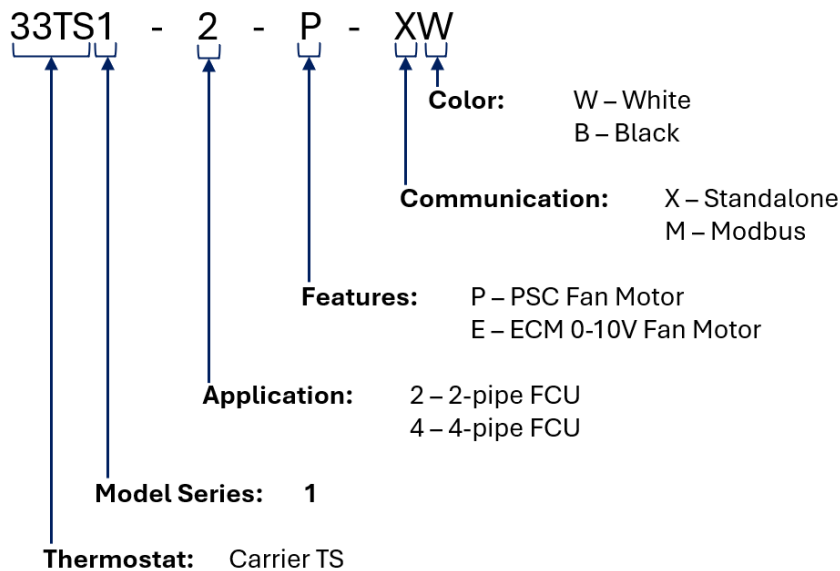


Identification and Overview

Carrier TS1 series thermostats feature a simple and sleek appearance with white-only color options. Equipped with an LCD display and push buttons, it controls regulating water valves plus ECM and AC three-speed fans with enhanced temperature control precision. The -BW/MW series is additionally equipped with an RS-485 interface, allowing integration with building automation systems via the BACnet MS/TP / Modbus-RTU protocol.



Part Number Codestring



Part Number	FCU Type	Fan Type	Valve Type	After Temp Setpoint Achieved	Key Card	External Sensor	Protocol	Color
TS1-2-P-XW	2-pipe	PSC	ON/OFF or 0-10V	Fan Continues to Operate	•	•	Standalone	White
TS1-4-P-XW	4-pipe	PSC	ON/OFF or 0-10V	Fan Continues to Operate	•		Standalone	White
TS1-2-E-XW	2-pipe	ECM	ON/OFF or 0-10V	Fan Continues to Operate	•	•	Standalone	White
TS1-4-E-XW	4-pipe	ECM	ON/OFF or 0-10V	Fan Continues to Operate	•		Standalone	White
TS1-2-P-MW	2-pipe	PSC	ON/OFF or 0-10V	Fan Continues to Operate	•	•	Modbus	White
TS1-4-P-MW	4-pipe	PSC	ON/OFF or 0-10V	Fan Continues to Operate	•		Modbus	White
TS1-2-E-MW	2-pipe	ECM	ON/OFF or 0-10V	Fan Continues to Operate	•	•	Modbus	White
TS1-4-E-MW	4-pipe	ECM	ON/OFF or 0-10V	Fan Continues to Operate	•		Modbus	White



