

Wireless Thermostat

WT401

Payload Protocol (HEX)

Contents

Chapter 1. Preface **3**

Chapter 2. Overview **4**

Chapter 3. Uplink Data **5**

Chapter 4. Downlink Commands **10**

Downlink Commands for Network Parameters 10

Downlink Commands for Temperature Control Parameters 12

Downlink Commands for Auxiliary Features 17

Chapter 5. Services **22**

Chapter 1. Preface

Readers

This guide introduces the raw HEX payload protocol used to communicate with the device when communication mode includes **LoRa**. It is intended for developers or users who integrate the device without Milesight gateways or codecs.

This document does not describe physical installation and configuration steps in detail. Please use it together with the related documents.

Related Document

Document	Description
WT401 User Guide	Provides introductions, compatibility check, installation and configuration steps.
WT401 BACnet Object List	Lists the BACnet objects exposed through a Milesight gateway with the BACnet feature enabled.
WT401 Payload Protocol (JSON)	Provides the decoded JSON format for uplink data and downlink commands when using the codec provided by Milesight.

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Revision History

Release Date	Version	Revision Content
Nov. 24, 2026	V1.0	Initial version.

Chapter 2. Overview

All messages follow the following format (HEX), the Parameter/Data field must follow **little-endian** byte order:

Command ID	Parameter/Data	...
N Bytes	0-N Byte	...

For decoder and encoder examples, please find files on https://github.com/Milesight-IoT/SensorDecoders. For details of uplink reports and downlink commands please refer to the sections below.

Chapter 3. Uplink Data

This chapter describes the reported data of the device.

Basic Information Packet

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

Item	Byte	Command	Description
Device Status	c8	1	00: Off, 01: On
TSL Version	df	2	Example: 01 02 = V1.2
Device Request	ee	0	Send after reset
Device Version	da	8	Hardware version (2B) + Software version (2B) + 00000000
OEM ID	d9	2	4 digits
Device Type	cf00	1	00: Class A, 01: Class B, 02: Class C, 03: Class C to B
Serial Number	db	8	16 digits

Example:

df0100 ee db6409f23258520003 da0102010100000000 d90000 c801 cf0000	
Command	**Value**
df	TSL Version: 0100=>V1.0
ee	Reset
db	SN: 6409f23258520003
da	Hardware version: 0102=V1.2 Software version: 0101=V1.1
d9	OEM ID: 0000
c8	01: Device is On
cf00	00: Class A

Periodic Data Report

The device will report a data report at a configured reporting interval. The report content depends on the periodic report mode.

Item	Byte	Command	Description
Status			
Battery Level	1+1	00	UINT8, Unit: % **Note:** This only report when the device is powered by batteries.
Temperature	1+2	01	INT16/100, Unit: °C
Humidity	1+2	02	UINT16/10, Unit: %RH
Occupancy Status	1+1	08	00=Vacant, 01=Occupied, 02=Night Occupied **Note:** This only report when Occupancy Detection is enabled.
Configuration			
Temperature Control Mode	1+1	03	00=Heat, 01=EM Heat, 02=Cool, 03=Auto, 04=Dehumidification, 05=Ventilation
Fan Mode	1+1	04	00=Auto, 01=Circulate, 02=On, 03=Low, 04=Medium, 05=High
Execution Plan	1+1	05	Plan ID, Range: 00-07 (ff=Not executed)
Target Temperature (Single Target Mode)	1+2	06	INT16/100, Unit: °C
Heat Target Temperature (Dual Target Mode)	1+2	06	INT16/100, Unit: °C

Item	Byte	Command	Description
Cool Target Temperature (Dual Target Mode)	1+2	07	INT16/100, Unit: °C
System Status	1+1	67	00=Off, 01=On

Example when the periodic report mode is Only Status:

006401860a02ef010801	
Command	**Value**
00	Battery: 64=>100%
01	Temperature: 86 0a => 0a 86=2694/100=26.94°C
02	Humidity: ef 01 => 01 ef=495/10=49.5% RH
08	Occupancy status: 01=Occupied

Status Change Report

The device reports a packet when a parameter or status is changed.

