hardware Version Domain: FOTA:	n: 01.01-r1 n: 1.0 Beijing Serve Up to	er 🔽		

5.7.3 Reboot and Reset

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

Via Hardware: Press and hold the system on/off and temperature control mode button for more than 3s until the screen blinks slowly to reboot, press and hold the system on/off and temperature control mode button for more than 10s until the screen blinks quickly to reset. Button reset feature can be disabled via child lock settings.

Via ToolBox App: Go to Device > Maintenance to tap Reboot or Reset, then attach the smartphone to the device via NFC to complete the operation.



Via ToolBox software: Go to Maintenance > Backup and Reset to click Reboot or Reset.

Mai	ntenance >			Reboot
	Upgrade	Backup and Reset		
	Config Backup	Export		
	Config File		Browse	
	Export Historical Data	Export		
	Historical data clearing	Clear		
	Restore Factory Defaults	Reset		

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

	Export Historical Data	
	Export	
	Export Record	
	Data Cleaning	
Maintenance >		
Upgrade	Backup and Reset	
Config Backup	Export	
Config File		Browse
Export Historical Data	Export	
	Clar	

6. Device Payload

All the data is based on the following format (HEX), the Data field should follow the 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 the files on https://github.com/Milesight-IoT/SensorDecoders.

6.1 Basic Information

WT201 reports basic information whenever joining the network.

Channel	Туре	Description
	0b (Power On)	Device is on
ff	01(Protocol Version)	01=>V1
	16 (Device SN)	16 digits

09 (Hardware Version)	01 40 => V1.4	
0a (Software Version)	01 14 => V1.14	
Of (Device Type)	00: Class A, 01: Class B, 02: Class C	

ff0bff ff0101 ff166791d19604050005 ff090100 ff0a0101 ff0f02							
Channel	Туре	Value	Channel	Туре	Value		
ff	0b	ff	ff	01	01		
	(Power On)	(Reserved)	11	(Protocol Version)	(V1)		
Channel	Туре	Value	Channel	Туре	Value		
ff	16	6791d19604050	ff	09	0100		
11	(Device SN)	005	11	(Hardware Version)	(V1.0)		
Channel	Туре	Value	Channel	Туре	Value		
ff	0a (Software Version)	0101 (V1.1)	ff	Of (Device Type)	02 (Class C)		

6.2 Sensor Data

Item	Channel	Туре	Description
Current Temperature	03	67	INT16, Unit: °C, Resolution: 0.1 °C
Target Temperature	04	67	INT16, Unit: °C, Resolution: 0.1 °C
Temperature Control Mode and Status	05	e7	1 Byte, Bit 7-4: Current control status, 0000=Standby, 0001=1-stage heat, 0010=2-stage heat, 0011=3-stage heat, 0100=4-stage heat, 0101=emergency heat, 0110=1-stage cool, 0111=2-stage cool Bit 3-2: 00 Bit 1-0: Current control mode, 00=Heat 01=FM Heat 10=Cool 11=Auto
Fan Mode and Status	06	e8	1 Byte, Bit7-4: 0000 Bit 3-2: Current fan status, 00=Off, 01=High (Speed), 10=Low(Speed), 11=On Bit1-0: Current fan mode, 00=Auto, 01=On, 10=Circulate

			1 Byte,
Plan Event	07	bc	00=Not executed, 01=Wake, 02=Away,
			03=Home, 04=Sleep
Temperature Control	00	0	00 Output Off 01 Output Or
System Status	08	8e	00=System Off, 01=System On
			3 Bytes,
			Byte 1-2: Temperature, INT16, Unit: °C,
			Resolution: 0.1 °C
			Byte 3: Alarm Type
		67	01-Emergency Heating Timeout Alarm
			02-Auxiliary Heating Timeout Alarm
	83		03 -Persistent Low Temperature Alarm
			04 -Persistent Low Temperature Alarm
Temperature Alarm			Release
			05 -Persistent High Temperature Alarm
			06 -Persistent High Temperature Alarm
			Release
			07 -Freeze Protection Alarm
			08 -Freeze Protection Alarm Release
			09 -Threshold Alarm
			0a -Threshold Alarm Release

1. Periodic packet when system is on: report as reporting interval (10 minutes by default) or when the target temperature, temperature control mode or fan mode changes.

