

Description

This full-featured thermostat is designed for cooling and heating systems in residential and commercial buildings. The thermostat can be configured for use with air handlers, fan coils, VAV, modulating valves and practically any HVAC application. All models support Bacnet and Modbus protocols which allows easy integration with the big name control systems like Niagara, Siemens, Honeywell, Johnson Controls, Delta, Reliable and Kreuter to name a few. There are five relay outputs. These outputs can be configured using the free software. There are more than 300 settings with many options for each of the settings so it's possible to configure these devices for most any application. Once the unit is configured, save the config file for copying to other controllers and backing up project settings. Options are available for occupancy sensor, WiFi, and humidity/enthalpy. Tstat 9 derivative products have light sensor function by default except for basic Tstat9.



Highlights

- Modbus TCP/IP protocols over WiFi.
- Well documented register list for easy integration with other systems.
- 5 relay outputs, each rated at 100~220V, 5 amps.
- Color LCD display
- Easily configure the thermostat for practically any application.
- Clock with infinite life supercap battery backup.
- Uses 32 bit Arm CPU with 12 bit analog readings.
- Fits in regular 3in*3in*1.4in(88mm*88mm*35mm) electrical box



Typical Application



Specifications

Outputs	5 relay outputs
Operating range	-30~70°C(-22~158°F) / 0 to 99% RH
Supply voltage	100~220VAC, 50-60Hz
Power consumption	200mA
Relay contacts	5 relays, 2A @ 220VAC
Plastic Housing	Flammability rating UL 94 file E56070
Enclosure rating	IP31
Protocols	Bacnet MSTP and Modbus TCP/IP
Baudrate	9600, 19200, 38400, 57600, 115200
Temperature sensor	10K thermistor ±0.5°C
Analog Input	10K thermistor
Analog Output	0-10VDC
Setup Software	Free, no licensing, open source
Occupancy sensor	
Field of View	138° Form center of element on Axis X 125° Form center of element on Axis Y
CO2 Measurement Accuracy	
Conditions	400 ppm – 2'000 ppm
Value	± (50 ppm + 5% of reading)

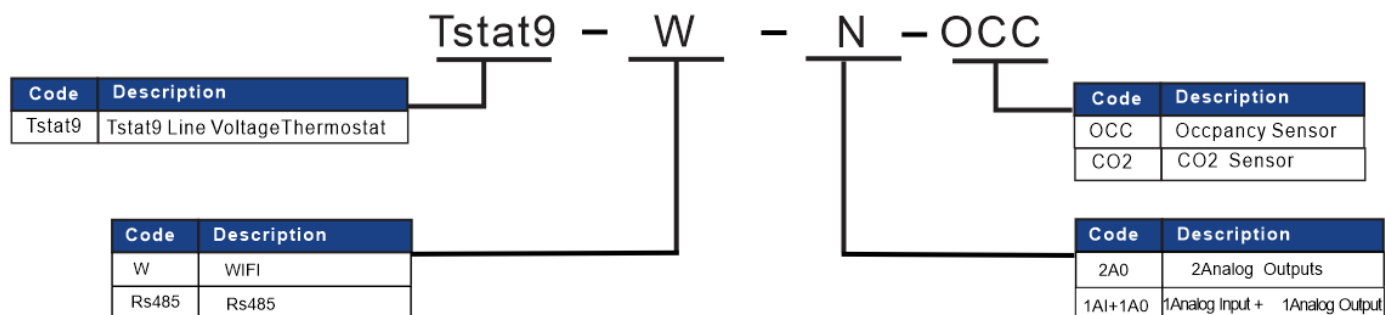
Approvals

Plastic Enclosure	PA66 UL94 V0 File E56070
PCB	FR-4 Epoxy Glass Cloth UL E479892
Terminal Block	PA66 UL94V-0