1. Configuration Change Report

   A configuration change report is sent when system status, target temperature, temperature control mode, fan mode or temperature control schedule ID changes.

Item	Byte	Command	Description
Temperature Control Mode	1+1	03	00=Heat, 01=EM Heat, 02=Cool, 03=Auto, 04=Dehumidification, 05=Ventilation
Fan Mode	1+1	04	00=Auto, 01=Circulate, 02=On, 03=Low, 04=Medium, 05=High
Execution Plan	1+1	05	Plan ID, Range: 00-07 (ff=Not executed)
Target Temperature (Single Target Mode)	1+2	06	INT16/100, Unit: °C
	1+2	06	INT16/100, Unit: °C

Item	Byte	Command	Description
Heat Target Temperature (Dual Target Mode)			
Cool Target Temperature (Dual Target Mode)	1+2	07	INT16/100, Unit: °C
System Status	1+1	67	00=Off, 01=On
Trigger Source	1+1	13	00=Non-button trigger, 01=Button trigger

Example:

1301670103030 62e09040005ff	
Command	**Value**
13	Trigger Source: 01=Button trigger
67	System Status: 01=On
03	Temperature Control Mode: 03=Auto
06	Target Temperature: 2e 09 => 09 2e =2350/100=23.5°C
04	Fan Mode: 00=Auto
05	Execution Plan: ff=Not executed

2. Bluetooth Status Packet.

When communication mode is **BLE + LoRa**, a Bluetooth status packet will be reported once after the device joins the network or when Bluetooth pairing status changes.

Byte	Command	Description
1+10	ba	**Byte 1**: 00 **Byte 2**: 00=Not paired, 01=Paired, 02=Disconnected **Byte 3-10**: Paired device EUI

Example:

ba000224e124826068b876	
Command	**Value**
ba	02=Disconnected Paired device EUI: 24e124826068b876

Alarm Report

The device supports various types of alarm reports.

Item	Byte	Command	Description
Temperature Alarm	1+1	0b	00=Collection error, 01=Under-range, 02=Over-range, 03=No data
Humidity Alarm	1+1	0c	00=Collection error, 01=Under-range, 02=Over-range, 03=No data
Button Event Report	1+1	0d	00=Button 1, 01=Button 2, 02=Button 3
Battery Alarm	1+1	0f	00=Normal, 01=Low battery voltage

Example:

1. Battery alarm

0f01	
Command	**Value**
0f	01=Low battery voltage

2. Button 1 event report

0d00	
Command	**Value**
0d	00=Button 1

Chapter 4. Downlink Commands

Downlink commands can be used for remote control of device through a network server. The downlink port (application port) is 85 by default and can be configured through ToolBox.

If you need to query the configurations first, please send a query command in the following format:

Command (1B)	Command ID Length (1B)	Command ID (1-N Byte)
ef	Query command ID length in bytes	Query command ID

If the device receives a downlink command requiring confirmation, it will send a reply packet in the following format:

Command (1B)	Result & Length (1B)	Command ID (1-N Byte)	...
ef	Bit 7-4: result code, 0=success, 5=parameter error, 7=execute error, 10=association error Bit 3-0: command length	Same as downlink command	...

For details of downlink commands please refer to the sections below.

Downlink Commands for Network Parameters

This section describes the downlink commands for network settings.

Configure Communication Parameters

Command description:

Item	Byte	Command	Value	Example
Communication Mode	1+1	8d	00=BLE, 01=LoRa, 02=BLE+LoRa	Set BLE Mode: **8d00**
LoRa Reporting Interval	1+4	61	**Byte 1-2**: 0101=LoRa, 0201=BLE+LoRa **Byte 3-4**: Interval time, range: 1-1440, unit: minute	LoRa Mode Reporting interval is 10 minutes: **6101010a00**

