Smart Thermostat

WT201 & WT211

Payload Protocol (HEX)

Contents

Chapter 1. Preface

Readers

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

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

Related Document

Document	Description
WT201 & WT211 User Guide	Provides introductions, compatibility check, wirings, installation and configuration steps.
WT201 & WT211 BACnet Object List	Lists the BACnet objects exposed through a Milesight gateway with the BACnet feature enabled.
WT201 & WT211 Payload Protocol (JSON)	Provides the decoded JSON format for uplink data and downlink commands when using the codec provided by Milesight.

Copyright Statement

Revision History

Release Date	Version	Revision Content
Jan. 17, 2025	V2.0	Initial version based on hardware v2.x: 1. Change room card switch input type and name; 2. Add D2D data receiving feature;

Release Date	Version	Revision Content
		3. Add compressor and auxiliary heat linkage feature; 4. Add Temperature Control Mode Enable and Target Temperature Resolution feature; 5. Add dual target temperature mode under Auto mode; 6. Add downlink feature: Temporary unlock, W2/Y2 auxiliary mode, Relay change report, Send humidity data. 7. Add schedule type: Occupied, Unoccupied, ECO. 8. Update the definition of O/B; 9. Update compressor protection to system protection; 10. Add temperature control mode and target temperature tolerance in the schedule.
May 20, 2025	V2.1	Add downlink command to enable/disable screen display
May 31, 2026	V2.2	1. Add data source to periodic report; 2. Support reporting data source alarm when timeout; 3. Add custom temperature control stages; 4. Add occupancy mode parameters, central target temperatures and adjustment tolerances; 5. Add unilateral tolerance; 6. Add timezone offset; 7. Add offline unlock; 8. Add downlink commands: switch data source, child lock enable/disable, screen time display enable/disable, time mode, timezone index, etc.

Chapter 2. Overview

All messages follow the following format, the Parameter/Data field uses **little-endian** byte order:

Channel	Type	Parameter/Data	...
1 Byte	1 Byte	1-N Bytes	...

For details of uplink reports and downlink commands please refer to the chapters below.

Chapter 3. Uplink Data

This chapter describes the uplink packets reported by the device.

Basic Information Packet

After joining the network, the device reports a packet containing the basic device information.

Packet description:

<table>
<tr><th>Item</th><th>Channel</th><th>Type</th><th>Byte</th><th>Description</th></tr>
<tr><td>Protocol Version</td><td rowspan="10">ff</td><td>01</td><td>1</td><td>Example: 01=V1</td></tr>
<tr><td>Hardware Version</td><td>09</td><td>2</td><td>Example: 01 20 = V1.2</td></tr>
<tr><td>Firmware Version</td><td>0a</td><td>2</td><td>Example: 01 02 = V1.2</td></tr>
<tr><td>Device Status</td><td>0b</td><td>1</td><td>ff=Power on</td></tr>
<tr><td>Work Mode</td><td>0f</td><td>1</td><td>00=Class A, 01=Class B, 02=Class C, 03=Class C to B</td></tr>
<tr><td>Serial Number</td><td>16</td><td>8</td><td>16 digits</td></tr>
<tr><td>Reset Event</td><td>fe</td><td>1</td><td>ff, report only after reset</td></tr>
<tr><td>TSL Version</td><td>ff</td><td>2</td><td>Example: 01 02 = V1.2</td></tr>
<tr><td>Wiring Settings</td><td>ca</td><td>3</td><td>Byte 1:
<table>
<tr><th>Bit</th><th>Wire</th><th>Value</th></tr>
<tr><td>7-6</td><td>W1</td><td rowspan="4">00=Disable,
01=Enable</td></tr>
<tr><td>5-4</td><td>O/B</td></tr>
<tr><td>3-2</td><td>G/GH</td></tr>
<tr><td>1-0</td><td>Y1</td></tr>
</table>
Byte 2:
<table>
<tr><th>Bit</th><th>Wire</th><th>Value</th></tr>
<tr><td>7-6</td><td>W2/AUX</td><td>00=Disable,
01=W2, 10=AUX</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Item</th><th>Channel</th><th>Type</th><th>Byte</th><th>Description</th></tr>
<tr><td></td><td rowspan="2"></td><td></td><td></td><td>
<table>
<tr><th>Bit</th><th>Wire</th><th>Value</th></tr>
<tr><td>5-4</td><td>PEK</td><td rowspan="3">00=Disable,
01=Enable</td></tr>
<tr><td>3-2</td><td>DI</td></tr>
<tr><td>1-0</td><td>E</td></tr>
</table>
Byte 3: 00=Disable, 01=Y2, 02=GL
</td></tr>
<tr><td>Supported Mode</td><td>cb</td><td>3</td><td>Byte 1: Supported temperature control mode, per bit 0=Not support, 1=Support
• Bit 3: Auto
• Bit 2: Cool
• Bit 1: EM Heat
• Bit 0: Heat
Byte 2: Supported heating stage, 00=No stage, 01=Up to Stage-1, 03=Up to Stage-2, 07=Up to Stage-3, 0f=Up to Stage-4, 1f=Up to Stage-5
Byte 3: Supported cooling stage, 00=No stage, 01=Up to Stage-1, 03=Up to Stage-2</td></tr>
</table>

Example:

<table>
<tr><th colspan="3">ff0bff ff0101 ff166791d19604050005 ff090210
ff0a0101 ff0f02 ffff0100 ffcb040003 ffca050401</th></tr>
<tr><th>Channel</th><th>Type</th><th>Value</th></tr>
<tr><td>ff</td><td>0b</td><td>ff=Power On</td></tr>
<tr><td>ff</td><td>01</td><td>01=V1</td></tr>
<tr><td>ff</td><td>16</td><td>SN: 6791d19604050005</td></tr>
<tr><td>ff</td><td>09</td><td>Hardware Version: 0210 => V2.1</td></tr>
<tr><td>ff</td><td>0a</td><td>Firmware Version: 0101=> V1.1</td></tr>
<tr><td>ff</td><td>0f</td><td>Work mode: 02=Class C</td></tr>
</table>

ff0bff ff0101 ff166791d19604050005 ff090210 ff0a0101 ff0f02 ffff0100 ffcb040003 ffca050401		
Channel	**Type**	**Value**
ff	ff	TSL Version: 01 00=> V1.0
ff	cb	Supported mode: 04=>100=Cool Supported heating stage: 00=No stage Supported cooling stage: 03=>Up to stage-2
ff	ca	05=>00000101 = G/GH and Y1 enable 04=>00000100 = DI enable 01 = Y2 enable

Periodic Data Packet

The device reports a data packet at a configured reporting interval.