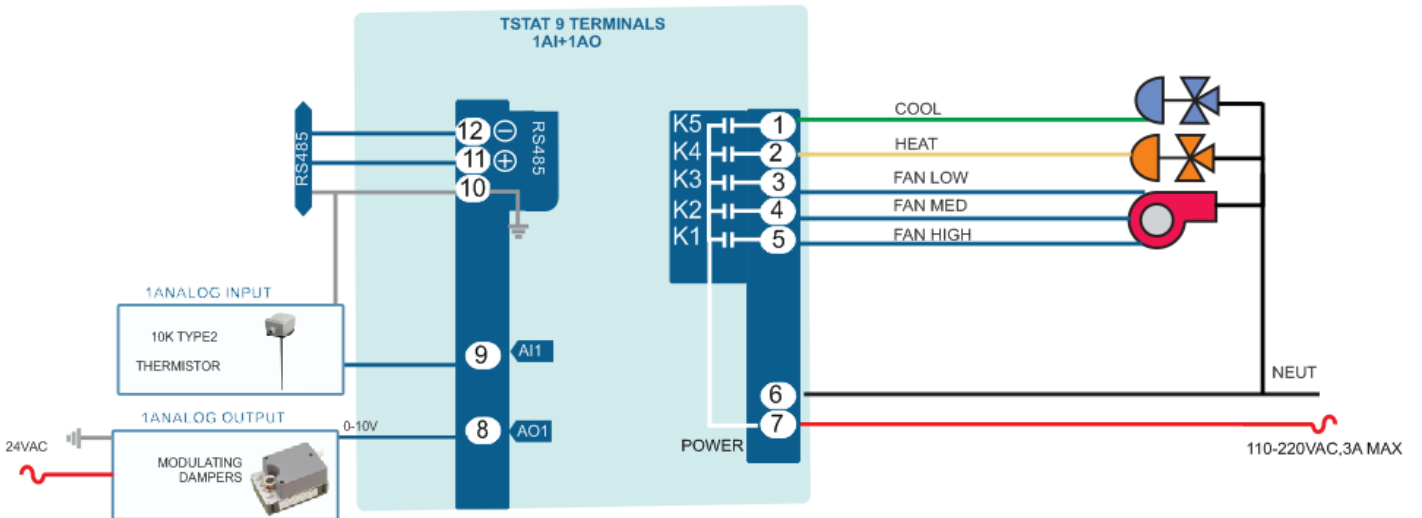
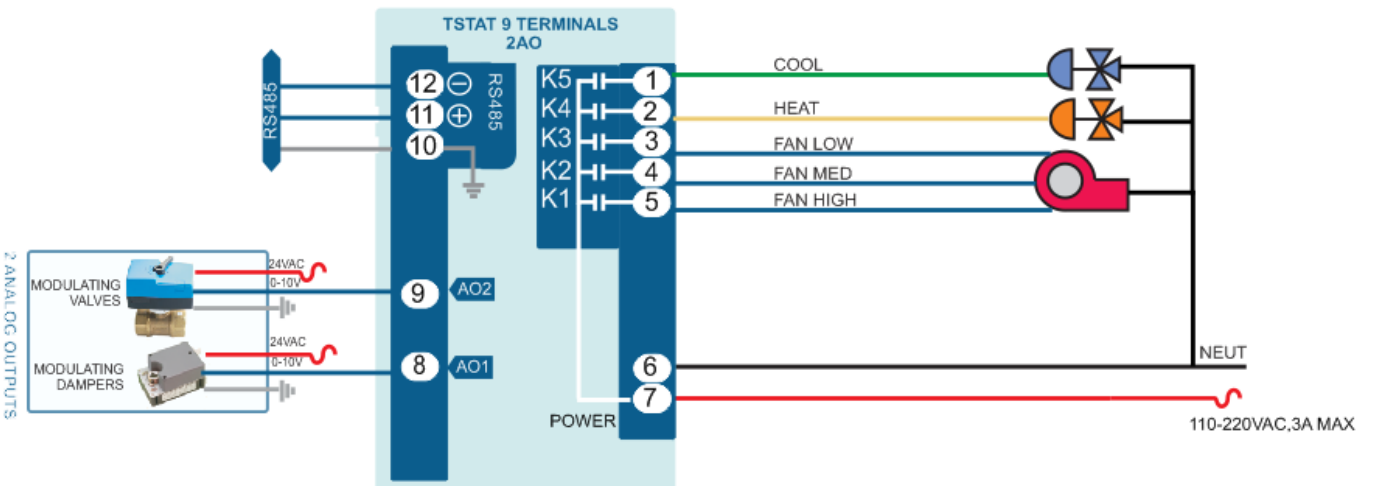
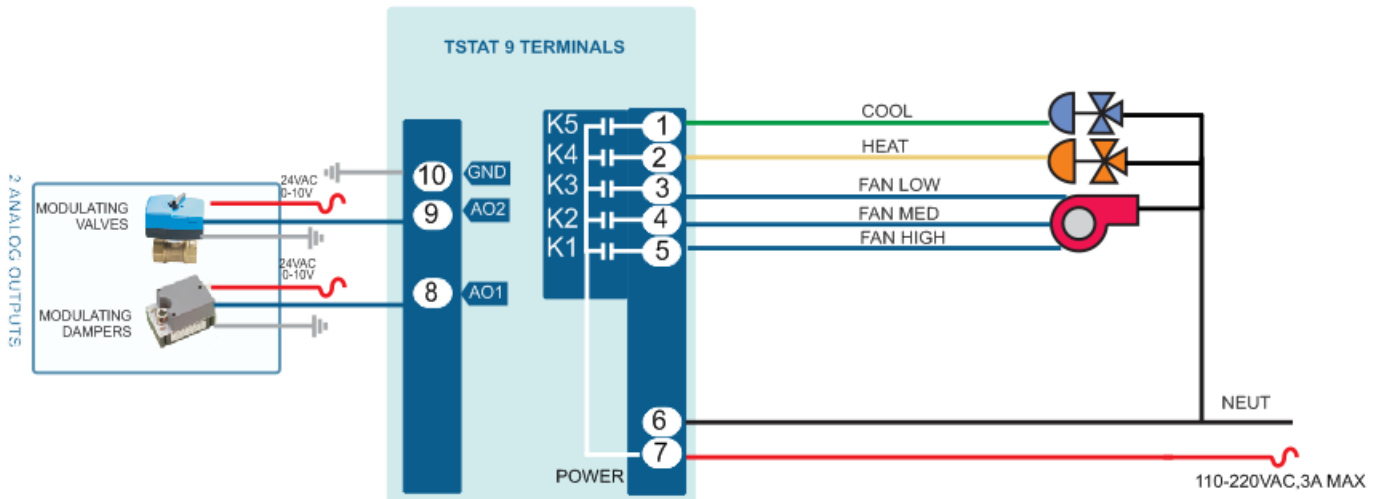
Software

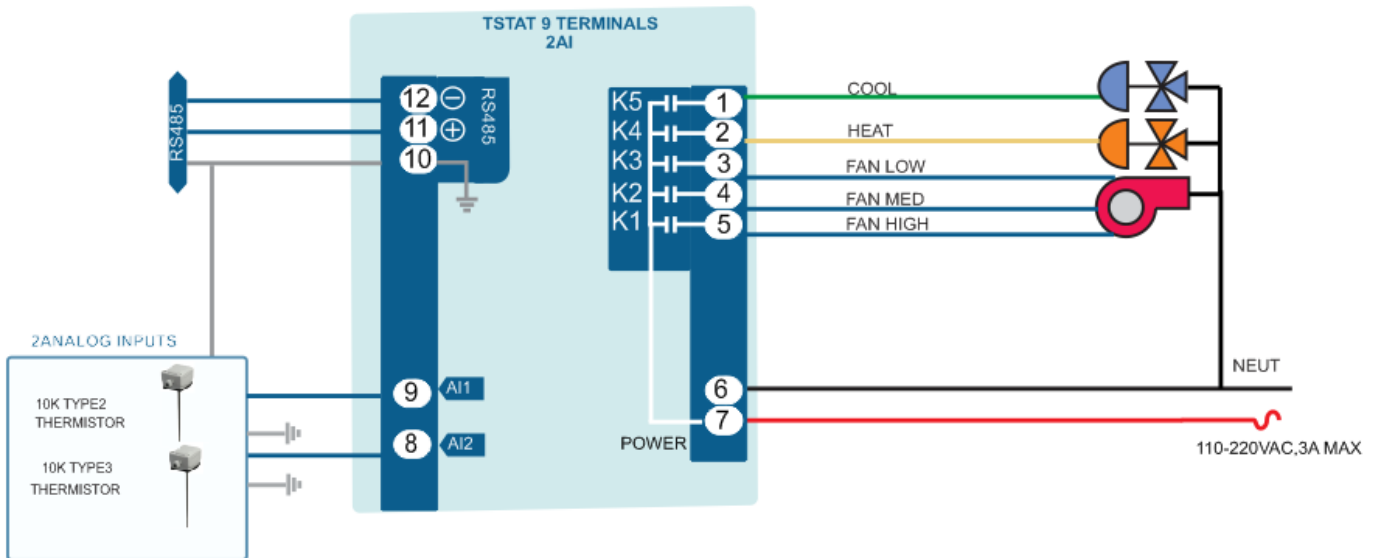
- 5 digital outputs
- Industry standard Modbus protocols
- User screen displays
- Day at home, work time, night at home, sleep, holiday
- 3 PID controllers