Item	Byte	Command	Value	Example
Periodic Report Mode	1+1	95	00=Only status (Default), 01=Only configuration, 02=Status + Configuration	Report configuration: **9501**
BLE Transfer Interval	1+4	6c	**Byte 1-2**: 0001=BLE, 0201=BLE+LoRa **Byte 3-4**: Interval time, range: 1-30, unit: minute	BLE + LoRa mode transfer interval is 10 minutes: **6c02010a00**
Reset Bluetooth Name	2	b400	-	-
Cancel Bluetooth Pairing	2	b401	-	-
Trigger Bluetooth Pairing	2	b402	Pair the device with the best signal	-
Bluetooth Name (First 8B)	2+8	cd05	ASCii to Hex strings (8B)	Name is `Room1`: **cd0552 6f6f6d31000000**
Bluetooth Name (Last 5B)	2+5	cd06	ASCii to Hex strings (5B)	

Rejoin the Network

Command description:

Item	Byte	Command	Value
Rejoin the Network	1	b6	-

Configure Milesight D2D Parameters

Command description:

Item	Byte	Command	Value	Example
D2D Data Transmission	2+1	9800	00=Disable (Default), 01=Enable	Enable: **980001**
LoRa Uplink	2+1	9801	00=Disable (Default), 01=Enable	Enable: **980101**

Item	Byte	Command	Value	Example
Transmission Data	2+2	9802	Per bit 0=Disable, 1=Enable, all enable=ffff • Bit 0: Temperature • Bit 1: Humidity • Bit 2: Occupancy Status • Bit 3: System On/Off • Bit 4: Temperature Control Mode • Bit 5: Fan Mode • Bit 6: Target Temperature • Bit 7: Schedule Type (ID)	Enable sending temperature and humidity: **98020300**

Downlink Commands for Temperature Control Parameters

This section describes the downlink commands for temperature control related parameters.

Configure Data Source

Command description:

Item	Byte	Command	Value	Example
Collect Interval	1+3	60	**Byte 1**: 00 **Byte 2-3**: Interval time, range: 1-3600, unit: s, default: 60	Collect interval is 300s: **60002c01**
Data Source	1+1	7d	00=Embedded (Default), 01=LoRa	Data source is LoRa: **7d01**
Data Timeout	1+1	7e	The timeout required to switch back to the embedded data source when no data is received from the LoRa data source.	Data timeout is 30 minutes: **7e1e**

Item	Byte	Command	Value	Example
			UINT8, unit: minute, range: 1-60, default: 10	
External Temperature	1+2	86	INT16/100, Unit: °C, Range: -20 ~ 60	Temperature is 20.5°C: **860208**
External Humidity	1+2	87	UINT16/10, Unit: %RH, Range: 0-100	Humidity is 47.3%RH: **87d901**

Configure Temperature Control System Parameters

Note:
When the thermostat is paired with or connected to the Milesight controller, the supported options depend on the controller and it is suggested to send downlink commands to the controller directly.

Command description:

Item	Byte	Command	Value	Example
System On/Off	1+1	67	00=Off, 01=On	System On: **6701**
Temperature Control Mode Enable	1+1	64	For every bit: 0=Disable, 1=Enable • Bit 0: Heat • Bit 1: EM Heat • Bit 2: Cool • Bit 3: Auto • Bit 4: Dehumidification • Bit 5: Ventilation	Enable Auto and Heat mode: **6409**
Temperature Control Mode	2+1	6800	00=Heat, 01=EM Heat, 02=Cool, 03=Auto, 04=Dehumidification, 05=Ventilation	Temperature control mode is Heat: **680000**
Target Temperature Mode	1+1	65	00=Single Target Temperature, 01=Dual Target Temperature	Dual target temperature mode: **6501**

Item	Byte	Command	Value	Example
Target Temperature Resolution	1+1	66	00=0.5, 01=1	Target temperature resolution is 0.5: **6600**
Target Temperature	1+3	69	**Byte 1**: 00=Heat, 01=EM Heat, 02=Cool, 03=Auto, 04=Auto-Heat, 05=Auto-Cool **Byte 2-3**: target temperature, INT16/100, Unit: °C, Range: 5~35	Heat target temperature is 20 °C: **6900d007**
Deadband	1+2	6a	INT16/100, Unit: °C, Range: 1-10, Default: 5	Deadband is 3°C: **6a2c01**
Target Temperature Regulation Range	1+5	6b	**Byte 1**: 00=Heat, 01=EM Heat, 02=Cool, 03=Auto **Byte 2-3**: Min. Range, INT16/100, Unit: °C, Range: 5~35 **Byte 4-5**: Max. Range, INT16/100, Unit: °C, Range: 5~35	Heat target temperature regulation range is 10.5 - 28.5°C: **6b001a04220b**
Fan Mode Enable	1+1	88	For every bit: 0=Disable, 1=Enable • Bit 0: Auto • Bit 1: Circulate • Bit 2: On • Bit 3: Low • Bit 4: Medium • Bit 5: High **Note:** When On is enabled, Low/Medium/High must be disabled; vice versa.	Enable Auto, Circulate and On modes: **8807**
Fan Mode	1+1	74	00=Auto, 01=Circulate, 02=On, 03=Low, 04=Medium, 05=High	Fan mode is Auto: **7400**