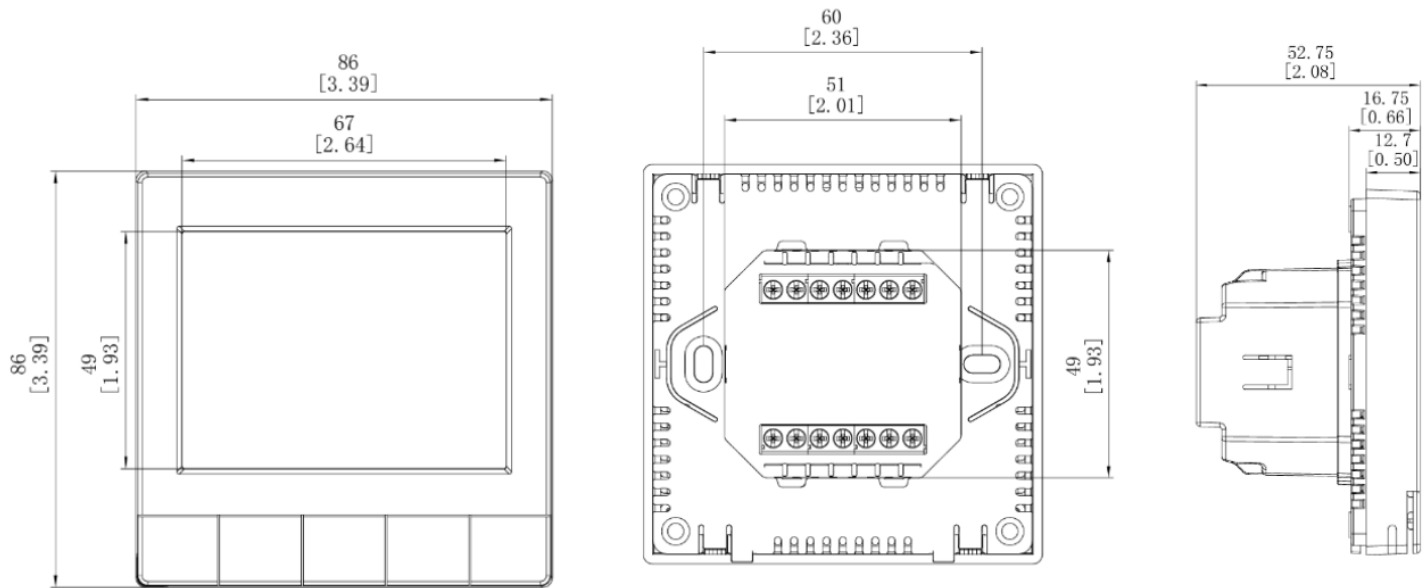
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Part Number	FCU Type	Fan Type	Valve Type	After Temp Setpoint Achieved	Key Card	External Sensor	Protocol	Color
TS1-2-P-BW	2-pipe	PSC	ON/OFF or 0-10V	Fan Continues to Operate	•	•	BACnet	White
TS1-4-P-BW	4-pipe	PSC	ON/OFF or 0-10V	Fan Continues to Operate	•		BACnet	White
TS1-2-E-BW	2-pipe	ECM	ON/OFF or 0-10V	Fan Continues to Operate	•	•	BACnet	White
TS1-4-E-BW	4-pipe	ECM	ON/OFF or 0-10V	Fan Continues to Operate	•		BACnet	White