03671101 0467fa00 05e772 06e806 07bc00							
Channel	Туре	Value	Channel	Туре	Value		
		Current Temp:			Target Temp: fa		
03	67	11 01=>01 11	04	67	00=>00 fa=250		
		=273*0.1=27.3°C			*0.1=25°C		
Channel	Туре	Value	Channel	Туре	Value		
05	e7	72=>0111 0010 Bit 7-4: 0111=2-stage cool Bit 1-0: 10=Cool	06	e8	06=> 0000 0110 Bit 3-2: 01=High Bit 1-0: 10=Circulate		
Channel	Туре	Value					
07	bc	00=Not executed					

2. Periodic packet when system is off: report as reporting interval (10 minutes by default).

03671401			
Channel Type Value			
03	67	Temp: 14 01=>01 14=276*0.1=27.6°C	

3. Temperature control system status packet: report immediately when system turns on or off.

088e00				
Channel Type Value				
08	8e	00=System off		

4. Temperature alarm or alarm release packet: report according to alarm settings.

8367140109				
Channel Type Value				
02	(7	Temp: 14 01=>01 14=276*0.1=27.6°C		
03	07	Alarm type: temperature threshold alarm		

6.3 Downlink Commands

WT201 supports downlink commands to configure the device. The application port is 85 by default.

Basic Settings:

Channel	Туре	Description
	10 (Reboot)	ff
	28 (Get Current Data)	ff
		3 Bytes,
	8e (Reporting Interval)	Byte 1: 00
		Byte 2-3: Interval time, unit: min
		2 Bytes,
	b7 (Temperature Control Mode)	Byte 1: 00=Heat, 01=EM Heat, 02=Cool, 03=
ff		Auto
		Byte 2: Target temperature, unit: °C
		2 Bytes, unit: °C
	b8 (Temperature Tolerance)	Byte 1: Target temperature tolerance*10,
		Byte 2: Temperature control tolerance*10
	b6 (Fan Mode)	1 Byte, 00=Auto, 01=On, 02=Circulate
		2 Bytes,
	25 (Child Lock)	Byte 1: ff

	Byte 2: 0=disable, 1=enable.		
	Bit Option		
	0 System on/off		
	1 Temperature +		
	2 Temperature -		
	3 Fan mode		
	4 Temperature control mode		
	5 Reset		
	6-7 00		
bd (Time Zone)	2 Bytes, UTC timezone * 60		
	10 Bytes,		
	Byte 1: 00-disable, 01-enable		
	Byte 2: DST bias, unit: min		
	Byte 3-6: Start time, Month (1B)+Week (1B		
ba (Davlight Saving Time)	+ Hours of a Day (2B)		
su (Buyingine ouving Time)	Week:		
	Bit7-4 Bit3-0		
	1: Monday, 2:		
	1: 1 st , 2: 2 nd , Tuesday,7: Sunday		
	Byte 7-10: End time		
68 (Data Storage)	00: disable, 01: enable		
69 (Data Retransmission)	00: disable, 01: enable		
, ,,	3 Bytes		
6a (Data Retransmission	Byte 1: 00		
Interval)	Byte 1.00		
interval)	byte 2-3. Interval time, unit. s		
	range: 30~1200s (600s by default)		
	1 Byte,		
	Bit 7-4: multicast group 4 to 1 change		
	status, 0 = not allow control, 1 = allow		
	control.		
8∠ (Multicast group)	Bit 3-0: multicast group 4 to 1 control		
	status, 0 for disable, 1 for enable.		
	Note: after disabling or enabling, the device		
	will re-join the network.		
c2 (Switch Schedule Plan)	00-Wake, 01-Away, 02-Home, 03-Sleep		

1. Reboot the device.

ff10ff			
Channel	Туре	Value	
ff	10 (Reboot)	ff	

2. Set reporting interval as 2 minutes.

ff8e 00 0200			
Channel	Туре	Value	
ff	8e (Reporting Interval)	02 00=>00 02=>2 mins	

3. Set temperature control mode as Cool and target temperature as 27°C.

ffb7021b			
Channel	Туре	Value	
ff	B7 (Temperature Control Mode)	02=Cool, 1b=>27 °C	

4. Set time zone.

ffbdc0fd		
Channel Type Value		
<i>ff</i>	hd	c0 fd => fd c0 = -240/60=-4
	bu	the time zone is UTC-4

5. Set DST time: start time is October 1st Sunday 2:00, end time is April 1st Sunday 2:00, bias is 1h (60 minutes).

ffba 01 3c 0a177800 04177800			
Channel	Туре	Value	
	ba	01=enable	
		DST bias: 3c=>60 mins	
ff		Start time: 0a=>10=October, 17=>1 st (1) Sunday(7), 78	
11		00 =>00 78=120 hours=2:00	
		End time: 04=>April, 17=>1 st (1) Sunday(7), 78 00 =>00	
		78=120 hours=2:00	

6. Set multicast group 1 as disable.

ff8210			
Channel Type Value			
ff	82 (Multicast group)	10=>0001 0000	
		Bit4=1=>group1, bit 0=0=>disable	

Advanced Settings:

1. Installation Settings:

These commands only take effect when corresponding wires are connected and selected.

