TEMCO
CONTROLS.COM

Bacnet and Modbus Modules

The T3 general purpose modules add input/output expansion space for building automation systems. Integrators regularly tell us they are winning more projects becuase of the excellent price point and features of these devices. Works well with Seimens, Reliable, Delta, KMD, Tridium, etc.

T3-22i and T3-8o support both Bacnet and Modbus over both RS485 and the ethernet ports. All settings are available as Bacnet objects and Modbus registers.

T3-22i

T3-8o

T3000 Building Automation
System Overview

Building
Operator

Firewall

Ethernet

Internet

Remote User

T3-BB   **T3-LB**   **T3-TB**   **T3-8o**   **T3-22i**

**MAIN NET1
RS485**   **TSTAT8 TSTAT7 TSTAT6**

Expansion I/O

**SUBNET2
RS485**

RS485

TSTAT8

CHILLERS

BOILERS

VALVES

VALVES

VAV

FAN COIL

Modbus   BACnet   C E   U.S. GREEN BUILDING COUNCIL LEED USGBC   Project Haystack   **10** *Year* **WARRANTY**
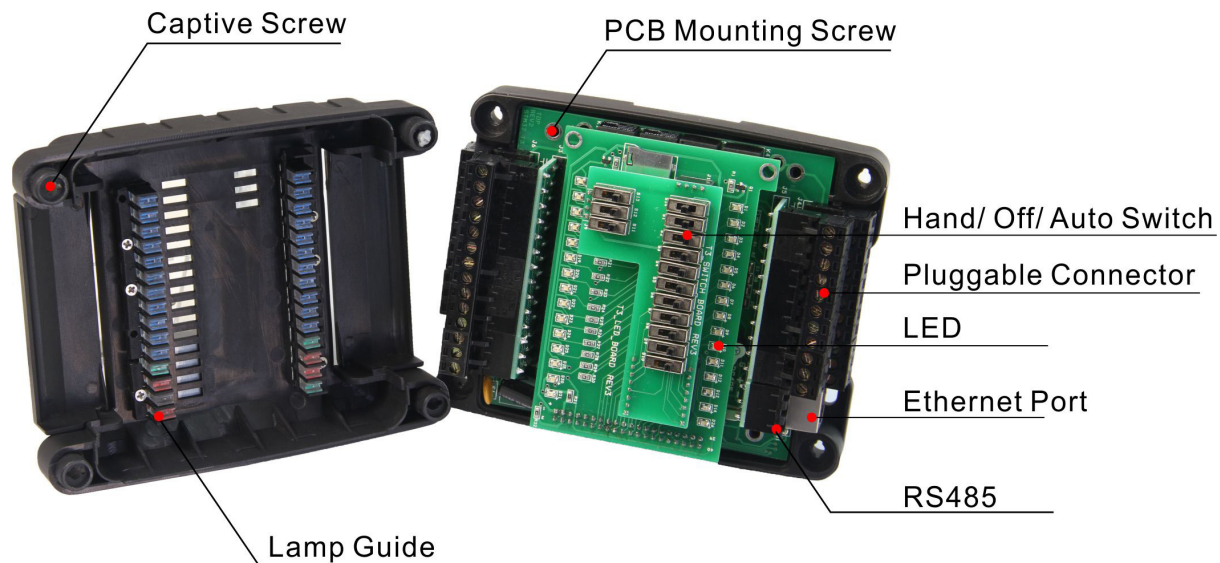
Features

•   Surge-protected Universal Inputs with 10-bit resolution.

•   UL listed ABS enclosure with rubberized texture creates a high end feel.

•   The RS485 port has separate upstream and a downstream connectors to make troubleshooting easier.

•   Software configure the I/O ranges with the free T3000 software or by writing to the registers with your own software.

•   Each input 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.

•   Each output has a hand-off-auto switch for easy troubleshooting and overrides.

•   Baudrates: 9600, 19200, 38400, 57600,76800 and 115200bps.

•   The T3 modules support Bacnet over MSTP and TCP/IP as well as Modbus.

•   In this first 10 seconds period, heartbeat LED on the T3-8o will be flashing, as the rhythm of 2 fast 1 slow, to show the device is in ISP mode now.

•   Source code for the modules is available with your first purchase.

•   T3000 front end is free and open source:
http://tinyurl.com//n7kkqp6

•   Compiled version of the front end is here:
http://tinyurl.com/y7uyu9n3

Specifications

•   T3-22i analog input: 22 AI@0-5V, 0-10V, 4-20mA, 10K Type2 NTC

•   T3-8o analog input: 8 AI@ 0-5V, 0-10V, 4-20mA,10K Type2 NTC.

•   T3-22i, T3-8o digital input: DI@pulse counter

•   T3-8o analog output: 8 outputs@0-10V Accuracy: 0.01V

•   T3-8o relay output: 6 relay dry-contact outputs DC12V, 3A@125VDC

•   Baudrate: 9600, 19200, 38400, 57600, 76800, 115200

•   Operating temperature: -30~70°C (-22~158°F)

•   Supply voltage: 15~24VAC/DC ±10%, 50-60Hz

•   Power consumption: 100mA at 15~24VAC/DC

•   Storage temperature: -40~85°C

•   Operating ambient humidity: 0-80 %Rh

•   Communications: RS485, Ethernet

•   Enclosure color: Black

Highlights

T3-8o

Captive Screw

PCB Mounting Screw

Hand/ Off/ Auto Switch

Pluggable Connector

LED

Ethernet Port

RS485

Lamp Guide

Bacnet and Modbus Modules

Part Number Scheme

T3 - 22i

Code	Description
T3	T3 Bacnet Modbus Module

Code	Option
22i	22 Universal Inputs
8o	8 Universal Inputs, 8 Analog Outputs, 6 Relays

Approvals

Plastic Enclosure	PA66
PCB	FR-4 Epoxy Glass Cloth UL file NO. E360179
Terminal Block	PA66 UL file NO. E365137
Relay	UL file NO. E332982

Wiring Diagram

The T3-22i has 22 inputs, 2 RS485 terminals that share the same serial port, and 1 Ethernet port.

T3-22i
WIRING DIAGRAM
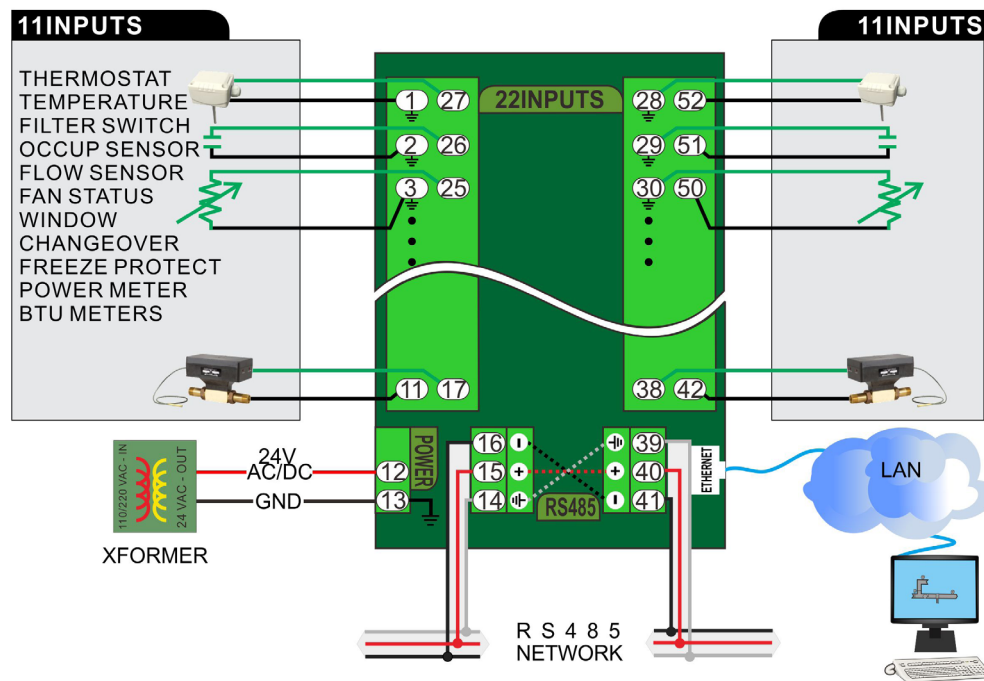
The T3-22i are amazing! The features that are most amazing:
- *Software Configurable I/O*
- *Ground Screw terminals for all 22 inputs.*
- *Feed through to aide in daisy chaining RS485 connection*
- *22 Pulse counters*
- *Higher Baud Rates*
- *BACNet support*
- *Supports Modbus TCP*
- *Cad is available, 3D and 2D acad/corel draw vector art.*

