SpaceLogic Thermostat

TC900 Protocol Series for Fan Coil Applications

User Guide

F-28335-1
03/2024

Schneider Electric

www.se.com

Legal Information

The Schneider Electric brand and any trademarks of Schneider Electric SE and its subsidiaries referred to in this guide are the property of Schneider Electric SE or its subsidiaries. All other brands may be trademarks of their respective owners.

This guide and its content are protected under applicable copyright laws and furnished for informational use only. No part of this guide may be reproduced or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), for any purpose, without the prior written permission of Schneider Electric.

Schneider Electric does not grant any right or license for commercial use of the guide or its content, except for a non-exclusive and personal license to consult it on an "as is" basis. Schneider Electric products and equipment should be installed, operated, serviced, and maintained only by qualified personnel.

As standards, specifications, and designs change from time to time, information contained in this guide may be subject to change without notice.

To the extent permitted by applicable law, no responsibility or liability is assumed by Schneider Electric and its subsidiaries for any errors or omissions in the informational content of this material or consequences arising out of or resulting from the use of the information contained herein.

Safety Information

Important Information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

Notice is used to address practices not related to physical injury.

Please Note

Electrical equipment should be installed, operated, serviced and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Safety Precautions

⚠ WARNING

LOSS OF CONTROL

The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and over travel stop.

- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of anticipated transmission delays or failures of the link.
- Each implementation of equipment utilizing communication links must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions could result in death, serious injury or equipment damage.

NOTICE

PRODUCT DAMAGE DUE TO ELECTROSTATIC DISCHARGE

Circuit boards and option cards can be damaged by static electricity. Observe the electrostatic precautions below when handling circuit boards or testing components.

- Keep static-producing material such as plastic, upholstery and carpeting out of the immediate work area.
- Store static-sensitive components in protective packaging when they are not installed in the drive.
- When handling a static-sensitive component, wear a conductive wrist strap connected to the component or drive through a minimum of 1 megohm resistance.
- Avoid touching exposed conductors and components leads with skin or clothing.

Failure to follow these instructions can result in equipment damage.

NOTICE

PRODUCT DAMAGE DUE TO INCORRECT CLEANING METHODS

- Use a soft, pre-moistened lint-free cloth for cleaning.
- Do not spray anything directly on the panel or use compressed air.
- Do not use caustic/corrosive products, ammonia, solvents or any cleaning product containing alcohol or grit.
- Never use tools directly on the glass surface.
- Never use paint on the panel.
- Do not drop or crush the panel or allow it to come into contact with liquids.
- Do not use a damaged device (such as one with cracked glass).

Failure to follow these instructions can result in equipment damage.

Table of Contents

Introduction

SpaceLogic TC900 Series fan coil thermostats are optimized for office buildings, hotels, hospitals and residential applications. The thermostat can be programmed to communicate with a Building Management System over BACnet or Modbus protocol. The TC900 Series can be used for 2-pipe or 4-pipe applications. This document provides information on how to use the TC900 Protocol Series thermostats, as well as a description of the various functions available.

Product Description

Part Number	Description
TC903-EF4LDPSA	SpaceLogic, Thermostat, FCU, On/Off, Protocol, ECM, Deluxe, 240V, LCD, White
TC903-3A4LXPXA	SpaceLogic, Thermostat, FCU, On/Off, Protocol, 3 Fan Auto, 240V, LCD, White
TC903-3A4LDPSA	SpaceLogic, Thermostat, FCU, On/Off, Protocol, 3 Fan Auto, Deluxe, 240V, LCD, White
TC903-3A4PDPSA-24	SpaceLogic, Thermostat, FCU, Proportional, Protocol, 3 Fan Auto, Deluxe, 24V, LCD, White
TC903-3A4PDPSA	SpaceLogic, Thermostat, FCU, Proportional, Protocol, 3 Fan Auto, Deluxe, 240V, LCD, White
TC907-EF4LDPSAB	SpaceLogic, Thermostat, FCU, On/Off, Protocol, ECM, Deluxe, 240V, Touch, Black
TC907-3A4LXPXAB	SpaceLogic, Thermostat, FCU, On/Off, Protocol, 3 Fan Auto, 240V, Touch, Black
TC907-3A4LDPSAB	SpaceLogic, Thermostat, FCU, On/Off, Protocol, 3 Fan Auto, Deluxe, 240V, Touch, Black
TC907-3A4PDPSA-24B	SpaceLogic, Thermostat, FCU, Proportional, Protocol, 3 Fan Auto, Deluxe, 24V, Touch, Black
TC907-3A4PDPSAB	SpaceLogic, Thermostat, FCU, Proportional, Protocol, 3 Fan Auto, Deluxe, 240V, Touch, Black

List of Included Items

- Thermostat
- Mounting Screws (2 pcs x M 4 x 25 mm Pan header, 2 pcs x M 3.5 x 35 mm countersunk)

Terminology

Term	Definition
Commissioning	Configure the application, physical connection and logical settings to make it operational.
BACnet	A Data Communication Protocol for Building Automation and Control Networks
Modbus	A Data Communication Protocol for Building Automation and Control Networks.