Specifications

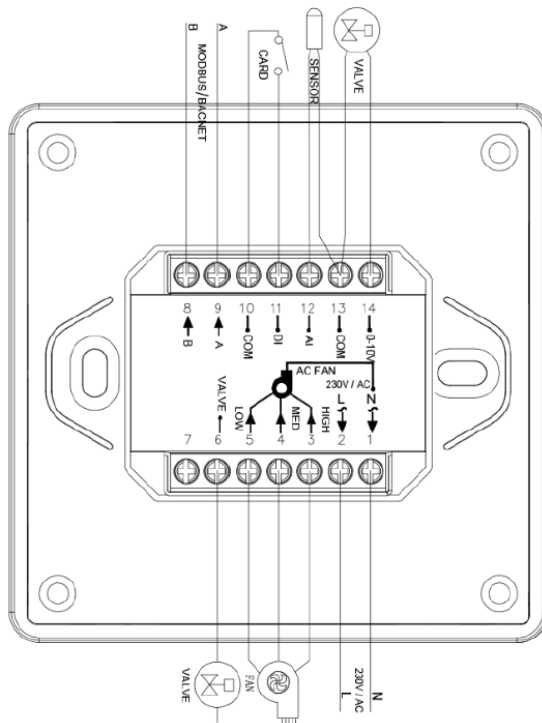
Product Type	FCU Thermostat
Application Options	2-pipe or 4-pipe FCU; 3-speed (PSC) or 0-10V (ECM) fan control; ON/OFF and 0-10V valve control
Communication Options	Standalone, Modbus RTU, or BACnet MS/TP (EIA-485 A, B wiring terminals), with baud rates up to 115,200 bps Recommended Max. of 32 devices
Power Requirements	Supply: AC 90–240VAC (L,N), 50/60Hz Max. Load Current: < 5 A (Resistive) , < 2 A (Inductive) Consumption: < 1W
Wiring Termination	Max. cable 2.5 mm ² per terminal
Display	Backlit LCD with Metric Units (°C)
Input	AI - Remote Temperature Sensor (low voltage) DI – Keycard Accessory (Dry Contact Input)
Output	L, M, H, Valve, 0-10V (2-Pipe, PSC/AC Fan) L, M, H, C-Valve, H-Valve, 0-10V, 0-10V (4-Pipe, PSC/AC Fan) 0-10V (EC Fan), Valve, 0-10V (2-Pipe, ECM Fan) 0-10V (EC Fan), C-Valve, H-Valve, 0-10V, 0-10V (4-Pipe, ECM Fan) Minimum Load = 0.5 ohms Maximum Load = <5A (resistive), <2A (inductive) Supports line voltage (90-240VAC) for fan speed and valve control.
Environmental Operating Range	0°C to 50°C, Humidity: 5–85% RH (non-condensing)
Compliance	CE mark, LVD 2014/35/EU, EMC 2014/30/EU, RoHS 2011/65/EU, REACH #1907/2006
Enclosure	PC+ABS UL94-5 Fire Retardant, IP30 rated, 86(H) × 86(W) × 16.75(D) mm
Scheduling	7-day/multiple periods per day
Temperature Sensor	Accuracy: ±1°C Range: 5 to 35°C
Humidity Sensor	Accuracy: ±5% Range: 0-100%
Display Resolution	±0.5°C
Setpoint Range	5°C – 35°C
Mounting	Standard 60 mm wall box mounting

Dimensional Drawing



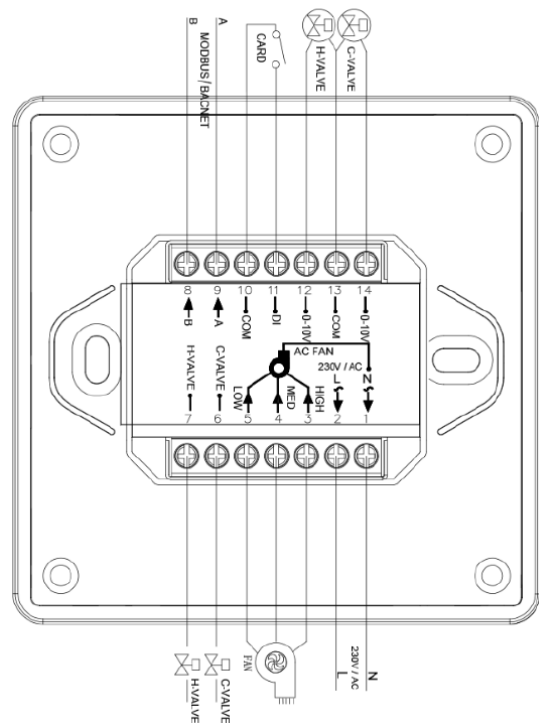
Wiring Diagram

2-pipe with PSC Motor



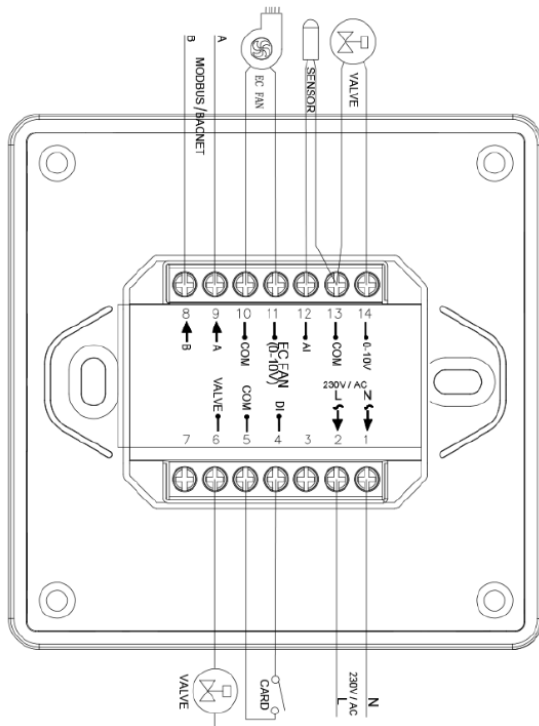
- For standalone models, there is no A, B terminals
- For Modbus/BACnet models the terminals are 8, 9