Packet description:

Item	Channel	Type	Byte	Description
Temperature	03	67	2	INT16/10, Unit: °C
Target Temperature	04	67	2	INT16/10, Unit: °C
Heating Target Temperature (Dual Target)	04	67	2	INT16/10, Unit: °C
Cooling Target Temperature (Dual Target)	0b	67	2	INT16/10, Unit: °C
Temperature Control Status and Mode	05	e7	1	**Bit 7-4**: 0000=Standby, 0001=Stage-1 Heat, 0010=Stage-2 Heat, 0011=Stage-3 Heat, 0100=Stage-4 Heat, 0101=EM Heat, 0110=Stage-1 Cool, 0111=Stage-2 Cool, 1000=Stage-5 Heat **Bit 3-2**: 00 **Bit 1-0**: 00=Heat, 01=EM Heat, 10=Cool, 11=Auto

Item	Channel	Type	Byte	Description
Fan Status and Mode	06	e8	1	**Bit 7-4**: 0000 **Bit 3-2**: 00=Standby, 01=High Speed, 10=Low Speed, 11=On **Bit 1-0**: 00=Auto, 01=On, 10=Circulate, 11=Disabled
Schedule Plan	07	bc	1	00=Not executed, 01=Wake, 02=Away, 03=Home, 04=Sleep, 05=Occupied, 06=Unoccupied, 07=ECO
Data Source	07	e9	1	01=Embedded (default), 02=LoRa, 03=D2D
System Status	08	8e	1	00=Off, 01=On
Humidity	09	68	1	UINT8/2, Unit: %RH
Relay Status	0a	6e	1	For per bit 0=Disconnected, 1=Connected • Bit 6: O/B • Bit 5: G/GH • Bit 4: E • Bit 3: W2/AUX • Bit 2: W1 • Bit 1: Y2/GL • Bit 0: Y1
Temperature Exception	b3	67	1	00=Read failed, 01=Out of range
Humidity Exception	b9	68	1	00=Read failed, 01=Out of range

Example:

1. Periodic packet when control permission is Thermostat

03671101 0467fa00 05e772 06e806 07bc00 088e01 096844 07e901		
Channel	**Type**	**Value**
03	67	Temperature: 11 01=>01 11 =273/10=27.3°C
04	67	Target Temperature: fa 00=>00 fa=250/10=25°C
05	e7	72=>0111 0010

03671101 0467fa00 05e772 06e806 07bc00 088e01 096844 07e901		
Channel	**Type**	**Value**
		Temperature Control Status: 0111=Stage-2 Cool Temperature Control Mode: 10=Cool
06	e8	06=> 0000 0110 Fan Status: 01=High Speed Fan Mode: 10=Circulate
07	bc	Schedule Plan: 00=Not executed
08	8e	System Status: 01=On
09	68	Humidity: 44=>68/2=34%RH
07	e9	Data Source: 01=Embedded

2. Periodic packet when control permission is Remote Control

03671101 088e01 096844 0a6e00		
Channel	**Type**	**Value**
03	67	Temperature: 11 01=>01 11 =273/10=27.3°C
08	8e	System Status: 01=On
09	68	Humidity: 44=>68/2=34%RH
0a	6e	00=All relays disconnected

Alarm Packet

The device reports the following types of alarm packets.

Item	Channel	Type	Byte	Description
Tempera-ture Alarm	83	67	3	**Byte 1-2**: Temperature, INT16/10, Unit: °C **Byte 3**: Alarm type 01=Emergency Heating Timeout Alarm, 02=Auxiliary Heating Timeout Alarm, 03=Persistent Low Temperature Alarm, 04=Persistent Low Temperature Alarm Release, 05=Persistent High Temperature Alarm, 06=Persistent

Item	Channel	Type	Byte	Description
				High Temperature Alarm Release, 07= Freeze Protection Alarm, 08=Freeze Protection Alarm Release, 09=Temperature Threshold Alarm, 0a= Temperature Threshold Alarm Release
Target Temperature Range Alarm	f9	40	7	**Byte 1**: 00=Heat, 01=EM Heat, 02=Cool, 03=Auto, 04=Auto-Heat, 05=Auto-Cool **Byte 2-3**: Target Temperature for current mode, INT16/10, Unit: °C **Byte 4-5**: Min. range for current mode, INT16/10, Unit: °C **Byte 6-7**: Max. range for current mode, INT16/10, Unit: °C
Data Source Alarm	87	e9	2	**Byte 1**: 01=Embedded (default), 02=LoRa, 03=D2D **Byte 2**: 01

Example:

1. Temperature threshold alarm

8367140109		
Channel	**Type**	**Value**
83	67	Temperature: 14 01=>01 14=276/10=27.6°C Alarm type: 09=Temperature Threshold Alarm

2. Target temperature range alarm: report when receiving a target temperature outside the regulation range.

f940 0024006400bc00		
Channel	**Type**	**Value**
f9	40	Temperature Control Mode: 00=Heat Target Temperature: 24 00=>00 24 = 36/10=3.6°C Min. Range: 64 00=>00 64 = 100/10=10°C Max. Range: bc 00 =>00 bc = 188/10=18.8°C

3. Data source alarm: report when not receiving temperature data for timeout and the data source is switched.

87e90101		
Channel	**Type**	**Value**
87	e9	01=Embedded

Status Change Packet

The device reports a packet when a parameter is changed.