Channel	Туре	Description			
	b5 (Reversing Valve)	00	00=0/B on cool, 01=0/B on heat		
			3 Bytes,		
		Ву	Byte 1: 00-disable, 01-enable		
	bu (Freeze Protection)	Ву	/te 2-3: P	rotection temperature*10,	
		ur	nit: °C		
		4	Bytes,		
		Ву	/te 1: 00-	disable, 01-enable	
	c1 (Room Card Setting)	Ву	/te 2: 00=	-System on/off, 01=Insert an	
		event			
		Byte 3: 0=disable, 1=enable			
TT I		Corresponding event of every bit:			
			Bit	Event	
			0	Insert card- Wake	
			1	Insert card- Away	
			2	Insert card- Home	
			3	Insert card- Sleep	
			4	Remove card- Wake	
			5	Remove card- Away	
			6	Remove card- Home	
			7	Remove card- Sleep	
		Ву	/te 4: 00-	Low level=insert card, 01-High	
		le	vel=inser	t card	

1) Enable freeze protection and set as 5°C.

	ffb0 01 3200			
Channel	Туре	Value		
ff	ah (Tamparatura Calibratian)	01=Enable		
11	ab (Temperature Calibration)	32 00=>00 32=50*0.1=5 °C		

2. Calibration and Threshold Settings:

Channel	Туре	Description
ff	ab (Temperature Calibration)	3 Bytes,
		Byte 1: 00-disable, 01-enable
		Byte 2-3: calibration value*10, unit: °C
	06 (Threshold Alarm)	9 Bytes,
		Temperature threshold:

CTRL(1B)+Min(2B)+Max(2B)+
0000000(4B)
CTRL: 00=disable, 01=below (minimum
threshold), 02=over (maximum threshold),
03=within, 04=below or over
Persistent low temperature threshold:
09+Difference value(2B)+0000+
Duration(2B), duration unit: s
Persistent high temperature threshold:
120000+Difference value(2B)+
Duration(2B), duration unit: s

2) Enable temperature and set calibration value.

ffab01fdff			
Channel Type Value			
"	ab (Temperature Calibration)	01=Enable	
11		fdff=>fffd=-3*0.1=-0.3 °C	

3) Enable threshold alarm and set the below threshold value as 10°C.

ff06 01 6400 00000000000			
Channel Type Value		Value	
ff	06(Set Threshold Alarm)	CTRL: 01=below	
		Threshold: 64 00=>00 64=100*0.1=10 °C	

4) Enable persistent high temperature threshold difference as 1°C and duration is 10 minutes.

ff06120000 0a00 0000 5802			
Channel Type Value			
ft	OC (Cat Thus shald Alarma)	Difference: 0a 00=>00 0a=10*0.1=1°C	
11		Duration: 58 02=> 02 58=600s=10 mins	

3. Milesight D2D Settings:

Channel	Туре	Description
		8 Bytes,
		Byte 1: 00-Wake, 01-Away, 02-Home, 03-Sleep
ff	96 (D2D Controller)	Byte 2: 00-disable, 01-enable
		Byte 3: 00-disable LoRa Uplink, 01-enable LoRa
		Uplink

Byte 4-5: D2D control command Byte 6-8: 000000 8 Bytes, Byte 1: Command ID, 0~15 Byte 2: 00-disable, 01-enable Byte 3-4: D2D control command Byte 5: control action, 00=System off, 01=System					
Byte 6-8: 000000 8 Bytes, Byte 1: Command ID, 0~15 Byte 2: 00-disable, 01-enable Byte 3-4: D2D control command Byte 5: control action, 00=System off, 01=System			Byte 4-5: D2D control command		
8 Bytes, Byte 1: Command ID, 0~15 Byte 2: 00-disable, 01-enable Byte 3-4: D2D control command Byte 5: control action, 00=System off, 01=System			Byte 6-8: 000000		
Byte 1: Command ID, 0~15 Byte 2: 00-disable, 01-enable Byte 3-4: D2D control command Byte 5: control action, 00=System off, 01=System			8 Bytes,		
83 (D2D Agent) Byte 2: 00-disable, 01-enable Byte 3-4: D2D control command Byte 5: control action, 00=System off, 01=System		83 (D2D Agent)	Byte 1: Command ID, 0~15		
Byte 3-4: D2D control command Byte 5: control action, 00=System off, 01=System			Byte 2: 00-disable, 01-enable		
Byte 5: control action, 00=System off, 01=System			Byte 3-4: D2D control command		
			Byte 5: control action, 00=System off, 01=System		
on, 10=Wake, 11=Away, 12=Home, 13=Sleep			on, 10=Wake, 11=Away, 12=Home, 13=Sleep		