Part Number Scheme



Wiring Diagram







Variable	Modbus Register and Description
0	Baudrate 96=9600 192=19200 384=38400 576=57600 1152=115200 unit:bps
1	Station Number
2	Protocol switch.0=MODBUS,1=MSTP
3	Instance Number
4	Schedule enable/disable 1:enable 0:disbale
5	Occupied/Home/Day setpoint
6	Unoccupied/Work/Night setpoint
7	Fan mode setting 0:unoccupied mode,1:user mode1 2: user mode2,3: user mode3 4:occupied mode
8	Firmware Version
9	Current Mode of Operation 0:coast mode 1 1:cool mode2 :heat mode
10	Temperature Unit 0:degreeC 1:degree F
11	Sytem Mode 0:auto 1:heat 2:cool,if set to0, sytem will control by PID,if set to1,system will be heat only mode and 2 will be cool only mode
12	spare
13	Override Timer Unit:minute
14	Pid loop2 occupied setpoint
15	Pid loop2 unoccupied setpoint
16	Output Manual/Auto,each bit indicate each output0:auto 1>manual

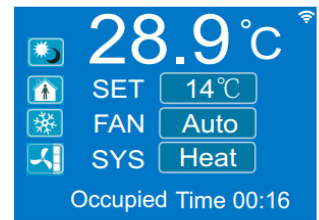
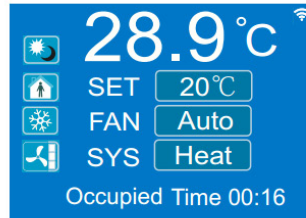
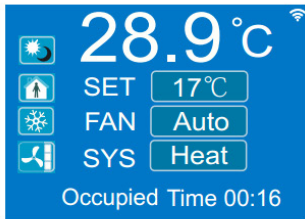
AI	Bacnet Register and Description	
AI1	Analog input1	
AI2	Analog input2	
AI3	Analog input3	
AI4	Analog input4	spare
AI5	Analog input5	
AI6	Analog input6	
AI7	Analog input7	
AI8	Analog input8	
AI9	Internal temperature value	
AI10	Humidity value	
AI11	CO2 value if it has CO2sensor present	spare







BO	Bacnet Register and Description	
BO1	Binary output1 state 1:on 0:off	
BO2	Binary output1 state 2:on 0:off	
BO3	Binary output1 state 3:on 0:off	
BO4	Binary output1 state 4:on 0:off	
BO5	Binary output1 state 5:on 0:off	



AO	Bacnet Register and Description	
AO1	Analog output1 value	
AO2	Analog output2 value	

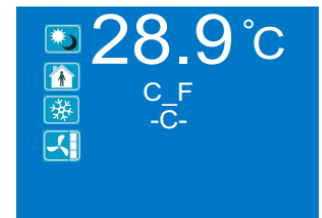
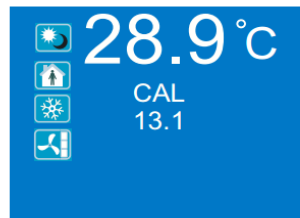
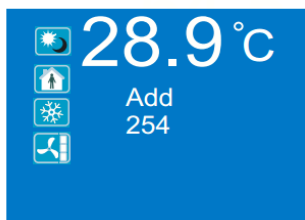
LCD Screen Display

1. When you press  or , it will decrease or increase the set point value. The value will flash two times, then it will confirm the setting automatically.



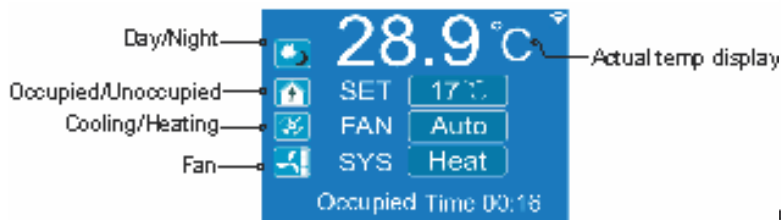
2. In the normal mode, press both  and  at the same time. Hold for several seconds, it will switch to the menu mode. Press  or  to scroll through the menu options such as 'Add', 'CAL', 'bAU', 'UNITS' and many others. To change the values at a particular menu, press  or , the chosen value will be stored automatically.

To change the unit's address, scroll through the menu until you reach 'Add'. Press  or  to increase or decrease the unit's address from 1 to 254.