1. Control permission change report

   Packet description:

Item	Channel	Type	Byte	Description
Control Permission	ff	f6	1	00=Thermostat, 01=Remote Control

   Example:

fff600		
Channel	**Type**	**Value**
ff	f6	00=Thermostat

2. Wiring Setting change report

   Packet description: Wiring Setting + Supported Mode

   Example:

ffcb040003 ffca050401		
Channel	**Type**	**Value**
ff	cb	Supported mode: 04=>100=Cool Supported heating stage: 00=No stage Supported cooling stage: 03=>Up to stage-2
ff	ca	05=>00000101 = G/GH and Y1 enable

ffcb040003 ffca050401		
Channel	**Type**	**Value**
		04=>00000100 = DI enable 01 = Y2 enable

3. A periodic report is sent when any of the following parameters change:
    - Target Temperature
    - Temperature Control Mode
    - Fan Mode
    - System Status
    - Relay Status under Remote Control permission
4. Relay status change report under thermostat control permission

    When Relay Change Report is enabled, the device will send this report whenever the relay status changes.

    Example:

0a6e00		
Channel	**Type**	**Value**
0a	6e	00=All relays disconnected

Historical Data Packet

When data retransmission is triggered, the device will report historical periodic reports at data retransmission interval.

Packet description:

<table>
<tr><th>Channel</th><th>Type</th><th>Byte</th><th>Historical Data</th></tr>
<tr><td rowspan="2">20</td><td rowspan="2">ce</td><td rowspan="2">13</td><td>Byte 1-4: Timestamp, UINT32, Unit: s
Byte 5-6: Mode and Status</td></tr>
<tr><td>
<table>
<tr><th>Bit</th><th>Item</th><th>Value</th></tr>
<tr><td>15-11</td><td>-</td><td>00000</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Channel</th><th>Type</th><th>Byte</th><th>Historical Data</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><th>Bit</th><th>Item</th><th>Value</th></tr>
<tr><td>10-7</td><td>Temp. Control Status</td><td>0000=Standby, 0001=Stage-1 Heat, 0010=Stage-2 Heat, 0011=Stage-3 Heat, 0100=Stage-4 Heat, 0101=EM Heat, 0110=Stage-1 Cool, 0111=Stage-2 Cool, 1000=Stage-5 Heat</td></tr>
<tr><td>6-5</td><td>Temp. Control Mode</td><td>00=Heat, 01=EM Heat, 10=Cool, 11=Auto</td></tr>
<tr><td>4-3</td><td>Fan Status</td><td>00=Standby, 01=High Speed, 10=Low Speed, 11=On</td></tr>
<tr><td>2-1</td><td>Fan Mode</td><td>00=Auto, 01=On, 10=Circulate</td></tr>
<tr><td>0</td><td>System Status</td><td>0=Off, 1=On</td></tr>
</table>
Byte 7-8: Target Temperature or Cooling Target Temperature (Dual Target), INT16/10, Unit: °C
Byte 9-10: Heating Target Temperature (Dual Target), INT16/10, Unit: °C
Byte 11-12: Temperature, INT16/10, Unit: °C
Byte 13: Humidity, UINT8/2, Unit: %RH
Note:
If no dual target temperatures, the heating target temperature will report <code>0xffff</code>.
</td></tr>
</table>

Example

20ce e0f62c65 4100 1501 ffff f600 4e		
Channel	**Type**	**Value**
20	ce	Timestamp: e0 f6 2c 65 => 65 2c f6 e0 =1697445600s

20ce e0f62c65 4100 1501 ffff f600 4e		
Channel	**Type**	**Value**
		Mode and Status: 41 00 => 00 41=0000 0000 0100 0001 (Standby, Cool, Off, Auto, System On) Target Temperature: 15 01=> 01 15 =277/10=27.7°C Heating Target Temperature: ffff Temperature: f6 00=>00 f6=246/10=24.6°C Humidity: 4e=>78/2=39%RH

Chapter 4. Downlink Commands

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

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

Channel (1 Byte)	Type (1 Byte)	Command (1-N Byte)	Return Code (1 Byte, Optional)
Downlink command channel -1	Same as downlink command		00=Success, 01=Not allowed, 02=Out of range

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.

Multicast Group Enable/Disable

Command description:

Channel	Type	Byte	Value	Example
ff	82	1	Bit7-4: group 4-1 control status, per bit 0=not allow control, 1=allow control Bit 3-0: group 4-1 enable status, per bit 0=disable, 1=enable	Enable group 1 and 3: **ff82f5**

Configure Milesight D2D Parameters

Command description:

Item	Channel	Type	Byte	Value	Example
D2D Data Receiving	f9	3e	9	**Byte 1**: Device ID, range: 0-4 **Byte 2-9**: Device EUI, all 0 means deleting this device	Add a device with EUI 24e1241234567890: **f93e0024e1241234567890**

Item	Chan-nel	Type	Byte	Value	Example
D2D Feature	ff	c7	1	10=D2D Controller disable, 11=D2D Controller enable, 20=D2D Agent disable, 22=D2D Agent enable	Enable D2D agent: **ffc722**
D2D Controller	ff	96	8	**Byte 1**: 00=Wake, 01=Away, 02=Home, 03=Sleep, 04=Occupied, 05=Unoccupied, 06=ECO **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	Enable sleep event to send command e004, enable LoRa Uplink: **ff960301 0104e0000000**
D2D Agent	ff	83	5	**Byte 1**: Command ID, range: 0-15 **Byte 2**: 00=disable, 01=enable **Byte 3-4**: D2D control command **Byte 5**: Control action, 00=System off, 01=System on, 10=Wake, 11=Away, 12=Home, 13=Sleep, 14=Occupied, 15=Unoccupied, 16=ECO	Enable command 4, command is e004 and action is system on: **ff83 030104e001**