4-pipe with PSC Motor



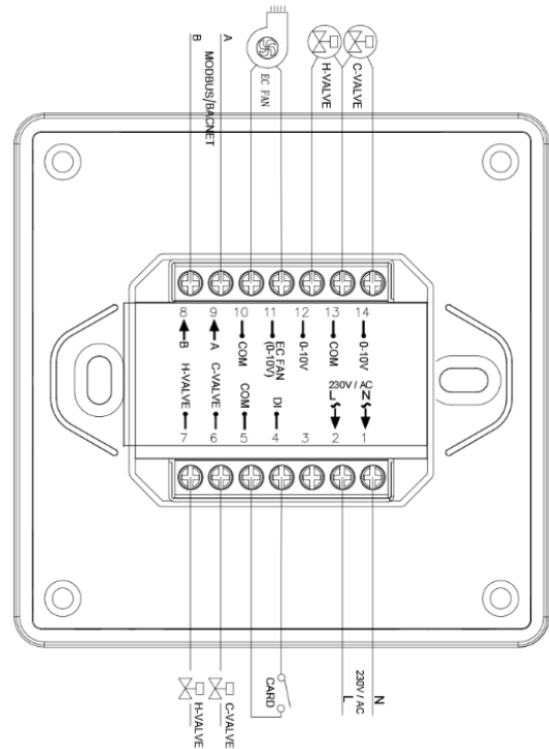
- For standalone models, there is no A, B terminals
- For Modbus/BACnet models the terminals are 8, 9

2-pipe with ECM Motor



- For standalone models, there is no A, B terminals
- For Modbus/BACnet models the terminals are 8, 9

4-pipe with ECM Motor



- For standalone models, there is no A, B terminals
- For Modbus/BACnet models the terminals are 8, 9



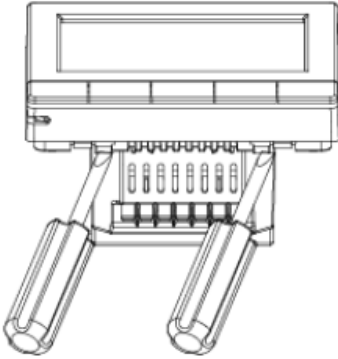
Warning Risk of electric shock and property damage. Disconnect power supply before making any and all electrical connections. The installation and troubleshooting is to be performed by a qualified electrician only.



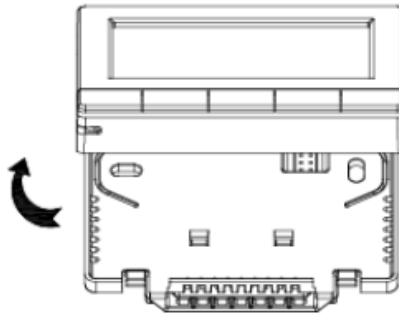
Caution If a normally closed two-wire valve is used, connect only the **Open** terminal. For **2-pipe models**, **Terminal 14** must use shielded wire, with **Terminal 13** used as ground. For **4-pipe models**, **Terminal 12 and Terminal 14** must use shielded wire, with **Terminal 13** used as the ground connection. Communication terminals **A (Terminal 8)** and **B (Terminal 9)** require shielded twisted-pair cable. All **AI, DI, valve output, ground, and communication terminals** are low-voltage and must not share conduit with **AC 220V high-voltage wiring**. For **2-pipe models**, low-voltage terminals include **AI (Terminal 12)**, **DI (Terminal 4)**, **Valve Output (Terminal 14)**, and **Ground (Terminal 13)**. For **4-pipe models**, low-voltage terminals include **DI (Terminal 4)**, **Valve Output (Terminal 12)**, and **Ground (Terminal 13)**. Always separate low- and high-voltage wiring to prevent damage to the thermostat.

