

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's, modulating valves and many other HVAC applications. All models support BACnet and Modbus protocols which allows for easy integration with big name control systems like Niagara, Siemens, Honeywell, Johnson Controls, Delta, Reliable and Kreuter just to name a few. There are five relays outputs and two analog outputs as well as 8 universal inputs. These can be configured using the T3000 free software avialable for download. There are more than 300 settings with many options. This makes it possible to configure these devices for most any HVAC application. Once the unit is configured, you can save the file and copy it to other controllers and backup project settings.

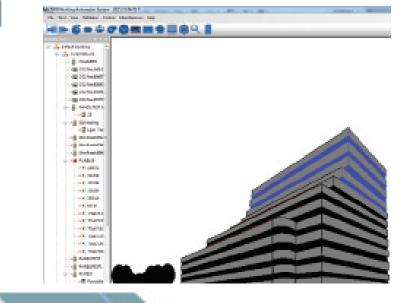
Options are available for occupancy, zigbee wireless and humidity / enthalpy control.



Highlights

- BACnet MS/TP and Modbus RTU protocols over RS485.
- Baudrates of 1.2k, 4.8k, 9.6k, 14.4k, 19.2k, 38.4k, 57.6k, 76.8k and 115.2k.
- Well documented register list for easy integration with other systems.
- 8 universal inputs for external temperature, voltage, contacts, etc.
- 5 relay outputs, rated at 12~24vac @ 2 amps each.
- 2 analog outputs, 0-10V @ 100ma each.
- Color LCD display with configurable scroll bar.
- Easily configure the thermostat for practically any application.
- On board clock with infinite life supercap battery backup.
- Uses a 32 bit Arm CPU with 12 bit analog resolution.

T3000 Software



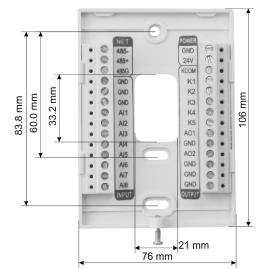
Typical Applications



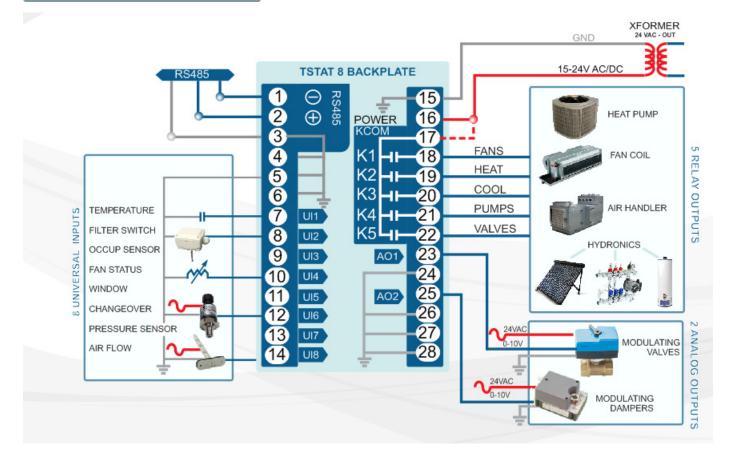
Specifications

Outputs	5 relay outputs 24vac @ 2 amps; 2 analog outputs 10V @100mA
8 Universal Inputs	10k therm, contacts, 4-20ma, 0-5V,0-10V
Operating range	-30~70°C(-22~158°F) / 0 to 99% RH
Supply voltage	12~24VAC/DC ±20%, 50-60Hz
Power consumption	100mA at 12VDC
Relay contacts	5 relays, 2A @ 24VAC UL File No.: E169380
Plastic Housing	Flammability rating UL 94 file E56070
Enclosure rating	IP31
Protocols	BACnet MS/TP and Modbus RTU RS485
Baudrate	9600, 19200, 38400, 57600, 76800, 115200
Temperature sensor	10K thermistor ±0.5°C
Setup Software	Free, no licensing, open source, down- load from website





Typical Applications



Approvals

Relay	UL File No. E169380
Plastic Enclosure	PA66 UL 94 V0 file E56070
PCB	FR-4 Epoxy Glass Cloth,
	UL E479892
Terminal Block	PA66 UL 94V-0

Software

- 8 analog inputs, 2 analog outputs; 5 digital outputs
- Industry standard BACnet MS/TP& Modbus proto cols
- Configurable user screen displays
- Day at home, work time, night at home, sleep and holiday Schedules

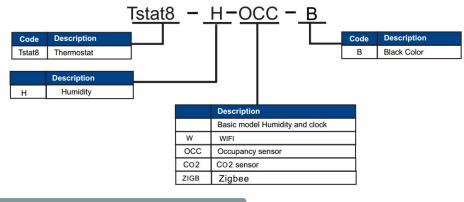


Bacnet Objects

Device	Object identifier;Object name;Object type;Vendor name;Vendor identifier;Model name;Firmware revision;Application software version;Protocol version;Protocol revision;Object list;Max apdu length accepted;Segmentation supported
Universal Input	UI1:temperature present value;UI2~UI9:present value Object identifier;Object name;Description;Object type;Present value;Out of service;Units
Analog Output	AO1:analog output 1 value;AO2:analog output 2 value Object identifier;Object name;Description;Object type;Present value;Out of service;Units;Priority array
Analog Value	AV0:baudrate select Object identifier;Object name;Description;Object type;Present value;Out of service;Units;Priority array
Binary Output	BO1~5:Relay Output 1~5 Object identifier;Object name;Description;Object type;Present value;Out of service;Units;Priority array;Polarity;Relinquish default;Active textInactive text

Part Number Scheme

* Tstat8 - Black : MOQ 50PCS



Structure Highlights

 NEI

 485

 485

 485

 6ND

 GND

 GND

 GND

 GND

 AI1

 AI2

 AI3

 AI4

 AI5

 AI6

 AI7

 AI8
 GND 24V **Deenee** KCOM K1 K2 Self reset fuses К3 Mount on electrical K4 K5 . box or surface mount AO1 GND 0 0.. 0 AO2 GND GND GND -Pluggable base 0. Jack to network Mounting screw

Menu Item Details

Tstat8 have several advanced menu items which can be adjusted in the field to suit the specific application and tune the operation of the thermostat. All the parameters are set up at the factory on an order-by-order basis and will give satisfactory results out of the box.



LCD Screen Display

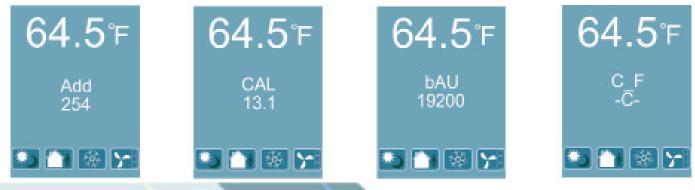
1 .When you press \blacktriangleleft or \blacktriangleright , it will increase or decrease the set point value. The value will flash two times, then it will confirm the setting automatically.



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

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

To change the baudrate, locate 'bAU' within the menu and use \square and \blacksquare to choose 1 9200 or 9600.







Tstat8-H-OCC



Tstat8-H-Zigbee

1.Visit https://tinyurl.com/y7uyu9n3, download T3000 software and install it;

2.Plug Tstat8 in power, connect the Tstat8 to a PC via RS485 or Ethernet;

3.Start the T3000 software, click *Q* to scan, the following view will appear. Close after the scan is complete.

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	Firmware Version 1.9	Model T3-8AI8AO6DO			
	Hardware Version 3 TCP/IP Info	Scan Result			×
	IP Model	SCAN RESULT:			
	IP Address	Model Building Floor TStats fault Build floor1	Room Sub_net Serial# A	ddress Port Protocol 254 COM7 Modbus 485	
	192 . 168 . 0 . 98			168.0.29 502 TCP/IP	

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4. Click Tstat8 log, then click 🔁 , this will display all of the Tstat8 inputs. Change the name of the input and range that fits the application.

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5.Click to see the status of the Tstat8. This window will display setpoints, temperature, inputs and outputs.

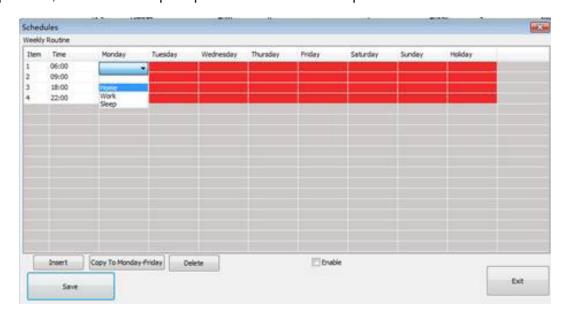
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	2 Input3	-100.0	3 Output3	off			
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T3-88/LB/TB-SN0122	10 CO2 Sensor 11 Lighting Sensor	400 X 8					
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6.Click 🔅 to to edit advanced settings. The window below will open. Click "PIDs Tables" to edit PIDs and change the function of the outputs.

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7.Click the schedule icon \checkmark to go to schedule window, you can do schedule settings.

Each day we support 6 events, and you can select the mode for each event: For home mode, unit will use day setpoint to control the outputs; For work mode, it will use night setpoint to control the outputs; For sleep mode, it will use sleep setpoint to control the outputs.



For example as below:

when time is between 6:00 to 9:00, unit will work on home mode;

when time is between 9:00 to 18:00, unit will work on work mode;

when time is between 18:00 to 22:00, unit will work on home mode;

when time is between 22:00 to Tuesday 6:00, unit will work on sleep mode.

chedu Veekly	Routine	
Item	Time	Monday
1	06:00	Home
2	09:00	Work
3	18:00	Home
4	22:00	Sleep

After you setup the Monday schedule, you can copy the Monday setting from Tuesday to Friday, then you can use the "Copy To Monday-Friday" function to copy the setting.



Holiday

If you need different setting for each day, you can use insert function to edit your schedule, for example, on Saturday, double click the window and it will show a small dialog to insert new event and you can set up the time.