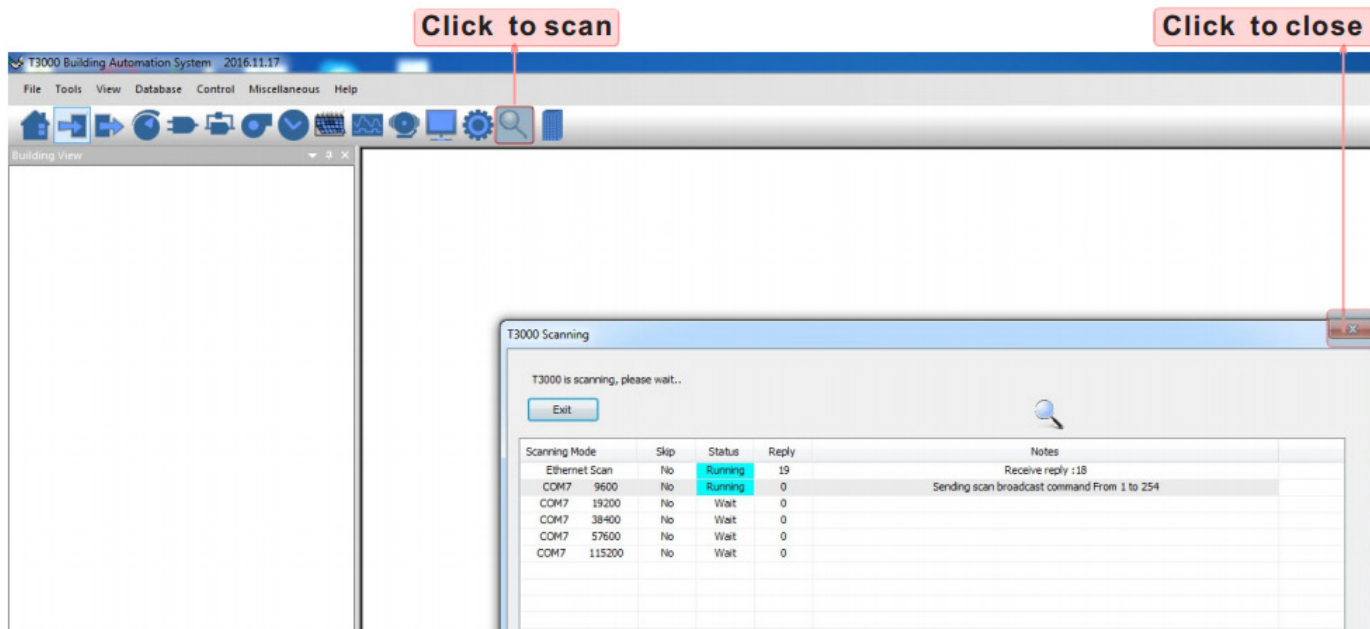
Advanced Menu Item Details

They have several advanced menu items which can be adjusted in the field to suit the application and tune the operation of the thermostat. Generally speaking, all the parameters are set up at the factory on an order-by-order basis and will give satisfactory results out of the box.

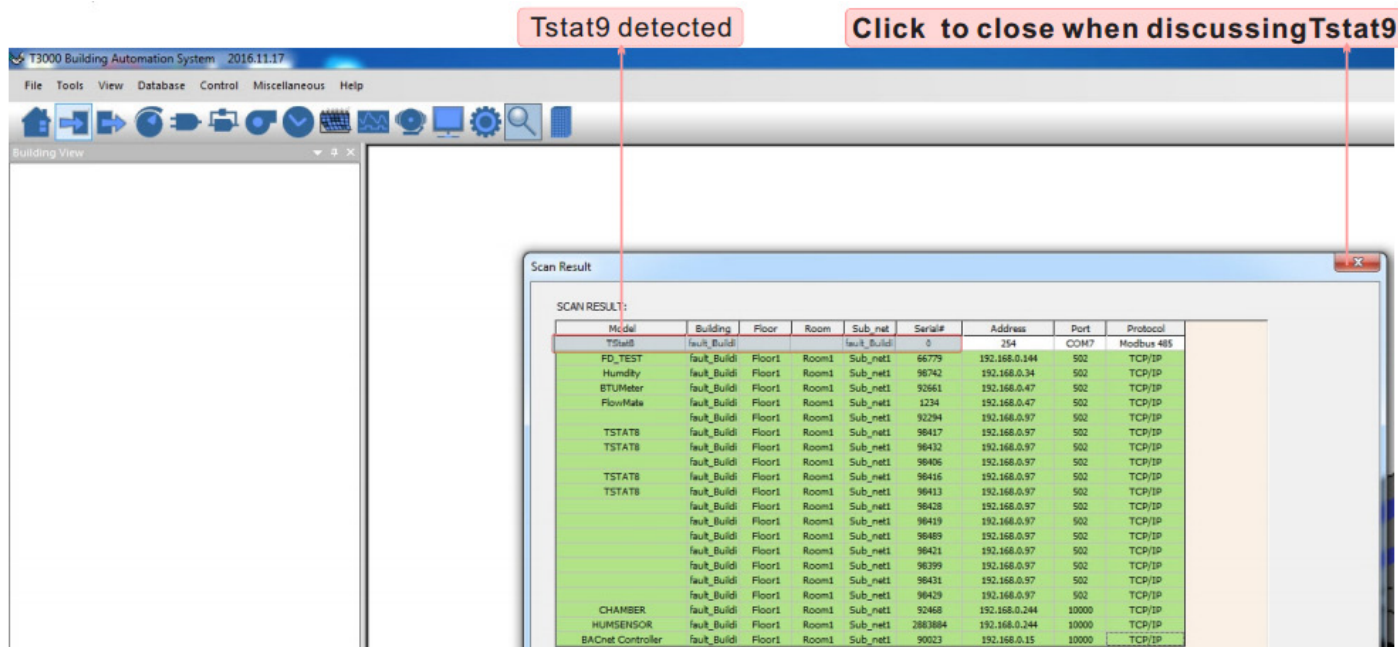



T3000 Operation

1. Connect Tstat9 to PC by RS485, start T3000 software



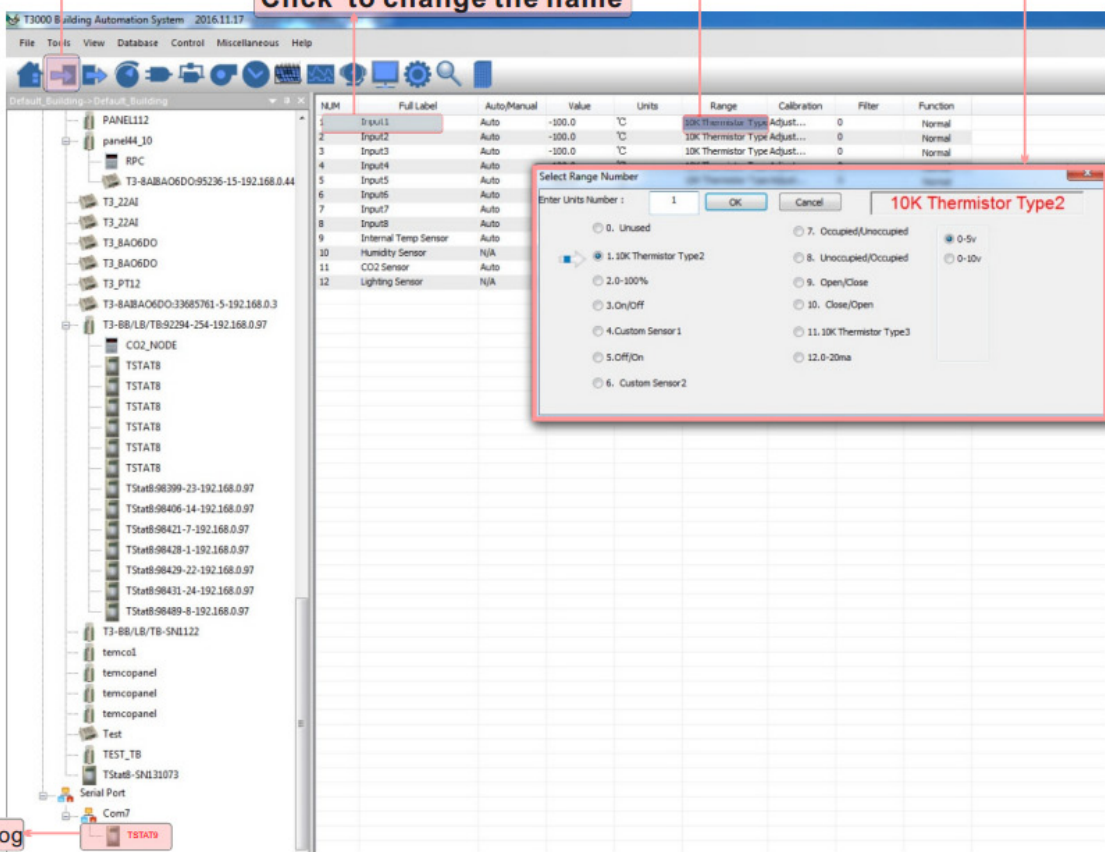
2. Click the button  to scan, the following view will appear and close it as the picture indicates. When discussing Tstat9, close the view.