Installation Diagram

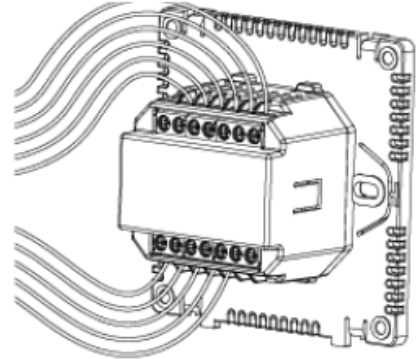
Step 1: Lift housing by utilizing a screw driver



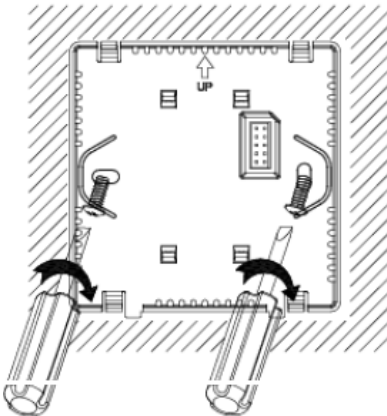
Step 2: Open the housing



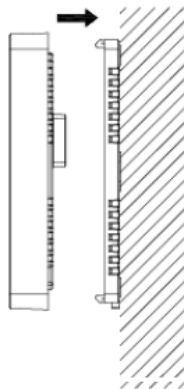
Step 3: Wire the cables to the terminals



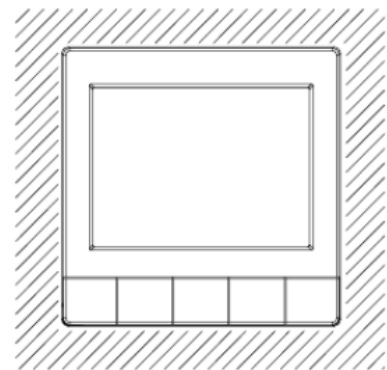
Step 4: Fasten the wall plate to the surface



Step 5: Attach the thermostat to the wall plate

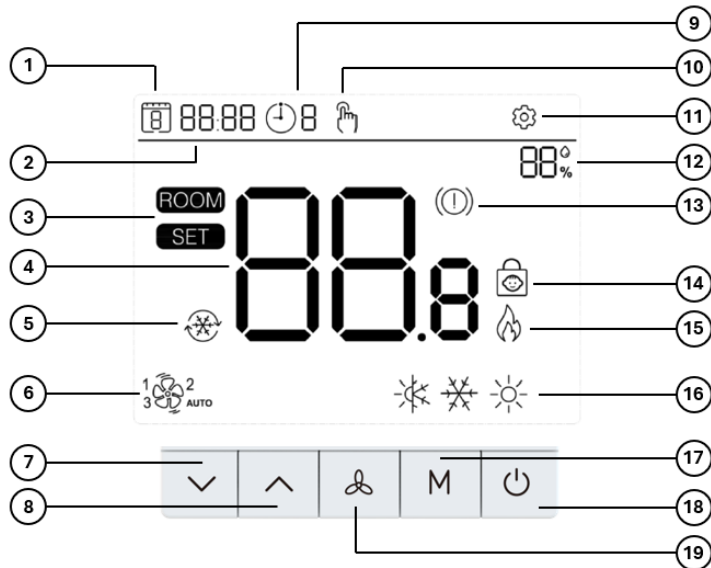


Step 6: Installation is complete



This product must be installed by a professional. Read this manual carefully before installation. Improper installation will cause damage to the equipment. Wire correctly in strict accordance with the wiring diagram.