Item	Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Holiday
1	06:00	Home	Home	Home	Home	Home			
2	09:00	Work	Work	Work	Work	Work			
3	18:00	Home	Home	Home	Home	Home			
4	22:00	Sieep	Sieep	Sleep	Sleep	Sleep			
					6				
					SetTime	×			
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Iten	Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Holiday	
1	06:00	Home	Home	Home	Home	Home		Home		2.
2	38:53						Home			
1	39:33	Work	Work	Work	Work	Work		- C		2
4	12:30						Work			2
5	18:00	theme	Hunt	Have	Hung	Hane				
6	20:30				a provincia de la companya de la compa		Haran	al Baseline		
7	22:00	Sirep	Since	Seep	Sizes	Seven		Sheep		2
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So on Saturday, when time is between 8:30 to 12:30, unit will work on home mode; when time is between 12:30 to 20:30, unit will work on work mode; when time is between 20:00 to 22:30, unit will work on home mode; when time is between 22:30 to Sunday 6:00, unit will work on sleep mode.

Note: Select "Enable" option to enable schedule function. After edit schedule, make sure click the save button to save the setting !

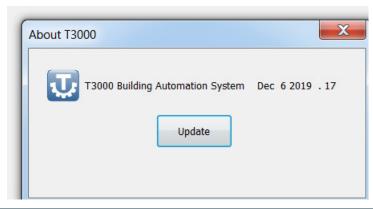
Update T3000

1.Visit <u>https://tinyurl.com/y7uyu9n3</u>, download T3000 software and install it;

2. Click" Help" and then click "Update T3000"

Help	
	Contents
	Version History
	Update T3000
	Check For Updates

3.Click"Update"



Download Firmware and Update

1.Plug Tstat8 in power, connect the Tstat8 to a PC via RS485 or Ethernet;

			1.0.1.00001	A REPORT A ADDRESS OF A
Download Firmware				
Product ID :	9 🗲		Update T3000	Download Firmware Only
Product Name :	TStat8	-	Open Firmware File Folder	Download Firmware And Update
modify negative icon for top fixed relay pwm output per rev 8_4 fix bacnet AV12 system mo fix input 4-20mA range whe rev8_3 fix when use register 101.8 rev8_2 fixed cycle delay and chang modify co2 fitter, before it modify compiler level to sol add new register 903 to cl Download finished.	erature input ; 803 to select delta temperatu p temperature displaying. ccentage 2 ode value and display bug. en current is over 17mA, dat & 691 to change the cool/hea ge over delay dose not work. Ive rev3 relays problem(relay ear all eeprom except serial : locally to C:\Program Files\ M7 0 14:1:49			
Initializing device Erasing device ID 254: Programming line:	s 13952 to 14080.(5%)	<u> </u>		•

WIFI configuration setting

There are three methods which are EspTouch,T3000 to set IP adress and ADhoc setting 1.Set up via EspTouch

First install this app in a android phone and connect your phone with your wifi router, power on Tstat8.

The app will get the SSID from your phone and you need enter the wifi password, click confirm

SSID: TEN	MCO_TEST_2.4G	
BSSID: 40):a5:ef:5d:32:ca	
Password	enter passw	vord
Device co	ount: 1	
Broadd	ast O Multicast	

After about less than 20 seconds, Tstat8 will get the IP, and can see the message from phone.

SSID: TEMC0_TEST_2.4G	
BSSID: 40:a5:ef:5d:32:ca	
Password: password	
Device count: 1	
Esptouch success, bssid = cc50e35ceef5, InetAddress = 192.168.10.240	
	确定
CONFIRM	
v0.3.7.0	

2.Set up via T3000

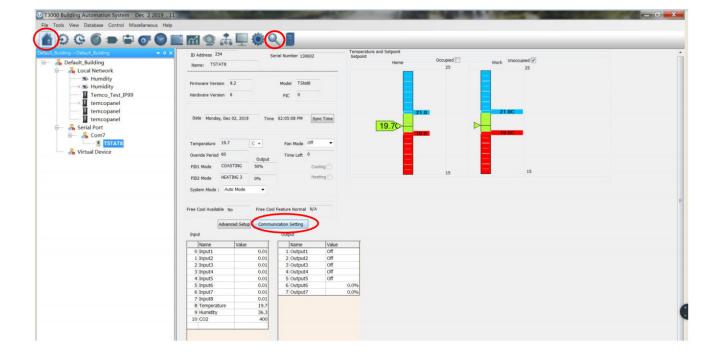
(1) Configure the wireless router and connect.

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

(3) Connect Tstat8 to PC via RS485

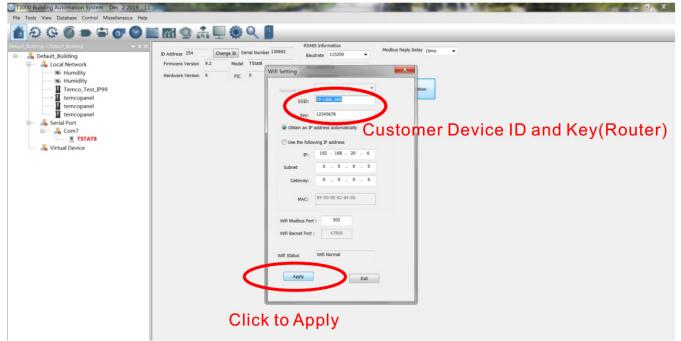
(4)Start T3000 software, click	to scan





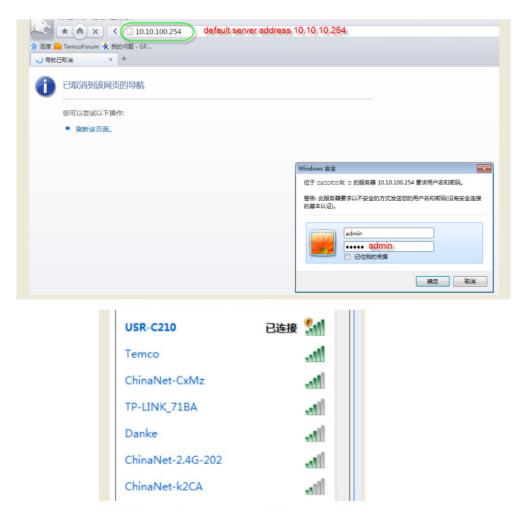
(6)Click" communication setting"

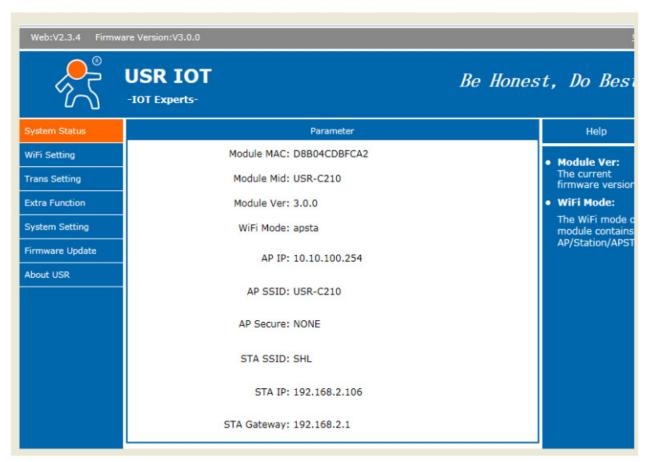
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3. ADhoc setting

ADhoc is a singel hot model, which supports iphone, win7&8. The IP default address is10.10.10.254 (1). To set passwords and IP addresses in Adhoc mode, start the Tstat8 first, then scan for a wifi signal named 'USR-C210' from a computer with wifi, connect to the wifi.





(3)Enter the Module MAC. The Module MAC:D8B04CDBFCA2

	kersion:V3.0.0 SR IOT)T Experts-	Be Honest	±z t, Do Best!	Ŕ	USR IOT -10T Experts-	Be Honest, Do Best!
				System Status	Serial Port Setting	Help
System Status	WiFi Mode Select		Help	Wifi Setting		bps Baud Rate:
WIFi Setting	WiFi Work Mode: AP+STA mode 💌		Network Name	Trans Setting		 bit 1200460800bps
Trans Setting	AP mode		(SSID): 1-32 characters:	Extra Function	Check Bit: None	CTSRTS/485: Default is NFC
Extra Function	Network Name(SSID): USR-C210		Case sensitive	System Setting		bit Port: 1~65535
System Setting	Password(8-63 bytes); NONE		 Password: The AP password 	Firmware Update	Network Setting	 Server IP
Firmware Update	Passion (0-03 Dytes). NONE		is 8-63 bytes (STA password	About USR		Address: When the module
	IP Address: 10.10.100.254		without this restriction), NONE		SocketA Connect Setting	remote server
About USR	Mask: 255 255 255 0		said no encryption; Case		Protocol: TCP-Server	address to be connected; When
			sensitive		Port: 502	it's TCP server, the parameter is
	STA Mode		 DHCP: Open this feature, 		Server IP Address: 10.10.100.254	invalid; The parameter can be
	Router SSID: Temco	Search	will get IP by		Socket8 Connect Setting	IP or domain name
	STA Password:		dhcp; turn off, need to manually		Protocol: UDP-Server	*
	STA Password:		enter the IP		Port: 1234	
	DHCP: Enable				Server IP Address: 10.10.100.254	
L	Save				Save	

Zigbee Setup

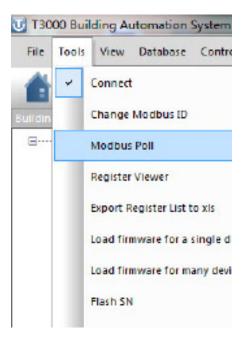
Click \bigcirc to scan, you can find the Zigbee BB.



Connect one tstat6 and two tstat8, then you can set the parameters of Zigbee BB.

- TS	tat6:72794-6-	192.1	168.0.97	
— 🗂 TS	TAT8			
TS	TAT8			
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Device Serial Po	ort Config			
RS485 SUB :	Unused	Ŧ	19200	1
		•	19200 19200	•
RS485 SUB :	Unused	· ·		
RS485 SUB : Zigbee : (Unused Modbus Master		19200	

You can also get more information using Temco Modbus Poll tool.



As below,ID 255 means reading zigbee BB itself. Address 299 indicates how many units are connecting

For this test, there are 3 units connecting:

reg300: ID + 256 of unit 1, the highest bit set to 1 means that device is online, if it is off line, reg300 = ID = 18

It's the same for reg301 and 302 and so on.