Downlink Commands for Temperature Control Parameters

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

Configure Data Source

Command description:

Item	Channel	Type	Byte	Value	Example
Data Source + Timeout	ff	c4	2	Byte 1: 00=Embedded (default), 01=LoRa, 02=D2D Byte 2: Timeout, unit: min, range: 3-60, default: 10	Data source is LoRa and timeout is 60 minutes: **ffc4013c**
Data Source	f9	2e	01	01=Embedded (default), 02=LoRa, 03=D2D	Data source is D2D: **f92e03**
Temperature	03	-	3	Byte 1-2: INT16/10, Unit: °C Byte 3: ff	Send 10°C from LNS: **036400ff**
Humidity	09	-	2	Byte 1: UINT8/2, Unit: %RH Byte 2: ff	Send 50% RH from LNS: 0964ff
Offline Control Mode	ff	f8	1	00=Keep current status (default), 01=Switch to internal, 02=Disable temp. control	Switch to internal if no receiving temperature data from LNS or D2D device: **fff801**

Configure Control Permission

Command description:

Channel	Type	Byte	Value	Example
ff	f6	1	00=Thermostat, 01=Remote Control	Thermostat control: **fff600**

Configure System Status

Command description:

Channel	Type	Byte	Value	Example
ff	c5	1	00=Off, 01=On	System on: **ffc501**

Configure Thermostat Parameters

When control permission is Thermostat, refer to Downlink Commands for Thermostat Parameters.

Configure Remote Control Parameters

When control permission is Remote Control, the device supports the following configurations.

<table>
<tr><th>Item</th><th>Channel</th><th>Type</th><th>Byte</th><th>Value</th><th>Example</th></tr>
<tr><td>Relay Status</td><td>ff</td><td>f7</td><td>4</td><td>Byte 1: per bit 0=not allow control, 1=allow control
Byte 2: 00
Byte 3: per bit 0=disconnected, 1=connected
Byte 4: 00
<table><tr><th>Bit</th><th>Relay</th></tr><tr><td>7</td><td>0</td></tr><tr><td>6</td><td>O/B</td></tr><tr><td>5</td><td>G/GH</td></tr><tr><td>4</td><td>E</td></tr><tr><td>3</td><td>W2/AUX</td></tr><tr><td>2</td><td>W1</td></tr><tr><td>1</td><td>Y2/GL</td></tr><tr><td>0</td><td>Y1</td></tr></table></td><td>Y1, Y2/GL, W1, W2/AUX, G connected: ff-f77f002f00</td></tr>
<tr><td>Offline Control Mode</td><td>ff</td><td>f8</td><td>1</td><td>00=Keep current status (default), 01=Switch to thermostat control, 02=Disable all relays</td><td>Switch to thermostat if offline: fff801</td></tr>
</table>

Downlink Commands for Thermostat Parameters

This section describes the downlink commands when control permission is **Thermostat**.

Configure Installation Parameters

Command description:

<table>
<tr><th>Item</th><th>Channel</th><th>Type</th><th>Byte</th><th>Value</th><th>Example</th></tr>
<tr><td>Wiring Settings</td><td>ff</td><td>ca</td><td>3</td><td>Byte 1:
<table><tr><th>Bit</th><th>Wire</th><th>Value</th></tr><tr><td>7-6</td><td>W1</td><td rowspan="4">00=Disable, 01=Enable</td></tr><tr><td>5-4</td><td>O/B</td></tr><tr><td>3-2</td><td>G/GH</td></tr><tr><td>1-0</td><td>Y1</td></tr></table>Byte 2:
<table><tr><th>Bit</th><th>Wire</th><th>Value</th></tr><tr><td>7-6</td><td>W2/AUX</td><td>00=Disable, 01=W2, 10=AUX</td></tr><tr><td>5-4</td><td>PEK</td><td rowspan="3">00=Disable, 01=Enable</td></tr><tr><td>3-2</td><td>DI</td></tr><tr><td>1-0</td><td>E</td></tr></table>Byte 3: 00=Disable, 01=Y2, 02=GL</td><td>Enable W1, Y1, Y2, G, O/B: ff-ca550001</td></tr>
<tr><td>Reversing Valve</td><td>ff</td><td>b5</td><td>1</td><td>00=Energize on heat, 01=Energize on cool</td><td>Set Energize on heat: ffb500</td></tr>
<tr><td>Fan Control during Heating</td><td>f9</td><td>62</td><td>1</td><td>00=Furnace or Boiler, 01=Thermostat</td><td>Set thermostat: f96201</td></tr>
<tr><td>Compressor and Auxiliary Heat Linkage</td><td>f9</td><td>46</td><td>1</td><td>00=disable, 01=enable</td><td>Enable: f94601</td></tr>
<tr><td>Freeze Protection</td><td>ff</td><td>b0</td><td>3</td><td>Byte 1: 00=disable (default), 01=enable
Byte 2-3: Protection temperature, INT16/10, unit: °C, range: 1-5, default: 3</td><td>Enable and the protection temperature is 1 °C: ffb0010a00</td></tr>
</table>

Item	Channel	Type	Byte	Value	Example
System Protection	f9	47	2	**Byte 1**: 00=disable, 01=enable **Byte 2**: Min. running duration, unit: min, range: 1-60, default: 5	Enable and duration is 10 mins: **f947010a**
W2/Y2 Auxiliary Mode	f9	3b	1	30=Y2 and W2 disable (default), 11=Y2 enable only, 22=W2 enable only, 33=Y2 and W2 enable	Enable Y2 auxiliary mode: **f93b11**

Custom Temperature Control Stage Setting:

Item	Channel	Type	Byte	Description	Example
Custom Temperature Control Stage	f9	80	1	00=disable (default), 01=enable	Enable: **f98001**
Stage-1 Heat	f9	81	1	Per bit 0=disable, 1=enable • Bit 0: Y1 • Bit 1: Y2 • Bit 2: W1 • Bit 3: W2 • Bit 4: E (only work for EM heat) • Bit 7-5: 000	Stage-1 heat enables Y1+Y2: **f98103** **Note:** If the lower stage is not configured, the higher stage command will be invalid.
Stage-2 Heat		82			
Stage-3 Heat		83			
Stage-4 Heat		84			
Stage-5 Heat		85			
EM Heat		86			
Stage-1 Cool		87			
Stage-2 Cool		88			
Stage-3 Cool		89			

Configure Temperature Control Basic Parameters

The device provide multiple kinds of commands for easy configuration.