Acronyms

Acronym	Definition
EBO	EcoStruxure™ Building Operation
ETS	Engineering Tool Software
FCU	Fan Coil Unit
FW	Firmware
HVAC	Heating, Ventilation and Air Conditioning
HW	Hardware
SI	System Integrator
RTU	Remote Terminal Unit
BAS	Building Automation System
APP	Application Program

Related Documents

- TC900 Protocol Series Specification Sheet (F-28318-x)
- TC900 Protocol Series Installation Instructions (F-28326-x)

Prerequisites

To install and configure the TC900 by BACnet interface, the following tools, software and equipment are recommended:

- EcoStruxure Building Operation WorkStation v5.0.3 .117
- SmartX Controller – AS-P with firmware v5.0.3 .117
- SmartX Controller – AS-B with firmware v5.0.3 .117

Please refer to the related installation instructions and specification sheet for detail.

Device Set-up

Mounting Instructions & Standard Installation Practices

Please refer to the TC900 Protocol Series Installation Instructions (F-28326-x) for detail.

Troubleshooting Tips

Set-up Issues

Issue	Potential Factors	Tips
Modbus cannot communicate	The Modbus address is the same in the network	Set a unique Modbus address in the network. Refer to item 14 of the Parameter Settings table on page 5.
	Incorrect wiring connection	1. RS-485 devices should be connected in a daisy chain. Refer to installation sheet wiring diagram and related RS-485 terminals (A, B). 2. For thermostats with 24V power input terminals (R,C), and power coming from the same external 24V power, the terminals should be R to R and C to C. Do not reverse the connections, R to C.
	Incorrect Modbus setting (such as Communication Protocol, Modbus address setting, Baud rate, Modbus parity check).	Set the correct Modbus setting. Refer to items 13,14,16 and 17 of the Parameter Settings table on page 5.

Issue	Potential Factors	Tips
BACnet cannot communicate	The BACnet address is the same in the network	Set a unique BACnet address in the network. Refer to item 15 of the Parameter Settings table on page 5.
	The BACnet device ID is the same in the network	Set a unique device ID in the network.
	Incorrect RS-485 wiring connection	1. RS-485 devices should be connected in a daisy chain. Refer to installation sheet wiring diagram and related RS-485 terminals (A, B). 2. For thermostats with 24V power input terminals (R,C), and power coming from the same external 24V power, the terminals should be R to R and C to C. Do not reverse the connections, R to C.
	Incorrect BACnet setting (such as Communication Protocol, BACnet address setting, Baud rate)	Set the correct BACnet settings. Refer to items 13,15 and 16 of the Parameter Settings table on page 5. For example, preset all devices (TC900, SmartX Controller, etc.) with the same Baud rate before connection.
EBO or SmartX Controller (AS-P/ AS-B) stops responding (until restarted to resume normal operation)	Change the Baud rate of the BACnet system (controller + TC900) communication	Do not change the baud rate during BACnet system communication. Follow the steps below. 1. Set the baud rate in the SmartX Controller (AS-P/AS-B,etc.). 2. Change the Baud rate of the TC900 devices to match. 3. Include the SmartX Controller (AS-P/AS-B,etc.) and TC900 device in one network.
BACnet devices cannot go offline in EBO	The BACnet device name is the same in the network	Set a unique device name in the network.
BACnet objects value and unit display in the APP is different from thermostat.	APP default display unit setting is different from the thermostat unit.	Set the APP unit/measurement system to **As Configured in Object**. For example, for Building Operation WorkStation, set the APP option **Tool > Measurement system > As Configured in Object** to get the thermostat unit.
	APP display value/unit is not being updated by the thermostat.	Upload all objects value/unit into the APP. For example, for Building Operation WorkStation, select the APP option **Devices > Upload All Objects** to get the updated value/unit from the thermostat.
Thermostat does not turn ON.	Incorrect power supply voltage.	Before connecting the power supply, refer to the installation sheet wiring diagram and related power supply (90-240 Vac or 24 Vac).
	Incorrect wiring connections.	Before connecting the power supply, refer to the installation sheet wiring diagram and related power supply terminals (L & N or R & C).

Maintenance Issues

In the event of an operating exception, the thermostat will attempt to command the valve to close and place the device in an inoperative state. The display will indicate the current status with one of five diagnostic messages:

EE: EEPROM failure

E1: Sensor short-circuit alert

E2: Sensor open-circuit alert

‘HI’ will be displayed if the temperature is higher than 50 °C.

‘Lo’ will be displayed if the temperature is lower than 0 °C.

When one of the messages listed below is displayed, the thermostat is operating normally:

‘99°F’ will be displayed for temperatures between 99 and 122 °F.

‘Load’ will be displayed after a firmware file upload.*

‘Boot’ will be displayed in the event of “Power on after the power disconnected” or “Firmware file upload and run the first time.”*

* For further information on uploading a firmware file, refer to the Firmware Update section on page 15.

Functions: Operational Instructions

Button Operations

Power On/Off

A short/long press of the ON/OFF button will turn the power on. Another short/long press of the ON/OFF button will turn off the power, fan coil and motorized valve. If no buttons are pressed for 10 seconds, the thermostat backlight turns off. Press any button to turn the backlight back on.

Temperature Setting

With the power on, press ∨ to decrease the temperature setting and ∧ to increase the temperature in steps of 0.5°C/1°F. The - + symbol will appear on the display. If no buttons are pressed for six seconds, is displayed, indicating the setpoint is confirmed.