7	ModbusPoll1				100		Window Help
M	odel Name	:	Read/Write	e Defini	tion	J.	X
Co	onnected		Slave ID:	255			ОК
	Description	Address	Function:	03 Read	d Holding	Registers((4x) - Cancel
0		0	Address:	299			
1		1		_	_		
2		2	Quantity:	10			Αρρίγ
3		3	Scan Rate:	1000			Read/Write Once
4		4	View				
5		5	Rows	© 20	@ 50	100	Fit to Quantity
6		6	Display				
7		7	Unsign	ed		-	Hide Alias Columns
8		8					PLC Addresses(Bace 1)

Description	Address	Value
TOTAL NO	299	3
SUBADDR F	300	274
SUBADDR L	301	265
SUBADOR L	302	262
SUBADOR L	303	0
SUBADOR L	304	0
SUBADOR L	305	0
SUBADOR L	306	0
SUBADOR L	307	0
SUBADDR L	308	0

For debugging:

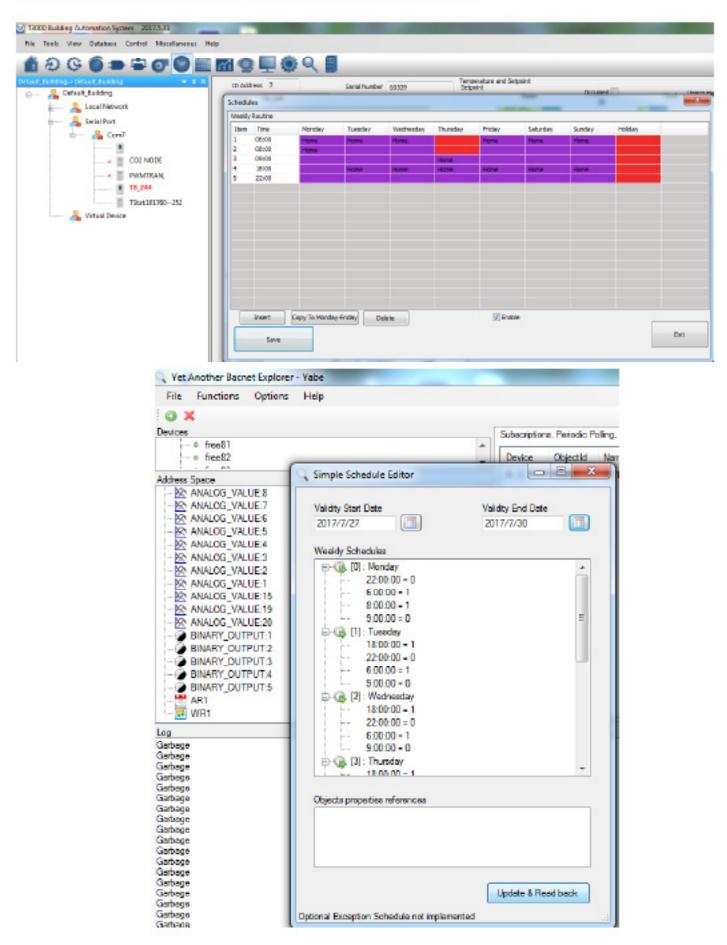
1. First make sure the zigbee unit is connected to the zigbee network, when it is connected you can see the red led keeps on, otherwise it will be flashing.

- 2. In these two situations you can try to re-power the zigbee BB
- A. If you wait for a long time the zigbee BB cannot find the units
- B. If you find the units by T3000,but when you click the unit icon you can not access them.
- 3. Using modbus poll to access each of the unit

	➡ 🖩 🔌 🍇 🖺 🖨 × 🔅 1x
	dbusPoll 1
	Name: Tx=15: Err=0:
Conne	
Des	Read/Write Definition
0	Slave ID: 255 OK
1	Function: 03 Read Holding Registers(4x) Cancel
2	Address: 0
3	Quantities 100 Apply
4	Quantity: 100 Appry
5	Scan Rate: 1000 Read/Write On
6	View Rows
7	
8	Display:

Schedules

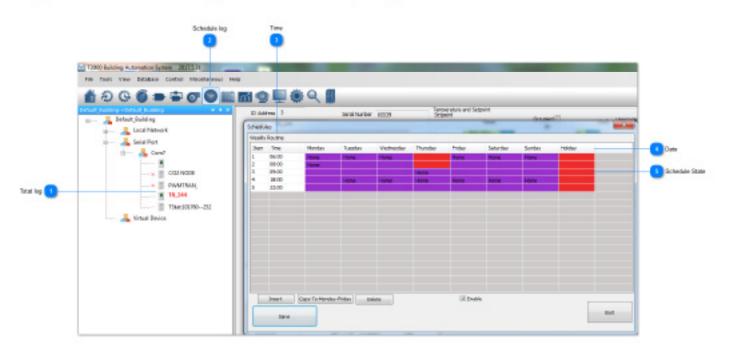
The schedules of Tstat8 can be managed using T3000 software and Bacnet.Select Modbus protocol when you use T3000,and Bacnet protocol when you use Bacnet.



Managing schedules in T3000

The schedules can be managed using T3000 software.Below are the steps: Step1.Visit 107.170.34.189/ftp/software/9TstatSoftware.zip ,download T3000 software and install it; Step2.Plug Tstat8 in power,connect Tstat8 to PC via RS485 or Ethernet;

Step3.Start T3000 software, click to scan, then you can find Tstat8 as below.





Click to select the thermostat.



Click to show schedule details.

Veekly Routine	
Item	Time
1	06:00
2	08:00
3	09:00
4	18:00
5	22:00

This is the time list.

D	ate		Wednesday					
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Holiday

The date diaplays from Monday to Sunday and Holiday.



Home	Home	Home		Home	Home	Home	
Home							
			Home				
	Home	Home	Home	Home	Home	Home	

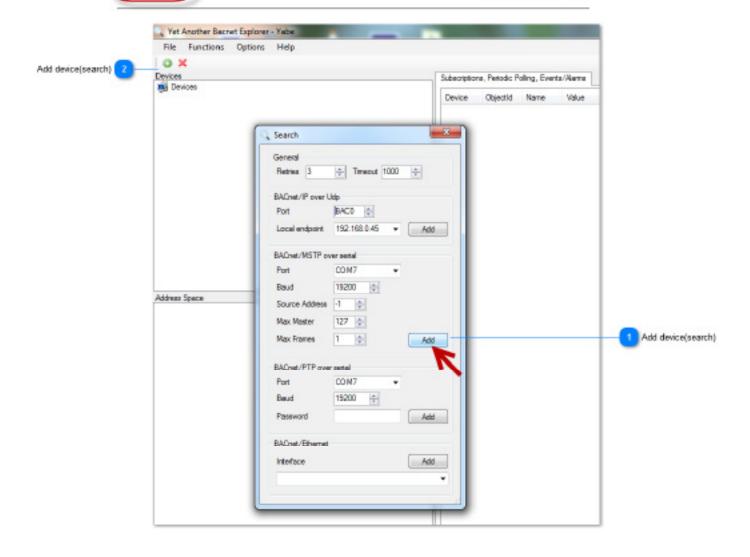
The tab shows the schedule state:Home/Work/Sleep.



Managing schedules using Bacnet The schedules can be managed using Bacnet.Download Yabe software as the link:107.170.34.189/ ftp/software/yabe.zip and install it.Connect Tstat8 to the computer, select Bacnet protocol.Start the Yabe software, add the device.

Index of /ftp/software/

eef.		
10SoftwareManualRev3.zip	13-Apr-2016	06:
12AccessDatabaseEngine.zip	03-Mar-2015	02:
13Zigbee_SupportDocs.zip	27-Dec-2014	00:
146K 7000 Linux.zip	27-Dec-2014	00:
1ModbusDll.zip	27-Dec-2014	00:
20SoftwareHanualRev2.0.chm	29-Jun-2015	03:
2HodbusD11.zip	27-Dec-2014	00:
5ModbusDllTestForVB.zip	27-Dec-2014	00:
6HodbusDllforVc.zip	27-Dec-2014	08:
7HodbusD11ForVC Example.zip	27-Dec-2014	00:
9TstatSoftware.zip	15-May-2017	02:
Blank RMA.doc	15-Feb-2017	08:
CC2531 Driver.zip	09-Mar-2017	08:
ExamplePRGFiles.zip	14-Jun-2017	03:
ISPTool_NoCheckingHex.zip	19-Apr-2016	07:
ModbusBacnetRegistersListRev9.xls	06-Jun-2017	05:
T3000.zip	24-Ju1-2017	07:
T3000Update.zip	07-Jul-2017	07:
(yabe.zip	15-Mar-2017	09:



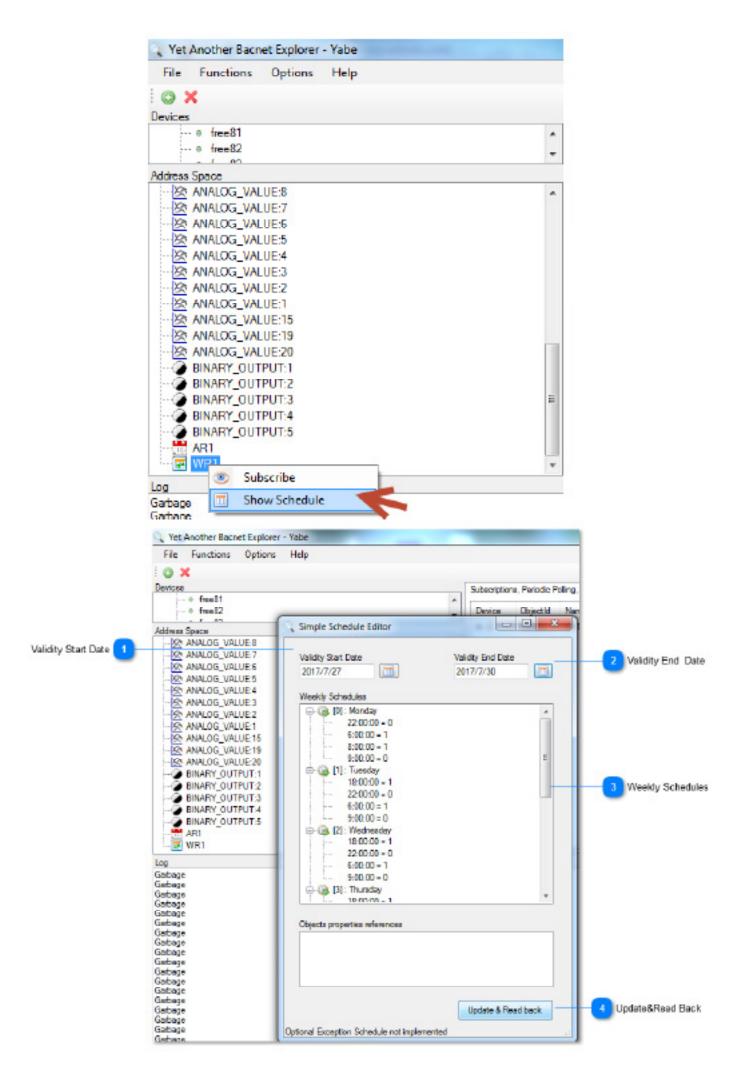


2 Add device(search)

Click to add device.