Configure Occupancy Detection Parameters

Command description:

Item	Byte	Command	Value	Example
Occupancy Detection	2+1	8201	00=Disable, 01=Enable (default)	Disable occupancy detection: **820100**
Occupied to Vacant Delay	2+2	8202	UINT16, Unit: minute, Range: 1 ~ 360, Default: 30	Delay time is 15 minutes: **82020f00**
Energy-saving Setting	2+1	8301	00=Disable, 01=Enable (default)	Disable energy-saving setting: **830100**
Occupied/Vacant Execution	2+2	8302	**Byte 1**: Occupied Execution Plan ID, Range: 0-7, ff=None **Byte 2**: Vacant Execution Plan ID, Range: 0-7, ff=None	Occupied execution plan is Occupied (0), Vacant execution plan is Unoccupied (1): **83020001**
Night Setting	2+1	8401	00=Disable (default), 01=Enable	Enable night setting: **840101**
Night Setting Time	2+4	8404	**Byte 1-2**: Start Time, Unit: min, Range: 0-1439 **Byte 3-4**: End Time, Unit: min, Range: 0-1439	Night time is 0:00 to 7:00: **84040000a401**
Night Occupied Execution	2+1	8405	Plan ID, Range: 0-7, ff=None	Night occupied execution plan is Occupied (2): **840502**

Configure Schedule Parameters

Command description:

Item	Byte	Command	Value	Example
Schedule Plan	3+1	7b+Schedule ID (1B, 0-7) + 00	00=Disable, 01=Enable	Enable/Add plan 4: **7b030001**

Item	Byte	Command	Value	Example
Schedule Name (First 6B)	3+6	7b+Schedule ID (1B, 0-7) + 01	ASCii to Hex strings (6B)	Schedule 1 name is Occupied: **7b00014f6363757069 7b000265640000**
Schedule Name (Last 4B)	3+4	7b+Schedule ID (1B, 0-7) + 02	ASCii to Hex strings (4B)	
System Status	3+1	7b+Schedule ID (1B, 0-7) + 05	00=Off, 01=On	Plan 4 sets system on, temperature control mode is Heat, fan mode is On: **7b030501 7b0306007b030702**
Temperature Control Mode	3+1	7b+Schedule ID (1B, 0-7) + 06	00=Heat, 01=EM Heat, 02=Cool, 03=Auto, 04=Dehumidification, 05=Ventilation	
Fan Mode	3+1	7b+Schedule ID (1B, 0-7) + 07	00=Auto, 01=Circulate, 02=On, 03=Low, 04=Medium, 05=High	
Heating Target Temperature	3+2	7b+Schedule ID (1B, 0-7) + 08	INT16/100, Unit: °C, Range: 5~35	Plan 4 heating target temperature is 18 °C, cooling target temperature is 27°C: **7b03080807 7b03098c0a**
Cooling Target Temperature	3+2	7b+Schedule ID (1B, 0-7) + 09	INT16/100, Unit: °C, Range: 5~35	
Auto Target Temperature	3+2	7b+Schedule ID (1B, 0-7) + 0a	INT16/100, Unit: °C, Range: 5~35	
Execute Schedule Plan	1+1	5c	Schedule ID, Range: 0-7	Execute plan 1: **5c00**
Delete/Reset Schedule Plan	1+1	5f	Schedule ID, Range: 0-7, ff=Reset all	Delete plan 2: **5f01**
The following commands apply only to firmware v1.2 or earlier:				
Schedule Content 1	3+7	7b+Schedule ID (1B, 0-7) + 03	**Byte 1**: Temperature control mode, 00=Heat, 01=EM Heat, 02=Cool, 03=Auto, 04=Dehumidification, 05=Ventilation **Byte 2-3**: Heating Target Temperature, INT16/100, Unit: °C, Range: 5 ~ 35	/