3. Click Tstat9 log, then click "input" , the T3000 will show all the information of it. To change name or choices, click as below.

Click to show input information **Press range to different choices**

Click to change the name



IDM	Full Label	Auto/Manual	Value	Units	Range	Calibration	Filter	Function
1	Tstat11	Auto	-100.0	°C	10K Thermistor Type Adjust...	0		Normal
2	Input2	Auto	-100.0	°C	10K Thermistor Type Adjust...	0		Normal
3	Input3	Auto	-100.0	°C	10K Thermistor Type Adjust...	0		Normal
4	Input4	Auto						
5	Input5	Auto						
6	Input6	Auto						
7	Input7	Auto						
8	Input8	Auto						
9	Internal Temp Sensor	Auto						
10	Humidity Sensor	N/A						
11	CO2 Sensor	Auto						
12	Lighting Sensor	N/A						

Select Range Number

Enter Units Number : 1

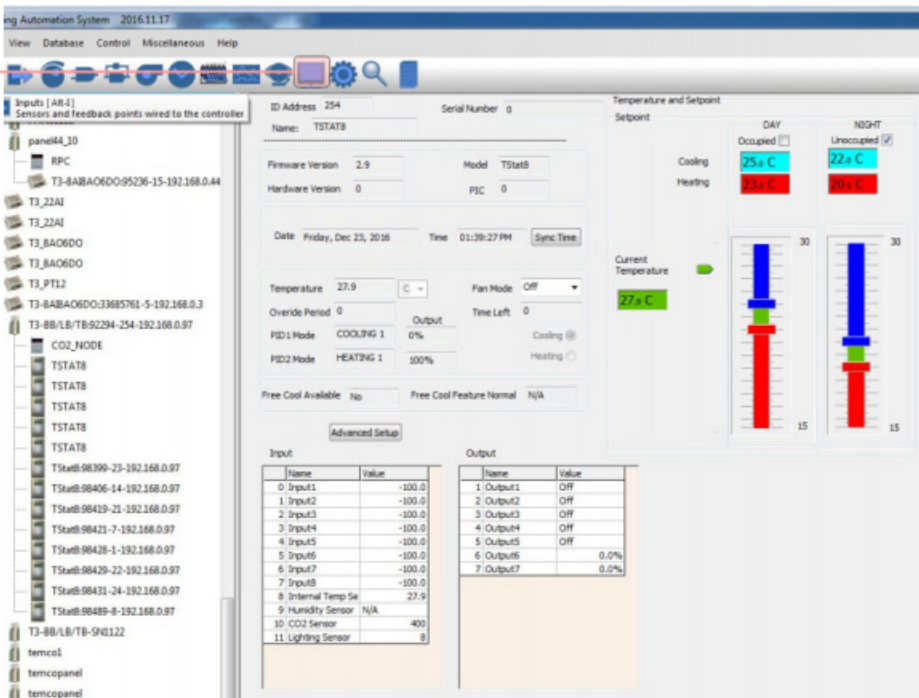
10K Thermistor Type2

- 0. Unused
- 1. 10K Thermistor Type2
- 2. 0-100%
- 3. On/Off
- 4. Custom Sensor 1
- 5. Off/On
- 6. Custom Sensor 2
- 7. Occupied/Unoccupied
- 8. Unoccupied/Occupied
- 9. Open/Close
- 10. Close/Open
- 11. 10K Thermistor Type3
- 12. 0-20ma