Weekly routines schedule

Right click "WR1" log (weekly routines) to set up the weekly schedule date. For the weekly routine, if status = 1, means unit will go to occupied and if status = 0, means unit will go to unoccupied. When the time is set up, click "Update & Read back" button to save and read the setting back.



	Validity Start Date
<u> </u>	Validity Start Date 2017/7/27
	Click to set the start date.

2 Validity End Date Valdty End Date 2017/7/30

Click to set the End date.

3 Weekly Schedules	
🖃 - 🚯 [0] : Monday	
22:00:00 = 0	1
6:00:00 = 1	
8:00:00 = 1	
9:00:00 = 0	E
😑 🔞 [1] : Tuesday	
18:00:00 = 1	
22:00:00 = 0	
··· 6:00:00 = 1	
9:00:00 = 0	
E- (Vednesday	
18:00:00 = 1	
22:00:00 = 0	
··· 6:00:00 = 1	
9:00:00 = 0	
- 😱 [3] : Thursday	
18:00:00 - 1	-

This tab shows the Weekly Schedules details.

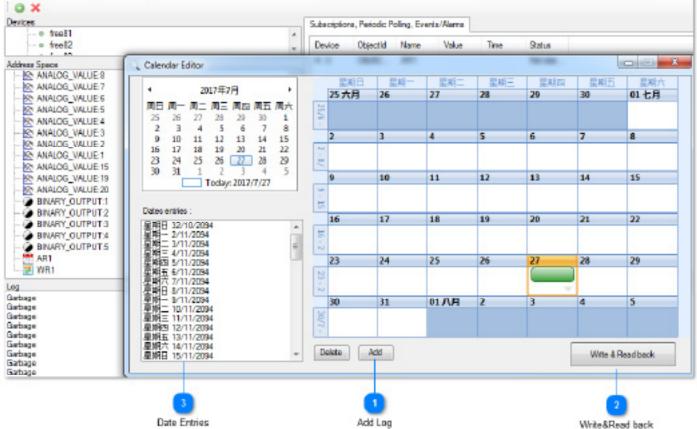


Click the log to update &Read Back.

Annual routine schedule

Step4.Right click "AR1" log to set up annual routine date. You can set up the annual date from this tab.

File Functions Option	ons Help	
O X		
Devices		
0 free81		
• free82		
Address Space		
ANALOG_VALUE:8		
ANALOG_VALUE:7		
ANALOG_VALUE:6		
- ANALOG_VALUE:5		
ANALOG_VALUE:4		
- 🖄 ANALOG_VALUE:3		
ANALOG_VALUE:2		
ANALOG_VALUE:1		
ANALOG_VALUE:15		
ANALOG_VALUE:19		
ANALOG_VALUE:20		
BINARY_OUTPUT:1		
BINARY_OUTPUT:2		
BINARY_OUTPUT:4		
BINARY_OUTPUT:5		
Subscribe		
Log 🛗 Show Calend	lar 🖌	
be		



Vet Another Bacnet Explor File Functions Option



Click to add the date.



Click to write & read back.

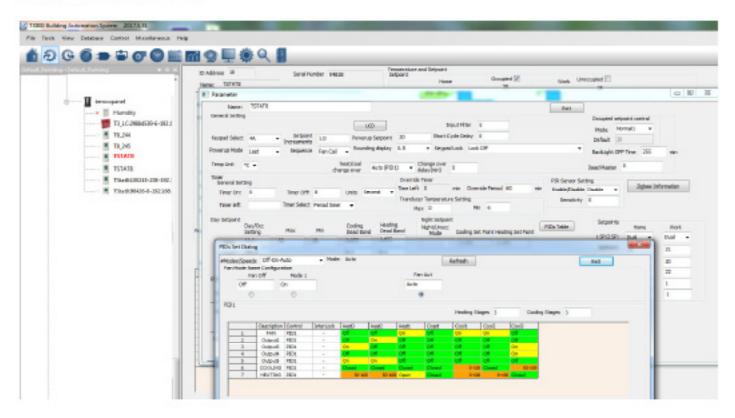
Data	Entries
Date	LIIUICS

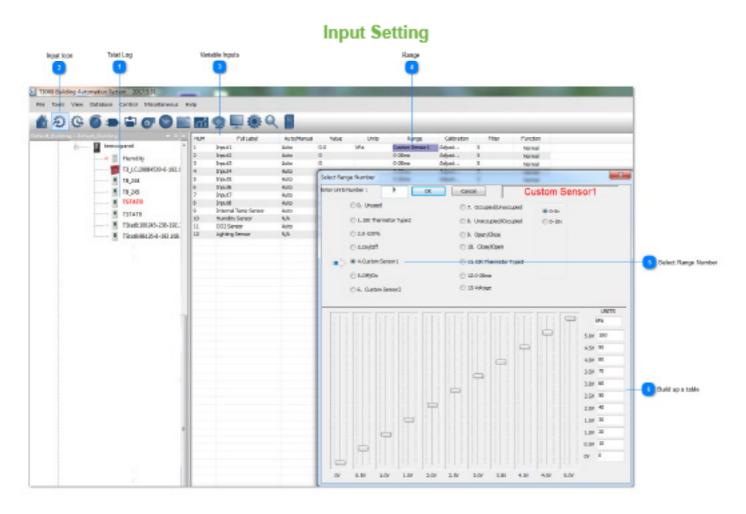
Dates entries :	
星期日 32/10/2094	
星期一 2/11/2094	
星期二 3/11/2094	
星明三 4/11/2094	
星期四 5/11/2094	
星期五 6/11/2094	
星期六 7/11/2094	
星期日 8/11/2094	
星期一 9/11/2094	
星期二 10/11/2094	
星期三 11/11/2094	
星期四 12/11/2094	
星期五 13/11/2094	
星期六 14/11/2094	
星期日 15/11/2094	

Click to choose the date.

Heating/Cooling Configuration

About Heating Cooling Mode Configuration, here are two examples: one heat one cool setting and two heat two cool setting.





As an example of a custom sensor, here we have built up a table for a custom sensor operating from 0 to 5V over the range of 0-100psi.



Select the thermostat from the tree.



Click on the INPUTS icon.

NUM	Ful Label
1	Inputi
2	Input2
3	Input3
4	Input4
5	Input5
6	Input6
7	Input7
8	Input8
9	Internal Temp Sensor
10	Humidity Sensor
11	CO2 Sensor
12	Lighting Sensor

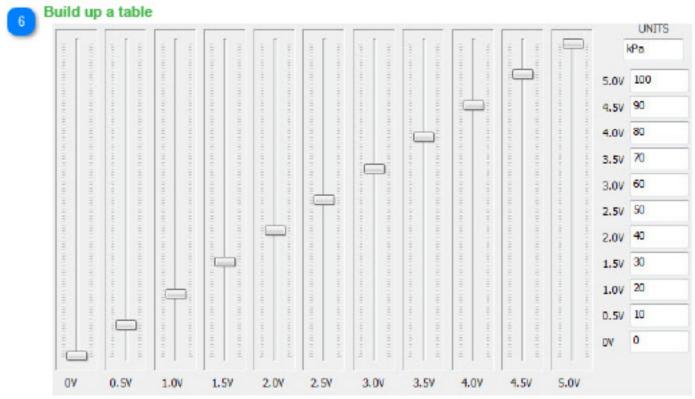
Give each input a name.



Set the range for the input by clicking on this column.

5 Select Range Number

Select from the various ranges or build your own.



As an example of a custom sensor, here we have built up a table for a custom sensor operating from 0 to 5V over the range of 0-100psi.

Output Setting

T3000 8u	icing Cutomation Syste	em 2017.5.21		and the same supplier of the same	the state of the state of the state					-	-	-	-
lie Tool	s View Database	Control Missellaneous H	telp										
	G 6 =	-00	NM.	Diluter	Auto/Namual	Tabar	Units	Range	Punction	Interlack	Off->Ch Deler	ON-SOFF Dates	Spal Ty
	tures	ipanal *	1	FAN	Auto	07	NPA	0101	Normal	ON	1	1	N/A
		Hamdity	2	Heating	A.0	off	MA	On Off	Hormal	ON	1	1	54,18.
			3	Cooling	Auto	0¥	MA	ON/O#	Normal	ON	8		54,44
		13_LC:29894559-6-1923	4	Spare	Auto	07	MPR.	01/01	Normal	ON	1	6	N/A
		10,244	3	Saare	A.0	off	MA	01/01	Normal	ON	8		54/8.
		18,245	1	Spare	Auto	1.0%	%	0-304(130%)	Normal	ON	1	1	54,4
			7	Spare	Ab	8.0%	5	0-209(120%)	Hormal	ON	1		ыж

Thermostat



Scan the network and discover all devices.

2 Thermostat

Select the thermostat from the tree.

For a fast way to set up the stat you can just load the config file, attached. The steps I did to create this config file are explained below.