Mode Selection

With the power on, press M to switch the operation mode. The display indicates cooling with , heating with and ventilation with . Auto mode can be selected in the parameter settings and is indicated on the display with .

The Auto mode hysteresis range will be adjusted automatically by the Deadband and Differential parameters setting.

Fan Speed Selection

With the power on, press (on TC903) or (on TC907) to select a fan wind/air speed of high , medium , low or automatic . In automatic mode, the fan speed changes automatically. For a difference of 1 °C (2 °F), the fan will automatically switch to low fan speed. For a difference of 2 °C (2 °F), the fan will automatically switch to medium fan speed. For a difference of 3 °C (5 °F) or more, the fan will automatically switch to high wind speed.

Button Lockout Function

Press and hold the up ∧ and down ∨ buttons at the same time for six seconds to activate the keypad lockup function to prevent thermostat operation by others. While lockout is active, the lock icon will be displayed on the screen. To deactivate the lockout function, press and hold the up ∧ and down ∨ buttons at the same time for six seconds to unlock the system.

Operation Instructions

Motorized Valve Control

In Cooling mode, the cold water valve will be opened when the room temperature is 1 °C (2 °F) higher than the temperature setting or closed when the room temperature drops to the setting. The hot water valve will remain closed.

In Heating mode, the hot water valve will open when the room temperature is 1 °C (2 °F) lower than the temperature setting and will close when the room temperature rises to the setting.The cold water valve will remain closed.

Time Setting Function

During power-on, press and hold for six seconds to enter Time Setting mode. Press the mode button again to select the hour, minute and week. Press the up ∧ and down ∨ buttons to adjust this parameter. Time Setting mode is exited automatically if no button is pushed for six seconds. Note: This RTC function is only available on models with an ‘S’ in the model number: ‘3A4LDPSA’, ‘3A4PDPSA’, ‘EF4LDPSA’, etc.

Remote Sensor/Key Card

This user-defined parameter selects whether input terminals are utilized for a remote temperature sensor and occupancy key card (except for 24V models which only support one, but not both, simultaneously). Note: This function is only available on models with an 'S' in the model number: '3A4LDPSA', '3A4PDPSA', 'EF4LDPSA', etc.

Energy-Saving Functions

Eco Mode

Press the FAN/ECO button (on TC903) or the ECO button (on TC907) to turn on Eco mode. The display will show the ECO and indoor icons. If the thermostat is in Cooling mode, the temperature is automatically set to 26 °C with the fan running at low speed. If the thermostat is in Heating mode, the temperature is automatically set to 18 °C with the fan running at low speed. To turn Eco mode off, press the up ∧ or down ∨ buttons to change the temperature setting or press the FAN/ ECO or ECO buttons.

Unoccupied Energy Saving Mode

Unoccupied Energy Saving mode can be entered via a hotel room key card or bioprobe. Example: after a hotel room key card is removed from the reader, the ECO and icons are displayed. If the thermostat is in Cooling mode, the temperature is automatically set to 28 °C with the fan running at low speed. If the thermostat is in Heating mode, the temperature is automatically set to 16 °C with the fan running at low speed. When the key card is returned to the reader, the indoor icon is displayed, the ECO icon is turned off and the thermostat returns to the previously set mode.

Sleep Energy Saving Mode

At 12:00 a.m., Sleep Energy Saving mode turns on and the Override icon displays at 1:00 a.m. The temperature setpoint increases or decreases automatically every hour by 1 °C until 3:00 a.m. Example: if the thermostat is in Cooling mode, the setpoint will increase 1 °C per hour until 3:00 a.m. then decrease 1 °C per hour until the original setpoint is reached at 7:00 a.m. when the Override icon turns off. If the thermostat is in Heating mode, the setpoint will decrease 1 °C per hour until 3:00 a.m. and then increases 1 °C per hour until the original setpoint is reached at 7:00 a.m. when the Override icon turns off. The cooling setpoint will not rise above 26 °C and the heating setpoint will not drop below 18 °C in Sleep Energy Saving mode.

Parameter Settings

Parameters on the TC900 Protocol Series device can be set to designate the thermostat as a BACnet MS/TP master device or a Modbus RTU secondary device. During LCD power off (but powered), press and hold the mode button M for six seconds to enter the settings table. Press the M button to select items and use the up ∧ and down ∨ buttons to adjust these parameters. It will automatically exit if there is no button operation for six seconds.

Parameter Settings Table

Number	Parameter	Default	Description
P01	Low temperature protection	On	OF: Disable On: Enable
P02	Fan operation after setting temperature is reached	DA	Db: Fan Off DA: Fan On
P03	Power-on state	00	00: Power-down memory 01: Power-down do not remember 02: Display is on when powered-up
P04	Differential	1 °C (2 °F)	1 to 3 °C (2 to 5 °F)
P05	ECO mode differential	2 °C (4 °F)	1 to 5 °C (2 to 9 °F)