1) D2D Controller

ff96 03 01 01 04e0 000000					
Channel Type Value					
		03=> Sleep, 01=> Enable;			
ff	96 (D2D Controller)	01=>Enable LoRa Uplink;			
		04 e0=>e0 04, Control Command is e004;			

2) D2D Agent

ff83 03 01 04e0 01				
Channel	Туре	Value		
ff	83 (D2D Agent)	03=> Sleep, 01=> Enable;		
		01=>Enable LoRa Uplink;		
		04 e0=>e0 04, Control Command is e004;		

4. Use External Temperature Sensor

WT201 supports to disable internal temperature sensor and use external temperature sensor data via downlink commands.

Channel	Туре	Description
		2 Bytes,
		Byte 1: 00-disable, 01-enable
ff	c4 (External Temperature	Byte 2: timeout, unit: min
	Sensor)	Note: when the device does not receive the
		temperature for timeout, it will stop working
		to control the temperature.
		3 Bytes,
03	-	Byte 1-2: Temperature*10, unit: °C
		Byte 3: 00

Enable external temperature sensor and set the timeout as 60 minutes.

ffc4013c				
Channel Type Value				
ff	c4 (External Temperature	01=Enable		
	Sensor)	3c=> 60 minutes		

Receive external temperature sensor data.

03640000			
Channel Value			
ff	64 00=>00 64=100 * 0.1=10 °C		

6.4 Historical Data Enquiry

WT201 support sending downlink commands to enquire historical data for specified time point or time range. Before that, ensure the device time is correct and data storage feature was enabled to store the data.

Command format:

Channel	Туре	Description	
fd	6b (Enquire data in time point)	4 Bytes, Unix timestamp	
		Start time (4 bytes) + End time (4 bytes),	
fd	6c (Enquire data in time range)	Unix timestamp	
fd	6d (Stop query data report)	ff	
ff 6a		3 Bytes,	
	6a (Report Interval)	Byte 1: 01	
		Byte 2: interval time, unit: s,	
		range: 30~1200s (60s by default)	

Reply format:

Channel	Type Description	
		00: data enquiry success
fc	6b/6c	01: time point or time range invalid
		02: no data in this time or time range
20	ce (Historical Data)	Data time stamp (4 Bytes) + Data Contents (4 Bytes)

Data Content Format:

Bit	15-5	4	3	2	1	0
	(Current	System	Fan s	status,	Fan mod	e, 00=Auto,

	temperature+1	on=1, 00=Off, 01=High,		01=On, 10=Circulat		
	00)*10, unit: °C	off=0	10=Lov	v, 11=On		
Bit	15-5	4	3	2	1	0
	(Target temperature+1 00)*10, unit: °C	c 000=St heat, 01 100 101= 110	ontrol stati andby, 001 010=2-stag 1=3-stage I 0=4-stage I eemergency 0=1-stage 0	us, =1-stage ge heat, neat, neat, y heat, cool,	Temp. Cc 00=Heat, (10=Coo	ontrol mode, 01=EM Heat, I, 11= Auto
		11	1=2-stage	cool		

Note:

1. The device only uploads no more than 300 data records per range enquiry.

2. When enquiring the data in time point, it will upload the data which is closest to the search point within the reporting interval range. For example, if the device reporting interval is 10 minutes and users send command to search for 17:00's data, if the device find there is data stored in 17:00, it will upload this data; if not, it will search for data between 16:50 to 17:10 and upload the data which is closest to 17:00.

Example:

1. Enquire historical data between 2023/10/16 16:30:00 to 2023/10/16 16:40:00.

	fd6c 88f42c65 e0f62c65				
Channel Type Value					
		Start time: 88f42c65 => 652cf488 =			
fd	6c (Enquire data in time range)	1697445000 =2023/10/16 16:30:00			
IU		End time: e0f62c65 => 652cf6e0 =			
		1697445600 =2023/10/16 16:40:00			

Reply:

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

20ce e0f62c65 969f 1ea0					
Channel	Туре	Time Stamp	Value		
20	ce (Historical Data)	e0f62c65 =>	969f=>9f96 => 10011111100 1 01 10		
		652cf6e0=2023/1	Current temperature:		
		0/16 16:40:00	10011111100=>1276/10-100=27.6°		

	С
	System: 1=On
	Fan Status: 01=High
	Fan Mode: 10=Circulate
	1ea0=>a01e=> 1010000000 111 10
	Target Temperature:
	1010000000=> 1280/10-100=28°C
	Control Status: 111=2-stage cooling
	Temp. Control Mode: 10=Cool

-END-