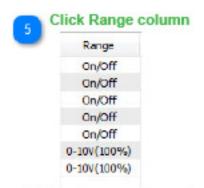




Select the outputs icon.

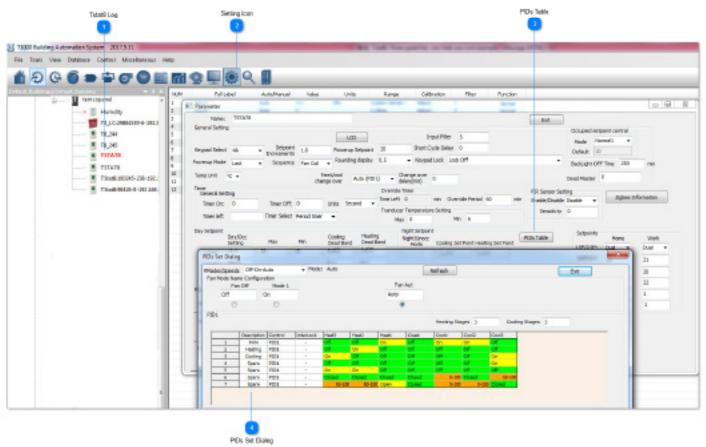
NUM	Ful Labe
1	FAN
2	Heating
3	Cooling
4	Spare
5	Spare
6	Spare
7	Spare

Click to give each output a name and a range, in the case of the fan the outputs are on-off and the valves are modulating 0-10V = 0-100% which are the default ranges already.



Click the Range column to see many options available for the range setting such as PWM and floating three wire control for modulating actuators using two relay outputs.

One heat one cool setting





Select the thermostat from the tree.



Click on the gear icon to get to the advanced settings.



Click to get to the PID tables, this is where we assign outputs to act over each stage of heating and cooling.



		s Off-On-A		+ Mode	: Auto				Refresh				Exit
		n Off	Node 1				Far	n Aut					
	off	0	n				Auto						
	O		O										
									11 11 11				
	-	Description	Control	InterLock	Hest3	Heat2	Heat1	Coast	Heating Sta Cools			ng Stages 3	_
F	1	Description	Control PID1	InterLock	Heat2		Heat1	Coast	Cooli	Cast	Cool3	ng Stages 3	_
E	1 2				_	Heat2 Off On	Heat1 On Off	Cost: Off				ng Støges 3	
	1 2 3	FAN	PID1		Off	Off	On	Off	Cool1 On	Casiz	Cool3	ng Støges 3	
	1 2 3 4	FAN Heating	PID1 PID1	:	off off	Off On	On Off	Off Off	Cool1 On Off	Casiz On Off	Ceal3 Off Off	ng Stages 3	
		FAN Heating Cooling	PID1 PID1 PID1	•	Off Off On	Off On Off	On Off Off	Off Off	Cool1 On Off	Casiz On Off	Coal3 Off Off On	ng Stages 3	
	4	FAN Heating Cooling Spare	PID1 PID1 PID1 PID1	•	Off Off On Off	Off On Off Off	On Off Off	Off Off Off	Cool1 On Off Off Off Off	Cool2 On Off Off	Coal3 Off Off On On		

PIDs Set Dialog shows the details of the setting.

Mocies: Speeds 2	PIDs Set Diel	-					-		-						
	Productipee Fer: Maile IS	di official	la tel	+ Hark	e Dee			1	ratein				Ext		
Mede Name Cerliquistics 🕖 —		the off	Plote 1					n Aut						1.1	
_	017		Om				4.60								
Off Wade			0					0							
	PER								March 10	Stepse 2	~	Ang Stages 2			
										-		ad a state of			-
Thermostat: Outputs 5		Description	FEE	MarLash	Head 2	Heald	Heat	Cuel	Creit	Canit	Cost				5 3 Heat 3
-	2	Heating		-	100	04	04	04	0.0	0.0	04				
	3	Cooling	F104		05	08	08	04	08	08	07				
	1	Spars .	PECE	-	-	200	-	04		08	6				
			FEE	-	Coed	COM	Class	Closed	Coed	COM	Coast				
	2		F104	-	Oceat	Cost	Costd	Oped	Cond	Cost	Cosed				
						10000		2000							
						_									
	-					-		-							
						•									

Here we set how many stages of heating and cooling the system will have. Since this is a three speed fan we can set three heating/cooling at this tab. If we set 2 or other number of heating and cooling stages, there will be corresponding quantity of tabs.

2	Modes/Speed	S			
0	#Modes/Speeds		•	Mode:	Off

Select here from the available options, this establishes the various modes the thermostat will operate in and also whether the user will be able to set the stat in certain modes or not. For example if you select OFF-ON-AUTO the user will be able to select up to three modes from the keypad: OFF, ON and AUTO mode. If we had selected only OFF-AUTO, the user will only be able to see select from the OFF and AUTO modes. Keep in mind that the keypad can be locked as well, this is a separate setting, but this is where we set the number of modes the system will operate in.

3	Node Name (Configuration guration
_	Fan Off	Mode 1
	Off	On
	۲	0

Each of these modes we established in the tab at 2 can be renamed along the row here at tab 3.

-	Off Mode	
ف	Fan Off	Mode 1
	Off	On
	۲	0

Now we set up which of the outputs will do what in each of the various stages and modes. We have selected the OFF mode and the state of the outputs is for the off mode.



	Description
1	FAN
2	Heating
З	Cooling
4	Spare
5	Spare
6	Spare
7	Spare

Each row represents one of the thermostat outputs.

6	3 Heat	3 cool						
	Heat3	Heat2	Heat1	Coast	Cooli	Cool2	Cool3	

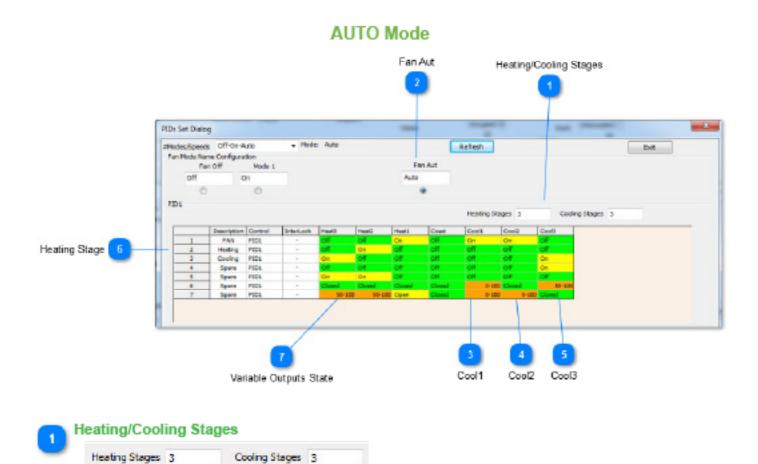
Each column represents a certain stage of heating or cooling. Heating is to the left and Cooling is to the right. The columns to the left represent increasing responses to the temperature being below setpoint. Moving to the right are increasing responses to the room temperature being over setpoint.



The center column represents the thermostat at rest, the setpoint is satisfied and the system is coasting.

| Closed |
|--------|--------|--------|--------|--------|--------|--------|
| Off |
| Off |
| Off |
| Off |
| Off |

Here are the states for the various outputs to each stage of cooling, heating and coasting. Since we have selected the OFF mode at tab18, all the outputs will be OFF with the system is set to OFF mode.



Here we set how many stages of heating and cooling the system will have. Since this is a three speed fan we can set three heating/cooling at this tab. If we set 2 or other number of heating and cooling stages, there will be corresponding quantity of tabs.



Now select the Auto mode. The state of each of the outputs has been set to on, off or modulating on all of the various states.



In the first stage of cooling, output1 is on for low speed fan operation and the cooling valve is modulating open from 0-50%.



In stage 2 of cooling, the medium fan speed is on and the valve is opening up from 50 to 100%.

	Cool3
2	Cool3
	Off
	Off
	On
	On
	Off
	50-100
	Closed

In stage 3 cooling the high speed fan is on and the valve is set once again to modulate from 50 to 100%.



The same sequence is set up to the right of the table for the three stages of heating. The heating valve modulates open as shown and the cooling valve is closed for all stages of heating.

off	0fl	On	of.	On .	On	off
OF	On	oli	OF	oř	Off	Off
On	Off	OE	OF	OF	OFF	On
off	Off	off	of	of	or	On
On	On	oli	of	off	Off	Off
Closed	Closed	Cloud	Closed	0-100	Closed	50-10
50-100	50-100	Open	Closed	0-100	0-100	Cosed

Each cell represents the state of a particular output at a certain stage of heating, cooling or coasting. In the coasting stage, all the outputs are off.

s Set Dialo	9		-			-				-	and and a second se	-
	s Off-On-A		+ Mode	: On				Refresh			Exit	
	ne Configura n Off	Mode 1				Fa	n Aut					
Off		in .	-			Auto						
0							0					
							9					
901								Heating Sta		Curle	Stages 3	
								meaning sua	des 1	Coort	a stades 1	
	Description	Control	InterLock	Heat3	Heet2	Heat1	Coast	Cool1	Cool2	Cool3		
1	FAN	PIDS		On	On	On	On		On	On		
2	Heating	PIDE		off	Off.	Off	Off	OF	Off	Off		
3	Cooling	PID1		Off	Off Off	OII OII	OF	OF	OII .			
4	Spare	91D1		OF	08	ON NO		OF	On	On		
5	Spare	P1D1		On	of	of	Off	Off	OF.	off		
6	Spare	PIDS		Closed	Closed	Closed	Closed		Closed	50-100		
7	Spare	PIDt		50-100	50-100	Open	Cosed	0-100	0-10	Cosed		
							2 Coast	Variable	4 Outputs 5	itate		

Here we set how many stages of heating and cooling the system will have. Since this is a three speed fan we can set three heating/cooling at this tab. If we set 2 or other number of heating and cooling stages, there will be corresponding quantity of tabs.



Now select the ON mode, this is generally used if you would like to allow the user to manually turn on the fan to get some fresh air in the zone.