Item	Byte	Command	Value	Example
			Byte 4-5: EM-Heating Target Temperature, INT16/100, Unit: °C, Range: 5 ~ 35 **Byte 6-7**: Cooling Target Temperature, INT16/100, Unit: °C, Range: 5 ~ 35	
Schedule Content 2	3+7	7b+Schedule ID (1B, 0-7) + 04	**Byte 1**: Fan mode, 00=Auto, 01=Circulate, 03=Low, 04=Medium, 05=High **Byte 2-3**: Auto Target Temperature, INT16/100, Unit: °C, Range: 5 ~ 35 **Byte 4-5**: Auto-Heating Target Temperature, INT16/100, Unit: °C, Range: 5 ~ 35 **Byte 6-7**: Auto-Cooling Target Temperature, INT16/100, Unit: °C, Range: 5 ~ 35	/

Downlink Commands for Auxiliary Features

This section describes the downlink commands for the auxiliary features.

Configure General Parameters

Command description:

Item	Byte	Command	Value	Example
Reboot	1	be	-	-
Temperature Unit	1+1	63	00=°C, 01=°F	Set unit as °F: **6301**

Item	Byte	Command	Value	Example
Enquiry Periodic Report	1	b9	-	-

Configure Button Parameters

Command description:

<table>
<tr><th>Item</th><th>Byte</th><th>Command</th><th>Value</th><th>Example</th></tr>
<tr><td>Button Customization</td><td>2+1</td><td>7100</td><td>00=Disable, 01=Enable</td><td>Enable: 710001</td></tr>
<tr><td>Button 1</td><td>2+1</td><td>7101</td><td>01=Temperature Control Mode (default), 02=Fan Mode, 06=Event 1 Report, 07=°C or °F switch</td><td rowspan="3">Button 1 sets Event 1 Report: 710106</td></tr>
<tr><td>Button 2</td><td>2+1</td><td>7102</td><td>01=Temperature Control Mode, 02=Fan Mode (default), 06=Event 2 Report, 07=°C or °F switch</td></tr>
<tr><td>Button 3</td><td>2+1</td><td>7103</td><td>00=System On/Off (default), 06=Event 3 Report, 07=°C or °F switch</td></tr>
<tr><td>Child Lock</td><td>1+3</td><td>72</td><td>Byte 1: 00=Disable, 01=Enable
Byte 2-3: for every bit: 0=Disable, 1=Enable
<table><tr><th>Bit</th><th>Button</th></tr><tr><td>0</td><td>Temperature +</td></tr><tr><td>1</td><td>Temperature -</td></tr><tr><td>2</td><td>System On/Off</td></tr><tr><td>3</td><td>Fan Mode</td></tr><tr><td>4</td><td>Temperature Control Mode</td></tr><tr><td>5</td><td>Reset</td></tr></table></td><td>Enable Child Lock and lock temperature +/-: 72010300</td></tr>
</table>