Bacnet and Modbus Modules

The T3-8o has 8 inputs, 8 outputs, 6 relays, 2 RS485 terminals that share the same serial port, and 1 Ethernet port.
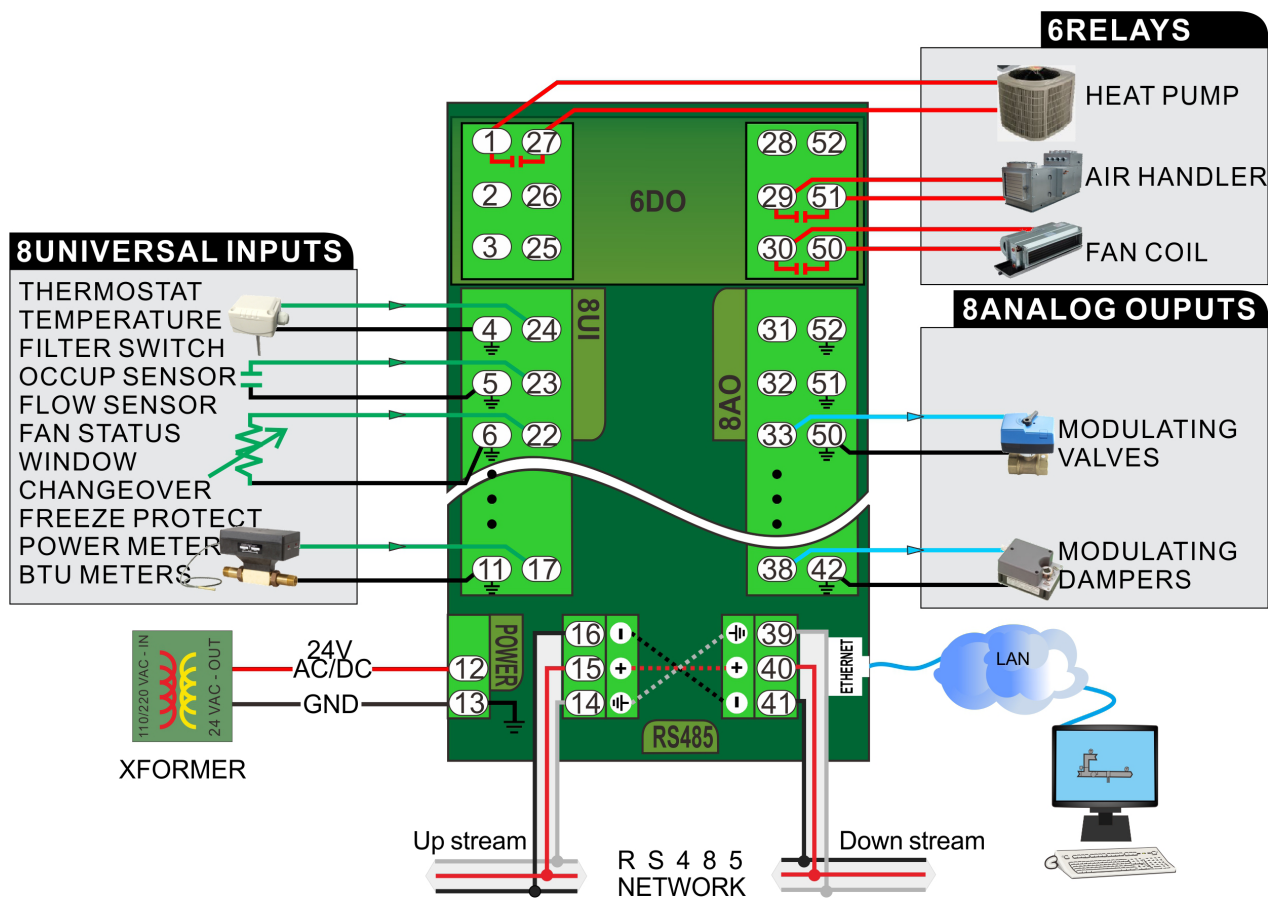
Dimensions
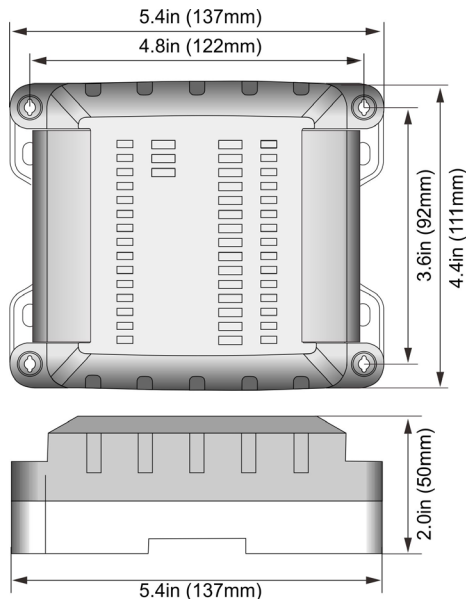
Standard Operation

Inputs

Each input of a T3 Module can be configured in 1 of 5 ways:

> 0-5V
> 0-10V
> 4-20mA
> 10K type2 NTC
> pulse counter

The value of each input is stored as a 10-bit number in the respective modbus register.

The maximum values for the 5V, 10V, 20mA is 1023, and pulse counter configurations would produce a reading of 65536*65536=4294967296. Each input has a corresponding LED which will light up if the value of the input is greater than 512.

Here following one table showing the info of pulse input.

Model	Number of inputs	Register address	Pulse
T3-22i	22	1-11 100-121	High Speed: Support up to 100KHz pulse input
		12-22 122-143	Low Speed: Support up to 100Hz pulse input
T3-8o	8	116-131	Low Speed: Support up to 100Hz pulse input

T3-22i high and low speed counters configured in T3000 software

Outputs

The state of each output is determined by its corresponding switch position for the T3-8o. The switches have 3 states: hand /off /auto.

	Analog	**Digital**
Hand	10V	Disconnected
Off	0V	Connected
Auto	Register Value	Non-zero value = activate

The registers addresses are as follows:

Model	Number of analog outputs	Register addresses
T3-8o	8	100-107

Model	Number of digital outputs	Register addresses
T3-8o	6	108-113

When the switch is set to the 'hand' position, the corresponding output will be switched to 10V for analog, the contact will be disconnected the relay, or 0V for sinking outputs. When it is on the 'off' position, the output will be set to 0V for analog, contact open for relay, or open circuit for sinking outputs. When it is on the 'auto' position the analog output will be set to the level stored in the corresponding MODBUS output registers. For digital or sinking outputs, a register value of 0 is to deactivate and a register value of 1000 is to activate.

These registers can be changed using the RS485 serial interface when in auto mode. For analog outputs, 0 corresponds to 0V, 1000 corresponds to 10V. For relay or sinking outputs, the output will be activated by any number greater than 0. The output registers are stored in RAM, thus the contents of each register will be lost upon power-off. Each output has a corresponding LED which will light up if the value of the output is greater than 0. For more information, please see the Standard Register lists starting on the next page.

Baudrate

T3-22i and T3-8o have adjustable baudrates that are set by register 15. The options include:
value 0 will set the baudrate to 9600bps
value 1 will set the baudrate to 19200bps
value 2 will set the baudrate to 38400bps
value 3 will set the baudrate to 57600bps
value 4 will set the baudrate to 57600bps
value 5 will set the baudrate to 115200bps

How to Update Firmware

There are two ways to update the firmware, T3000 and ISPTool. For ISPTool, it also contains RS485 network and Ethernet.
Download T3000 software http://tinyurl.com/y7uyu9n3 and install it.
Then you will see two icons on your desktop, T3000 and ISPTool.
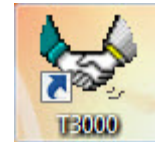
1. Use ISPTool RS485 to Update

In this section, we will first explain how to use ISPTool RS485 to update the firmware. Here take an example of T3-8o, connect T3-8o to your computer via RS485 connectors. Connect the T3-8o to 24V AC/DC power.
1) Start ISPTool software, as below photo shows, you will see RS485 setting, click and choose it.
2) Set broadcast ID 255 or module Modbus ID.
3) Choose the com port what you used and click select to choose the file you prepare to program.
4) Turn on the power of the T3-8o, within the first 10 seconds of powerd on, click flash.
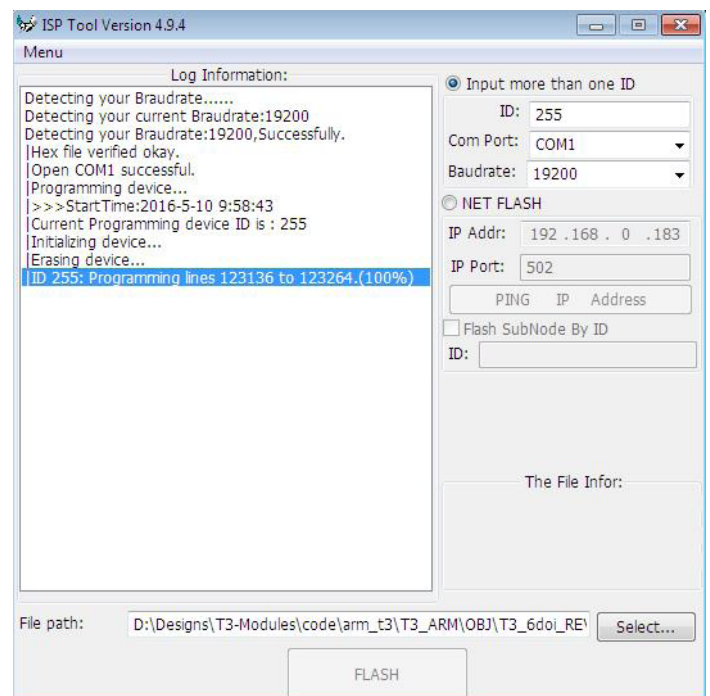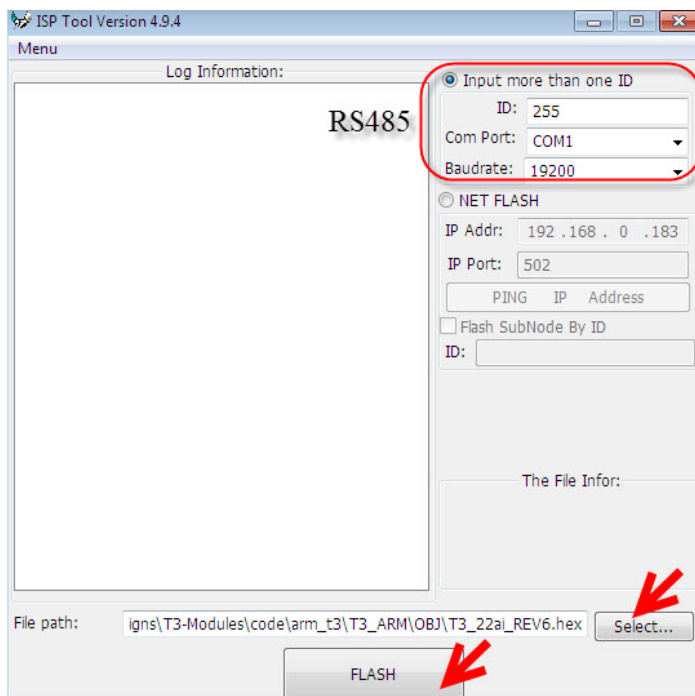
2. Use ISPTool Ethernet to Update

In this section, we will display how to use ISPTool Ethernet to update the firmware. Connect T3-8o, for example, to your computer by Ethernet and turn on the power of 24VAC/DC of the unit.
1) Start ISPTool software, as below photo shows, you will see Ethernet setting.
2) Set IP address, ensure that the IP address of the module and the IP address of the computer must in the same subnet.
3) Set IP port to 502.
4) Click "PING IP Address" to check whether the communication is good. If not, then check the wire and setting. If it's good as below the screen shot, after you choose the file, click FLASH to program.
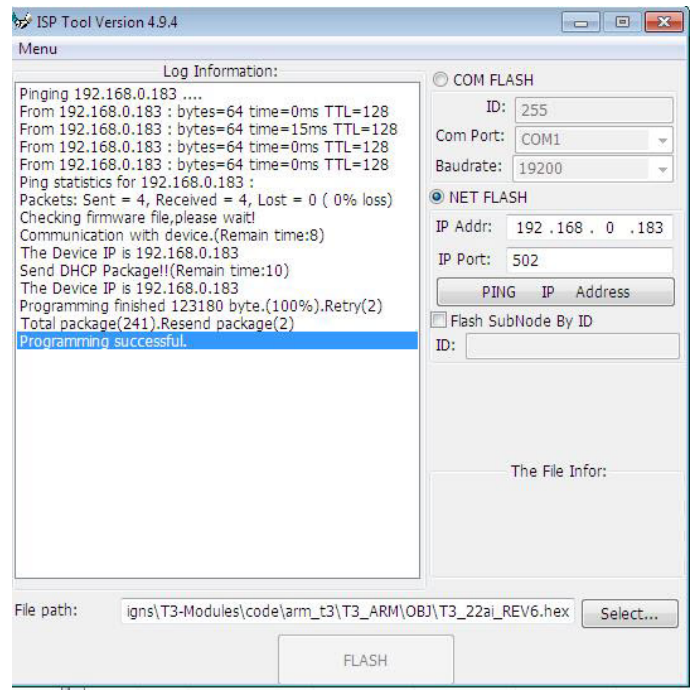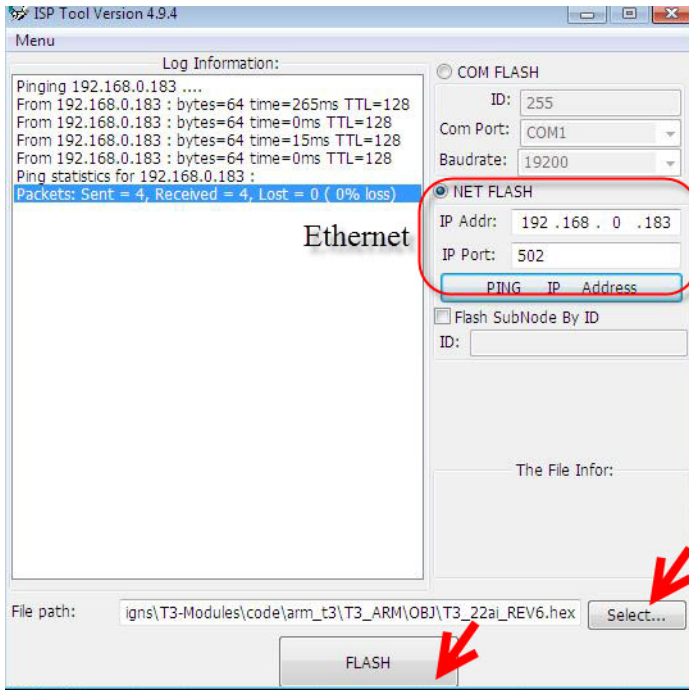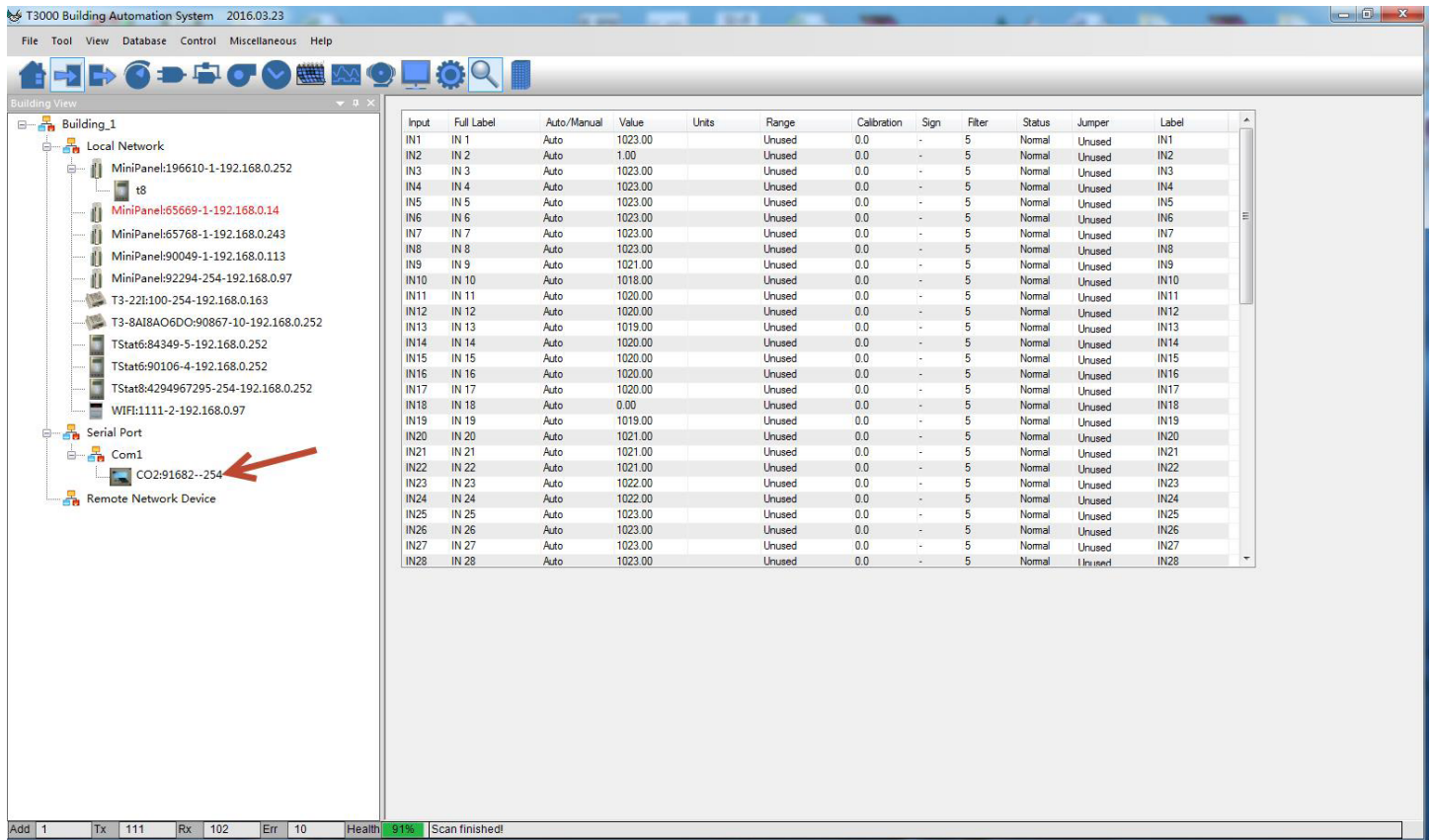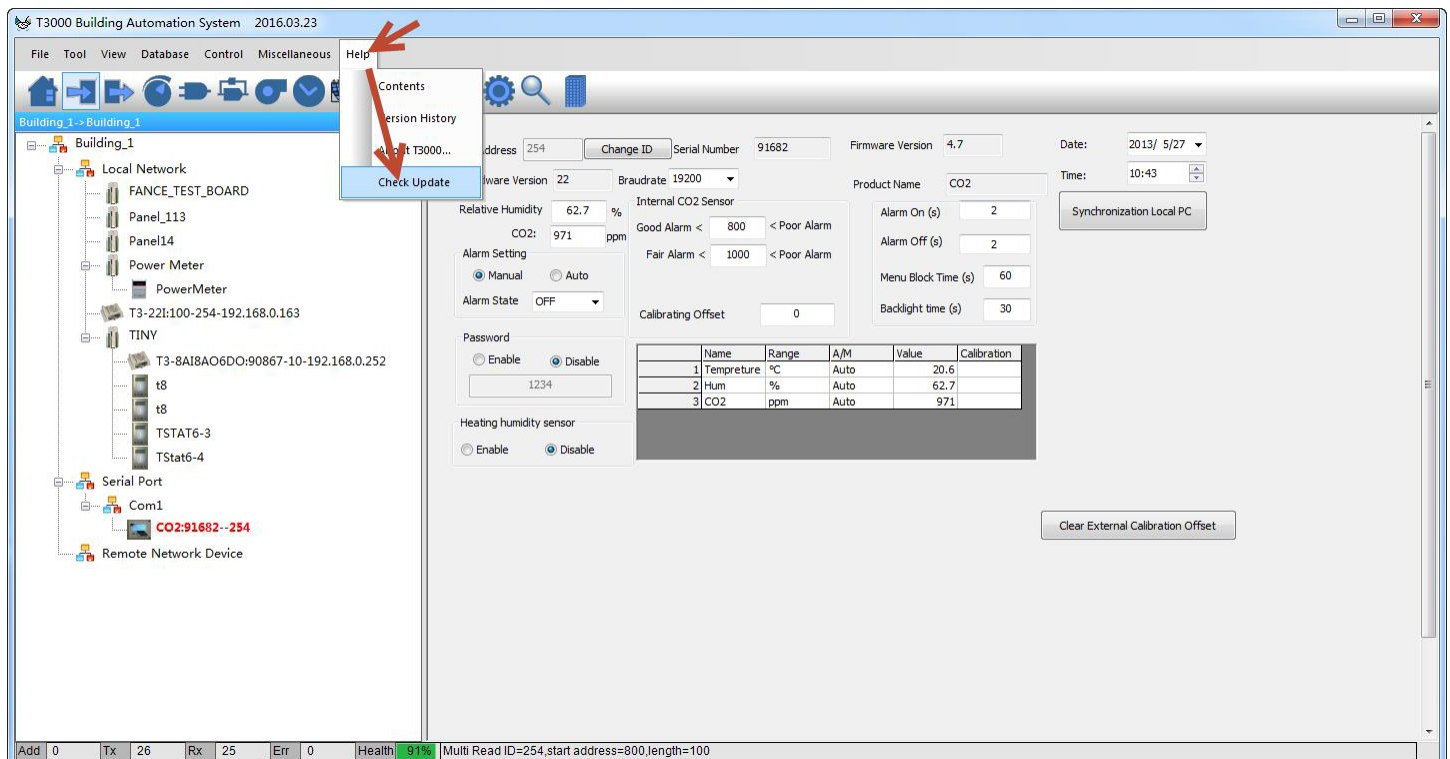
3. Use T3000 to Update

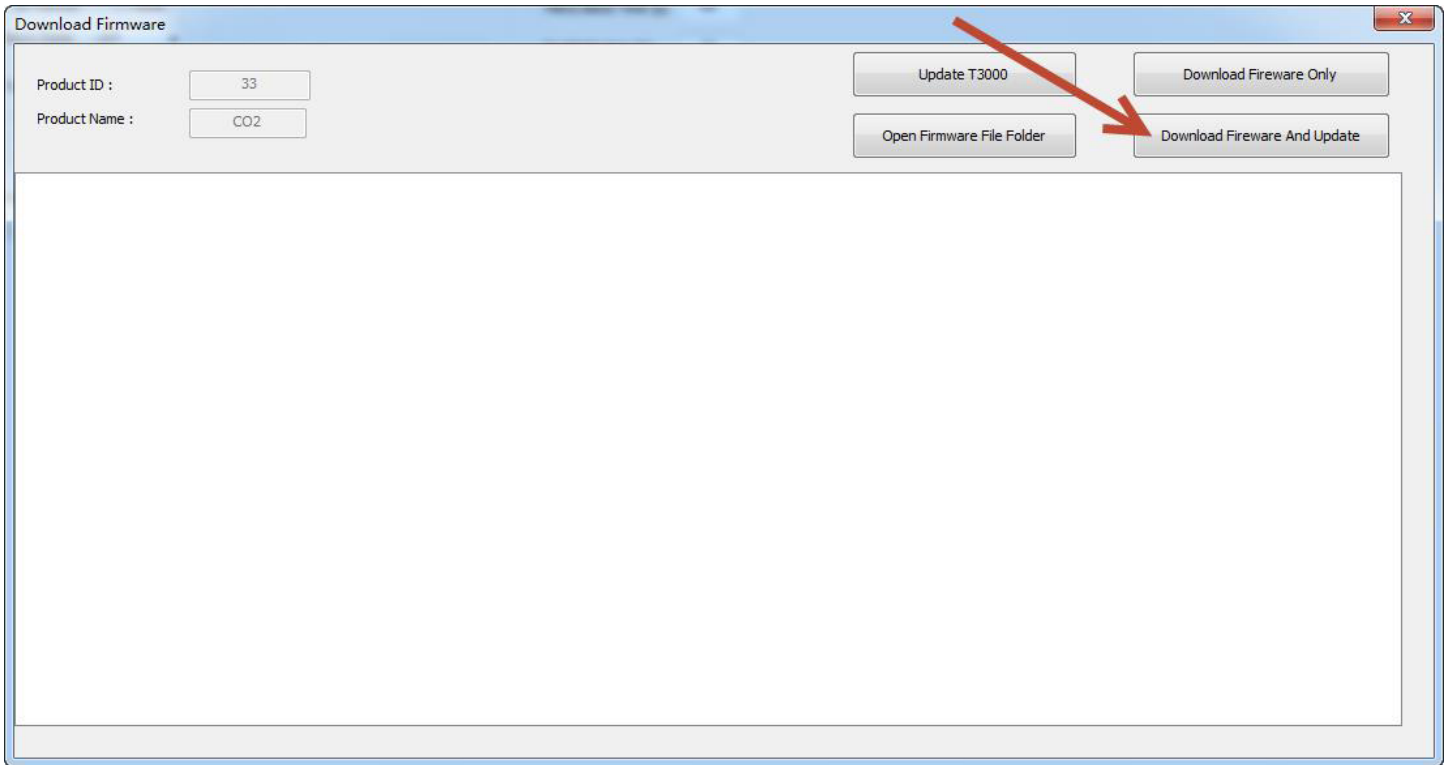1). Connect your device to PC via RS485 or Ethernet cable, then start T3000 software and click the 'Scan'.
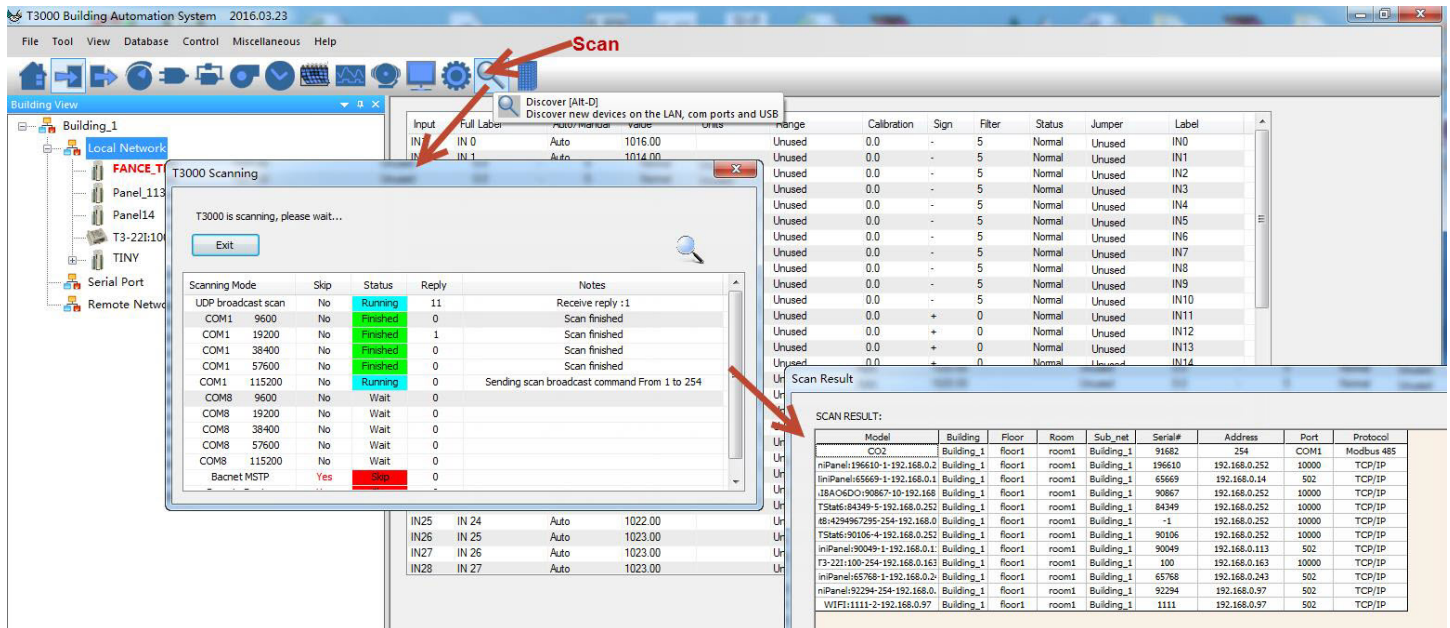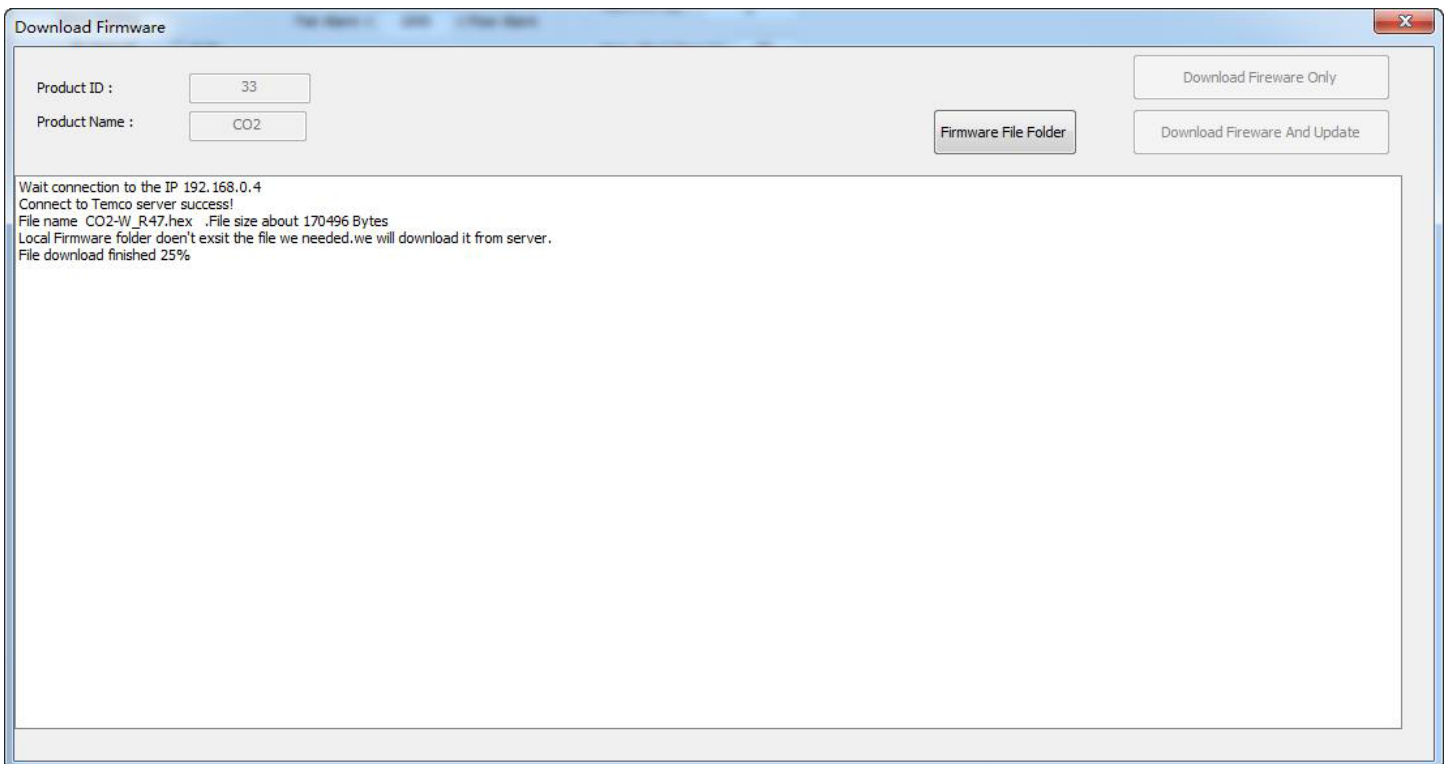
2). You will get the devices on the left device tree.

3). Update the firmware online.

Downloading the firmware:

Updating the firmware:

Update done.

T3000 Software Introductions

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

2. Connect T3-22i to PC via RS485 at pin 14, 15 and 16 or Ethernet. Open the software T3000, it will
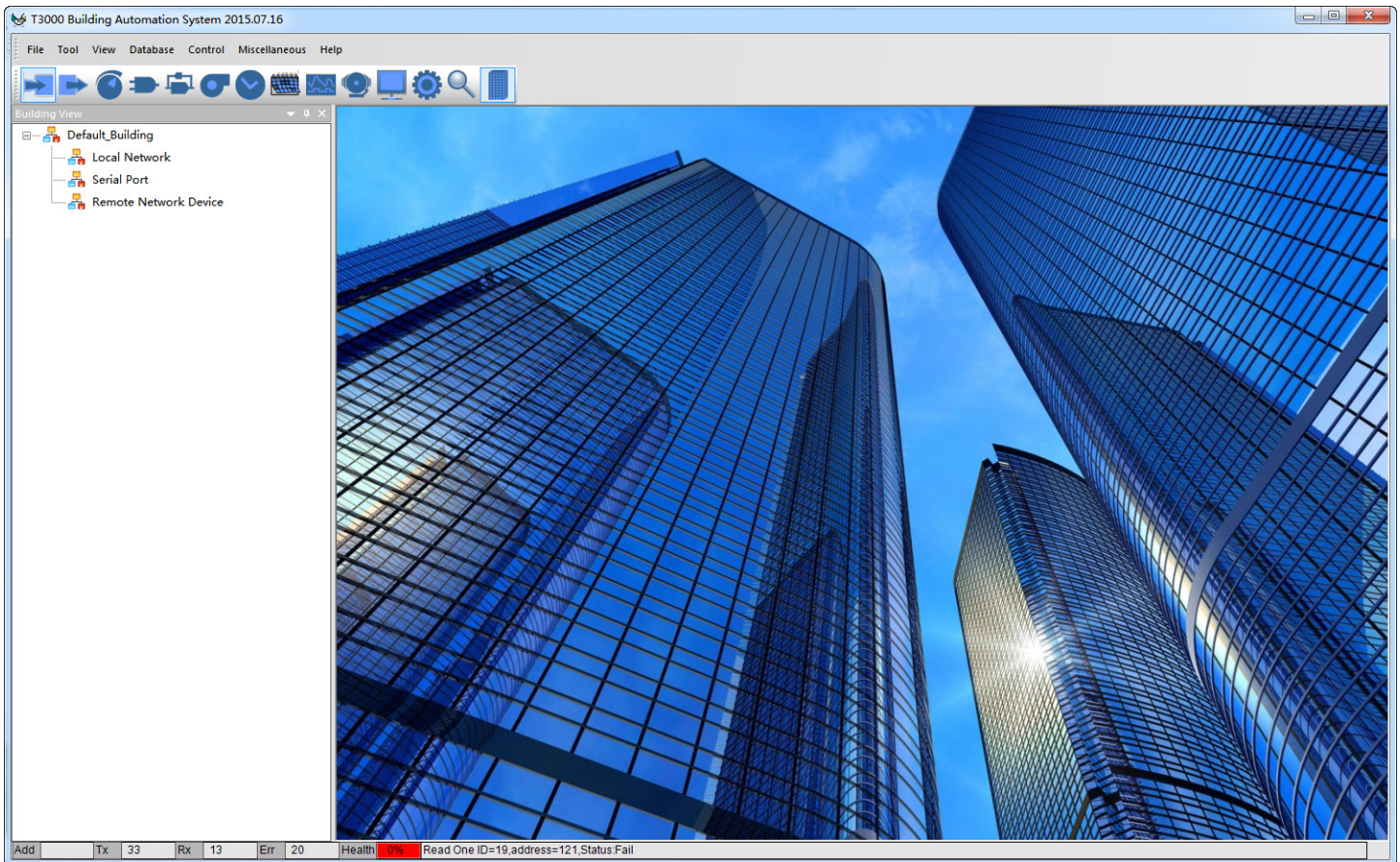
3. Click scan, it will open below the window view, then close it.
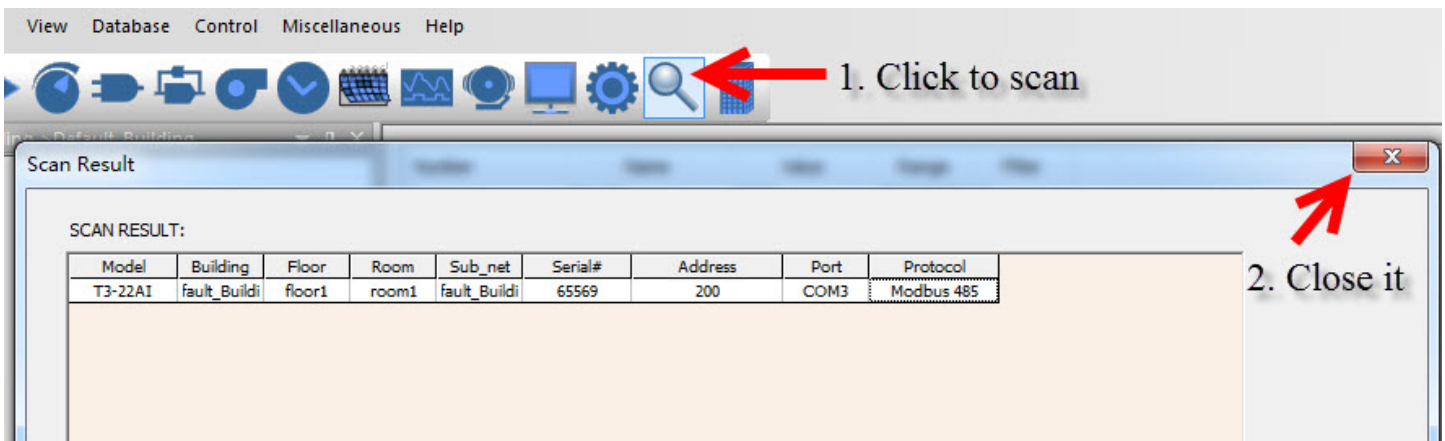
4. Click T3-22i log, it will show all the information of it.
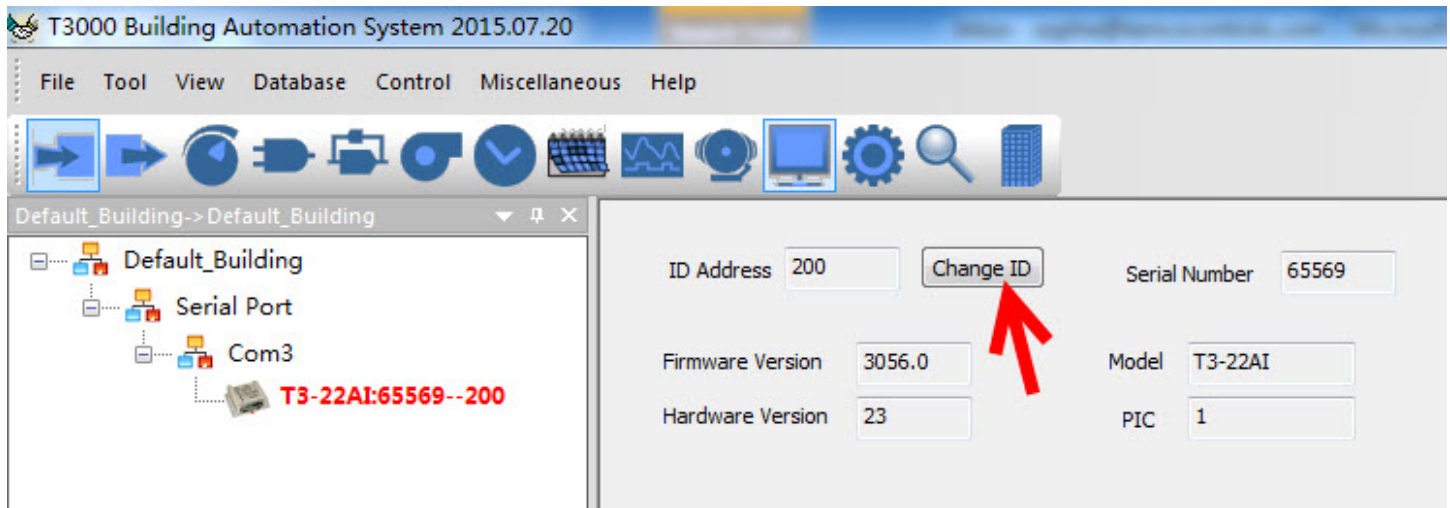
5. Click input, it will show the view of all inputs. For T3-22i, from input channel 1-11, it's high speed pulse counters. From input channel 12-22, it's low speed pulse counters.

Default_Building-> Default_Building

- Default_Building
  - Local Network
    - MiniPanel:65669-100-192.168.0.14
      - 90922-1
      - 90923-2
      - 90924-3
      - 90925-4
      - 90926-5
      - 90932-6
      - 90933-7
      - 90935-9
      - 90936-10
    - MiniPanel:90023-1-192.168.0.15
      - ID15t
      - ID198
      - ID20
      - ID201
      - ID235
      - TStat6:65566-30-192.168.0.15
      - TStat6:65789-253-192.168.0.15
    - MiniPanel:90049-1-192.168.0.129
      - HUM R
    - T3-22I:10000022-254-192.168.0.183
  - Serial Port
    - Com2
      - CS-SM-DC:190324468--254
  - Remote Network Device

| Number	Name	Value	Range	Filter	Calibra...
1	Input1	1022	-	5	500
2	Input2	1022	-	5	500
3	Input3	1022	-	5	500
4	Input4	1022	-	5	500
5	Input5	1022	-	5	500
6	Input6	1022	-	5	500
7	Input7	1022	-	5	500
8	Input8	1022	-	5	500
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

Enter Units Number :   14   [OK]   [Cancel]

High Speed Count

- 0. Unused
- 1.TYPE2 10K C
- 2.TYPE2 10K F
- 3.0-100%
- 4.ON/OFF
- 5.OFF/ON
- 6 Low Speed Count
- 7. Lighting Control
- 8. TYPE3 10K C
- 9. TYPE3 10K F
- 10. NO USE
- 11.0-5V
- 12.0-10V
- 13.0-20 ma
- 14 High Speed Count

1. Download T3000 software https://temcocontrols.com/ftp/software/09T3000Software.zip and install it.
2. Connect T3-8o to PC via RS485 at pin 14, 15 and 16 or Ethernet. Start the software T3000, it will
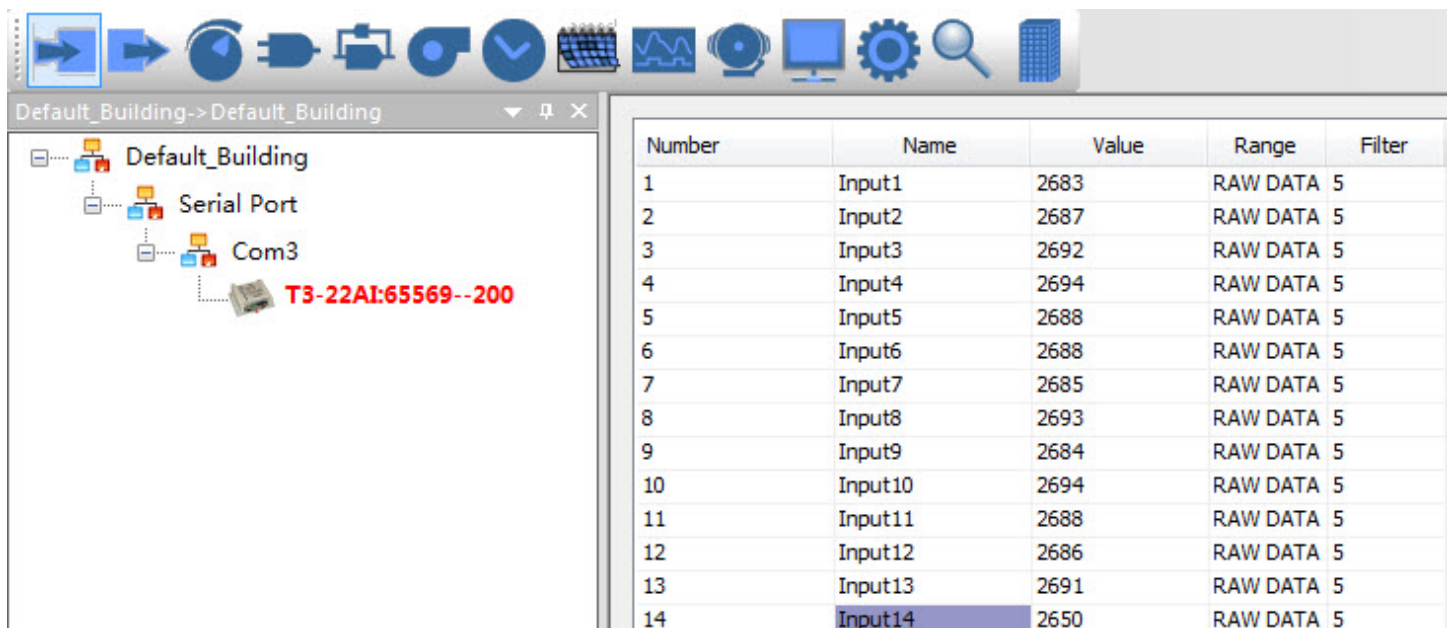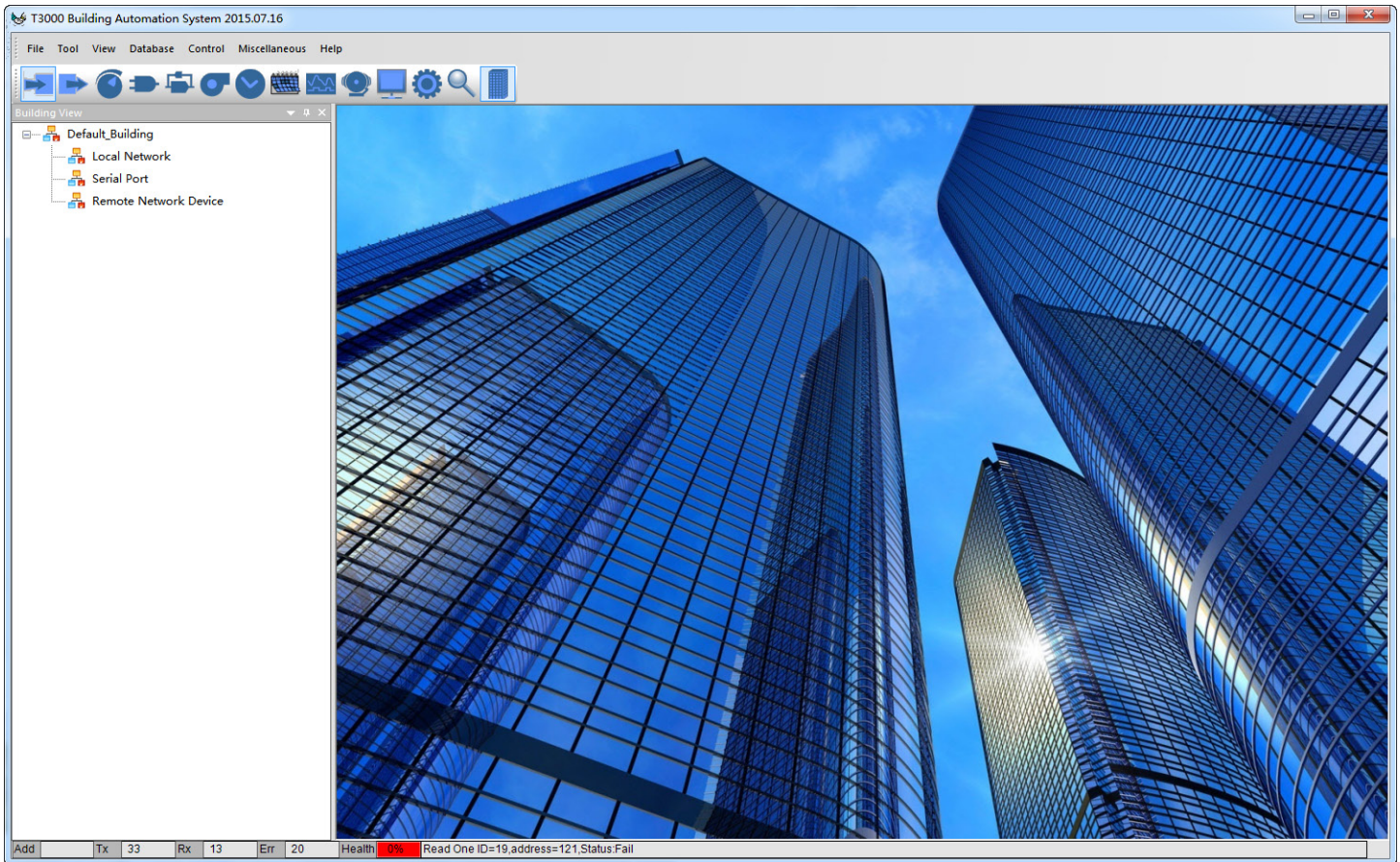

3. Click scan, it will appear one pop up window.
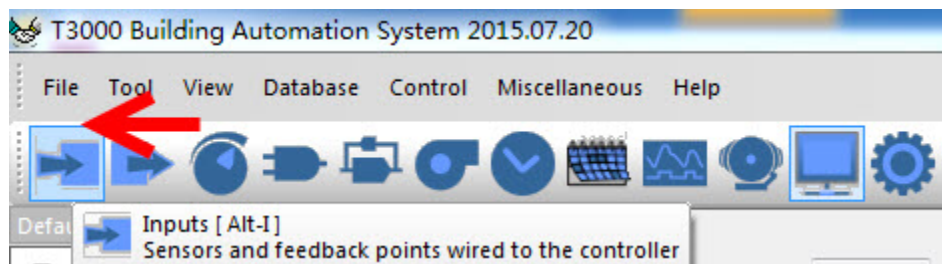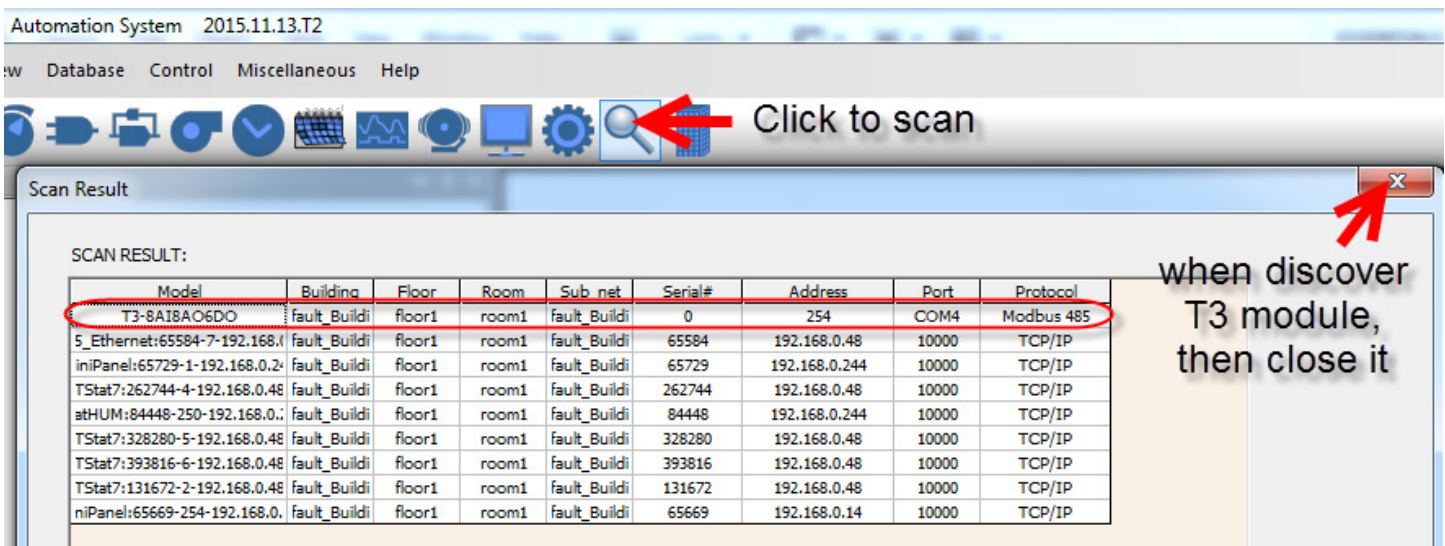
4. Click T3-8o log, it will show all the information of it.

5. Click input, it will show the view of all inputs.
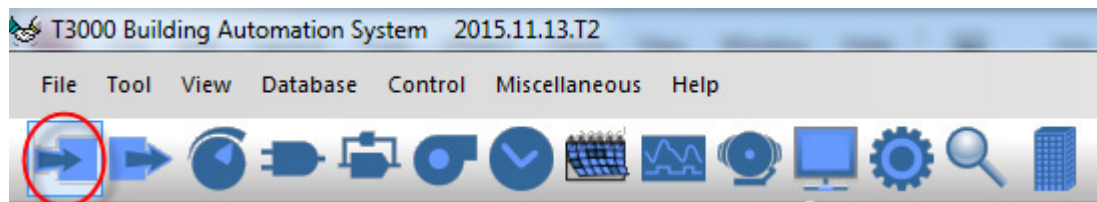
Click input1 range, it will appear one pop up window, you can choose "pulse input", then click ok.
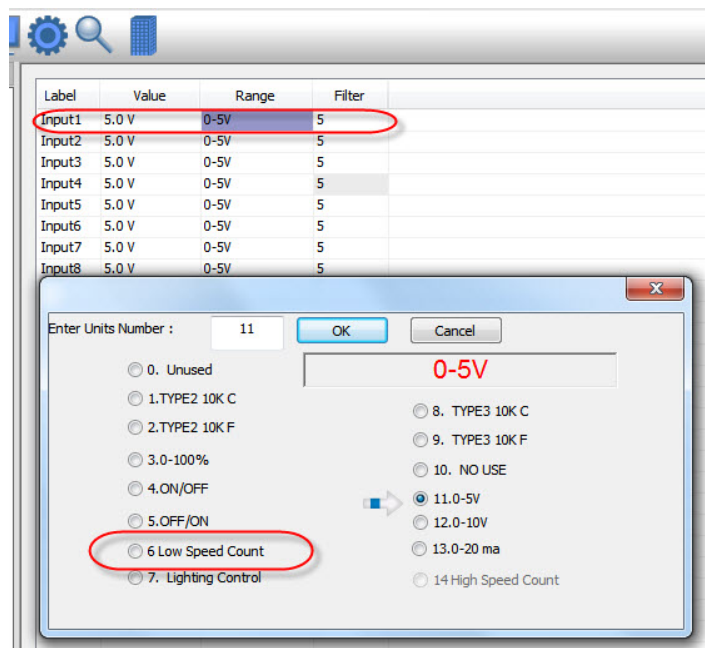
Register List

T3-22i Register List

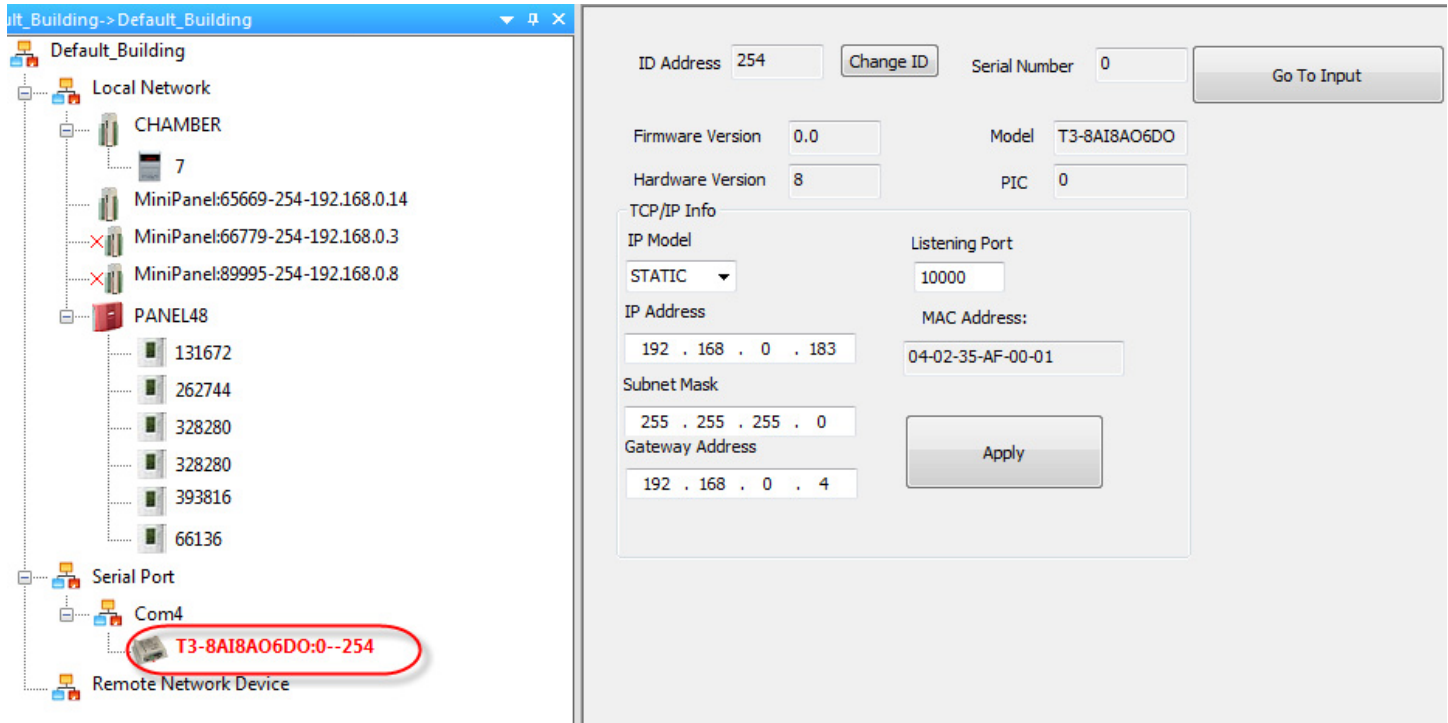| Address	Num	Length	Description	Bacnet
0~3	1	4	Serial number	AV0
4	1	1	Firmware version number	AV1
5	1	1	software version number	AV2
6	1	1	modbus service address	AV3
7	1	1	product model	AV4
8	1	1	hardware version number	AV5
9~13	1	5	spare	
15	1	1	baudrate	AV6
16~39	0		spare	
40~45	1	6	Mac address. Read only	
46	1	1	DHCP setting. 0 = static 1=dynamic Read only	
47~50	1	4	Ip address Read only	
51~54	1	4	sub mask address Read only	
55~58	1	4	gateway address Read only	
59	1	1	tcp server Read only	
60	2	1	listen port Read only	
61	1	1	gost ip mode Read/Write	
62~65	1	4	gost Ip address Read/Write	
66~69	1	4	gost sub mask address Read/Write	
70~73	1	4	gost gateway address Read/Write	
74	1	1	gost tcp server Read/Write	
75	2	1	gost listen port Read/Write	
76	1	1	gost write gost value to sytem and refresh the the real parameter Read/Write	
77~99	0		spare	
100	2	1	Input1 high word	AI1
101	2	1	Input1 low word Input1: 2 registers, Value = Reg100 * 65535 + Reg 101 The A/D converer is 12 bits so for most ranges you can read reg101 only. For pulse counting use reg 100 and 101.	
102	2	1	Input2 . see input1 description for details	AI2
103	2	1		
104	2	1	Input3 . see input1 description for details	AI3
105	2	1		
106	2	1	Input4 . see input1 description for details	AI4
107	2	1		

T3-22i Register List

Address	Num	Length	Description	Bacnet
108	2	1	Input5 . see input1 description for details	AI5
109	2	1		
110	2	1	Input6 . see input1 description for details	AI6
111	2	1		
112	2	1	Input7 . see input1 description for details	AI7
113	2	1		
114	2	1	Input8 . see input1 description for details	AI8
115	2	1		
116	2	1	Input9 . see input1 description for details	AI9
117	2	1		
118	2	1	Input10 . see input1 description for details	AI10
119	2	1		
120	2	1	Input11 . see input1 description for details	AI11
121	2	1		
122	2	1	Input12 . see input1 description for details	AI12
123	2	1		
124	2	1	Input13 . see input1 description for details	AI13
125	2	1		
126	2	1	Input14 . see input1 description for details	AI14
127	2	1		
128	2	1	Input15 . see input1 description for details	AI15
129	2	1		
130	2	1	Input16 . see input1 description for details	AI16
131	2	1		
132	2	1	Input17 . see input1 description for details	AI17
133	2	1		
134	2	1	Input18 . see input1 description for details	AI18
135	2	1		
136	2	1	Input19 . see input1 description for details	AI19
137	2	1		
138	2	1	Input20 . see input1 description for details	AI20
139	2	1		
140	2	1	Input21 . see input1 description for details	AI21
141	2	1		
142	2	1	Input22 . see input1 description for details	AI22
143	2	1		
144~199	0	1	spare	AV32
200~221	2	22	filter for input1~22	AV7~28

T3-22i Register List

Address	Num	Length	Description	Bacnet
222~224	0		spare	
225~246	1	22	range for input1~22	AV29~50
247~249	0	spare		
250~271	2	22	offset for input1~22	AV51~72

Bacnet and Modbus Modules

T3-8o Register List

Address	Num	Length	Description	Bacnet
0~3	1	4	Serial number	AV0
4	1	1	Firmware version number	AV1
5	1	1	software version number	AV2
6	1	1	modbus service address	AV3
7	1	1	product model	AV4
8	1	1	hardware version number	AV5
9~13	1	4	spare	
15	1	1	baudrate	AV6
16~39	0		spare	
40~45	1	6	Mac address. Read only	
46	1		Ip mode. 0 = static 1=dynamic Read only	
47~50	1	4	Ip address Read only	
51~54	1	4	sub mask address Read only	
55~58	1	4	gateway address Read only	
59	1	1	tcp server Read only	
60	2	1	listen port Read only	
61	1	1	gost ip mode Read/Write	
62~65	1	4	gost Ip address Read/Write	
66~69	1	4	gost sub mask address Read/Write	
70~73	1	4	gost gateway address Read/Write	
74	1	1	gost tcp server Read/Write	
75	2	1	gost listen port Read/Write	
76	1	1	gost write gost value to sytem and refresh the the real parameter Read/Write	
77 to 99	0		spare	
100~107	2	8	analog output1~8	AO0~7
108~113	2		digit output1~6	BO1~6
114~115	2	2	switch bank1~2	AV7~8
116	2	2	analog input1	AI0
117				
118	2	2	analog input2	AI1
119				
120	2	2	analog input3	AI2
121				
122	2	2	analog input4	AI3
123				
124	2	2	analog input5	AI4
125				

T3-8o Register List

Address	Num	Length	Description	Bacnet
126	2		analog input6	AI5
127				
128	2		analog input7	AI6
129				
130	2		analog input8	AI7
131				
200~207	2	8	analog input1~8 filter	AV9~16
225~232	2	8	range for input1~8	AV17~24
250~257	2	8	offset for input1~8	AV25~32