Command description:

<table>
<tr><th>Item</th><th>Channel</th><th>Type</th><th>Byte</th><th>Value</th><th>Example</th></tr>
<tr><td>Temperature Control Enable</td><td>f9</td><td>5d</td><td>1</td><td>Per bit 0=disable, 1=enable<table><tr><th>Bit</th><th>Mode</th></tr><tr><td>7-4</td><td>0000</td></tr><tr><td>3</td><td>Auto</td></tr><tr><td>2</td><td>Cool</td></tr><tr><td>1</td><td>EM Heat</td></tr><tr><td>0</td><td>Heat</td></tr></table></td><td>Enable Heat, Cool and Auto: f95d0d</td></tr>
<tr><td>Temperature Control Mode</td><td>ff</td><td>fb</td><td>1</td><td>00=Heat, 01=EM Heat, 02=Cool, 03=Auto</td><td>Auto: fffb03</td></tr>
<tr><td>Target Temperature</td><td>ff</td><td>fa</td><td>3</td><td>Byte 1: 00=Heat, 01=EM Heat, 02=Cool, 03= Auto, 04=Auto-Heat (Dual Target), 05=Auto-Cool (Dual Target)
Byte 2-3: Target value, INT16/10, unit: °C, range: 5-35</td><td>Cool mode target temperature is 21.6°C: ffffa02d800</td></tr>
<tr><td>System Status + Temperature Control Mode + Target Temperature</td><td>f9</td><td>45</td><td>4</td><td>Byte 1: 00=system off, 01=system on
Byte 2: 00=Heat, 01=EM Heat, 02=Cool, 03=Auto
Byte 3-4: Target value, INT16/10, unit: °C, range: 5-35</td><td>System is On, control mode is Cool, target temperature is 25°C: f9450102fa00</td></tr>
<tr><td>Target Temperature Resolution</td><td>f9</td><td>41</td><td>1</td><td>00=0.5, 01=1</td><td>/</td></tr>
<tr><td>Target Temperature Mode</td><td>f9</td><td>58</td><td>1</td><td>00=Single Target, 01=Dual Target</td><td>/</td></tr>
</table>

Item	Channel	Type	Byte	Value	Example
Temperature Tolerance (Single Target)	ff	b8	2	Byte 1: Target temperature tolerance, UINT8/10, unit: °C Byte 2: Temperature control, tolerance, UINT8/10, unit: °C	Both tolerances are 1°C: **ffb80a0a**
Temperature Tolerance (Dual Target)	f9	5a	2	Byte 1: 00=Heating tolerance,01=Cooling tolerance Byte 2: Tolerance value, UINT8/10, Unit: °C, range: 0.1-5, default: 2	Heating tolerance is 1°C: **f95a000a**
Target Temperature Regulation Range	f9	42	5	**Byte 1**: 00=Heat, 01=EM Heat, 02=Cool, 03=Auto **Byte 2-3**: Min. range value, INT16/10, unit: °C, range: 5-35 **Byte 4-5**: Max. range value,INT16/10, unit: °C, range: 5-35 **Note:** Max. -Min. >1	Cool mode target temperature range is 15 - 30°C: **f9420296002c01**

Configure Occupancy Mode Parameters

Command description:

Item	Channel	Type	Byte	Value	Example
Occupancy Mode	f9	27	1	01=Off (default), 02=Occupied, 03=Unoccupied	Switch to Occupied: **f92702**

Item	Chan-nel	Type	Byte	Value	Example
Occupied Delay	f9	28	1	Range: 1-60, Unit: min, default: ff=Dis-able	The delay time is 60 minutes: **f9283c**

When Occupancy Mode is Occupied:

Item	Channel	Type	Byte	Value	Example
Cooling Target Temperature	f9	64	2	INT16/10, unit: °C, range: 5-35	The cooling target temperature is 21.6°C: **f964d800**
Heating Target Temperature	f9	65	2	INT16/10, unit: °C, range: 5-35	
Cooling Target Tem-perature Tolerance	f9	6a	1	UINT8/10, Unit: °C, range: 0.1-5, default: 1	The cooling tar-get temperature tolerance is 2°C: **f96a14**
Heating Target Tem-perature Tolerance	f9	6b	1	UINT8/10, Unit: °C, range: 0.1-5, default: 1	
Deadband	f9	32	1	UINT8/10, Unit: °C, range: 1-10, default: 5	Deadband is 2°C: **f93214**

When Occupancy Mode is Unoccupied:

Item	Channel	Type	Byte	Value	Example
Cooling Target Temperature	f9	66	2	INT16/10, unit: °C, range: 5-35	The cooling tar-get tempera-ture is 21.6°C: **f966d800**
Heating Target Temperature	f9	67	2	INT16/10, unit: °C, range: 5-35	
Cooling Target Tem-perature Tolerance	f9	6c	1	UINT8/10, Unit: °C, range: 0.1-5, default: 2	The cooling tar-get tempera-ture tolerance is 2°C: **f96c14**
Heating Target Tem-perature Tolerance	f9	6d	1	UINT8/10, Unit: °C, range: 0.1-5, default: 2	
Deadband	f9	32	1	UINT8/10, Unit: °C, range: 1-10, default: 5	Deadband is 2°C: **f93214**

When Occupancy Mode is Unoccupied or Occupied, the thermostat supports configuring central temperature as the target temperature, and adjustment tolerance to define the regulation range (=central temperature +/ adjustment tolerance). This is mainly used for BACnet downlink.