Tstat9 log **TSTAT9**

4. Click  to do settings, you can see a tab below about setpoint and temperature.

Click to do settings



Temperature and Setpoint

Name: TSTAT8 ID Address: 254 Serial Number: 0

Firmware Version: 2.9 Model: TStat8

Hardware Version: 0 PIC: 0

Date: Friday, Dec 23, 2016 Time: 01:39:27 PM Sync Time

Temperature: 27.9 °C Fan Mode: Off

Override Period: 0 Output: Time Left: 0

PID1 Mode: COOLING 1 0% Cooling

PID2 Mode: HEATING 1 100% Heating

Free Cool Available: No Free Cool Feature Normal: N/A

Temperature and Setpoint

Setpoint

DAY: Occupied Unoccupied

Cooling: 25.0 °C


Heating: 18.0 °C

Current Temperature: 27.9 °C

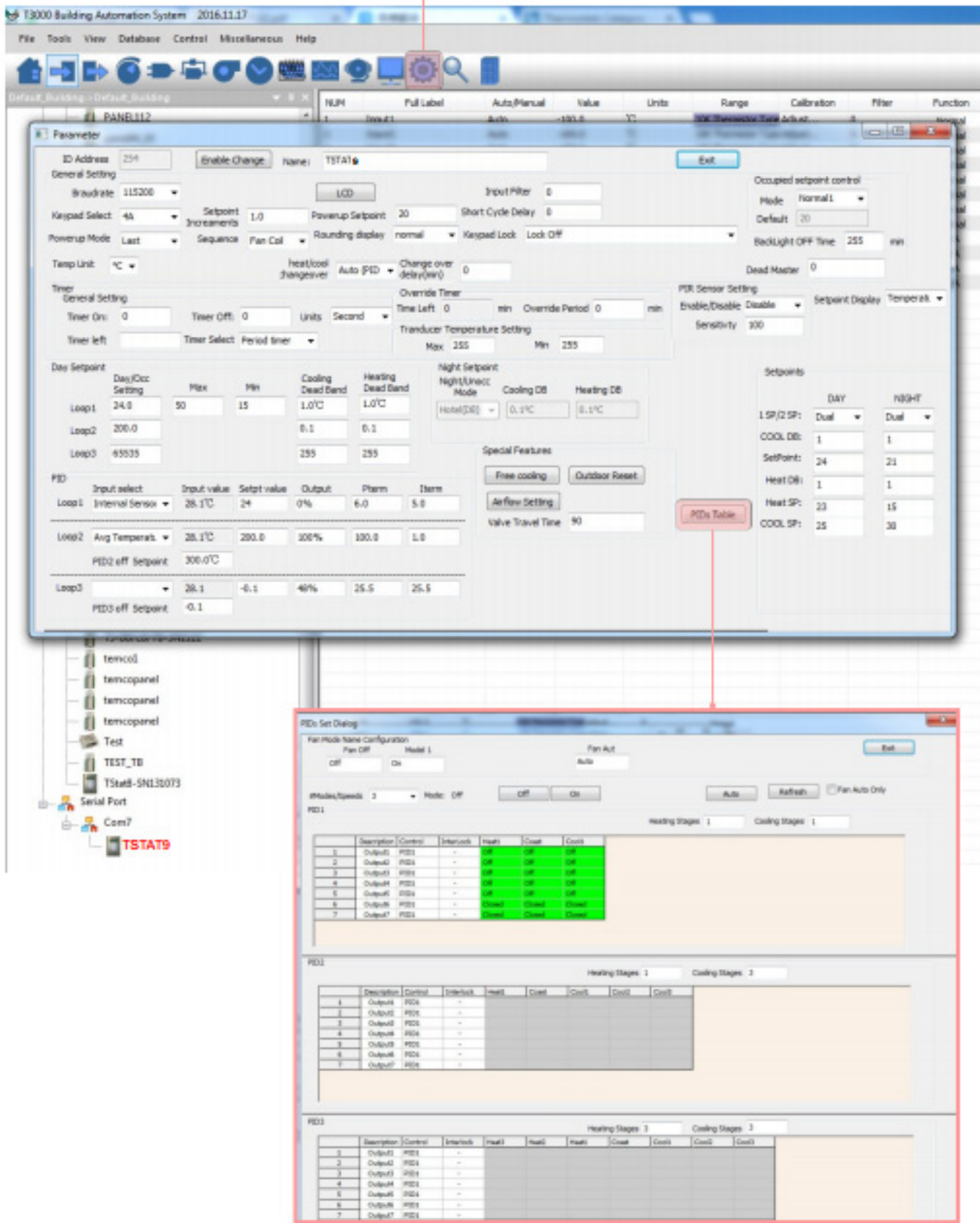
Advanced Setup

Input	Name	Value
0	Input1	-100.0
1	Input2	-100.0
2	Input3	-100.0
3	Input4	-100.0
4	Input5	-100.0
5	Input6	-100.0
6	Input7	-100.0
7	Input8	-100.0
8	Internal Temp Se	27.9
9	Humidity Sensor	N/A
10	CO2 Sensor	400
11	Lighting Sensor	8

Output	Name	Value
1	Output1	Off
2	Output2	Off
3	Output3	Off
4	Output4	Off
5	Output5	Off
6	Output6	0.0%
7	Output7	0.0%

5. Click  to do settings, you can see a tab below about parameter. Click PIDs tables, you can find PIDs set Dialog.

Click to do settings



The image shows two overlapping windows from the T3000 Building Automation System software. The top window is the 'Parameter' dialog for device TSTAT9, and the bottom window is the 'PIDs Set Dialog'.

Parameter Dialog (TSTAT9):

- General Setting:** ID Address 254, Name: TSTAT9, Baudrate 115200, Keypad Select 4A, Powerup Mode Last, Temp Unit °C.
- Timer:** Timer On/Off 0, Units Second, Timer Select Period timer.
- Day Setpoint:** Loop1: Day/Off Setting 24.0, Max 50, Min 15, Cooling Dead Band 1.0°C, Heating Dead Band 1.0°C. Loop2: 200.0, 0.1, 0.1. Loop3: 65535, 355, 255.
- Night Setpoint:** Night/Unset Mode Hotel(24), Cooling DB 0.1°C, Heating DB 0.1°C.
- PID Table:**

Loop	Input select	Input value	Setpt value	Output	Plarm	Item
Loop1	Internal Sensor	28.1°C	24	0%	6.0	5.0
Loop2	Avg Temperat.	28.1°C	200.0	300%	100.0	1.0
Loop3		28.1	-0.1	40%	25.5	25.5

PIDs Set Dialog:

Fan Mode Name Configuration: Fan Off (Off/On), Model 1, Fan Auto (Auto).

#Modes/Speeds 2, Mode: Off (Off/On), Auto, Refresh, Fan Auto Only.

PID1: Heating Stages 1, Cooling Stages 1

Description	Control	Interlock	Heat	Cool	Cool
1 Output1	PID1	-	OK	OK	OK
2 Output2	PID1	-	OK	OK	OK
3 Output3	PID1	-	OK	OK	OK
4 Output4	PID1	-	OK	OK	OK
5 Output5	PID1	-	OK	OK	OK
6 Output6	PID1	-	Flowed	Flowed	Flowed
7 Output7	PID1	-	Flowed	Flowed	Flowed

PID2: Heating Stages 1, Cooling Stages 3

Description	Control	Interlock	Heat	Cool	Cool	Cool
1 Output1	PID2	-				
2 Output2	PID2	-				
3 Output3	PID2	-				
4 Output4	PID2	-				
5 Output5	PID2	-				
6 Output6	PID2	-				
7 Output7	PID2	-				

PID3: Heating Stages 1, Cooling Stages 3

Description	Control	Interlock	Heat	Cool	Cool	Cool
1 Output1	PID3	-				
2 Output2	PID3	-				
3 Output3	PID3	-				
4 Output4	PID3	-				
5 Output5	PID3	-				
6 Output6	PID3	-				
7 Output7	PID3	-				