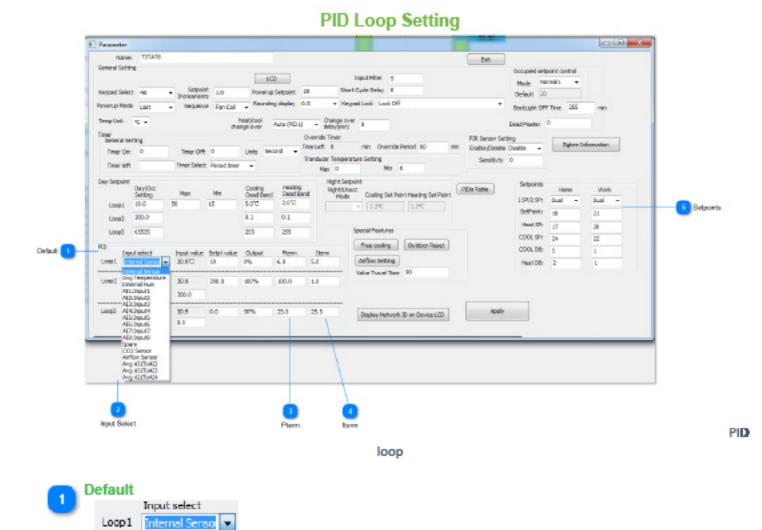


The stages of heating and cooling are set up exactly as everything was done in the Auto mode, the only difference is the Coast tab, you can see that the fan will be on in the coasting mode. This means even when the setpoint is satisfied at least the low speed fan will be on and the heating & cooling valves will be closed.

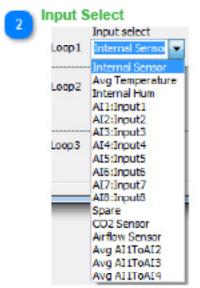


50-100	50-100	Open	Closed	0-100	0-100	Closed
Closed	Closed	Closed	Closed	0-100	Closed	50-100
On	Off	Off	Off	Off	Off	Off
off	off	off	Off	Off	On	On
O lf	Off	Off	Off	Off	Off	Off
off	Off	Off	Off	Off	Off	Off
On	On	On	On	On	On	On

In all other stages of heating stage three on over to cooling stage3, the fan and valve are sequenced just like they were in the auto table.



Now we set up the PID loop, for the most part you can leave the settings at their default. You can select which of the inputs will provide feedback for the PID loop, the default is the internal temperature sensor.

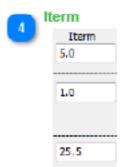


For the PID feedback you can select from many options such as the average of some sensors, any of the 8 external sensors or the internal humidity or C02 sensor if it has one.



Pterm 6.0	
100.0	
25.5	

This is the PID proportional setting. The default value of 6 means that the PID loop will output a full response when the temperature error is 6 degrees, in this case celcius, away from setpoint. So if the setpoint were 20C, the maximum heating to the maximum cooling will occur over a span of 6 degrees. When we're three degrees below setpoint we'll be in stage 3 heating and when we're 3 degrees above setpoint the PID will be at stage 3 cooling.



This is the integral term. This is a nudge factor so that if the temperature is hovering a little ways below the setpoint for a long period eventually the integral term will accumulate some error over time and begin to bring on the next stage of heating. During commissioning this term can be set to zero because it can wind-up and cause confusion. For example the room is just below the setpoint by half a degree or so you would think the unit will be in stage1 heat yet it is running at high speed. It is the integral term which has wound up and is calling for stage three. When commissioning is done you can enter something for the I term to get better PID loop action, the default value of 5 is reasonable and means you can get an extra 5% of PID action for every degC – hour of accumulated error.

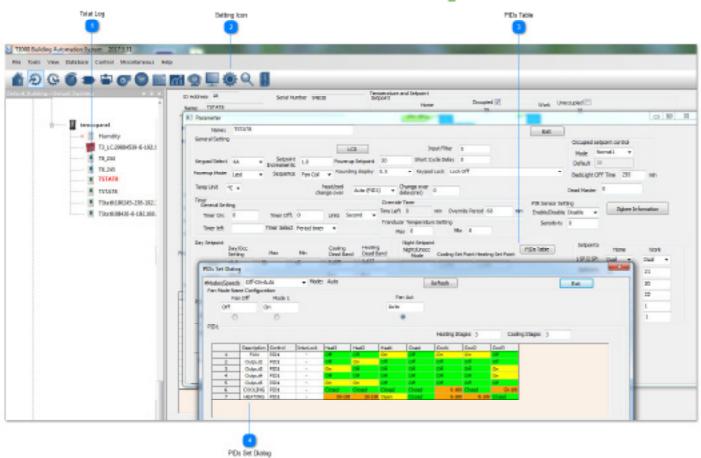
A small value for the P term means the PID loop will be more sensitive to a deviation from setpoint. A small term for the I term means the PID loop will be lazy over time.

Small P =	= hype	eractiv	е
Small I =	lazy,	overt	time.

5 8	etpoints		
<u> </u>	Setpoints	Home	Work
	1 SP/2 SP:	Dual 🔫	Dual 👻
	SetPoint:	19	21
	Heat SP:	17	20
	COOL SP:	24	22
	COOL DB:	5	1
	Heat DB:	2	1

Finally set up the setpoints. Dual setpoints operate like a residential thermostat where you can set up a separate heating and cooling setpoint. Single setpoints are more for commercial settings where you would like to keep things simple and let the user adjust only a single setpoint up or down. The HOME and WORK columns show the heating and cooling setpoints for occupied (home) and unoccupied modes (work). There are other modes which we need to add to this dialog, SLEEP and AWAY which are common with residential thermostats. In single setpoint mode there is only one setpoint we talk about, so the heating setpoint is calculated from the 'setpoint' minus the heating deadband. Similarly, the cooling setpoint is equal to the 'setpoint' plus the cooling deadband.

Two heat two cool setting





Click on the gear icon to get to the advanced settings.



Click to get to the PID tables, this is where we assign outputs to act over each stage of heating and cooling.



<TODO>: Insert description text here...



	ts Off-On-A		- Mode	: Auto				Refresh				Exit
	-	Mode 1				Te.	n Aut					
Off	0	m				Auto						
C)	0				8	8					
								Heating Sta	9 88 3	Coolir	ng Stages 3	
	Description	Control	InterLock	Heat3	Heat2	Heat1	Coest			Cooli	ng Stages 3	
1	Description	Control PID1	InterLock	Heat3	Heat2	Heat] On	Coest		ges 3 Cool2	Cool3	ng Stages 3	
1 2								Cooli	Cool2		ng Stages 3	
1 2 3	PAN	FID1	-	off	Off	On	off	Cael1 On	Cool2 On	Cool3	ng Stages 3	
1 2 3 4	PAN Output2	P1D1 P1D1	•	off Off	Off On	On Off	OF OF	Caoli On Off	Cool2 On Off	Cool3 Off Off	ng Stages 3	
1 2 3 4 5	PAN Output2 Output3	PID1 PID1 PID1	•	off off On Off	Off On Off	On Off	off Off Off	Caelt On Off	Cool2 On Off	Cod3 Off Off On	ng Stages 3	
1 2 3 4 5 6	PAN Output2 Output3 Output4	PID1 PID1 PID1 PID1 PID1	•	off off On Off	off On Off Off	On Off Off	off off off off	Cash On Off Off Off	Cool2 On Off Off	Cool3 Off Off On On	ng Stages 3	

PIDs Set Dialog shows the details of the setting.

						OFF	Mode	e				
	Modes Setting							I	leating/Cooling	Stage		
	PIDs Set Dialog				-	-	-		the second second			
ting 🧿	Mades,Speeds Pan Mode Name (Pan O Off	Configurat		+ Mode	e Auto		Part Auto	(Art	Refresh			fuit
	PIDI								Heating Stage	s z . c	Cooling Stages Z	
Heating/	1 2 3 4 5 6	PAN PAN COOLL COOLL COOLL COOLL HEATS HEATS SPARES SPARES	Control PID4 PID4 PID4 PID4 PID4 PID4 PID4 PID4	UterLock	Heat2 Off Off Off Off Off Off Off Off Off Of	Heat2 OH OH OH OH OH OH OH Oh Oh Oh Oh Oh Oh Oh Oh Oh Oh Oh Oh Oh	Coat Off Off Off Off Off Coat Coat	Costs Off Off Off Off Off Off Off Off Off Of	Cool2 Off Off Off Off Off Off Off Off Off Of			
Heati	ng Stages	2			Co	oling	Stage	s 2				
	er of stage		heat	ting ar								
Modes S	-0.	5 01		g ai		Shing						
#Mode	s/Speeds	Of	F-Aut	to			- 1	lode	: Auto			

You can set the number of modes at the tab, two modes have been selected here with the default names as Off and Auto.

3 OFFSe	electing	
3 F	an Off	Fan Aut
Off		Auto
	•	0

You can rename them by editing the names at the tab.Next we'll edit the Off table by selecting the radio button. The grid shown represents the outputs when the stat is in the off mode.



The center column represents the coasting mode, everything is off there as well.



Heat2	Heat1	Coast	Cool1	Cool2
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
Closed	Closed	Closed	Closed	Closed
Closed	Closed	Closed	Closed	Closed

Each row is one output and the columns represent the outputs in each of the stages of heating and cooling. In this example, everything is off for all 2 stages of heat and two cool.





Set the number of stages of heating and cooling.



Fill in the grid for the Auto mode.



Heat2 will be on in the column called Heat2 and off for the other stages and so on. The fan is on all the time as shown by the FAN row with all yellow entries.



You could optionally turn the fan off during coasting by setting the cell to OFF.