Item	Channel	Type	Byte	Value	Example
Cooling Central Temperature	f9	72	2	UINT16/10, unit: °C, range: 5-35	Cooling central temperature is 21.6 °C: **f972d800**
Heating Central Temperature	f9	73	2	UINT16/10, unit: °C, range: 5-35	
Cooling Adjustment Tolerance	f9	74	2	UINT16/10, unit: °C, range: 0.5-16	The cooling adjust tolerance is 5°C: **f9743200**
Heating Adjustment Tolerance	f9	75	2	UINT16/10, unit: °C, range: 0.5-16	

Configure Unilateral Tolerance

Item	Channel	Type	Byte	Value	Example
Unilateral Tolerance	f9	2b	1	00=Disable (default), 01=Enable	Enable: **f92b01**

Configure Fan Mode Parameters

Command description:

Item	Channel	Type	Byte	Value	Example
Fan Mode	ff	b6	1	00=Auto (default), 01=On, 02=Circulate	Set auto mode: **ffb600**
Fan Circulate Operation Time	f9	06	1	UINT8, unit: min/h, range: 5-55, default: 30	Operation time is 10 minutes: **f9060a**
Fan Delay under Auto Mode	f9	44	3	**Byte 1**: 00=disable (default), 01=enable **Byte 2-3**: Duration, unit: s, range: 1-3600, default: 60	Enable and the duration is 300s: **f944012c01**

Item	Channel	Type	Byte	Value	Example
Regulate Humidity	f9	07	2	**Byte 1**: 00=disable (default), 01=enable **Byte 2-3**: Regulate interval, unit: min/h, range: 5-55, default: 30	Enable and the regulate interval is 10 minutes: **f907010a**

Temperature Control Stage Switch

Command description:

Item	Channel	Type	Byte	Value	Example
Temperature Delta	f9	43	3	Byte 1: 00 Byte 2: ΔT1, UINT8/10, unit: unit: °C, range: 1-10, default: 3 Byte 3: ΔT2, UINT8/10, unit: unit: °C, range: 1-10, default: 5 **Note:** ΔT2>ΔT1	ΔT1 is 1°C , ΔT2 is 2°C: **f943000a14**
Setforward/Setback	f9	1b	2	Setforward: 0100=disable,0101=enable Setback: 0200=disable, 0202=enable Setback and setforward: 0300= disable, 0303= enable	Enable both: **f91b0303**
Stage-up Switch	ff	b9	3	Byte 1: 00=Heat, 01=Cool Byte 2: Change time, unit: min, range: 1-10, default: 5 Byte 3: Change value, UINT8/10, unit: unit: °C, range: 1-10, default: 1	When the ambient temperature does not change 1 °C for 10 minutes, switch to a higher heating stage: **ff-b9000a0a**

Configure Temp. Control and Dehumidify

Command description:

Item	Channel	Type	Byte	Value	Example
Target Humidity Range	f9	09	2	**Byte 1**: Min. range, unit: %RH, range: 0-100 **Byte 2**: Max. range, unit: %RH, range: 0-100 **Note:** Max. range > Min, range	Target humidity range is 20 % - 80% RH: **f9091450**
Temp. Control and Dehumidify	f9	0a	2	**Byte 1**: 00=disable, 01=enable **Byte 2**: Tolerance, UINT8/10, unit: °C, range: 1-5, default: 1	Enable and the tolerance is 2°C: **f90a0114**

Configure Schedule Parameters

Command description:

Item	Channel	Type	Byte	Value	Example
Schedule Switch	ff	c2	1	00=Wake, 01=Away, 02=Home, 03=Sleep, 04=Occupied, 05=Unoccupied, 06=ECO	Switch to Home plan: **ffc202**
Schedule Content (Single Target)	f9	5e	7	**Byte 1**: Schedule type, 00=Wake, 01=Away, 02=Home, 03=Sleep, 04=Occupied, 05=Unoccupied, 06=ECO **Byte 2**: Temperature Control Mode, 00=Heat, 01=EM Heat, 02=Cool, 03= Auto **Byte 3**: Fan Mode, 00=Auto, 01=On, 02=Circulate	Wake plan temperature control mode is Auto, fan mode is on, target temperature is 23°C, target temperature tolerance is 1°C, temperature control tolerance is 2°C: **f95e000301e6000a14**

Item	Chan-nel	Type	Byte	Value	Example
				Byte 4-5: Target Temperature, INT16/10, unit: °C, range: 5-35, default: 17 **Byte 6**: Target Temperature Tol-erance, UINT8/10, unit: °C, range: 0.1-5, default: 2 **Byte 7**: Temperature Control Tol-erance, UINT8/10, unit: °C, range: 0.5-10, default: 5	
Schedule Content (Dual Target)	f9	59	9	**Byte 1**: Schedule type, 00=Wake, 01=Away, 02=Home, 03=Sleep, 04=Occupied, 05=Unoccupied, 06=ECO **Byte 2**: Temperature Control Mode, 00=Heat, 01=EM Heat, 02=Cool, 03= Auto (default) **Byte 3**: Fan Mode, 00=Auto, 01=On, 02=Circulate **Byte 4-5**: Heating Target Tem-perature, INT16/10, unit: °C, range: 5-35, default: 17 **Byte 6**: Heating Target Temper-ature Tolerance, UINT8/10, unit: °C, range: 1-5, default: 2 **Byte 7-8**: Cooling Target Tem-perature, INT16/10, unit: °C, range: 5-35, default: 17 **Byte 9**: Cooling Temperature Tol-erance, UINT8/10, unit: °C range: 1-5, default: 2	Wake plan temperature control mode is Auto, fan mode is on, heating tar-get temperature is 16°C, cooling target tempera-ture is 20°C, heating and cooling target tempera-ture tolerance are 1°C: **f959000301a0000ac8000a**
Schedule Time Content	ff	c9	6	**Byte 1**: Schedule type, 00=Wake, 01=Away, 02=Home, 03=Sleep,	Add a Wake plan time on weekdays