WiFi configuration setting

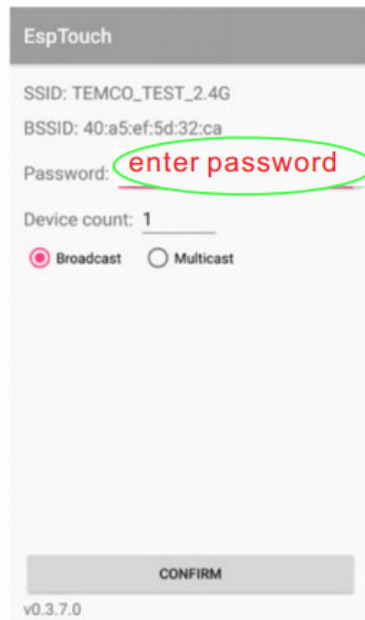
There are two methods which are EspTouch and T3000 to set IP address

1. Set up via EspTouch

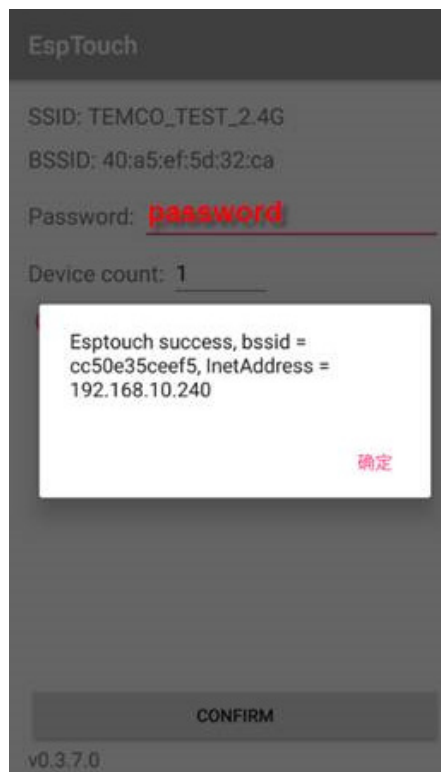
First click the link to download, install the app in Android phone, then connect the phone to WiFi router and turn on tstat 9.

<https://temcocontrols.com/ftp/software/24esptouch.zip>

The app will get the SSID from your phone and you need enter the wifi password, click confirm button then app will send a broadcast message through wifi router to Tstat9




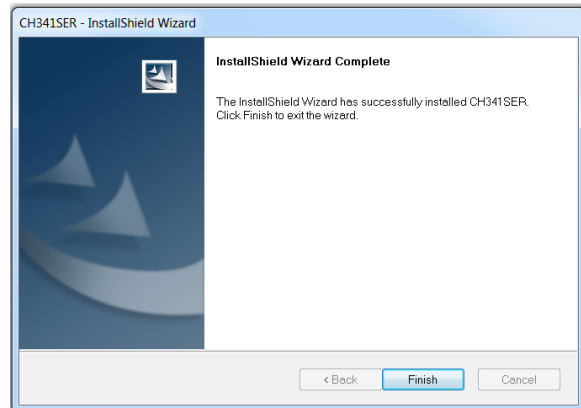
After about less than 20 seconds, Tstat9 will get the IP, and can see the message from phone.



2. Set up via T3000

(1) Visit <https://temcocontrols.com/ftp/file/CH340SerSetup.zip>, download serial port drive software and install it.

 CH341SerSetup.exe

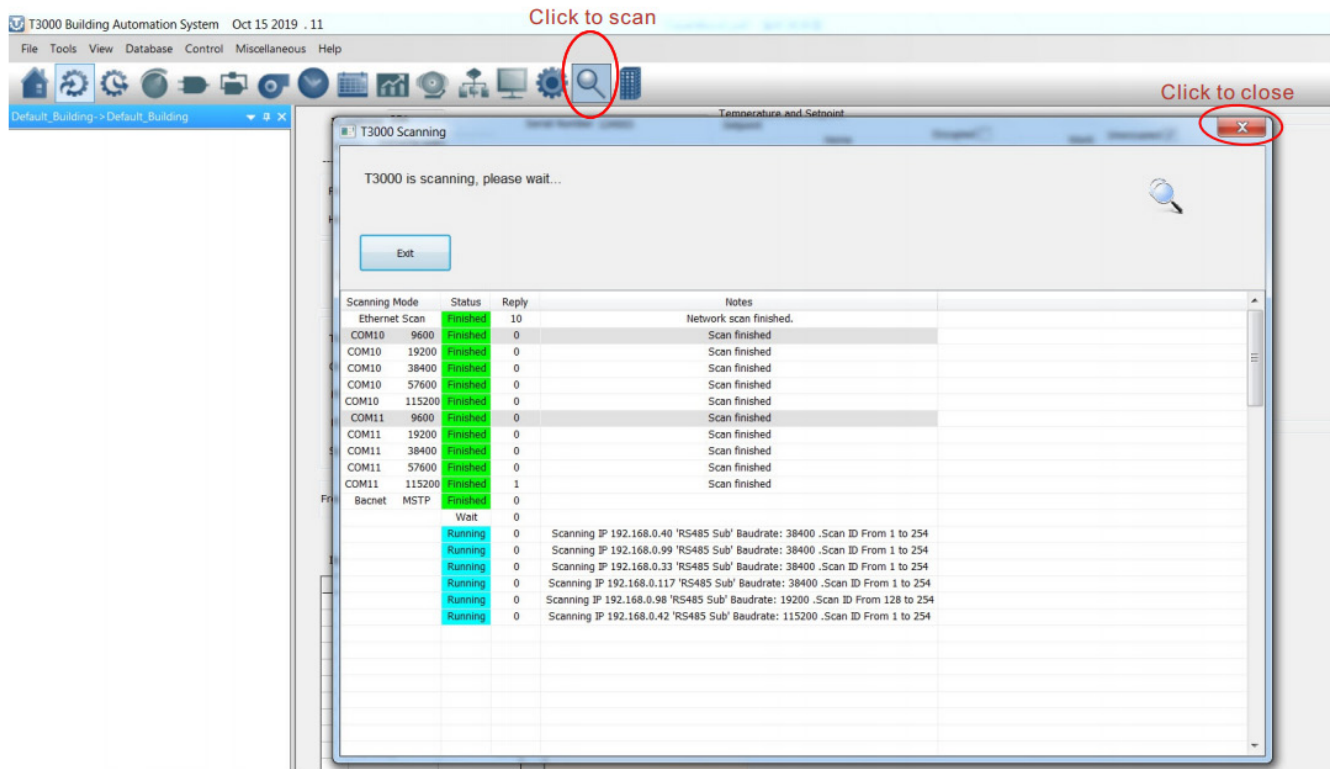


(2) Visit <https://temcocontrols.com/ftp/software/09T3000Software.zip>, download T3000 software and install it;