Number	Parameter	Default	Description
P06	Heating set-point upper limit	35 °C (95 °F)	5 to 35 °C (41 to 95 °F)
P07	Cooling set-point lower limit	5 °C (41 °F)	5 to 35 °C (41 to 95 °F)
P08	Dead-band for Auto	1 °C (2 °F)	1 to 3 °C (2 to 5 °F)
P09	Mode button selection (4-pipe)	02	00: Heating only (Heating + Vent) 01: Cooling only (Cooling + Vent) 02: Cooling and heating (Heating + Cooling + Vent) 03: Auto 04: 2-pipe mode with 3-wire valve*
P10	Auto fan setting	0n	0F: Disable – Fan mode can be High, Medium or Low 0n: Enable – Fan mode can be High, Medium, Low or Auto. No Auto option in Ventilation mode.
P11	Show temperature selection	00	00: Room temperature 01: Setpoint
P12	F/C degree	01	00: Degrees Fahrenheit (°F) 01: Degrees Celsius (°C)
P13	Communication Protocol Selection	00	00: BACnet Enabled (Modbus disabled) 01: Modbus Enabled (BACnet disabled)
P14	Modbus address setting	01	01 to 64
P15	BACnet address setting	01	00 to 127
P16	Baud rate	00	00: 76800 bps 01: 9600 bps, 02: 19200 bps 03: 38400 bps
P17	Modbus Parity check	00	00: Odd check 01: Even check 02: No check
P18	RTC clock Display	0N	0F: Disable 0N: Enable
P19	12 / 24 Hour clock	24	12: 12-hour clock 24: 24-hour clock
P20	Sleep energy saving mode	On	OF: Disable On: Enable
P21	Cooling temperature, Unoccupied Energy Saving mode	28 °C	22 to 32 °C (72 to 90 °F)
P22	Heating temperature, Unoccupied Energy Saving mode	16 °C	10 to 21°C (50 to 70 °F)
P23	Fan speed, Unoccupied Energy Saving mode	02	00: High speed 01: Medium speed 02: Low speed
P24	Temperature sensor selection	00	00: Built-in sensor 01: External sensor
P25	Low-speed fan output voltage	3.3 V	Range: 0 V to medium-speed setting
P26	Medium-speed fan output voltage	6.6 V	Range: Medium-speed setting to high-speed setting Medium
P27	High-speed fan output voltage	10 V	Range: Medium-speed setting to 10 V
P28	Selection of external temp sensor or key-card switch	00	00: External temp sensor, 01: Key-card switch
P29	Backlight Standby brightness	05	00 (0% brightness) to 05 (5% brightness)

*For a 2-pipe system with a 3-wire motorized valve, the thermostat supports either Heating Mode or Cooling Mode, but not both simultaneously.

Notes:

1. Parameters 01 to 17 apply to all models.
2. Parameters 18 to 24 only apply to models with ‘S’ in the part number (real-time clock and external sensors connection).
3. Parameters 25 to 27 only apply to models with ‘F’ in the part number (DC brushless fan).

4. Parameter 28 only applies to models with '-24' in the part number (24V models).
5. Parameter 29 only applies to TC907 models.
6. For models without one of the specific functions mentioned above, skip the parameters entirely.
7. Parameters in this table must be set by specialized installation personnel authorized by Schneider Electric. Any inconvenience or damage caused by unauthorized operation will not be covered by warranty.

Modbus Communication Overview

TC900 Protocol Series thermostats support the Modbus protocol, allowing simple integration of the device within a Building Management System using standard Modbus serial communication.

The thermostats communicate as a Modbus RTU secondary device over a serial (not isolated) RS-485 connection, allowing for the transfer of real-time data. RS-485 communication parameters such as baud rate, parity check, Modbus address and protocol selection can be adjusted as follows:

- Communication Protocol*: BACnet / Modbus
- Baud rate: 9600, 19200, 38400 and 76800 bps
- Modbus address: 01 to 64**
- Modbus parity check: Odd / Even / No check

*If BACnet is selected, Modbus communication will be disabled. If Modbus is selected, BACnet communicaiton will be disabled.

**For the maximum number of Modbus devices allowed in a daisy chain, refer to the Modbus Controller Guidelines, BMS Software Guidelines, Baud Rate, Total Cable Length, RS-485 Repeater, etc. for detail.

These parameters are defined for each thermostat in the Parameter Settings table on page 5. If required, adjust the settings to disable the Modbus connection. All of these settings can be completed under menu items 13, 14, 16 and 17. Connection to the RS-485 network is made via dedicated terminals on the back of the thermostat marked A (+) and B (-).

Modbus communication data format: 1 start bit + 8 data bits + 0/1 parity check bit + 1 stop bit.

Supported function codes are described below.

Function Code	Register Type	Data	Format
01	Read coils	Boolean	Binary/digital
02	Read discrete inputs	Boolean	Binary/digital
03	Read holding registers	Word	16-bit integer
04	Read input registers	Word	16-bit integer
06	Write single registers	Word	16-bit integer

Function Code 01

Register	Description	Definition
0	Cooling valve (4-pipe)	0 = OFF, 1 = ON
4	Fan speed status high	0 = OFF, 1 = ON
5	Fan speed status medium	0 = OFF, 1 = ON
6	Fan speed status low	0 = OFF, 1 = ON
7	Heating valve (4-pipe)	0 = OFF, 1 = ON

Function Code 02

Register	Description	Definition
2	Temp sensor, short circuit	0 = OK, 1 = FAULT
3	Temp sensor, open circuit	0 = OK, 1 = FAULT

Function Code 03/06

Register	Description	Definition
2	Thermostat mode	0 = OFF, 1 = ON, 02 = Frost protection*
3	Operation mode	1 = Cool, 2 = Heat, 3 = Ventilation, 4 = Auto
4	Set-point	5 to 35 °C (41 to 95°F)
5	Fan mode	00 = High, 01 = Medium, 02 = Low, 03 = Auto
6	Heating set-point, upper limit	5 to 35 °C (41 to 95 °F)
7	Cooling set-point, lower limit	5 to 35 °C (41 to 95 °F)
8	ECO mode	0 = Disable, 1 = Enable
9	ECO mode, cooling set-point	22 to 32 °C (72 to 90 °F)
10	ECO mode, heating set-point	10 to 21 °C (50 to 70 °F)
11	Temperature compensation	-5 to 5 °C (-9 to 9 °F)
12	Setpoint, upper limit	2 to 49.5 °C (36 to 121 °F)
13	Setpoint, lower limit	0 to 47.5 °C (32 to 118 °F)
14	Sleep mode	0 = Disable, 1 = Enable
15	Low temperature protection	0 = Disable, 1 = Enable
16	Fan operation after setting temperature is reached	0 = Fan OFF, 1 = Fan ON
17	Power-on state	00 = Power-down memory, 01 = No power-down memory, 02 = Display on when powered
18	Differential	1 to 3 °C (2 to 5 °F)
19	ECO mode differential	1 to 5 °C (2 to 9 °F)
20	Auto deadband	1 to 3 °C (2 to 5 °F) for 4-pipe only
21	Operation mode configuration	0 = Heat only (heat & vent) 1 = Cool only (cool & vent) 2 = Heat and cool (heat, cool & vent) 3 = Auto 4 = 2-pipe mode with 3-wire valve
22	Auto fan	0 = Disable, 1 = Enable
23	Display temperature	00 = Room temp., 01 = Set-point
24	Temperature sensor	00 = Built-in sensor, 01 = External sensor
25	Communication protocol selection	00= BACnet Enabled (Modbus Disabled), 01= Modbus Enabled (BACnet Disabled)
26	Modbus address setting	1 to 64
27	Baud rate	00= 76800 bps, 01= 9600 bps, 02= 19200 bps, 03= 38400 bps
28	Modbus parity check	00 = Odd check, 01 = Even check, 02 = None
29	RTC clock display	0 = Disable, 1 = Enable
30	12/24-hour clock	12 = 12-hour clock, 24 = 24-hour clock
31	Occupancy/Auxiliary input close/open	00 = Occupied when short-circuit, unoccupied when open-circuit 01 = Unoccupied when short-circuit, occupied when open-circuit

Register	Description	Definition
32	Unoccupied mode, cooling setpoint	22 to 32 °C (72 to 90 °F)
33	Unoccupied mode, heating setpoint	10 to 21 °C (50 to 70 °F)
34	Unoccupied mode, fan speed	00 = High, 01 = Medium, 02 = Low
35	Temperature value from connection	00 = Local device 01 = Modbus connection
36	Temperature input	0 to 500 (e.g.,‘500’ is 50°C)
37	Heating KP	1 to 99
38	Cooling KP	1 to 99
39	PID sampling time	1 to 99 s
40	KI	0 to 99
41	Span	1 to 99
42*	Heating valve 2, output voltage	10x voltage (e.g., if voltage is 5.7V, ‘57’ is displayed)
43*	Cooling valve 1, output voltage	10x voltage (e.g., if voltage is 5.7V, ‘57’ is displayed)
44	Low-speed fan output voltage	0V to medium-speed setting
45	Medium-speed fan output voltage	Medium-speed setting to high-speed setting
46	High-speed fan output voltage	High-speed setting to 10V
47	Keypad status	0 = Unlocked, 1 = Locked
48*	Occupancy status	0 = Unoccupied, 1 = Occupied
49	Occupancy override	0 = No, 1 = Occupied, 2 = Unoccupied
50*	Keycard status	0 = Not present, 1 = Present
51	Backlight brightness (TC907 only)	00 (0% brightness) to 05 (5% brightness), in 01(1%) increments.
52	F/C degree	0 = Degrees Fahrenheit (°F) 1 = Degrees Celsius (°C)
53	BACnet address setting	00 to 127
*Read only.		

Function Code 04

Register	Description	Definition
0	Actual room temperature	0 to 50 °C (32 to 122 °F)

Note: For all Modbus related Celsius and Fahrenheit degree values, the Modbus transfer data is the Celsius value multiplied by 10.

BACnet Communication Overview

TC900 Series thermostats support the BACnet protocol, allowing simple integration of the device within a Building Management System using standard BACnet MS/TP communication.

The TC900 Series thermostats communicate as a BACnet MS/TP master device over a serial (not isolated) RS-485 connection, allowing for the transfer of real-time data. RS-485 communication parameters such as baud rate, BACnet address and protocol selection can be adjusted as follows:

- Communication Protocol: BACnet / Modbus*
- Baud rate: 9600, 19200, 38400 and 76800 bps**
- BACnet address: 00 to 127***
- Modbus parity check: Odd / Even / No check

*If BACnet is selected, Modbus communication will be disabled. If Modbus is selected, BACnet communicaiton will be disabled.
** For the best balance between speed and reliability, select a Baud rate of 38400 bps.
***For the maximum number of BACnet devices allowed in a daisy chain, refer to the BACnet Controller Guidelines, BMS Software Guidelines, Baud Rate, Total Cable Length, RS-485 Repeater, etc. for detail.

These parameters are defined for each thermostat in the Parameter Settings table on page 5. If required, adjust the settings to disable the BACnet connection. All of these settings can be completed under menu items 13, 15 and 16. Connection to the RS-485 network is made via dedicated terminals on the back of the thermostat marked A (+) and B (-).

BACnet Protocol Implementation Conformance Statement

Vendor name: Schneider Electric

Vendor ID: 10

Base ASHRAE standard: 135-2019

BACnet Protocol version: 1

BACnet Protocol revision: 19

BACnet Standardized Device Profile: BACnet Application Specific Controller (B-ASC)

List All BACnet Interoperability Building Blocks Supported: DS-RP-B, DS-RPM-B, DS-WP-B, DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-RD-B, DM-TS-B, DM-UTC-B

Data Link Layer Options: MS/TP Master, baud rates 9600, 19200, 38400, 76800

Networking Options: Static Device binding supported.

Character Sets supported: ISO 10646 (UTF-8)

BACnet Descriptions

The following BACnet objects and formats are supported. Note: In the tables below, all properties are read-only unless otherwise noted.

Standard Object Types Supported

Object Type	Supported Optional Properties	Writeable Properties
Analog Input - AI	Description Resolution Max_Pres_Value Min_Pres_Value	None
Analog Output - AO	Description Resolution Max_Pres_Value Min_Pres_Value	Present_Value
Binary Input - BI	Description Inactive_Text Active_Text	None
Analog Output - AO	Description Inactive_Text Active_Text	Present_Value
Multistate Input - MSI	Description State_Text	None
Multistate Output - MSO	Description State_Text	Present_Value

Object Type	Supported Optional Properties	Writeable Properties
Device - DEV	Description Max_Master Max_Info_Frames Local_Time Local_Date UTC_Offset Daylight_Savings Status	Object_Identifier Object_Name Location APDU_Timeout Max_Master Max_Info_Frames UTC_Offset Number_Of_APDU_Retries
Network Port	Description MAC_Address Max_Master Max_Info_Frames	Max_Master Max_Info_Frames

Restrictions on Object Types and Properties

The following tables list the valid ranges of the writable object types and properties.

Object Type	Min. Value	Max. Value
Device_Instance	0	4,194,302

Object Property	Min. Value	Max. Value
DEV_Location	1 Character	32 characters
DEV_Name	1 Character	32 characters
APDU_Timeout	0	65,535
Max_Master	0	127
Max_Info_Frames	1	2
UTC_Offset	-1,440*	1,440*
Number_Of_APDU_Retries	0	255

* Should be a multiple of 15.

BACnet Objects Table 1

Object Name	Object Identifier	Default Value	Min. Value	Max. Value	Object Property	Units
Heating valve 2, output voltage	AI 0	0	0	10	Voltage (e.g., if voltage is 5.7V, ‘5.7’ is displayed, 0~10V)	V
Cooling valve 1, output voltage	AI 1	0	0	10	Voltage (e.g., if voltage is 5.7V, ‘5.7’ is displayed, 0~10V)	V
Actual room temperature	AI 2	-	0	50	Value (0 to 50 °C) if °C is selected	°C
		-	32	122	Value (32 to 122 °F) if °F is selected	°F
Set-point	AO 0	25	5	35	Value (5 to 35 °C, in 0.5 °C increments)	°C
		77	41	95	Value (41 to 95 °F, in 1 °F increments) if °F is selected	°F
Heating set-point, upper limit	AO 1	35	5	35	Value (5 to 35 °C, in 0.5 °C increments)	°C
		95	41	95	Value (41 to 95 °F, in 1 °F increments) if °F is selected	°F
Cooling set-point, lower limit	AO 2	5	5	35	Value (5 to 35 °C, in 0.5 °C increments)	°C
		41	41	95	Value (41 to 95 °F, in 1 °F increments) if °F is selected	°F
ECO mode, cooling set-point	AO 3	26	22	32	Value (22 to 32°C, in 0.5 °C increments)	°C
		79	72	90	Value (72 to 90 °F, in 1 °F increments) if °F is selected	°F
ECO mode, heating set-point	AO 4	18	10	21	Value (10 to 21 °C, in 0.5 °C increments)	°C
		64	50	70	Value (50 to 70 °F, in 1 °F increments) if °F is selected	°F
Temperature compensation	AO 5	0	-5	5	Value (-5 to 5 °C, in 0.5 °C increments) if °C is selected	ΔK
		0	-9	9	Value (-9 to 9 °F, in 1 °F increments) if °F is selected	Δ°F

Object Name	Object Identifier	Default Value	Min. Value	Max. Value	Object Property	Units
Setpoint, upper limit	AO 6	35	7	49.5	Value (*7 to 49.5 °C, in 0.5 °C increments)	°C
		95	45	121	Value (*45 to 121 °F, in 1 °F increments) if °F is selected	°F
Setpoint, lower limit	AO 7	5	0	33	Value (0 to *33 °C, in 0.5 °C increments)	°C
		41	32	91	Value (32 to *91 °F, in 1 °F increments) if °F is selected	°F
Differential	AO 8	1	1	3	Value (1 to 3 °C, in 0.5 °C increments) if °C is selected	ΔK
		2	2	5	Value (2 to 5 °F, in 1 °F increments) if °F is selected	Δ°F
ECO mode differential	AO 9	2	1	5	Value (1 to 5 °C, in 0.5 °C increments) if °C is selected	ΔK
		4	2	9	Value (2 to 9 °F, in 1 °F increments) if °F is selected	Δ°F
Auto deadband	AO 10	1	1	3	Value (1 to 3 °C, in 1 °C increments) if °C is selected	ΔK
		2	2	5	Value (2 to 5 °F, in 1 °F increments) if °F is selected	Δ°F
Modbus address setting	AO 11	1	1	64	1 to 64	
Unoccupied mode, cooling setpoint	AO 12	28	22	32	Value (22 to 32 °C, in 0.5 °C increments) if °C is selected	°C
		82	72	90	Value (72 to 90 °F, in 1 °F increments) if °F is selected	°F
Unoccupied mode, heating setpoint	AO 13	16	10	21	Value (10 to 21 °C, in 0.5 °C increments) if °C is selected	°C
		61	50	70	Value (50 to 70 °F, in 1 °F increments) if °F is selected	°F
Temp. input	AO 14	0	0	50	Value (0 to 50 °C) if °C is selected	°C
		32	32	122	Value (32 to 122 °F) if °F is selected	°F
Heating mode KP	AO 15	10	1	99	1 to 99	-
Cooling mode KP	AO 16	10	1	99	1 to 99	-
PID sampling time	AO 17	20	1	99	1 to 99 S	S
KI	AO 18	1	0	99	0 to 99	-
Span	AO 19	5	1	99	1 to 99	-
Low-speed fan output voltage	AO 20	3.3	0	Medium speed voltage - 0.1	0V to Medium-speed fan output voltage - 0.1	V
Medium-speed fan output voltage	AO 21	6.6	Low speed voltage + 0.1	High speed voltage - 0.1	Low-speed fan output voltage + 0.1 to High-speed fan output voltage - 0.1	V
High-speed fan output voltage	AO 22	10	Medium speed voltage + 0.1	10	Medium-speed fan output voltage + 0.1 to 10V	V
BACnet address setting	AO 23	1	0	127	0 to 127	-
Backlight brightness (TC907 only)	AO 24	5	0	5	0 (0% brightness) to 5 (5% brightness), in 1 (1%) increments	%
Thermostat mode	MSI 0	1	1	3	1 = OFF, 2 = ON, 3 = Frost protection (read only)	-
Operation mode	MSO 0	2	1	4	1 = Cool, 2 = Heat, 3 = Ventilation, 4 = Auto	-
Fan mode	MSO 1	3	1	4	1 = High, 2 = Medium, 3 = Low, 4 = Auto	-
Power-on state	MSO 2	1	1	3	1 = Power-down memory, 2 = No power-down memory, 3 = Display on when powered	-
Operation mode configuration	MSO 3	3	1	5	1 = Heat only (heat + vent), 2 = Cool only (cool + vent), 3 = Heat and cool (heat + cool + vent), 4 = Auto, 5 = 2-pipe mode	-
Baud rate	MSO 4	1	1	4	1 = 76800 bps, 2 = 9600 bps, 3 = 19200 bps, 4 = 38400 bps	-
Modbus parity check	MSO 5	1	1	3	1 = Odd check, 2 = Even check, 3 = None	-
Unoccupied mode, fan speed	MSO 6	3	1	3	1 = High, 2 = Medium, 3 = Low	-
Occupancy override	MSO 7	1	1	3	1 = No, 2 = Occupied, 3 = Unoccupied	-

BACnet Objects Table 2

Object Name	Object Identifier	Default Value	Inactive	Active	Object Property
Cooling valve (4-pipe)	BI 0	0	0	1	0 = OFF, 1 = ON
Fan speed status high	BI 1	0	0	1	0 = OFF, 1 = ON
Fan speed status medium	BI 2	0	0	1	0 = OFF, 1 = ON
Fan speed status low	BI 3	0	0	1	0 = OFF, 1 = ON
Heating valve (4-pipe)	BI 4	0	0	1	0 = OFF, 1 = ON
Temp sensor, short circuit	BI 5	0	0	1	0 = OK, 1 = Fault
Temp sensor, open circuit	BI 6	0	0	1	0 = OK, 1 = Fault
Occupancy status	BI 7	0	0	1	0 = Unoccupied, 1 = Occupied
Keycard status	BI 8	0	0	1	0 = Not present, 1 = Present
Thermostat on or off	BO 0	0	0	1	0 = OFF, 1 = ON
ECO mode	BO 1	0	0	1	0 = Disabled, 1 = Enabled
Sleep mode	BO 2	1	0	1	0 = Disabled, 1 = Enabled
Low temperature protection	BO 3	1	0	1	0 = Disabled, 1 = Enabled
Fan operation after setting temperature is reached	BO 4	1	0	1	0 = Fan OFF, 1 = Fan ON
Auto fan	BO 5	1	0	1	0 = Disabled, 1 = Enabled
Display temperature	BO 6	0	0	1	0 = Room temp, 1 = Set-point
Temperature sensor	BO 7	0	0	1	0 = Built-in sensor, 1 = External sensor
Communication protocol selection	BO 8	0	0	1	0 = BACnet, 1 = Modbus
RTC clock display	BO 9	1	0	1	0 = Disable, 1 = Enable
12 or 24-hour clock	BO 10	1	0	1	0 = 12-hour clock, 1 = 24-hour clock
Occupancy or auxiliary input closed or open	BO 11	1	0	1	0 = Occupied if closed, unoccupied if open 1 = Unoccupied if closed, occupied if open
Temp. value from connection	BO 12	0	0	1	0 = Local device, 1 = BACnet input
Keypad status	BO 13	0	0	1	0 = Unlocked, 1 = Locked
F or C degree	BO 14	1	0	1	0 = °F, 1 = °C

Notes:

1. For all temperature related parameters:
   For degrees Celsius, the transfer data is the Celsius value.
   For degrees Fahrenheit, the transfer data is the Fahrenheit value.
2. The “Set-point” adjustment range, can be adjusted by “Heating set-point, upper limit,” “Cooling set-point,lower limit,” “Setpoint, upper limit,” “Setpoint, lower limit” and “Operation mode.”
3. The “Heating set-point, upper limit” and “Cooling set-point, lower limit,” ranges can be adjusted by “Setpoint, upper limit” and “Setpoint, lower limit.”
4. The “Cooling set-point, lower limit” maximum value can be adjusted automatically using the “Heating set-point, upper limit” default value. For example:

   If the “Heating set-point, upper limit” default value is 35 °C (95 °F), then the “Cooling set-point, lower limit” maximum value will be adjusted automatically to 33 °C (91 °F).

   If the “Heating set-point, upper limit” default value is 49.5 °C (121 °F), then the “Cooling set-point, lower limit” maximum value will be adjusted automatically to 47.5 °C (118 °F).

5. The “Heating set-point, upper limit” minimum value can be adjusted automatically with the “Cooling set-point, lower limit” default value. For example:

   If the “Cooling set-point, lower limit” default value is 5 °C (41 °F), then the “Heating set-point, upper limit” minimum value will be adjusted automatically to 7 °C (45 °F).

   If the “Cooling set-point, lower limit” default value is 0 °C (32 °F), then the “Heating set-point, upper limit” minimum value will be adjusted automatically to 2 °C (36 °F).
6. The “Operation mode” adjustment range can be adjusted by using “Operation mode configuration.”
7. The “Fan mode” adjustment range can be adjusted by using “Auto fan.”
8. For models without one of the specific functions mentioned above, skip the parameters entirely.
9. The BACnet command “Warm Start” will restart the thermostat.
10. The BACnet command “Cold Start” will reset NV Memory (non-volatile memory) to the default factory setting, all imported settings are cleared, then restart the thermostat.
11. The parameters in this table must be set by specialized installation personnel authorized by Schneider Electric. Any inconvenience or damage caused by unauthorized operation will not be covered by warranty.

Cybersecurity

At Schneider Electric, we have always considered cybersecurity as a key requirement and are committed to providing more reliable, stable and secure products to minimize potential cyber risks and better protect customer life, property and the environment.

Cybersecurity aims to protect your systems, communications networks, devices, etc., from possible attacks such as destruction, data tampering, or disclosure of confidential information. It is strongly recommended that you follow the Schneider Electric Defense in Depth approach to cybersecurity, as described in the system technical note “How to Reduce Vulnerability to Cyber Attacks.” In addition, you can find more useful resources and up-to-date information at Schneider Electric's Cybersecurity Support Portal.

Equipment Security Features

The following security features are supported:

- Using digital signature technology based on public key infrastructure PKI, to ensure that the device firmware believable and integrity, and prevent malicious code injection.
- Using verification techniques to guarantee the integrity of important configuration data, business data, etc., which are stored in the device.
- Protect the security of the equipment system through the legitimacy of the input data check.

Communication Security

TC900 Protocol Series thermostats use a serial (not isolated) RS-485 port communication for data read and write. The RS-485 port can configure as a BACnet MS/TP master device or a Modbus RTU secondary device, and it supports firmware upgrades if configured as a BACnet MS/TP device. BACnet MS/TP and Modbus-RTU, which are recognized as a security risk in the

industry, have inherent defects in security, which need to be compensated by additional physical security in the application. Physical security measures (such as dedicated piping) are recommended to protect communication cables from unauthorized access, dropped traffic, data leakage, and tampering. Periodically check the RS485 communications cables to make sure there is no unauthorized access.

Security Disposal

When equipment needs to be disposed of, it is recommended to destroy it through a safe channel to ensure that the equipment is not re-deployed to your operational systems or illegally exploited.

Cybersecurity Vulnerability/Incidents

Access the Schneider Electric Cybersecurity Support Portal (https://www.se.com/ww/en/work/support/cybersecurity/vulnerability-policy.jsp) to check the vulnerability management policy or report potential cybersecurity vulnerability or incidents.

Firmware Updates

To update the device firmware, follow these steps:

1. Register on the Schneider Electric Cybersecurity Support Portal.
2. Contact Schneider Electric's technical support engineers or channel partners to help you update the device firmware.

Recommended Maintenance Operations

Recommended maintenance is required regularly over the lifetime of the device:

- Make sure that the latest firmware is updated.
- Regularly check the I/O cables to ensure they are properly connected and there is no unauthorized access.
- Regularly check the communication cables to ensure there is no unauthorized access.
- Power off the device when it’s not needed.

Schneider Electric
35 rue Joseph Monier
92500 Rueil Malmaison – France
Phone: +33 (0) 1 41 29 70 00
www.se.com

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this publication.

F-28335-1
03/2024