<table>
<tr><th>Item</th><th>Chan-nel</th><th>Type</th><th>Byte</th><th>Value</th><th>Example</th></tr>
<tr><td></td><td></td><td></td><td></td><td>04=Occupied, 05=Unoccupied, 06=ECO

Byte 2: ID, range: 0-15
Byte 3: 00=disable, 01=enable
Byte 4: Repeat day, per bit 0=dis-able, 1=enable

<table><tr><th>Bit</th><th>Repeat Day</th></tr><tr><td>7</td><td>Sun.</td></tr><tr><td>...</td><td>...</td></tr><tr><td>1</td><td>Mon.</td></tr><tr><td>0</td><td>0</td></tr></table>
Byte 5-6: Time, unit: min, range: 0-1439

Note:
The time of different schedules must be dif-ferent.</td><td>(Mon. to Fri.) 6:30AM: ffc90000013e8601</td></tr>
<tr><td>Schedule Time Status</td><td>f9</td><td>8b</td><td>2</td><td>Byte 1: per bit 0=not allow con-trol, 1=allow control

Byte 2: per bit 0=all disable, 1=all enable

<table><tr><th>Bit</th><th>Schedule</th></tr><tr><td>7</td><td>0</td></tr><tr><td>6</td><td>ECO</td></tr><tr><td>5</td><td>Unoccupied</td></tr><tr><td>4</td><td>Occupied</td></tr></table></td><td>Disable all time periods of ECO: f98b4000</td></tr>
</table>

<table>
<tr><th>Item</th><th>Chan-nel</th><th>Type</th><th>Byte</th><th>Value</th><th>Example</th></tr>
<tr><td></td><td></td><td></td><td></td><td><table><tr><th>Bit</th><th>Schedule</th></tr><tr><td>3</td><td>Sleep</td></tr><tr><td>2</td><td>Home</td></tr><tr><td>1</td><td>Away</td></tr><tr><td>0</td><td>Wake</td></tr></table></td><td></td></tr>
</table>

Relay Change Report

Enable or disable to report relay status when changing.

Command description:

Channel	Type	Byte	Value	Example
f9	3a	1	00=Disable (de-fault), 01=Enable	Enable relay change report: **f93a01**

Downlink Commands for Auxiliary Features

This section describes the downlink commands for the auxiliary features.

Configure General Parameters

Command description:

Item	Channel	Type	Byte	Value	Example
Reboot	ff	10	1	ff	**ff10ff**
Reporting Interval	ff	8e	3	Byte 1: 00 Byte 2: Interval, unit: min, range: 1-1440, default: 10	Set 20 minutes: **ff8e001400**
Collect-ing Interval	ff	02	2	Unit: s, range: 10-60, default: 30	Set 30s: **ff021e00**
Temperature Unit	ff	eb	1	00=°C, 01=°F (default)	Set unit as °F: **ffeb01**

Configure Time Parameters

Command description:

Item	Chan-nel	Type	Byte	Value	Example
Sync Time from LNS	ff	4a	1	ff	Ask device to sync time from LNS: **ff4aff**
Time Zone	ff	bd	2	INT16/60	UTC-4: **ffbd10ff**
Timezone Index	f9	2f	1	Range: 1-37, 1=UTC-12, ..., 15=UTC, ..., 37=UTC+14	UTC-4: **f92f0a**
Daylight Time Saving	ff	ba	10	**Byte 1**: 00-disable, 01-enable **Byte 2**: DST bias, unit: min, range: 1-120 **Byte 3**: Start month, range: 1-12 **Byte 4**: Start week • Bit 7-4: week number, range: 1-5 • Bit 3-0: weekday, range: 1-7 **Byte 5-6**: Start time, unit: min, range: 0-1439 **Byte 7**: End month, range: 1-12 **Byte 8**: End week **Byte 9-10**: End time, unit: min, range: 0-1439	Enable DST, start time is October 1st Sunday 2:00, end time is April 1st Sunday 2:00, bias is 60 minutes: **ff-ba013c0a17780004177800**
Time Zone Offset	f9	30	2	Range: -1440 ~ 1440, Unit: min, default: 0	Offset is -300 minutes: **f930d4fe**

Configure Screen Parameters

Command description:

Item	Channel	Type	Byte	Value	Example
Screen Display	f9	08	1	00=Enable (default) , 01=Disable plan display, 02=Disable all	Disable plan display: **f90801**
Screen Time Display	f9	91	1	00=Disable, 01=Enable (default)	Disable time display: **f99100**
Time Mode	f9	2c	1	01=12-Hour Clock (default), 02=24-Hour Clock	Set 24-hour clock: **f92c02**

Configure Child Lock

Command description:

<table>
<tr><th>Item</th><th>Channel</th><th>Type</th><th>Byte</th><th>Value</th><th>Example</th></tr>
<tr><td>Child Lock Setting</td><td>ff</td><td>25</td><td>2</td><td>Byte 1: ff
Byte 2: per bit 0=disable, 1=enable
<table><tr><th>Bit</th><th>Option</th></tr><tr><td>0</td><td>System On/Off</td></tr><tr><td>1</td><td>Temperature+</td></tr><tr><td>2</td><td>Temperature-</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 and reboot</td></tr></table></td><td>Lock temperature +/-: ff2506</td></tr>
<tr><td>Child Lock Enable</td><td>f9</td><td>31</td><td>1</td><td>00=Disable (default), 01=Enable</td><td>Enable child lock: f93101</td></tr>
<tr><td>Temporary Unlock</td><td>f9</td><td>5c</td><td>3</td><td>Byte 1: per bit 0=disable, 1=enable, at least two buttons must be enabled
<table><tr><th>Bit</th><th>Option</th></tr><tr><td>0</td><td>Button 1: System On/Off</td></tr><tr><td>1</td><td>Button 2: Temperature+</td></tr><tr><td>2</td><td>Button 3: Temperature-</td></tr></table></td><td>Press button 1 and 2 together to release the child lock for 10 minutes: f95c065802</td></tr>
</table>