User Interface Description



- 1 – Schedule, Weekday/Weekend Auto
- 2 – Time
- 3 – Room Temperature / Setpoint
- 4 – Temperature Display
- 5 – Cooling Operation
- 6 – Fan Speed
- 7 – Down Adjustment / Setting
- 8 – Up Adjustment / Setting
- 9 – Time Period
- 10 – Schedule, Manual
- 11 – Settings
- 12 – Humidity Display
- 13 – Alarm
- 14 – Push Button Lock
- 15 – Heating Operation
- 16 – Auto / Cool / Heat Mode
- 17 – Mode Setting
- 18 – ON/OFF
- 19 – Fan Speed Setting

Parameter Configuration

- To change mode parameter configuration, push button to change heating / cooling / ventilation and Auto mode.
- To enter the advanced parameter configuration menu, when the thermostat is OFF (when HVAC equipment is OFF, display is OFF), hold and button together.
- The advanced parameter menu is setup to flow sequentially starting with parameter 01 through 50.
- The button is used on the subsequent screens to select or confirm your choice of setting.
- The and buttons are used to navigate between the setting range for each parameter.
- Once a parameter is set, the next parameter is shown in series.
- The button in the advanced configuration menu is utilized as the back button in advanced parameter configuration menu only.
- The power button exits the advanced configuration menu.

Parameters	Description	Setting Range	Default
01	Temperature calibration	-8°C - 8°C	0
02	Function Mode Selection	0: Ventilation only 1: Cool only 2: Heat only 3: Cool+ ventilation 4: Heat+ ventilation 5: Cool+ heat 6: Cool+ heat+ ventilation 7: Auto (4-pipe only) 8: Auto+ Cool + Heat (4-pipe only) 9: Auto+ Cool + Heat+ Fan (4-pipe only)	6
03	Sensor select	0: internal 1: external	0
04	Room card activation	0: off 1: activated	1
05	Room card polarity	0: NO 1: NC	0
06	Fan stop or not when temp. is satisfied	0: STOP 1: NOT STOP	1
07	Child lock To temporarily unlock, hold the Up and Down buttons.	0: off 1: on	0
08	IO mode: DI/AI selection 4 pipes SKU Only(TS1-4-X-XX) Corresponding room card/sensor select menu will appear/disappear	0:DI 1:AI	0
09	Max set temp	5°C - 35°C	35°C
10	Min set temp	5°C - 35°C	5°C
11	Valve 0-10V range setting	0: 0-10v 2: 2-10v	0
12	PI control configuration	0: Disable I function 1: Enable I function	1
13	P value setting,(unit: 0.1°C)	2-10	10
14	I value setting,(unit: second)	10-60	30
15	Deadband	0.1-1.0°C	1°C

**Modbus SKUs only (for TS1-X-X-MW models)**

16	Modbus Address	1-254	1
17	Modbus baud rate	4800/9600/19200/38400/115200	9600
18	Modbus parity bit	0: none 1:odd 2 even	0
19	2 pipe / 4 pipe selection 4 pipe only (TS1-4-X-MW models)	2: 2 pipe 4: 4 pipe	4

BACnet SKUs only: (for TS1-X-X-BW models)

20	BACnet MAC address	1-127	5
21	BACnet example	1-65534	40001
22	BACnet baud rate	4800 / 9600 / 19200 / 38400 / 115200	384
23	BACnet parity bit	0: none 1:odd 2: even	0
24	Standby brightness (when screen is off)	0-100	0

EC SKUs only: (for TS1-X-E-XW models)

25	EC fan low speed 0-10v configuration	0-100%	4%
26	EC fan mid speed 0-10v configuration	0-100%	65%
27	EC fan high speed 0-10v configuration	0-100%	100%
38	Selection of Modbus/BACnet for BACnet model NOTE The BACnet models could be programmed as Modbus port.	1: BACnet 2: Modbus	1
48-49	Software version		
50	Factory reset: Set the value to 1 and hold power button for 5 seconds.		