(3) Plug Tstat9-wifi in power, connect it to PC via USB cable;



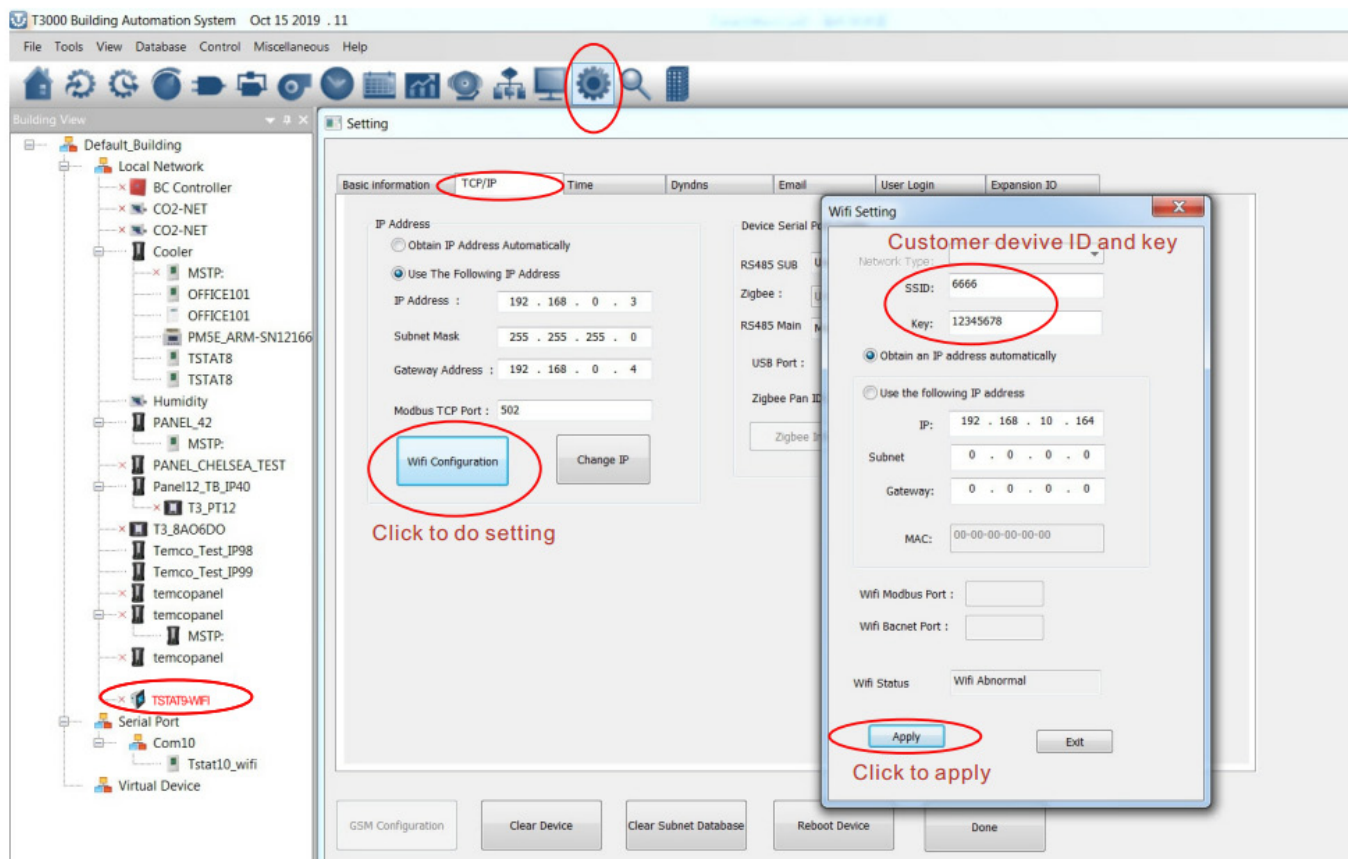
(4) Start T3000 software, click  to scan.



The screenshot shows the T3000 Scanning window. The title bar includes 'T3000 Scanning' and 'Temperature and Setpoint'. The window contains a table with the following data:

Scanning Mode	Status	Reply	Notes
Ethernet Scan	Finished	10	Network scan finished.
COM10 9600	Finished	0	Scan finished
COM10 19200	Finished	0	Scan finished
COM10 38400	Finished	0	Scan finished
COM10 57600	Finished	0	Scan finished
COM10 115200	Finished	0	Scan finished
COM11 9600	Finished	0	Scan finished
COM11 19200	Finished	0	Scan finished
COM11 38400	Finished	0	Scan finished
COM11 57600	Finished	0	Scan finished
COM11 115200	Finished	1	Scan finished
Bacnet MSTP	Finished	0	
	Wait	0	
	Running	0	Scanning IP 192.168.0.40 'RS485 Sub' Baudrate: 38400 .Scan ID From 1 to 254
	Running	0	Scanning IP 192.168.0.99 'RS485 Sub' Baudrate: 38400 .Scan ID From 1 to 254
	Running	0	Scanning IP 192.168.0.31 'RS485 Sub' Baudrate: 38400 .Scan ID From 1 to 254
	Running	0	Scanning IP 192.168.0.117 'RS485 Sub' Baudrate: 38400 .Scan ID From 1 to 254
	Running	0	Scanning IP 192.168.0.98 'RS485 Sub' Baudrate: 19200 .Scan ID From 128 to 254
	Running	0	Scanning IP 192.168.0.42 'RS485 Sub' Baudrate: 115200 .Scan ID From 1 to 254

(5) click  to set, then you can find Tstat9-wifi as below



The screenshot shows the T3000 Setting window. The 'TCP/IP' tab is selected. The 'Wifi Configuration' button is highlighted. A 'Wifi Setting' dialog box is open, showing the following configuration:

Customer device ID and key

Network Type: [Dropdown]
SSID: 6666
Key: 12345678
 Obtain an IP address automatically
 Use the following IP address
IP: 192.168.10.164
Subnet: 0.0.0.0
Gateway: 0.0.0.0
MAC: 00-00-00-00-00-00
Wifi Modbus Port: [Input]
Wifi Bacnet Port: [Input]
Wifi Status: Wifi Abnormal
[Apply] [Exit]

Tstat9-OCC

The fan Angle is 60 degrees and the range is about 3 meters

Detecting Area View:

