

T3 Series Bacnet Programmable Controller

T3000 controller is a multi-user, including T3-BB, T3-LB and T3-TB. It can stand DDC panel alone or in a multiple network system with full communication capabilities. The multiple communication ports allow the controller to operate on a network or host sub networks and to communicate with local and remote operators simultaneously.

Setup and programming are done on a PC not necessary to connect to live hardware as it is the case with many systems. When the program is ready for on-site testing, connect it to a live panel and download the T3000 software. Programming can be done remotely over the network and modem connections as well. The network system is very flexible and economical for the installation.



T3-BB



T3-TB



T3-LB



T3 Series Bacnet Programmable Controller

Specifications

Software

Interactive dynamic color graphics
Industry standard Bacnet & Modbus protocols
User programming, built in networking features
16 Control Basic programs
16 User screen displays
8 Weekly routines, 4 annual routines
128 User variables
16 PID controllers
8 passwords or users

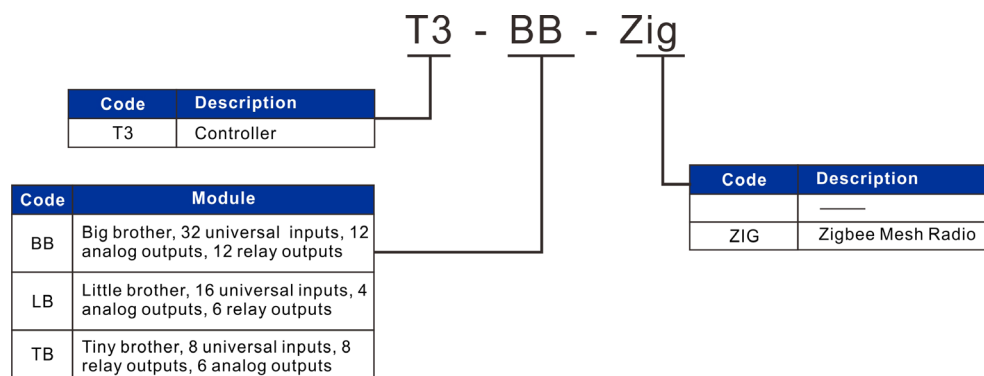
Hardware

Highly Configurable: any combination of input/output cards totalling up to 64 points
Digital output: 5V/125VAC, 30VDC
Analog output: 0-10V
Universal input: Thermistor, 0-10V, 0-5V, 0-20mA
Mechanical relays 2A, 24VAC/DC
Diagnostic LEDs & Hand-Off-Auto Switches
512K Flash / 512k Ram
SD Disk slot for trend logs, alarms, graphics
Ethernet Port: Bacnet & Modbus supported simultaneously
2 x RS485 ports
USB Port only for T3-BB, T3-LB
RS232 only for T3-BBt
Zigbee port is optional, only for T3-BB, T3-LB
Clock with battery backup

- Surge-protected Universal Inputs with 12-bit resolution
- UL listed ABS enclosure with rubberized texture creates a high end feel.
- Software configure the I/O ranges with the free T3000 software or by writing to the registers with your own software.
- Each output has a hand-off-auto switch for easy troubleshooting and overrides.
- Each I/O as well as the RS485 connections have a separate screw terminal, there's no need to gang two wires under one terminal for any of the terminations.
- High/Low speed input pulse counters
- RS485 sub baudrates: 9600, 19200
- RS485 main baudrates: 1200~921600
- Communication methods are RS485, Ethernet, USB, Zigbee but it can, at the same time, support Modbus and Bacnet.
- Starter space source code is available.
- T3000 front end is free and open source: <http://tinyurl.com/n7kkqp6>
- Compiled version of the front end is here: <https://tinyurl.com/y7uyu9n3>
- Power Supply Voltage: 24V AC/DC
- Relay: 5A/125VAC, 30VDC
- Operating Temperature: -30~70°C (-22~158°F)
- Maximum Power Consumption
 - T3-BB: 10W
 - T3-LB: 10W
 - T3-TB: 6W
- Case Color: Black

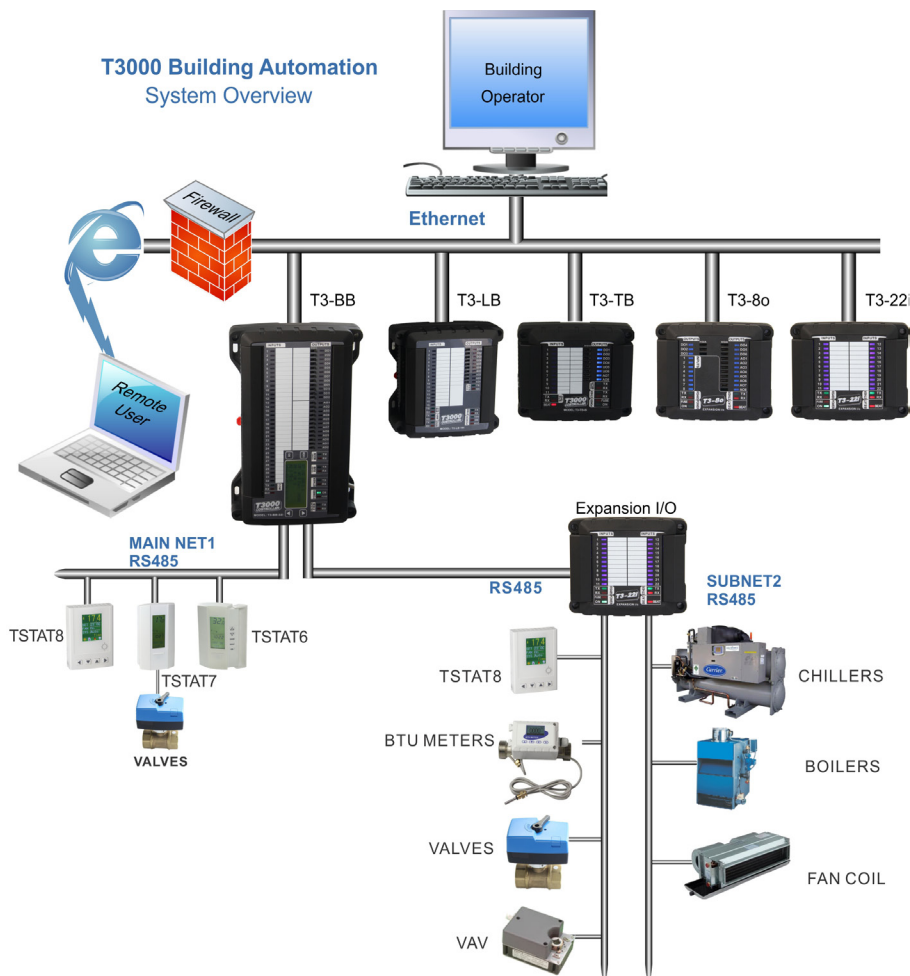
[https:// www.bravocontrols.com/ftp/software/09T3000Software.zip](https://www.bravocontrols.com/ftp/software/09T3000Software.zip)

Part Number Scheme



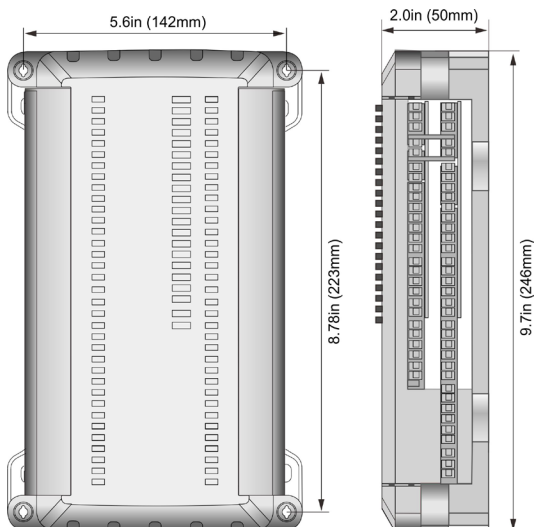
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Network Diagram

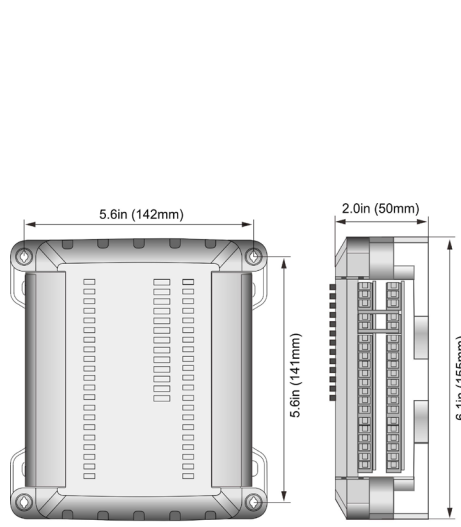


Dimensions

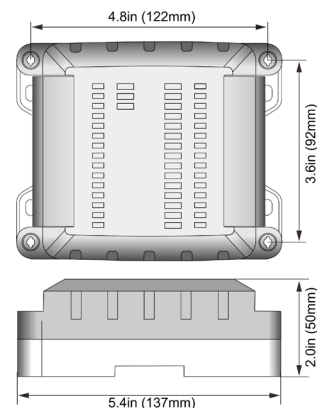
1) T3-BB(Big Brother)



2) T3-LB(Little Brother)



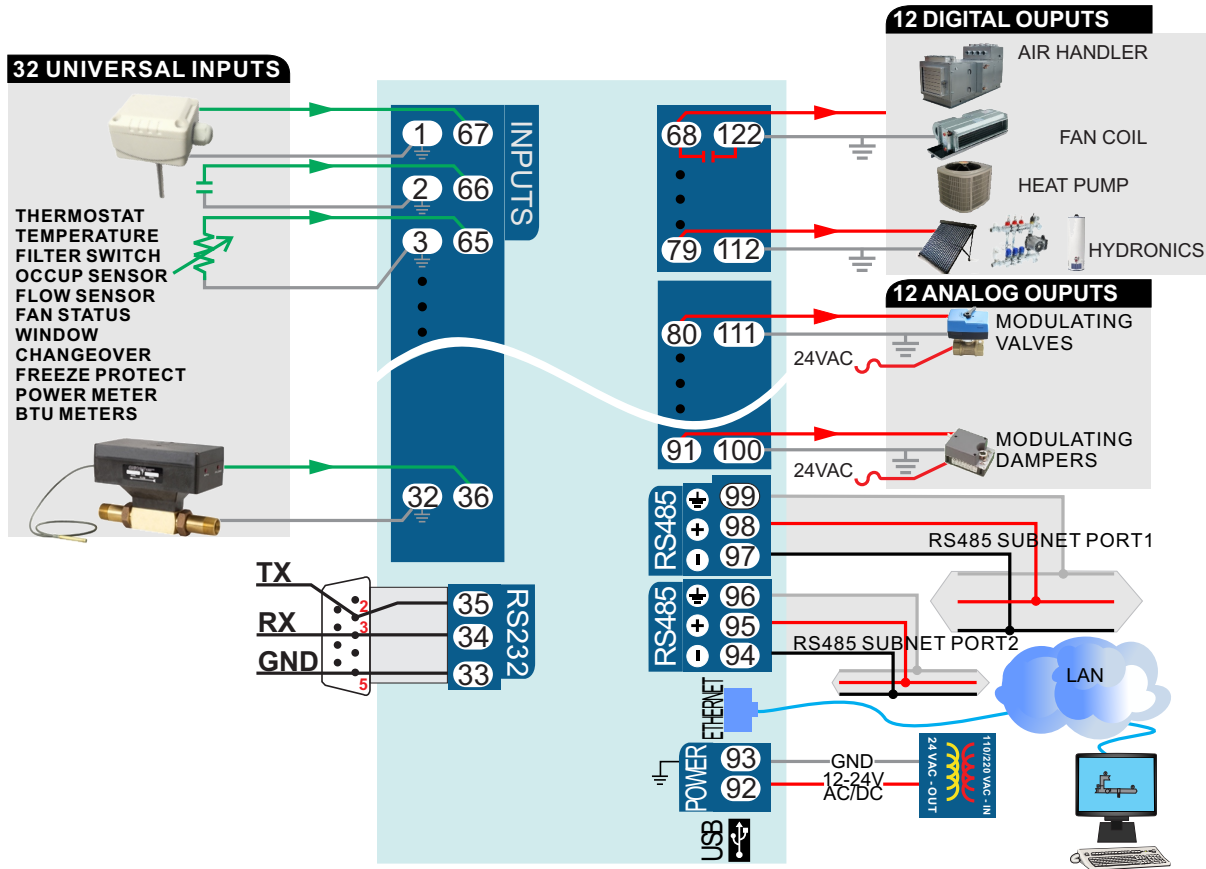
2) T3-TB(Little Brother)



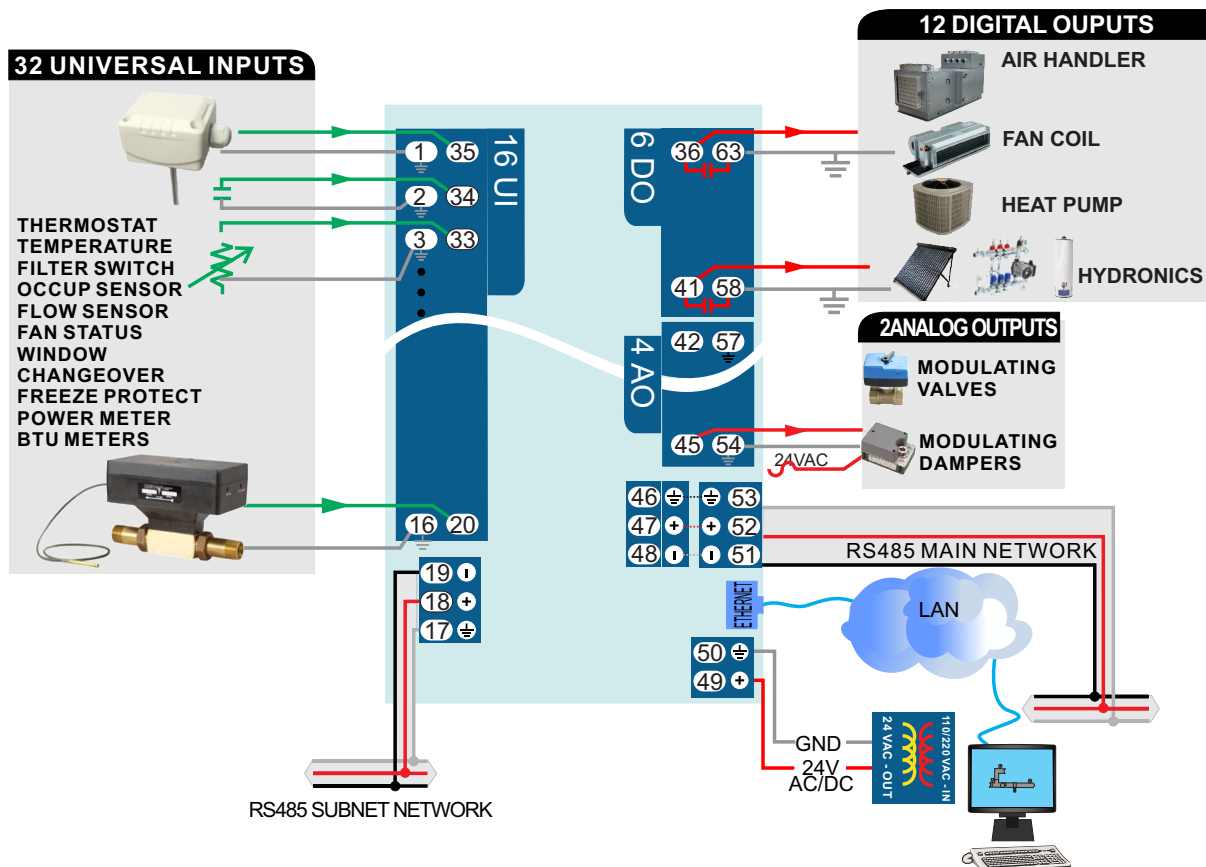
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Wiring Diagram

T3-BB WIRING DIAGRAM

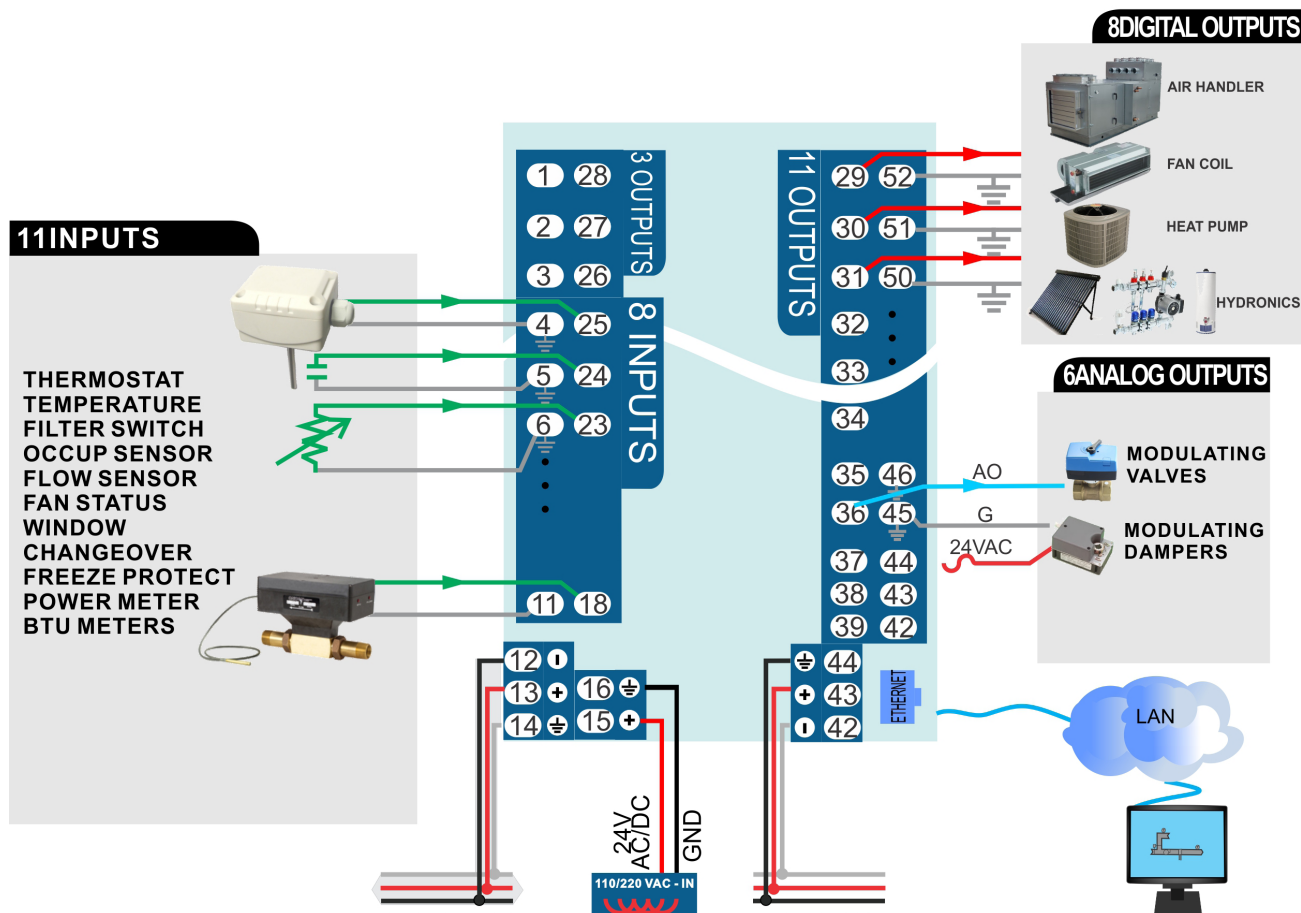


T3-LB WIRING DIAGRAM



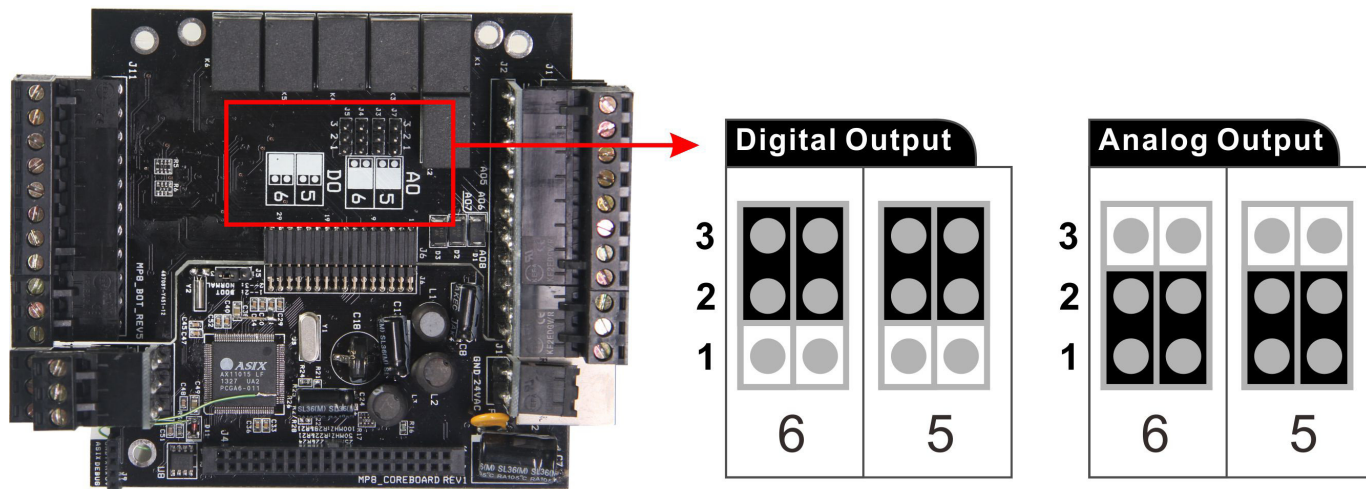
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T3-TB WIRING DIAGRAM



T3-TB Output Jumper Settings

T3-TB Output Jumper settings



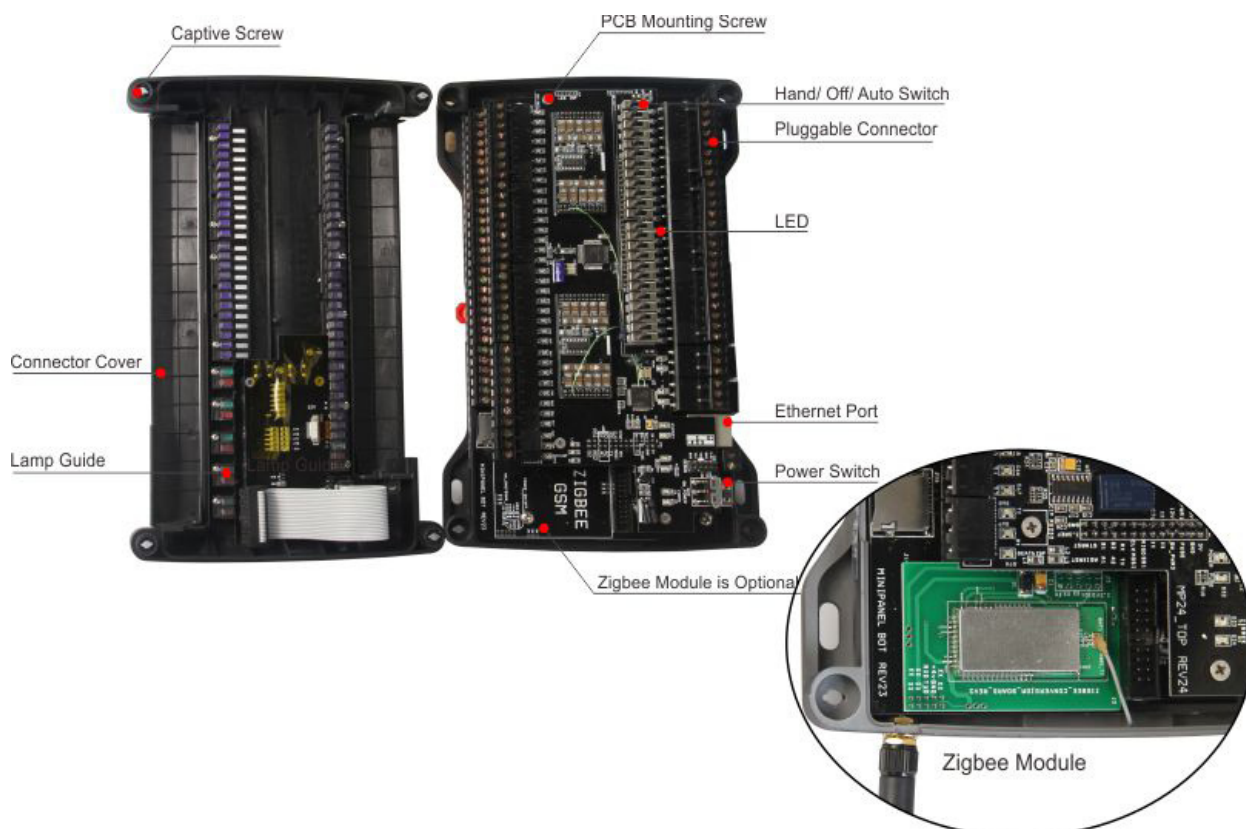
	Controller		
	T3-BB Big Brother	T3-LB Little Brother	T3-TB Tiny Brother
Total Channels:	56	26	22
Universal Input	32	16	8
Analog Output	12	4	6
Relay Output	12	6	8
Comm ports:			
RS485	2	2	2
RS232	1	0	0
Ethernet	1	1	1
USB	1	1	0
Option port**	1	1	0

* The 2 universal output can be selected by jump as either 1-10V analog or relay outputs.

** zigbee module.

Transportation methods of these units are RS485, Ethernet, USB, Zigbee, at the same time, they support Modbus and Bacnet. The T3-BB unit features 32 channels input and 24 channels output including 12 channels analog output and 12 channels digital output. As for the T3-LB, there are 16 channels input and 10 channels output including 4 channels analog output and 6 channels digital output. For T3-TB, it includes 8 inputs and 14 outputs which contain 6 analog outputs, 8 digital outputs. All of these channels can be controlled directly by minipanel through input and output cards.

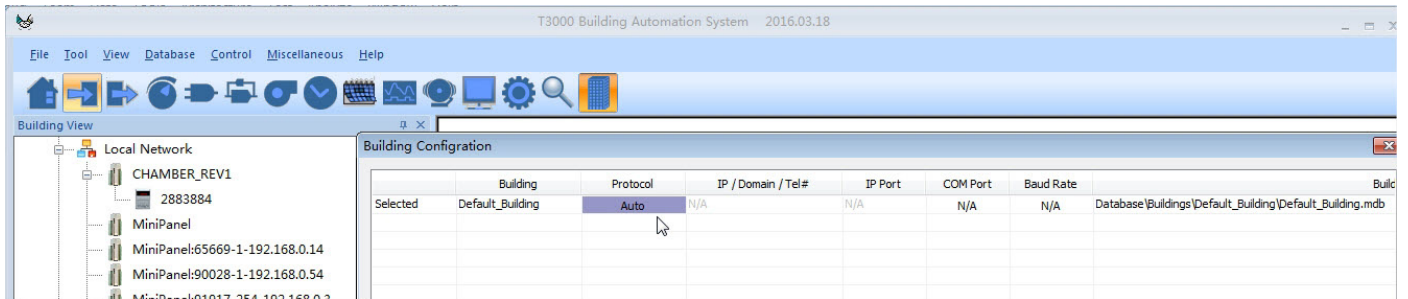
Highlight



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T3000 Operation Instructions

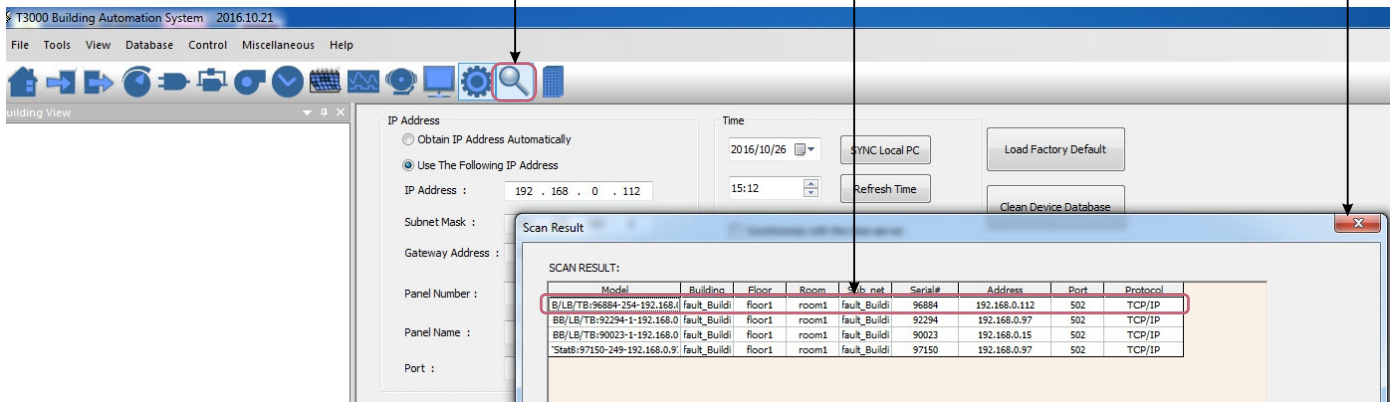
1. Visit <https://tinyurl.com/y7uyu9n3>, download 09T3000 software.zip and install it;
2. Take an example of T3-BB here, connect T3-BB to PC by RS485 network at pin 94, 95, and 96 or Ethernet.
3. Open T3000 software, and click icon building, an popup window will appear, set protocol to Auto, then close it. Click scan icon which is next to the icon building to find the connected unit.



1. Click to scan

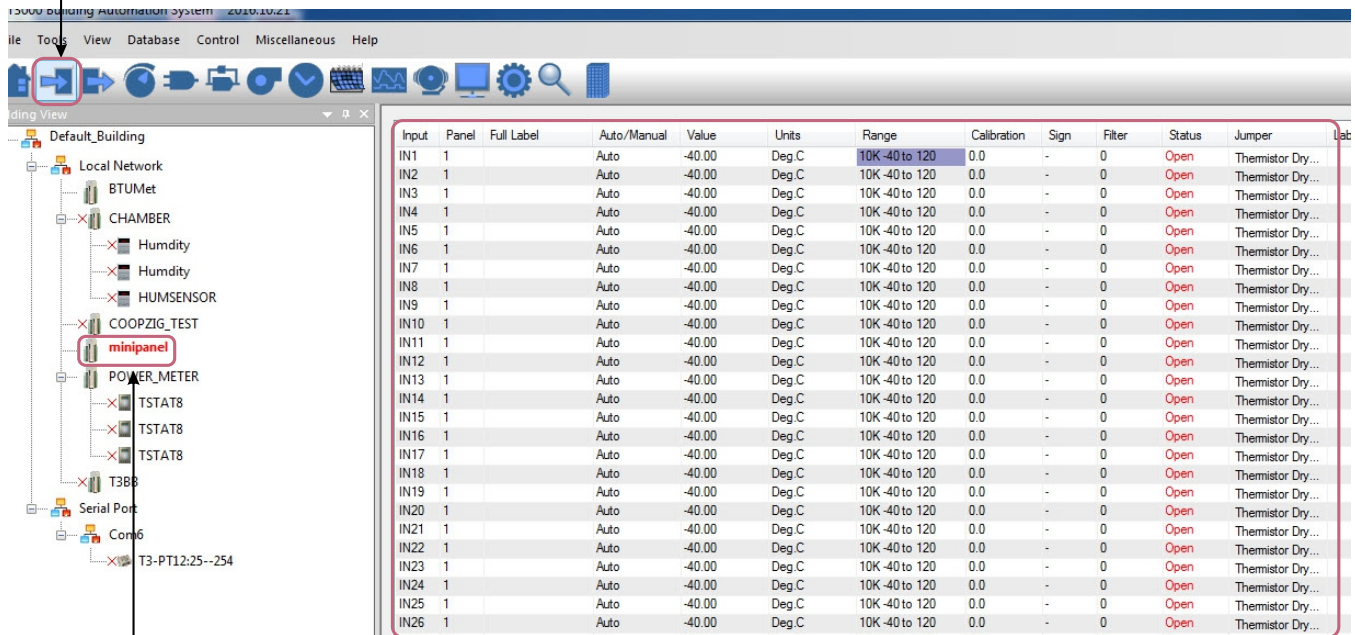
Device detected

2. Click to close



Then click the device log what have been connected, T3000 software will show the info in right hand place. You can click Input, Output and other icon.

4. Click input to show table right



3. Click to select minipanel

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4. Click input icon, it will show all inputs in T3000 software.

	T3-BB	T3-LB	T3-TB	Speed
Low Speed Input channels	1-32	1-16	1-8	1 Hz
High Speed Input channels	27-32	11-16	3-8	1M Hz

For T3-BB, T3-LB, T3-TB, all the inputs channels have pulse counters. High speed counters capable of 1M Hz. Low speed inputs channels reach to 1 hz per channel.

Here we take an example of T3-BB, showing how to configure the high speed and low speed counters in T3000 software.

5. Click input to show table below

The screenshot shows the T3000 Building Automation System software interface. On the left, a tree view shows the project structure, including 'Default_Building', 'Local Network', 'CHAMBER', 'COOPZIG_TEST', 'POWER_METER', and 'Serial Port'. The main window displays a table of input channels. A dialog box titled 'Select Range Number' is open, showing 'Enter Units Number: 45' and 'Speed Count' selected. The dialog also lists various digital and input analog units.

Input	Panel	Full Label	Auto/Manual	Value	Units	Range	Calibration	Sign	Filter	Status	Jumper	Label
IN1	1		Auto	-40.00	Deg.C	10K -40 to 120	0.0	-	0	Open		Thermistor Dry...
IN2	1		Auto	-40.00	Deg.C	10K -40 to 120	0.0	-	0	Open		Thermistor Dry...
IN3	1		Auto	-40.00	Deg.C	10K -40 to 120	0.0	-	0	Open		Thermistor Dry...
IN4	1		Auto									
IN5	1		Auto									
IN6	1		Auto									
IN7	1		Auto									
IN8	1		Auto									
IN9	1		Auto									
IN10	1		Auto									
IN11	1		Auto									
IN12	1		Auto									
IN13	1		Auto									
IN14	1		Auto									
IN15	1		Auto									
IN16	1		Auto									
IN17	1		Auto									
IN18	1		Auto									
IN19	1		Auto									
IN20	1		Auto									
IN21	1		Auto									
IN22	1		Auto									
IN23	1		Auto									
IN24	1		Auto									
IN25	1		Auto									
IN26	1		Auto									
IN27	1		Auto									
IN28	1		Auto									
IN29	1		Auto									
IN30	1		Auto									
IN31	1		Auto									
IN32	1		Auto									

Select Range Number

Enter Units Number: 45 OK Cancel Speed Count

Digital Units

- 0. Unused
- 1. Off/On
- 2. Close/Open
- 3. Stop/Start
- 4. Disable/Enable
- 5. Normal/Alarm
- 6. Normal/High
- 7. Normal/Low
- 8. No/Yes
- 9. Cool/Heat
- 10. Unoccupy/Occupy
- 11. Low/High
- 12. On/Off
- 13. Open/Close
- 14. Start/Stop
- 15. Enable/Disable
- 16. Alarm/Normal
- 17. High/Normal
- 18. Low/Normal
- 19. Yes/No
- 20. Heat/Cool
- 21. Occupy/Unoccupy
- 22. High/Low
- 23. /
- 24. /
- 25. /
- 26. /
- 27. /
- 28. /
- 29. /
- 30. /

Input Analog Units

- 31. Y3K -40 to 150 Deg.C
- 32. Y3K -40 to 300 Deg.F
- 33. 10K-40 to 120 Deg.C(Type2)
- 34. 10K-40 to 250 Deg.F(Type2)
- 35. G3K -40 to 120 Deg.C
- 36. G3K -40 to 250 Deg.F
- 37. 10K-40 to 120 Deg.C(Type3)
- 38. 10K-40 to 250 Deg.F(Type3)
- 39. A10K -50 to 110 Deg.C
- 40. A10K -60 to 200 Deg.F
- 41. 0.0 to 5.0 Volts
- 42. 0.0 to 100 Amps
- 43. 0.0 to 20 ma
- 44. 0.0 to 20 psi
- 45. Low Speed Count
- 46. 0.0 to 3000 FPM
- 47. 0 to 100 %(0-5V)
- 48. 0 to 100 %(4-20ma)
- 49. 0.0 to 10.0 Volts
- 50. Table 1
- 51. Table 2
- 52. Table 3
- 53. Table 4
- 54. Table 5
- 55. High Speed Count
- 56. HZ

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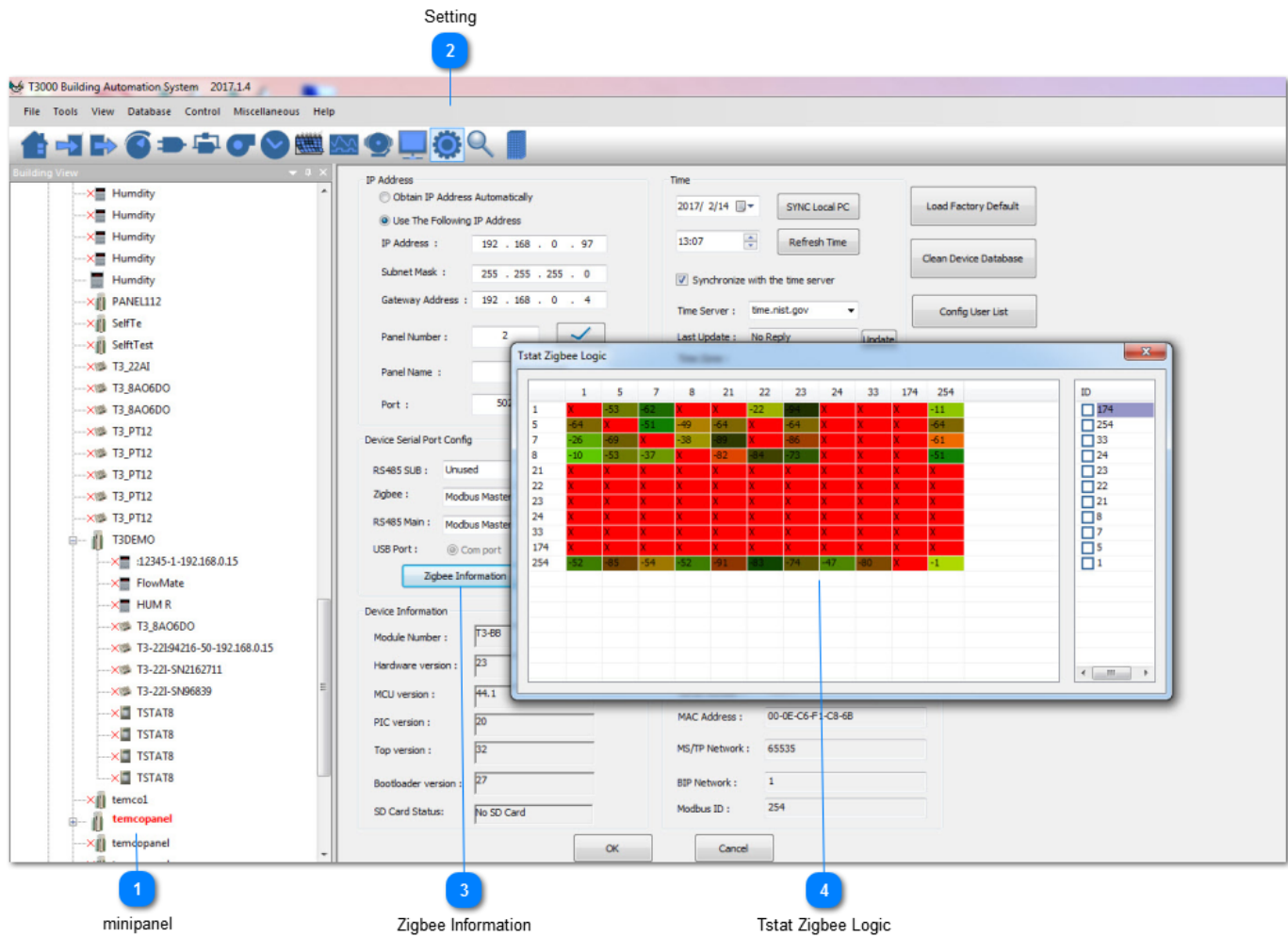
5. Click output icon, it will show the output view.


Click input to show table below


The screenshot displays the T3000 Building Automation System software interface. The title bar reads "T3000 Building Automation System 2016.10.21". The menu bar includes "File", "Tools", "View", "Database", "Control", "Miscellaneous", and "Help". The toolbar contains various icons, with the "Output" icon (a blue square with a white arrow pointing right) highlighted by a red circle. A callout box with the text "Click input to show table below" points to this icon. The main window is divided into two panes. The left pane, titled "building View", shows a hierarchical tree structure of the building system components, including "Default_Building", "Local Network", "BTUMet", "CHAMBER", "Humidity", "COOPZIG_TEST", "minipanel", "POWER_METER", "TSTAT8", "T3BB", "Serial Port", and "Com6". The right pane displays a table of output data.

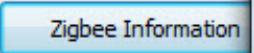
Output	Panel	Full Label	Auto/Manual	HOA Switch	Value	Units	Range	PWM Period	Status	Label
OUT1	1		Auto	MAN-ON	On		Off/On	0	OK	
OUT2	1		Auto	MAN-ON	On		Off/On	0	OK	
OUT3	1		Auto	MAN-ON	On		Off/On	0	OK	
OUT4	1		Auto	MAN-ON	On		Off/On	0	OK	
OUT5	1		Auto	MAN-ON	On		Off/On	0	OK	
OUT6	1		Auto	MAN-ON	On		Off/On	0	OK	
OUT7	1		Auto	MAN-ON	On		Off/On	0	OK	
OUT8	1		Auto	MAN-ON	On		Off/On	0	OK	
OUT9	1		Auto	MAN-ON	On		Off/On	0	OK	
OUT10	1		Auto	MAN-ON	On		Off/On	0	OK	
OUT11	1		Auto	MAN-ON	On		Off/On	0	OK	
OUT12	1		Auto	MAN-ON	On		Off/On	0	OK	
OUT13	1		Auto	MAN-ON	10.00	Volts	0.0 -> 10	0	OK	
OUT14	1		Auto	MAN-ON	10.00	Volts	0.0 -> 10	0	OK	
OUT15	1		Auto	MAN-ON	10.00	Volts	0.0 -> 10	0	OK	
OUT16	1		Auto	MAN-ON	10.00	Volts	0.0 -> 10	0	OK	
OUT17	1		Manual	MAN-ON	10.00	Volts	0.0 -> 10	0	OK	
OUT18	1		Manual	MAN-ON	10.00	Volts	0.0 -> 10	0	OK	
OUT19	1		Auto	MAN-ON	10.00	Volts	0.0 -> 10	0	OK	
OUT20	1		Manual	MAN-ON	10.00	Volts	0.0 -> 10	0	OK	
OUT21	1		Manual	MAN-ON	10.00	Volts	0.0 -> 10	0	OK	
OUT22	1		Manual	MAN-ON	10.00	Volts	0.0 -> 10	0	OK	
OUT23	1		Manual	MAN-ON	10.00	Volts	0.0 -> 10	0	OK	
OUT24	1		Manual	MAN-ON	10.00	Volts	0.0 -> 10	0	OK	
OUT25	1		Auto	AUTO	0.00		Unused	0	-	
OUT26	1		Auto	AUTO	0.00		Unused	0	-	
OUT27	1		Auto	AUTO	0.00		Unused	0	-	
OUT28	1		Auto	AUTO	0.00		Unused	0	-	
OUT29	1		Auto	AUTO	0.00		Unused	0	-	
OUT30	1		Auto	AUTO	0.00		Unused	0	-	
OUT31	1		Auto	AUTO	0.00		Unused	0	-	
OUT32	1		Auto	AUTO	0.00		Unused	0	-	
OUT33	1		Auto	AUTO	0.00		Unused	0	-	

*6.Steps to get zigbee information by T3000.



1 minipanel
 **temcopanel**
 Click to select minipanel

2 Setting

 Click to show tab below

3 Zigbee Information

 Click to show Tstat Zigbee Logic

4 Tstat Zigbee Logic

	1	5	7	8	21	22	23	24	33	174	254
1	X	-53	-62	X	X	-22	-94	X	X	X	-11
5	-64	X	-51	-49	-64	X	-64	X	X	X	-64
7	-26	-69	X	-38	-69	X	-86	X	X	X	-61
8	-10	-53	-37	X	-82	-84	-73	X	X	X	-51
21	X	X	X	X	X	X	X	X	X	X	X
22	X	X	X	X	X	X	X	X	X	X	X
23	X	X	X	X	X	X	X	X	X	X	X
24	X	X	X	X	X	X	X	X	X	X	X
33	X	X	X	X	X	X	X	X	X	X	X
174	X	X	X	X	X	X	X	X	X	X	X
254	-52	-85	-54	-52	-91	-93	-74	-47	-80	X	-1

It shows the information details

To read the zigbee signal for the T3 controller, read registers 5030 thru 5099. 5031~5099 are ID and signal strength, high byte is ID, low byte is signal strength. Register 5030 holds the number of neighbors the controller can see, let's say there are three thermostats near the T3 controller so N=3.

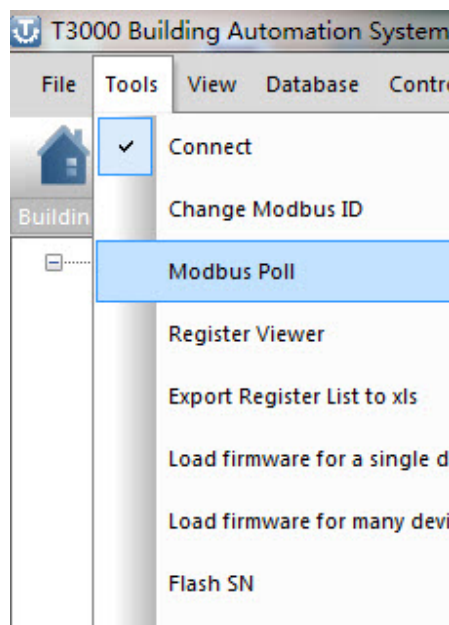
Register 5031 holds the Modbus ID and signal strength of the first neighbor, high byte is ID, low byte is signal strength.

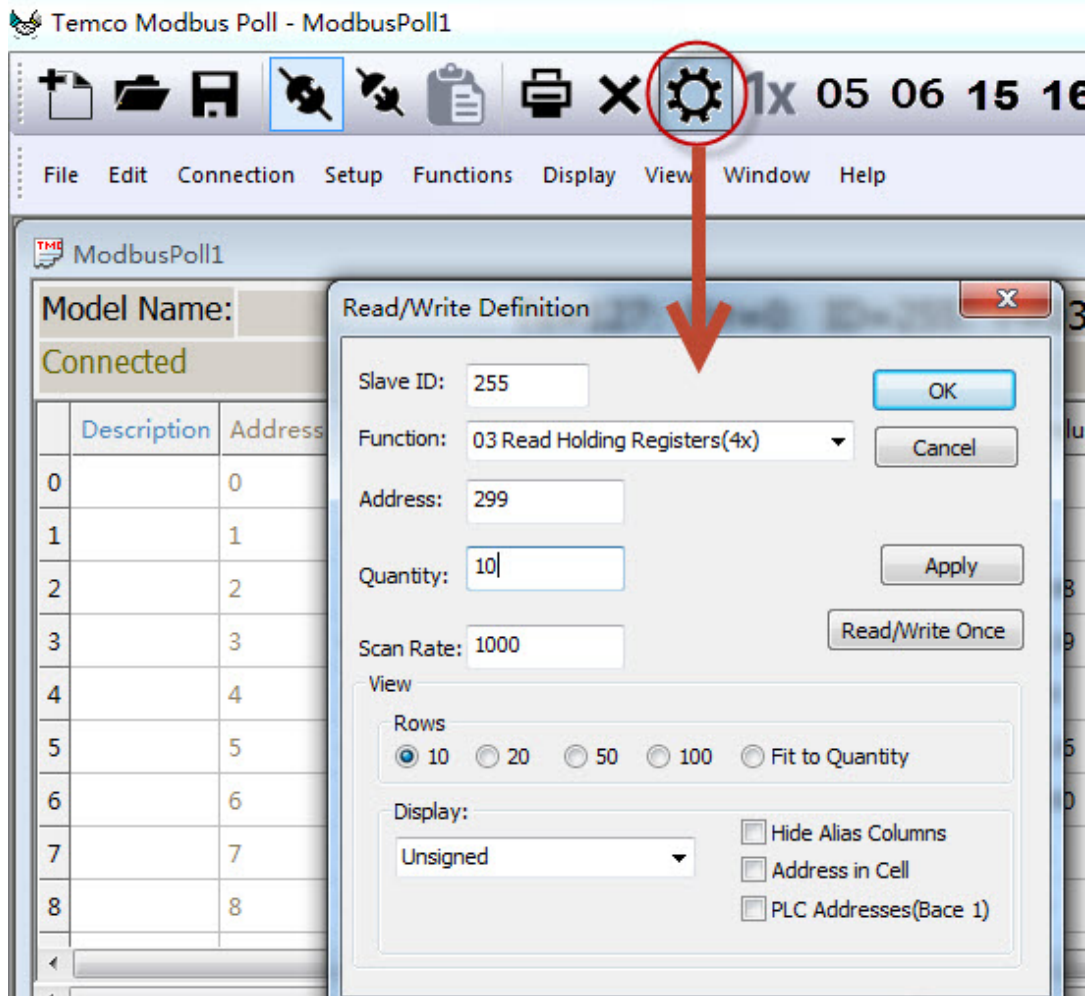
Register 5032 holds the Modbus ID and signal strength of the second neighbor, high byte is ID, low byte is signal strength.

Register 5033 holds the Modbus ID and signal strength of the third neighbor, high byte is ID, low byte is signal strength.

.....
 To read the signal strength for any of the thermostats the same applies but the table starts at register 51, this holds the number of neighbors for the thermostat. Let's use N=3 again. Register 52 thru 54 holds the Modbus ID of the three neighbors. Register 55 thru 57 holds the signal strength of the three neighbors.

*You can also get the detail information using Temco Modbus Poll tool.



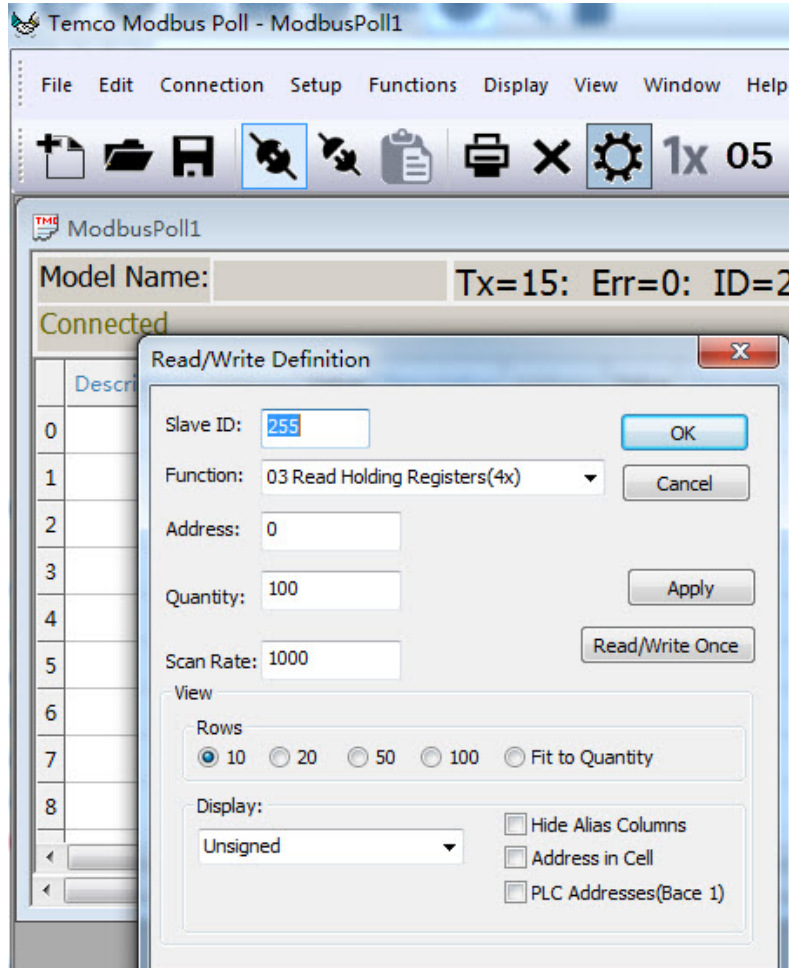


ID 255 means reading zigbee BB itself. Address 299 indicates how many units are connecting
 For this test, there are 3 units connecting:
 reg300: ID + 256 of unit 1, the highest bit set to 1 means that device is online, if it is off line, reg300 = ID = 18
 It's the same for reg301 and 302 and so on.

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

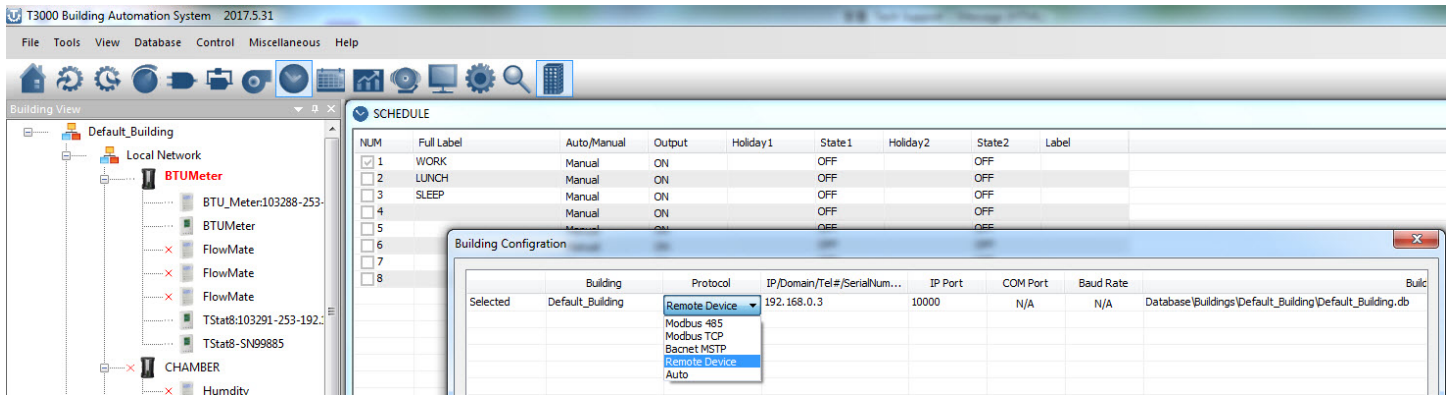


*Port Forwarding

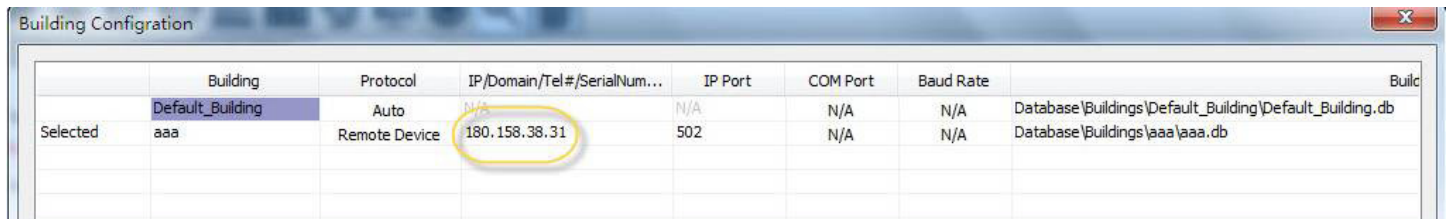
Following are steps for port forwarding:

Step1. Set port forward for router:TCP 502(modbus TCP);UDP 47808(Bacnet port); UDP 1234(Temco private scan).

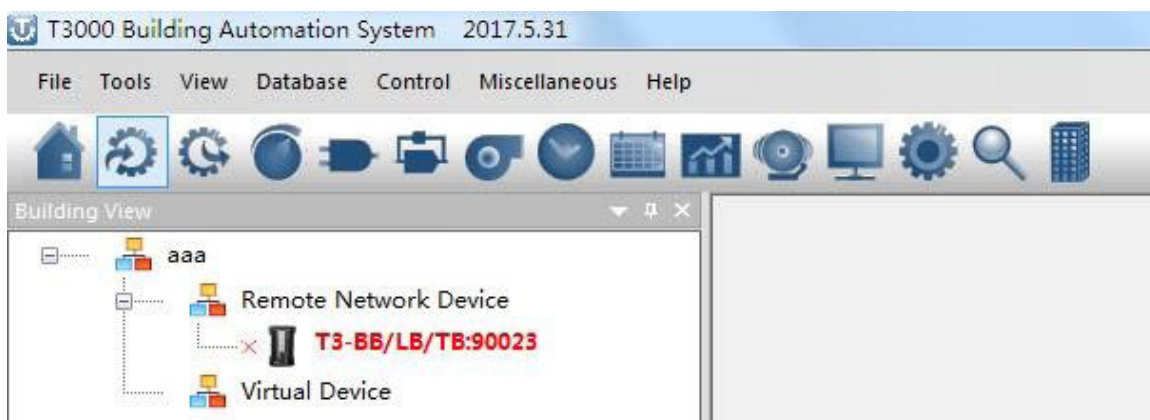
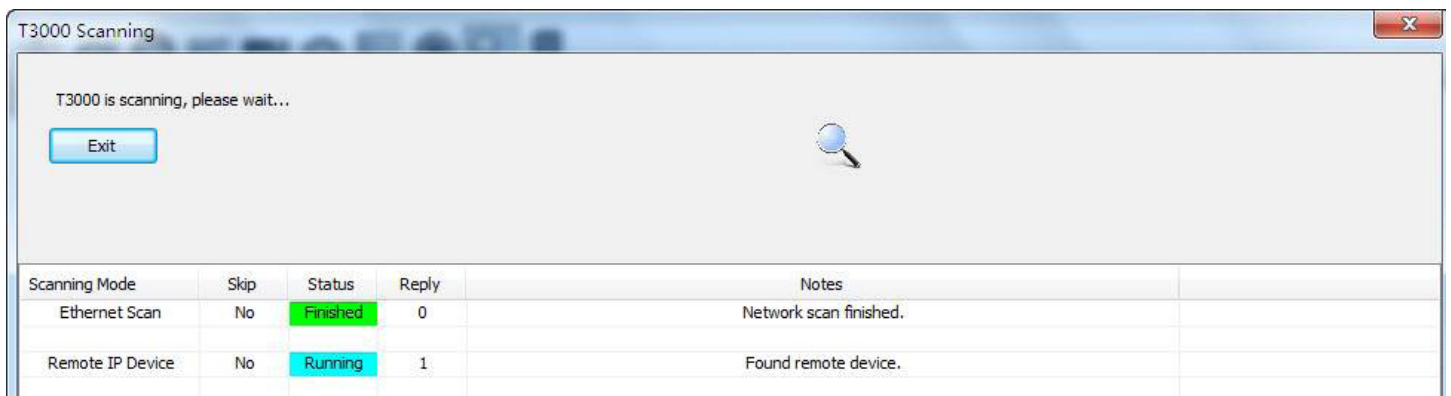
Step2. Click  to show the tab as below,select "Remote Device"protocol.



Step3. It will show the tab as below, click to fill out net IP or domain name.




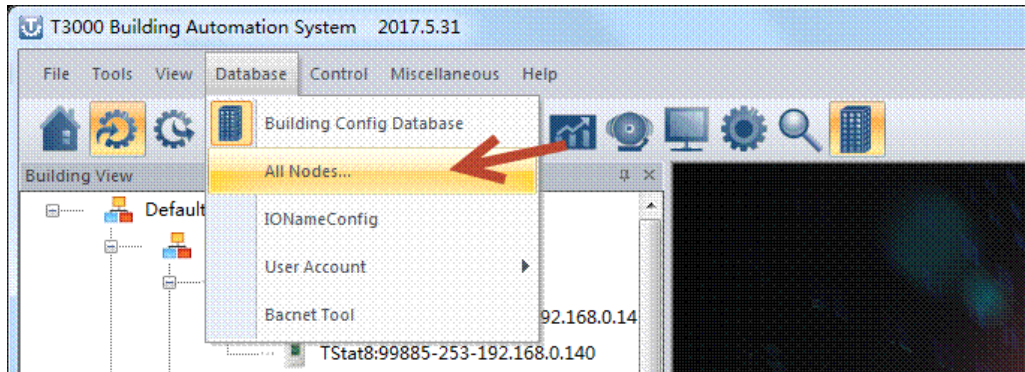
Step4. Scan via T3000 software, the remote device can be connected.



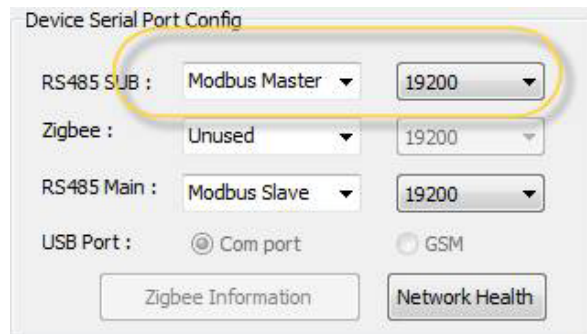
* Adding Custom Devices

Only Temco's device can be discovered by T3-BB serial controller automatically,so we have to add custom device manually. Following are the steps to add custom devices:

Step1. Click  and choose "All Notes..." bar.



Sep2.If the customer would like to add a device in sub RS485 port,the protocol is Modbus/TCP to Modbus/RS485,we need to confirm which RS485 port to select;If custom device is on RS485 SUB PORT,you need to confirm which port from the three sub net ports current device is on.Then add a new name and ID for the custom device,and you can find the serial number is generated by T3000.



All Nodes Dialog

Main Build	Sub Net	Serial ID	Floor	Room	Product Name	IP /Baud Rate	Graphic Name	HardW_Ver
1	Default_Bu	103916	floor1	room1	T3-BB/LB/TB	192.168.0.33	T3000_Default_Building_P	8.0
2	Default_Bu	104170	floor1	room1	T3-BB/LB/TB	192.168.0.33	T3000_Default_Building_P	0
3	Default_Bu	103718	floor1	room1	T3_6CTA	192.168.0.205	T3000_Default_Building_P	1024.0
4	Default_Bu	102629	floor1	room1	T3_6CTA	192.168.0.205	T3000_Default_Building_P	1024.0
5	Default_Bu	65834	floor1	room1	TSTAT8		00_Default_Building_P	23.0
6	Default_Bu	92294	floor1	room1	temcopanel		00_Default_Building_P	23.0
7	Default_Bu	92661	floor1	room1	BTUMeter		00_Default_Building_P	23.0
8	Default_Bu	102643	floor1	room1	LBARM		00_Default_Building_P	7.0
9	Default_Bu	90023	floor1	room1	VFDEExample	192.168.0.15	T3000_Default_Building_P	5.0
10	Default_Bu	103288	floor1	room1	BTU_Meter:1	192.168.0.140	T3000_Default_Building_P	23.0
11	Default_Bu	99885	floor1	room1	TStat8:99885	192.168.0.140	T3000_Default_Building_P	23.0
12	Default_Bu	103345	floor1	room1	Humidity	192.168.0.34	T3000_Default_Building_P	0
13	Default_Bu	65538	floor1	room1	T8_245	192.168.0.97	T3000_Default_Building_P	23.0

serial number is generated by T3000, dont mind it

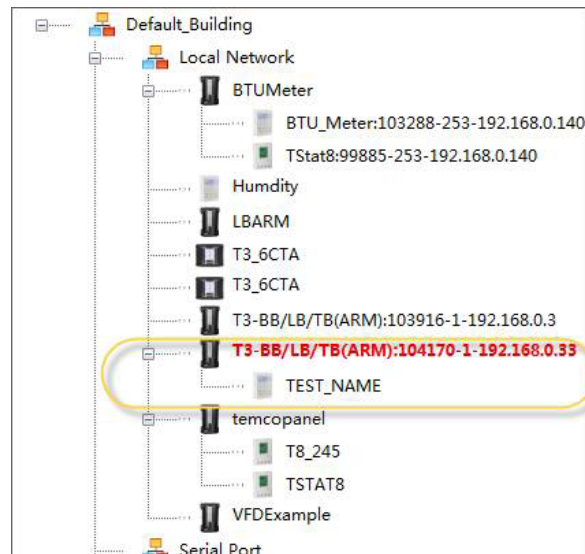
there are 3 sub net port, confirm which port current device is on

name customer device

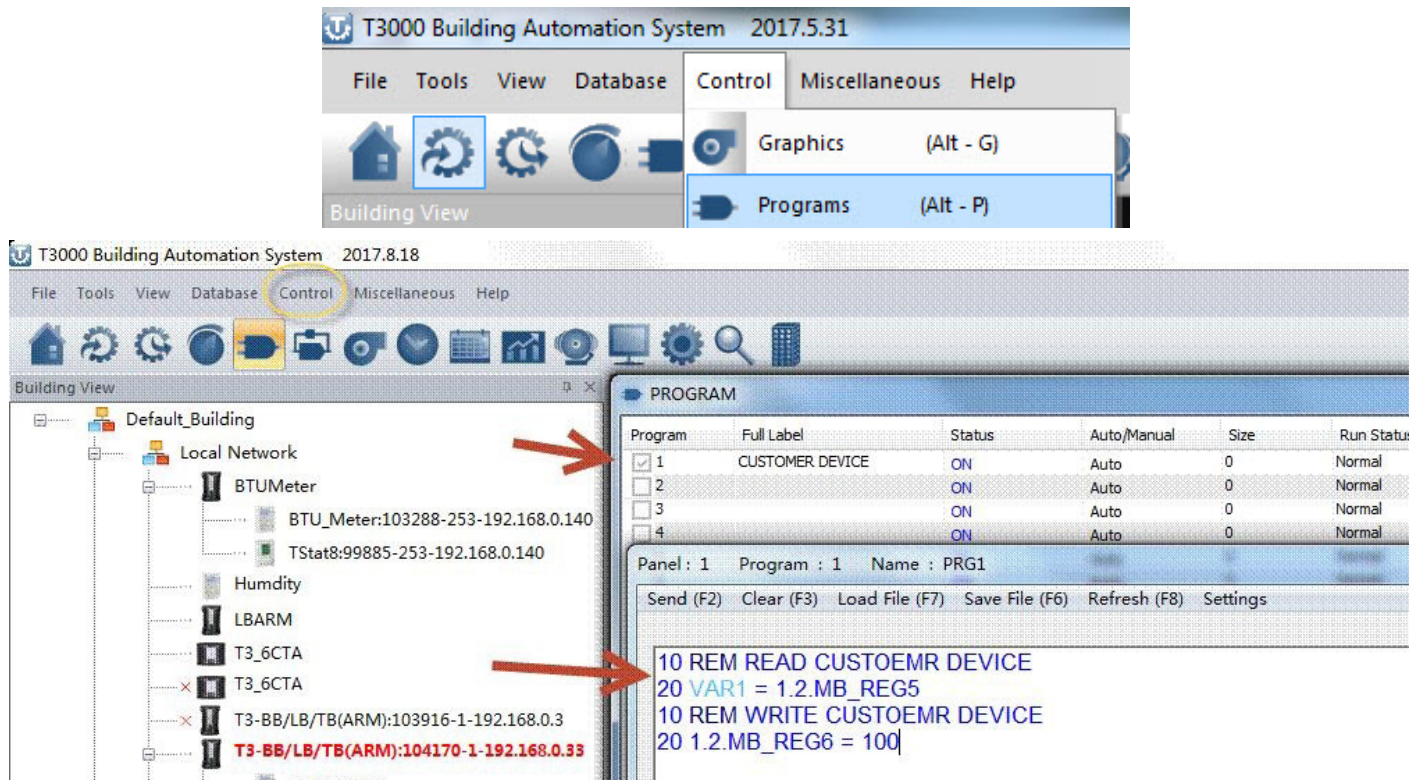
customer device id

Connect

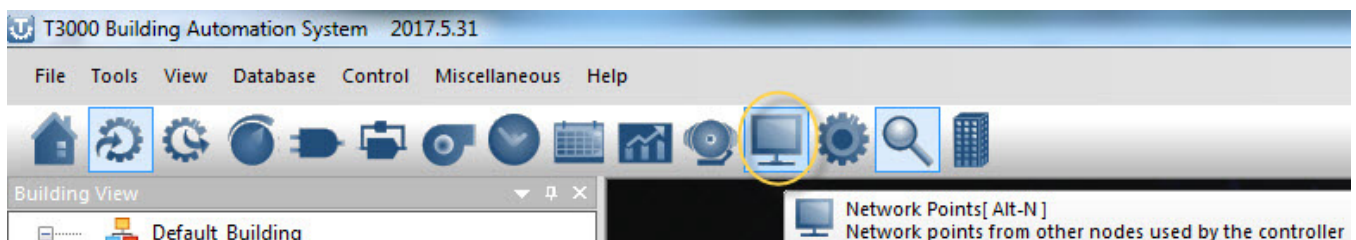
Step3. The custom device will appear in the tree node as below.



Step4. Choose Control->Program, then we can make a program to read and write custom device's register.



Step5. Click "Network Point table" to check whether the remote points reading is ok.



*** Network and remote points support**

T3-serial controller (only new ARM) can support network points and remote points.

1. Network points function

For example, there are panel 1 and 2 in network. We can use 2.2.VARx 2.2.OUTx 2.2.Inx to read or write the network points. Range of x is 1 to 255.

2. Remote Bacnet points

For example, panel 1 is T3000 controller, device 3 is MSTP slave device, which is integrated in only master RS485 port, and this port is set to master MSTP function. We can use 1.3.AVx 1.3.Aix 1.3.DOx 1.3.AOx to read and write remote bacnet points. Range of x is 1 to 255.

3. Remote Modbus points

For example, panel 2 is controller, device 4 is Modbus slave device, which is integrated in master or slave RS485 port, and this port is set to master modbus function. We can use 2.4.MB_REGx or 2.4.REGx to read and write remote modbus points. MB_REG is base 0, and REG is base 1. Range of x is 0 to 2047.

4. Local points

INx (x: 1 - 64), OUTx (x: 1 - 64), VARx (x: 1 - 128), PRGx (x: 1 - 16), GRPx (x: 1 - 16), SCHx (x: 1 - 8), HOLx (x: 1 - 4), PIDx (x: 1 - 16).



Local points:

VARx
Inx
OUTx

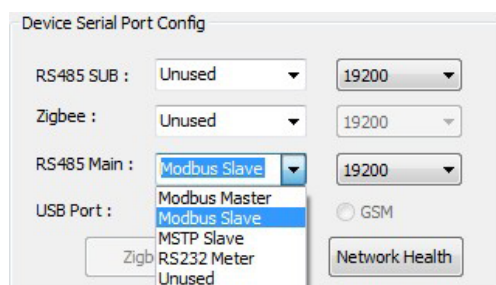
In Panel1:

2.2.VARx
2.2.OUTx
2.2.Inx } Network points
x:1~255

1.3.AVx
1.3.AOx
1.3.DOx
1.3.Aix } Remote Bacnet points
x:1~255

In Panel2:

2.4.MB_REGx
x:0~2047 } Remote Modbus points



T3 Series Bacnet Programmable Controller

Register List

Address	R/W	Length	Description
0~3	R	4	Reserved for serial numblert
4~5	R	2	firmware Version Number
6	R/W	1	Modbus device address
7	R	1	Prodouct model
8	R	1	Hardware Version Number
9	R	1	PIC rev
12	R	1	UART0 Baudrate. 5 - 9600 , 6 - 19200
14	R	1	ISP Version
18	R/W	1	UART1 Baudrate. 5 - 9600 , 6 - 19200
19	R/W	1	UART2 Baudrate.(UART_1200 = 0, UART_2400 = 1, UART_3600 = 2, UART_4800 = 3, UART_7200 = 4, UART_9600 = 5, UART_19200 = 6, UART_38400 = 7, UART_57600 = 8, UART_115200 = 9, UART_921600 = 10
33	N	1	test cmd, write 77 - reboot, 100 - set default paramer, 111 - erase prg, 150 - clear tstat db
34	R	1	board type, big or small. 1 - big , 2 - samll,3-tiny,4-vav
35	R	1	instance number
36	R	1	station number
39	R/W	1	EN clear tstat db
42	R/W	1	USB MODE
43	R/W	1	EN DYNDNS ,// 0 - no 1 - disable 2 - enable
44	R/W	1	DYNDNS provider, // 0- www.3322.org 1-www.dyndns.com 2 - www.no-ip.com
45	R/W	1	dyndns update timer
46	R/W	1	NETWORK: MSB, MSB-1
47	R/W	1	MSTP NETWORK: MSB, MSB-1
51	R	1	TOP hardware
52	R	1	c8051f023 firmware rev
53	R	1	sm5964 firmware rev
...			

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