BACnet Protocol

Serial	Register type	R/W	Name	Type	Object ID	Description
1	AI	R	RoomTemp	float	0	Current room temperature
2	AI	R	ExternalTemp	float	1	Current external sensor temperature
3	AI	R	Humidity	float	2	Current humidity
4	AI	R	ECOut	uint	3	EC fan output voltage, range 0-100, data=ECout*0.1
5	AI	R	ColdPIOut	uint	4	Cool valve output voltage, range 0-100, data=ColdPIOut*0.1

Serial	Register type	R/W	Name	Type	Object ID	Description
6	AI	R	HeatPIOut	uint	0	Heat valve output voltage, range 0-100,data=HeatPIOut*0.1
7	AV	RW	SetTemp	uint	0	Set temperature
8	BI	R	CardSta	Boolean	0	Room card status: Insert (1) or Remove (0)
9	BV	RW	ON-OFF	Boolean	1	Power on(1) / off(0) control
10	BV	RW	Lock	Boolean	0	Child lock activate 1: on 0: off
11	MI	R	RelaySta	uint	0	Relay status bit 0-7: 1:on 0:off bit 0: low speed bit 1: mid speed bit 2: high speed bit 3: valve 1 status bit 4: valve 2 status bit 5-7: reserved function
12	MI	R	Main_SV	uint	1	Host software version; Bit addressing; e.g. V1.0 High 8 bits:sub version e.g. -0 Low 8 bits: main version e.g. -1
13	MV	RW	NowWorkMode	uint	0	Current operating modes of the equipment: 1 = Ventilation 2 = Cooling 3 = Heating 4 = Auto (4-pipe only)
14	MV	W	FanSpeed	uint	1	Fan speed control 1 = auto 2 = low 3 = mid 4 = high
15	MV	RW	TempAdjustMode	unit	2	Temperature control modes; =1 Manual mode =2 Programmable mode



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Modbus protocol

No.	Address	Item	R/W	Description
1	40000	POWER ON/OFF	RW	= 55H ON = AAH OFF
2	40001	Child lock ON/OFF	R	= 55H ON = AAH OFF
3	40002	Current working mode	RW	= 00H: Ventilation = 11H: Cool mode = 22H: Heat mode = 33H: Auto (4-pipe only)
4	40003	Fan speed	RW	= 00H: Auto = 01H: Low speed = 02H: Mid speed = 03H: High speed
5	40004	Relay status	R	bit: 0-15 value: 1:ON, 0:OFF bit0: Low speed relay bit1: Mid speed relay bit2: High speed relay bit3: Valve1 status bit4: Valve2 status bit5-15: reserved function
6	40005	Room temp	R	Data = RoomTemp * 10;
7	40006	Set temp	RW	Data = TargetTemp * 10;
8	40007	Room card status	R	= 0: out = 1: in
9	40008	External sensor temp	R	Data = ExternalTemp * 10;
10	40009	Cool PI Output	R	Cool valve output voltage, range 0-100, data=ColdPIOut*0.1
11	40010	Heat PI Output	R	Heat valve output voltage, range 0-100, data=ColdPIOut*0.1
12	40010	EC (0-10V) fan output setting	R	EC fan output voltage,range 0-100, data=ECout*0.1
13	40011	Software version	R	eg. V1.0.2 bit15-12: first number, eg. = 1 bit11-8 : second number, eg. = 0 bit7-0: third number, eg. = 2
14	40012	Humidity	R	0-100%
15	40013	Temperature setting mode	RW	= 0: manual mode =1: schedule mode

Functions and Logic Control

Setting the Clock and Schedule

- Hold the  button to start editing the time and schedule.
- Press the  button to change the digit/item and use the  and  buttons to set the corresponding value.
 - During this process, a short press of the  button quits the programming of the Clock and Schedule.
 - A long press of the  button saves the user specified setting. A short press of the  button changes the schedule or manual operation mode.

Function	Description
Temperature control	The internal temperature sensor and thermostat programming controls the HVAC equipment. If a remote temperature sensor is connected, the advanced configuration parameter must be configured to the same programming.
HVAC Equipment Mode	Available modes are heat, cool, ventilation, and auto mode. Select the appropriate mode based on the season or water temperature,. Hold the  button to switch between the selected modes. Auto mode is only possible in 4 pipe models.
Valve control	Each thermostat is compatible with ON/OFF type valve or PWM valve (0-10V). Follow the PID settings in the advanced configuration parameter menu (installer menu) to configure the PID values for the valve. In cooling mode, when the room temperature is higher than the set point + differential (1°C by default), the cooling valve opens. When the room temperature drops to the set point, the cooling valve closes. In heating mode, when the room temperature is lower than the set point-differential (1°C by default), the heating valve opens. When the room temperature rises to the set temperature, the heating valve closes.
PSC / AC Fan control	The fan is controlled by 3 x outputs (Low, Medium, High or L, M, H terminals). Each output regulates the speed of the fan when the fan is ON. If the fan or thermostat is OFF, the HVAC equipment does not operate. The fan outputs are controlled via a -230V power supply. The fan speed can be controlled manually or automatically (if selected). In manual mode, the  button allows the user to select the fan speed regardless of room temperature. In automatic mode the thermostat adjusts the speed according to the room temperature. Fan status after valve closing: Fan continues to operate/run after setpoint is reached