<table>
<tr><th>Item</th><th>Channel</th><th>Type</th><th>Byte</th><th>Value</th><th>Example</th></tr>
<tr><td></td><td></td><td></td><td></td><td><table><tr><th>Bit</th><th>Option</th></tr><tr><td>3</td><td>Button 4: Fan mode</td></tr><tr><td>4</td><td>Button 5: Temper-
ature control mode</td></tr></table>
Byte 2-3: unlock time, unit: s, range: 1-65535</td><td></td></tr>
<tr><td>Offline Unlock Heartbeat</td><td>f9</td><td>2a</td><td>1</td><td>Range: 0-255, the value increments in a loop with each heartbeat packet transmission.</td><td>f92a01</td></tr>
<tr><td>Offline Timeout</td><td>f9</td><td>29</td><td>1</td><td>Range: 1-60, unit: min, default: ff=disable</td><td>Timeout is 10 minutes: f9290a</td></tr>
</table>

Configure Data Storage & Retransmission

Command description:

Item	Chan-nel	Type	Byte	Value	Example
Data Storage	ff	68	1	00=Disable, 01=Enable	Enable data storage: **ff6801**
Data Re-transmission	ff	69	1	00=Disable, 01=Enable	Enable data retrans-mission: **ff6901**
Data Retrans-mission Interval	ff	6a	3	**Byte 1**: 00 **Byte 2-3**: Inter-val, unit: s, range: 30-1200, default: 600	Data retransmission inter-val is 1200s: **ff6a00b004**

Configure Calibration Parameters

Command description:

Item	Channel	Type	Byte	Value	Example
Temperature Calibration	ff	ab	3	Byte 1: 00=disable, 01=enable Byte 2-3: calibration value, INT16/10, unit: °C, range: -60-60	Enable and set the calibration value as -0.3: **ffab01fdff**
Humidity Calibration	ff	f9	3	Byte 1: 00=disable, 01=enable Byte 2-3: calibration value, INT16/10, unit: %RH, range: -100-100	

Configure Temperature Threshold Parameters

Command description:

Item	Chan-nel	Type	Byte	Value	Example
Temperature	ff	06	9	Byte 1: 00=disable, 01=below, 02=above, 03=within, 04=be-low or above Byte 2-3: Min. threshold, INT16/10, unit: °C, range: -20-60 Byte 4-5: Max. threshold, INT16/10, unit: °C, range: -20-60 Byte 6-9: 00000000	Enable and below threshold value is 10°C: **ff06016400000000000000**
Persistent Low Temperature				**Byte 1**: 09 **Byte 2-3**: Difference, INT16/10, unit: °C, range: 1-10 **Byte 4-7**: 00000000 **Byte 8-9**: Duration, unit: s, range: 0-3600, default: 3600	Enable and differ-ence is 1°C, dura-tion is 10 minutes: **ff06090a00000000005802**
Persistent High Temperature				**Byte 1-3**: 120000	Enable and difference is 1°C, duration is 10 min-

Item	Chan-nel	Type	Byte	Value	Example
				Byte 4-5: Difference, INT16/10, unit: °C, range: 1-10 **Byte 6-7**: 0000 **Byte 8-9**: Duration, unit: s, range: 0-3600	utes: **ff061200000a00 00005802**

Configure Room Card Parameters

Command description:

<table>
<tr><th>Channel</th><th>Type</th><th>Byte</th><th>Value</th><th>Example</th></tr>
<tr><td>ff</td><td>c1</td><td>4</td><td>Byte 1: 00-disable (default), 01-enable
Byte 2: 00=System on/off, 01=Insert an event
Byte 3: Insert event (bit7-4)+Remove event (bit3-0)
<table>
<tr><th>Bit</th><th>Event</th></tr>
<tr><td>0000</td><td>Wake</td></tr>
<tr><td>0001</td><td>Away</td></tr>
<tr><td>0010</td><td>Home</td></tr>
<tr><td>0011</td><td>Sleep</td></tr>
<tr><td>0100</td><td>Occupied</td></tr>
<tr><td>0101</td><td>Unoccupied</td></tr>
<tr><td>0110</td><td>ECO</td></tr>
</table>
Byte 4: 00=Low level is insert card (default), 01=High level is insert card</td><td>Enable room card set-tings, action is Insert an event, insert card event is Wake, remove card event is Away: ffc101010100</td></tr>
</table>

Downlink Commands for Query

This section describes the downlink commands for querying the device data.

Query Current Data

Command description:

Channel	Type	Byte	Value	Example
ff	28	1	00: Schedule Content and Time 01: Periodic Data Packet 02: Target Temperature and Regulation Range of all temperature control modes	Query periodic report: **ff2801**

Query Historical Data

Prerequisites: Data Storage was enabled and device time is synced.

Command description:

Item	Channel	Type	Byte	Value	Example
Query a Time Point	fd	6b	4	Timestamp, Unit: s	/
Query a Time Range	fd	6c	8	**Byte 1-4**: Start timestamp, unit: s **Byte 5-8**: End timestamp, unit: s	Query data from 1697445000s to 1697445600s: **fd6c88f42c65e0f62c65**
Stop Query	fd	6d	1	ff	/
Query Report Interval	ff	6a	3	**Byte 1**: 01 **Byte 2-3**: Interval, unit: s, range: 30-1200, default: 60	Report interval is 1200s: **ff6a01b004**

Reply description: Query Result + Historical Data Packet

Item	Channel	Type	Byte	Value	Example
Query Result	fc	6b/6c	1	00=Success, 01=Time invalid, 02=No data in this time or time range	Query a time range success: **fc6c00**

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

Online Support Portal: https://support.milesight-iot.com

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MILESIGHT CHINA

TEL: +86-592-5085280

FAX: +86-592-5023065

Add: Building C09, Software Park Phase III, Xiamen 361024, Fujian, China