<table>
<tr><th>Item</th><th>Byte</th><th>Command</th><th>Value</th><th>Example</th></tr>
<tr><td></td><td></td><td></td><td><table><tr><th>Bit</th><th>Button</th></tr><tr><td>6</td><td>Power On/Off</td></tr><tr><td>7</td><td>Cancel Pairing</td></tr><tr><td>8-10</td><td>0</td></tr><tr><td>11</td><td>Button 1 Event Report</td></tr><tr><td>12</td><td>Button 2 Event Report</td></tr><tr><td>13</td><td>Button 3 Event Report</td></tr><tr><td>14</td><td>°C | °F switch</td></tr><tr><td>15</td><td>0</td></tr></table></td><td></td></tr>
<tr><td>Temporary Unlock</td><td>1+2</td><td>81</td><td>Byte 1: 00=Disable (default), 01=Enable
Byte 2-3: Unlock time, Unit: s, Range: 1-3600, Default: 30</td><td>Enable temporary unlock and unlock time is 3600s: 8101100e</td></tr>
<tr><td>Temporary Unlock Enable</td><td>1+1</td><td>96</td><td>00=Disable (default), 01=Enable</td><td>Enable: 9601</td></tr>
<tr><td>Temporary Unlock Time</td><td>1+2</td><td>97</td><td>Unit: s, Range: 1-3600, Default: 30</td><td>Unlock time is 3600s: 97100e</td></tr>
<tr><td>Temporary Unlock Button</td><td>1+1</td><td>80</td><td>For every bit: 0=Disable (default), 1=Enable, at least two buttons must be enabled
• Bit 0: Button 1
• Bit 1: Button 2
• Bit 2: Button 3
• Bit 3: Button 4
• Bit 4: Button 5</td><td>Press Button 1 and 2 together to unlock: 8003</td></tr>
</table>

Configure Screen Parameters

Command description:

Item	Byte	Command	Value	Example
Screen Display	1+1	75	00=Disable all, ff=Enable all (default) For every bit: 0=Disable, 1=Enable • Bit 0: Temperature Control Schedule • Bit 1: Temperature • Bit 2: Humidity • Bit 3: Target Temperature	Disable temperature display: **750d**
Temperature Control Mode Display	1+1	8a	00=Disable, 01=Enable (default)	Disable: **8a00**
Fan Mode Display	1+1	8c	00=Disable, 01=Enable (default)	Disable: **8c00**
Display Data When System Off	1+1	99	00=Not Display (display OFF), 01=Display (Default)	Display the data when the system is off: **9900**
Screen Smart Mode	1+1	62	00=Disable, 01=Enable (default)	Disable: **6200**
Frontlight (WT4 01-Flat-FL Only)	1+1	89	00=Disable, 01=Enable (default)	Disable: **8900**

Configure Time Parameters

Command description:

Item	Byte	Command	Value	Example
UTC Time Zone	1+2	c7	INT16/60	UTC-4: **c710ff**
Daylight Saving Time	1+10	c6	**Byte 1**: 00=Disable, 01=Enable **Byte 2**: DST bias, unit: min, range: 1-120	Enable DST, start time is October 1st Sunday 2:00, end time is April 1st Sunday 2:00, bias

<table>
<tr><th>Item</th><th>Byte</th><th>Command</th><th>Value</th><th>Example</th></tr>
<tr><td></td><td></td><td></td><td>Byte 3-6: Start time, Month (1B)+Week&Day (1B) + Minute Time (2B)

Byte 7-10: End time, Month (1B)+Week&Day (1B) + Minute Time (2B)

Week&Day:
<table><tr><th>Bit7-4</th><th>Bit3-0</th></tr><tr><td>Week number, range: 1-5</td><td>Weekday, range: 1-7</td></tr></table></td><td>is 60 minutes: c6013c0 a17780004177800</td></tr>
<tr><td>Sync time from LNS</td><td>1</td><td>b8</td><td>-</td><td>-</td></tr>
</table>

Configure Calibration Parameters

Command description:

<table>
<tr><th>Item</th><th>Byte</th><th>Command</th><th>Value</th><th>Example</th></tr>
<tr><td>Temperature Calibration</td><td>1+3</td><td>76</td><td>Byte 1: 00=Disable, 01=Enable

Byte 2-3: Calibration Value, INT16/100, Unit: °C, Range: -80 ~ 80</td><td rowspan="2">Enable and set the temperature calibration value as -2°C: 760138ff</td></tr>
<tr><td>Humidity Calibration</td><td>1+3</td><td>77</td><td>Byte 1: 00=Disable, 01=Enable

Byte 2-3: Calibration Value, INT16/10, Unit: %RH, Range: -100 ~ 100</td></tr>
</table>

Chapter 5. Services

Milesight provides customers with timely and comprehensive technical support services. End-users can contact their local dealer to obtain technical support. Distributors and resellers can contact Milesight directly for technical support.

Technical Support Mailbox: iot.support@milesight.com

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