ECM Fan control	The fan is controlled by a 0-10V (EC Fan terminal). The thermostat provides 0-10V modulating output with a default value of 3V / 6V / 10V for 3 x speeds. The value is configurable in the advanced configuration parameter menu. The fan speed can be controlled manually or automatically if selected and accessible. The fan speed can be controlled manually or automatically if selected and accessible. In manual mode, the  button allows you to select the fan speed, regardless of room temperature. In automatic mode, the thermostat adjusts the speed according to the room temperature. Fan status after valve closing: Fan continues to operate/run after setpoint is reached
Digital Input (DI) / Analog Input (AI)	When a thermostat activated and disconnected, the thermostat turns off (showing OFF), and closes the valves and fans. When the digital signal is on again, the thermostat returns to its previous status (if ON, it returns to ON, if OFF it returns to OFF). The AI input is a wired external sensor contact that uses the NTC 3950 10K type (SKU: N1-10K[3950]-PP-25) temperature sensor. You must select the external sensor on the display. The thermostat runs the logic based on the external sensor value.
Room Temp source	The temperature sensor reads the room temperature every 5 seconds. Place the sensor in a well-ventilated area, away from the heating components of the PCB to ensure it reads correctly.
Deadband	A hysteresis value allows the thermostat to not open/close immediately based on the setpoint temperature and room temperature difference (for example, when the deadband is 0, and when setpoint temperature > room temperature, valves open for heating mode). When the deadband is set to 1, the valve only opens when setpoint temperature > room temperature +1, the deadband allows the room temperature to stay comfortable.
4 pipe Auto Mode	When the system is configured as a 4 pipe application, the control and the mode is set to cool and heat (auto); manual switching mode is prohibited. The thermostat automatically switches between cooling and heating modes according to the set point and room temperature.
Auto fan speed	When set to Auto fan speed the system operates the fan speed automatically based on the room temperature and setpoint temperature difference (for example, in cooling mode, deadband = 1°C, low speed: when setpoint temperature < room temperature - deadband (1°C) , mid speed: when setpoint temperature < room temperature - deadband (1°C) - 1°C , high speed: when setpoint temperature < room temperature – deadband (1°C) - 2°C).

Faults and Alarms

Display	Failure Type
	Remote Sensor Failure

Troubleshooting

Issue	Recommendation
Error message: “Error: 20 – No connection available when modifying communication settings (e.g., refresh rate, communication status enabled, register address, etc.) and writing values from the WebCTRL Network Points page”. NOTE This issue occurs only when a user has a Gen5 device and more than 10 Modbus Thermostats are connected.	- All required parameters and Points must be configured with the necessary communication settings (e.g., refresh rate, communication status enabled, address, etc.) before downloading to the controller. - Any modifications to the communication parameter settings on the Network Properties page require the controller to be re-downloaded to resolve the error and ensure the thermostat functions properly

Environmental Protection

Disposal of thermostat must comply with local regulations and guidelines. This product has an onboard battery and should be recycled accordingly.

- Do not dispose of thermostat with ordinary waste
- Never recharge non-rechargeable batteries or throw them into a fire
- Do not expose thermostat/battery to high temperatures or direct sunlight
- Do not incinerate

Appendix – Symbols Key

 Warning	Potential for death, serious injury, or permanent damage to a system.
 Caution	Potential for injury, damage to a system, or system failure.
 Tip	Useful information not related to injury or system damage.