Tstat8 Configuration Menu manual

Code and description

Code	Description [Menu Display] (Range, Default)
Modbus Address	[Add] Modbus Device Address (1-254, 254) This is the modbus address of the tstat. It is the address to which the stat will re- spond to when receiving serial communication. Each tstat must have a unique address on the network.
Tempera-	[CAL] Calibration of the on board Temperature Sensor (0-1000, 500)
ture Calibrate	To calibrate the temperature sensor on the tstat use a accurate hand held mercury or digital thermometer. Both the thermostat and the temperature meter need to be in equilibrium with the space before calibration can occur. Hold the meter close to the thermostat. Use the keypad to get into the menu mode until CAL is shown on the display. Adjust the reading using the up and down buttons till the temperature shown matches the handheld meter. This sequence can be repeated if necessary till the readings on the thermostat and meter are the same. The thermostat will store the calibration figures even through extended power outages and will not need to be adjusted. The thermostat should be powered up for 5 minutes prior to any calibration value is centered around 500 (50.0°) This means that anything above 500 will be added on to the raw temperature and anything below 500 will be subtracted from the raw temperature. Calibration units are in increments of 0.1° (i.e. 500 means 50.0°) and are in the same units (C or F) as the tstat. Some calibration tips: *The main error in calibration comes from not waiting long enough for the handheld thermometer to come to equilibrium. *Calibrate using the customer's thermometer, even if it is not an accurate one so that all subsequent measurements are compared to the same benchmark. *The sensor inside the thermostat is a digital chip capable of readings down to 0.06°C so the weak link in calibrating is usually the procedure used rather than the tstat accuracy.
Tompora	also affect readings.
Tempera- ture	[tSS] Temperature Sensor Select (0-3, 0) The tstat has an extra input which can be used as an external temperature sensor.
Select	Use this menu to select which sensor to use. tSS = 0: The tstat will use the internal IC temperature sensor for the display and
	PID calculations.
	tSS = 1: The tstat will use an external thermistor which is shown on the display and used for PID calculations.
	tSS = 2: The tstat will use an internal thermistor which is shown on the display and used for PID calculations.
	tSS = 3: The tstat will use an average of the internal thermistor and the external thermistor which is shown on the display and used for PID calculations.

Code	Description(Range, Default)
Tempera-	[FIL] Temperature Sensor Filter (0-10, 5)
ture	Filter used for the raw temperature being read by the sensor.
Filter	This configures the weighted average used when filtering the raw temperature. 0
	corresponds to no filter. 10 corresponds to a high level of filtering. Set this to a low
	value if you want the input to respond quickly, a high value will smooth the read-
	ings more but make them respond more slowly. This setting should not need to be
	adjusted for most applications.
Baudrate	[bAU] Baud Rate (1200-115200, 9600)
Select	This will adjust the speed (baud rate) of which the thermostat communicates. This
	value must match the device it is connected too.
Short	[dSC] Short Cycle Delay (0-20, 0)
Cycle	This parameter adjusts the delay between cycling between the modes of operation.
Delay	It is the number of minutes after entering the coasting mode until the tstat can re-
	enter the mode it came from. For example, if the tstat is in Cooling1 mode and then
	enters Coasting mode, it will take a delay of dSC minutes until it can re-enter into
	Cooling1 mode. This value is in increments of 1 minute.
Change-	[dCH] Changover Delay (0-200, 0)
Over	This parameter adjusts the delay between switching from a heating mode of opera-
Delay	tion to a cooling mode of operation or vice versa. It is the number of minutes after
	leaving cooling or heating mode before the tstat can enter the opposite mode. This
	value is in increments of 1 minute.
Propor-	[PPr] Proportional Term (10-255, 20)
tional	The proportional term is the 'P' term of the familiar PID control strategy and deter-
Term	mines how fast a valve will react to a deviation from setpoint at a particular instant
	in time. The default value of 2.0° (C or F) is fine for most applications where a 2.0° deviation is required to make the value respond to 100% . For example, with the DDr
	deviation is required to make the valve respond to 100%. For example, with the PPr term set to 2.0 (°C) and the cooling setpoint is set to 20°C the valve will be open
	100% by the time the room hits 22°C. A larger PPr term will make the valve open
	less since the deviation from setpoint will have to be greater before it opens 100%.
	A smaller value makes the valve respond more quickly. The factory setting of 2.0°
	(Cor F) is fine where the thermostat is located out of the direct airflow in an office
	size room. For a smaller room or if the thermostat is located directly under the air
	vent, a slower acting valve is required to avoid short cycling, so set the value of PPr
	to 3.0° or 4.0°. The PPr term acts in cooperation with the PIn term which is de-
	scribed next. The P value is in increments of 0.1° (i.e. 20 means 2.0°) and is in the
	same units (Cor F) as the tstat.

Code	Description(Range, Default)
Code Integral Term	Description(Range, Default) [PIn] Integral Term (0-255, 50) The integral term is the 'I' term of the familiar PID control strategy and determines how fast a valve will react to a deviation from setpoint over time.For example, with the room slightly above setpoint the 'P' term may be basically satisfied but a small deviation still exists. This deviation is summed up or 'Integrated' over time and the Iterm will gradually open the valve to make up the final small deviation from set- point. The default value of 5.0(%/Deg per minute) is fine for most applications and will cause the valve to open 5% for one degree (Cor F) of error per minute. For ex- ample, when the PIn term set to the default of 5.0 (%/Deg per minute), the cooling setpoint is set to 20°C and the room temperature is 21°C, the valve will be open partially due to the "P" term described earlier but the condition continues and we would like the valve to be opening up slowly to make up the final temperature error. If this situation of 1.0°C error continues for one minute, the error accumulates and the Iterm nudges the valve open an additional 5%. If the previous explanation is not clear, a couple of helpful reminders are as follows: Think of the Iterm as the oppo- site of the Pterm, "a bigger I means faster valve, smaller I means slower valve". The default value of 5% will work fine for most applications. If the valve is short excline
Operation Sequence	 default value of 5% will work fine for most applications. If the valve is short cycling, make the Iterm smaller. The I value is in increments of 0.1 %/°minute (i.e. 50 means 5.0%/°minute) and is in the same units (Cor F) as the tstat. [SOP] Sequence of Operations (0-2, 1) The Sequence of operation is normally set at the factory and does not need to be adjusted. The thermostat supports field adjustment of the operation to suit different variations of mechanical equipment. Setting this value to a different value will cause the thermostat to stop working properly so be careful not to adjust this value unless you are familiar with the various sequences.
	Standard Operation (1): When SOP is set to 1 the sequence of operations is stored in a table that allows for basically any arbitrary sequence of operation. For example, the tstat could be set up to control 5 stages of cooling and 5 stages of heating or anything in between. Each output is individually assigned to be active in any particular section of the cooling or heating cycle. There are 7 discreet steps: Heat3, Heat2, Heat1, Coast- ing, Cool1,Cool2 and Cool3. So the table is 5 outputs x 7 steps via a spread sheet arrangement and you fill in the blanks to suit the application. The settings can be stored in an external text file that is easily read and modified in a text editor. The "TstatFactory" software utility on our website(http://www.tem- cocontrols.com/ftp/tstat5software.zip) allows you to send your favorite sequence of operations table to a new tstat speeding up the configuration process. Transducer Mode (2):
	Setting SOP to 2 puts the Tstat into transducer mode. In this mode the cooling ana- log output corresponds directly to the room temperature in degrees C (i.e. at 25°C, the output would be 2.5V). The heating analog output corresponds directly to the setpoint in degrees C. and relay1 corresponds to the occupied/unoccupied mode (occupied= relay1 ON, unoccupied= relay1 OFF). Test Mode (0): A special sequence of operations is embedded in the tstat that assists in the com- missioning and testing of the installation. When SOP is set to '0' this will start the testing sequence and the unit will cycle the relay outputs on and off in a slow rota- tion. The analog outputs are also cycled in a slow ramp. The cooling goes from 0

Code	Description(Range, Default)
	to 10 Volts while the heating goes in reverse from 10 to 0 Volts. The duty cycle of this rotation is approximately 20 seconds. Be sure the mechanical system is able to handle this sort of cycling before using this feature. Damage may occur if used improperly.
HeatCool	[HC] Heating Cooling Mode Configuration (0-5, 0)
Config	This item configures the method by which the tstat determines the heating or cool-
	ing mode. HC = 0: mode is controlled automatically by the on board PID control. PID > 52 is heating mode, PID < 48 is cooling mode. PID between 48 and 52 is Coasting. This is used for most applications. HC = 1: mode is controlled by the keypad or serial communication. This is for key- pad configurations in which the user or serial comminication can manually set heat-
	ing or cooling mode.
	HC = 2: mode is controlled by the active high digital input. High is heating, low is cooling.
	HC = 3: mode is controlled by the active low digital input. High is cooling, low is heating.
	HC = 4: mode is controlled by difference in temperature of setpoint and analog input 1 temperature sensor. If the temperature of the sensor is greater than the setpoint, the tstat will be in cooling mode and if the temperature of the sensor is less than the setpoint the tstat will be in heating mode. This is primarily used for 2-pipe systems. Analog input 1 would be a well or strap on temperature sensor located in the sup- ply piping of a 2-pipe system to detect if heating or cooling is being supplied to the
	equipment. HC = 5: same as mode 4 but using the analog input 2 sensor instead of analog input 1
Heating	[Cdb] [Hdb] Heating & Cooling Deadbands (1-200, 10)
Deadband	If there is one setpoint then heating setpoint follows the cooling setpoint and is cal-
Cooling	culated by:
Deadband	Heating Setpoint = Setpoint - Heating Deadband. Cooling Setpoint = Setpoint + Cooling Deadband.
	If there are two setpoints heating and cooling are separately adjusted. The set-
	points are calculated as follows:
	Heating Setpoint = Max(Cooling Setpoint + Cooling Deadband , Heating Setpoint) Cooling Setpoint = Min(Cooling Setpoint, Heating Setpoint - Cooling Deadband) The minimum value for Cdb and Hdb is 1.0° (C or F) to ensure that simultaneous heating and cooling is never allowed. The maximum value is arbitrarily set to 20.0°. The deadband values are in increments of 0.1° (i.e. 20 means 2.0°) and are in the
	same units (C or F) as the tstat.
Degree C/F	[C_F] Degrees C/Degrees F (0-1, 0) The display can be switched to show Degrees C or Degrees F. 0 = C, 1 = F.
FanSpeed Select	[FAn] Number of Fan Speeds to show on the display (0-3, 3) The number of fan speeds allowed. FAn = 3, the user will see "Off/On/Med/Hi/Auto"; FAn = 2, the user will see "Off/On/Med/Auto"FAn = 1, the user will see "Off/On/ Auto";Fan = 0 then the user will see "Off/Auto"
NightHeat	[nCd] [nHd] Night Cooling Deadband (0-99, 10) for deg C and F / Night Heating
Deadband	Deadband (0-35, 10) for deg C, (0-95, 10) for deg F.
NightCool	When the tstat is in unoccupied mode and APP is set to 0 then the heating setpoint
Deadband	is adjusted downwards by the amount of the nHd. The cooling setpoint is adjusted

Istat8 Bacnet Thermostat

Code	Description(Range, Default)
	upwards by the amount of nCd. The night deadband values are in increments of 1° (i.e. 10 means 10°) and are in the same units (C or F) as the tstat.
	Note: The night heating setpoint is prevented through an internal software interlock
	from being set below 5°C, regardless of the user heating setpoint and the value stored in NHS.
NightHeat	Set night heating setpoint and night cooling setpoint, in degree C or degree F
Setpoint NightCool	
Setpoint	
Applica- tion	[APP] Application (0-1, 0) 0 - OFFICE applications mode
Mode	The night time setpoints are specified value
	Night Heating Setpoint = nHS value.
	Night Cooling Setpoint = nCS value. 1 - HOTEL or RESIDENTIAL applications mode
	The night time setpoints are a specified deadband in relation with the day time set-
	points
	Night Heating Setpoint = Cooling Setpoint - nHd value.
PowerUp	Night Cooling Setpoint = Cooling Setpoint + nCd value. [POS] Power on setpoint (0-255, 20) for deg C, (0-255, 68) for deg F
Setpoint	Certain applications require the thermostat to power up with a known setpoint that
	is stored through a power outage. This feature is useful in some of the transducer
	modes where the central DDC controller can cycle the power to the thermostats to reset the room setpoints to a known value everyday. The power on setpoint value is
	in increments of 1° (i.e. 20 means 20°) and is in the same units (C or F) as the tstat.
PowerUp	[POn] Power on Mode (0-3, 3)
On/Off	This setting allows the thermostat to power up in one of three modes: 0 = power off,1 = power up in on mode, 2 = last value(default),3 =auto mode. The on and off
	settings are self explanatory and are useful in certain DDC applications where the
	central controller can cycle the power to each thermostat to sweep them off each
	evening for example. The default value is "last value" and will cause the thermostat
Analog-	to power up in whatever state it was in before the power outage. [Ou1] [Ou2] Output settings (0-4, 0)
Out1	Sets the full-scale voltage of the analog outputs. Ou1 sets analog out 1 (Cooling).
Setting	Ou2 sets analog out 2 (Heating). This setting is used to match the analog outputs to
Analog-	various types of actuators, transducers or other controllers. For example, by set-
Out2 Setting	ting the output range to act over a 5VDC scale can be used to set the tstat up as a transducer to interface into a master DDC controller. This also works with a valve
octing	that operates over the 2-10VDC range, this 'output' type setting lets you tailor the
	tstat to the particular application. Setting OuX to 0 will set the output to act in ON/
	OFF mode. There are 4 types of tstats. Only the Tstat5A and Tstat5CM have analog output
	capability.
	For Tstat5B and Tstat5C, the firmware recognizes the relays and this will be perma-
	nently set to 0 and is not adjustable.
	For Tstat5A and Tstat5CM with analog outputs, the output will be 0V when OFF and 10V when ON. This is useful when using a Tstat5A or Tstat5CM and need extra ON/
	OFF outputs.
L	

Code	Description(Range, Default)
	OuX = 1, the outputs will modulate from 0V to 10V over the 0-100% range of any particular stage of heating or cooling. OuX = 2, same as the '1' setting but the output modulates over the 0-5V scale OuX = 3, same as the '1' setting but the output modulates over the 2-10V full scale OuX = 4, same as the '1' setting but the output modulates in reverse i.e. 10V-0V Note: For a 4-20ma actuator it is simple to convert the 2-10VDC signal to a 4-20ma signal by installing a 250 ohm, 1/2 watt resistor in series with the output and making
	sure the grounds of the actuator and tstat are common to each other.
Max Set- point Min Set-	[SLO] Setpoint Minimum (0-255, 15) for deg C, (0-255, 55) for deg F [SHI] Setpoint Maximum (0-255, 50) for deg C, (0-255, 99) for deg F The maximum and minimum allow able user setpoint settings. The occupants can-
point	not adjust the setpoint above or below these settings. The min and max setpoint values are in increments of 1° (i.e. 20 means 20°) and are in the same units (C or F) as the tstat. Note: the heating and cooling deadbands act in a way that reduces these settings by the amount of the deadband. For example, if the highest setpoint allowed is 'SHI' = 30°C and the heating deadband 'Hdb' = 2°C, heating will actually only be active up to 28°C. Similarly, if the 'Cdb' cooling deadband parameter is at 2°C and the minimum setpoint is at 20°C, then cooling takes place only as low as 22°C.
MenuLock mode	[LOC] Keypad lockout (0-3, 0) Rev25 only: This setting is useful to keep the building occupants from experiment- ing in the menu system. When the LOC parameter is set to '1' the keypad will be locked out from all menu operations. The normal operation of the keypad is not affected; the fan and setpoint buttons work as usual. When the LOC parameter is set to '2' the keypad will be locked out from partial menu operations allowing maintenance personnel to access some of the less critical menu parameters while maintaining a LOC on functions reserved for the primary administrator. This option allows access to calibration of the internal and external temperature sensor (CAL and CAE) and the override time parameter(ORT). LOC= 3, The user cannot do any- thing from keypad except enter the menu mode. In the menu mode, the user can set the setpoint, fan speed, calibration and override timer. When the menu system is locked out, the only way to adjust the tstat parameters is through the network port or through the communications jack at the bottom of the tstat. The parameter can be set back to '0' only though the communications ports as well.
ValveTrav-	[Vtt] Valve Transient Time (10-255, 0)
le Time	This setting allows the user to adjust the valve transient time from fully open to fully closed. Value ranges from 10 to 255 seconds.
RS485/ ZGB Select	Selet RS485 or ZIGBEE communication mode. This is only for Tstats with wireless ZIGBEE
MODBUS BACNET	Switch between Modbus protocol or BACnet protocol
WIFI Mode	Select ADHOC mode or Infra mode network. This is only for Tstat wifi product.
Factory Default	[FAC] Factory Default Setting (0-1, 0) This returns the Tstat back to factory default settings. "YES" will reset the Tstat back to original settings. "NO" will keep the changes made.

Modbus register list

Tstat8	Count	Register and Description
0 to 3		Serial Number - 4 byte value. Read-only
4 to 5		Software Version- 2 byte value. Read-only
6		ADDRESS. Modbus device address
7		Product Model. This is a read-only register that is used by the microcon-
		troller to determine the product model.
8		Hardware Revision. This is a read-only register that is used by
		the microcontroller to determine the hardware revision.
9		PIC firmware version
10		PIC version of Humidity module
11		PLUG_N_PLAY_ADDRESS, 'plug n play' address, used by the network master to resolve address conflicts. See VC code for algorithms
12~14		Spare
15		Bau - Baudrate, 0=9.6kbaud, 1=19.2kbaud 2=38.4kbaud 3=57.6kbaud 4=115.2kbaud 5=76.8kbaud 6=1.2kbaud 1=4.8kbaud 1=14.4kbaud
16		Update Register, used to show the status of firmware updates. Writing 143 sets the config back to out of the box except for Modbus ID and baud rate. Write 159 to fix the current config as the user defaults, this is done automatically by T3000 any time a config file is loaded. Writing 175 resets the unit back to the user defaults.
17~19		Spare
20		Hardware Options Register, starting with LSB: Bit0=Clock present or not, Bit1 = Humidity present or not, Bit2 = C02 Sensor, Bit3=CO sensor, Bit4 = Motion Sensor
21		PANID for zigbee devices
22		Device type of zigbee. 0 means coordinator, 1 means router
23~24		Channel of Zigbee, default channel is channel 13, 0x00002000
25		Zigbee module software revision
26~33		Zigbee extented address(MAC address)
34		Set 1 to reboot zigbee module
35~50		Security key
51		The number of zigbee neighbors around
52		The modbus ID of the 1st zigbee neighbor
53		The signal strength of the 1st zigbee neighbor
54		The modbus ID of the 2nd zigbee neighbor

*The register list is very long ,it can be downloaded as an excel spreadsheet (03ModbusBacnetRegisterList.xls) at the following link:<u>http://tinyurl.com/ybaj9d3u</u>

Bacnet object list

Supported BACnet Object Types

analog-input, analog-output, analog-value, binary-input, binary-output, device

Supported BACnet Services

who-is, i-am

object-identifier, object-name, object-type, present-value, units, object-list, vendor-id, vendor-name, system-status, confirmed-service, unconfirmed-service

AV	AV and Description		
0	Buadrate 96=9600 192=19200 384=38400 1152=115200 unit:bps		
1	Station Number		
2	Protocol swith 0=MODBUS,1=MSTP		
3	Instance Number		
4	Schedule enable/disable 1:enable 0:disable		
5	Occupied/Home/Day setpoint		
6	Unoccupied/Work/Night setpoint		
7	Fan mode setting 0:unoccupied mode,1:user mode1,2:user mode 2 3:user mode3,4:usermode4		
8	Firmware Version		
9	Current Mode of operation 0:coast mode 1:cool mode 2:heat mode		
10	Temperature Unit 0:degree C 1:degree F		
11	System Mode 0:auto 1:heat 2:cool,if set to 0, system will control by PID,if set to 1,system will be in heat only mode,and 2 will be cool 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 output 0:auto 1:manual		

AI	Description
Al1	Analog input1
Al2	Analog input2
AI3	Analog input3
Al4	Analog input4
AI5	Analog input5
Al6	Analog input6
AI7	Analog input7
Al8	Analog input8
Al9	Internal temperature value
AI10	Humidity value
AI11	CO2 value if it has CO2 sensor present

BO	Description
BO1	Binary output1 state 1:on 0:off
BO2	Binary output2 state 1on 0:off
BO3	Binary output3 state 1:on 0:off
BO4	Binary output4 state 1:on 0:off
BO5	Binary output5 state 1:on 0:off
AO	Description
AU	Description
AO1	Analog output 1 value
AO2	Analog output2 value