TEMCO CONTROLS LTD.

Temco Product Catalog

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Modulating Valve – Modulating Valve.....
Globe Valve.....
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Electrical.....
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Power Adapter – PA-12V.....
Terminal Shorting Bar.....
Momentary Push Button.....
Plastic Switch Box.....
Flashing Strobe Annunciator.....

Connectors.....
Floor Heating Manifold & Electro-thermal Actuator.....
Damper Motors.....
3-point Floating Type Damper Actuator.....
Damper Motor.....
Power Meter.....
Wattnode Meter.....
Wattnode 3 phase power meter.....
Single Phase Meter.....
Single Phase Power Meter,with internal CT.....
OEM.....
Custom Labels.....
Bluetooth Module with BLE.....
ZigBee Module.....
Plastic Enclosures.....
Humidity Sensor Module.....

T3000 Series Bacnet Programmable Controller

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

5 Year WARRANTY

Modbus BACnet Project Haystack

T3000 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, 30DVC
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 avaliable.
- 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

T3 - BB - Zig

Code	Description
T3	Controller

Code	Module
BB	Big brother, 32 universal inputs, 12 analog outputs, 12 relay outputs
LB	Little brother, 16 universal inputs, 4 analog outputs, 6 relay outputs
TB	Tiny brother, 8 universal inputs, 8 relay outputs, 6 analog outputs

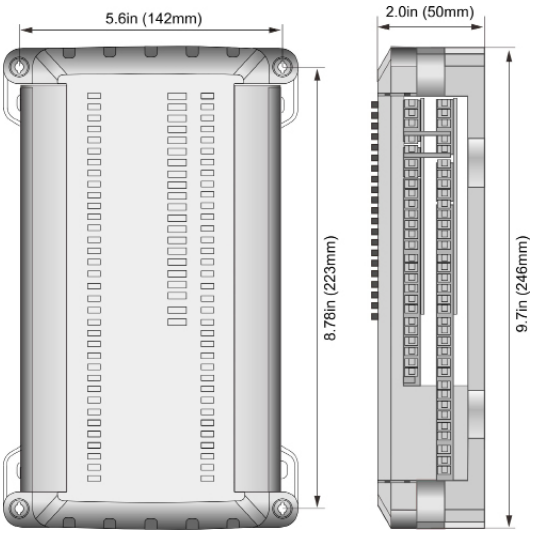
Code	Description
	——
ZIG	Zigbee Mesh Radio

Network Diagram

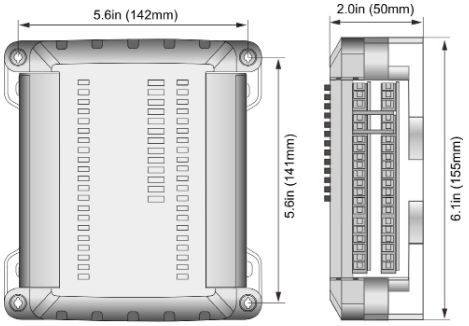


Dimensions

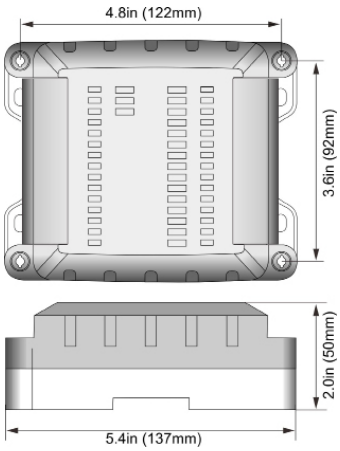
1) T3-BB(Big Brother)



2) T3-LB(Little Brother)

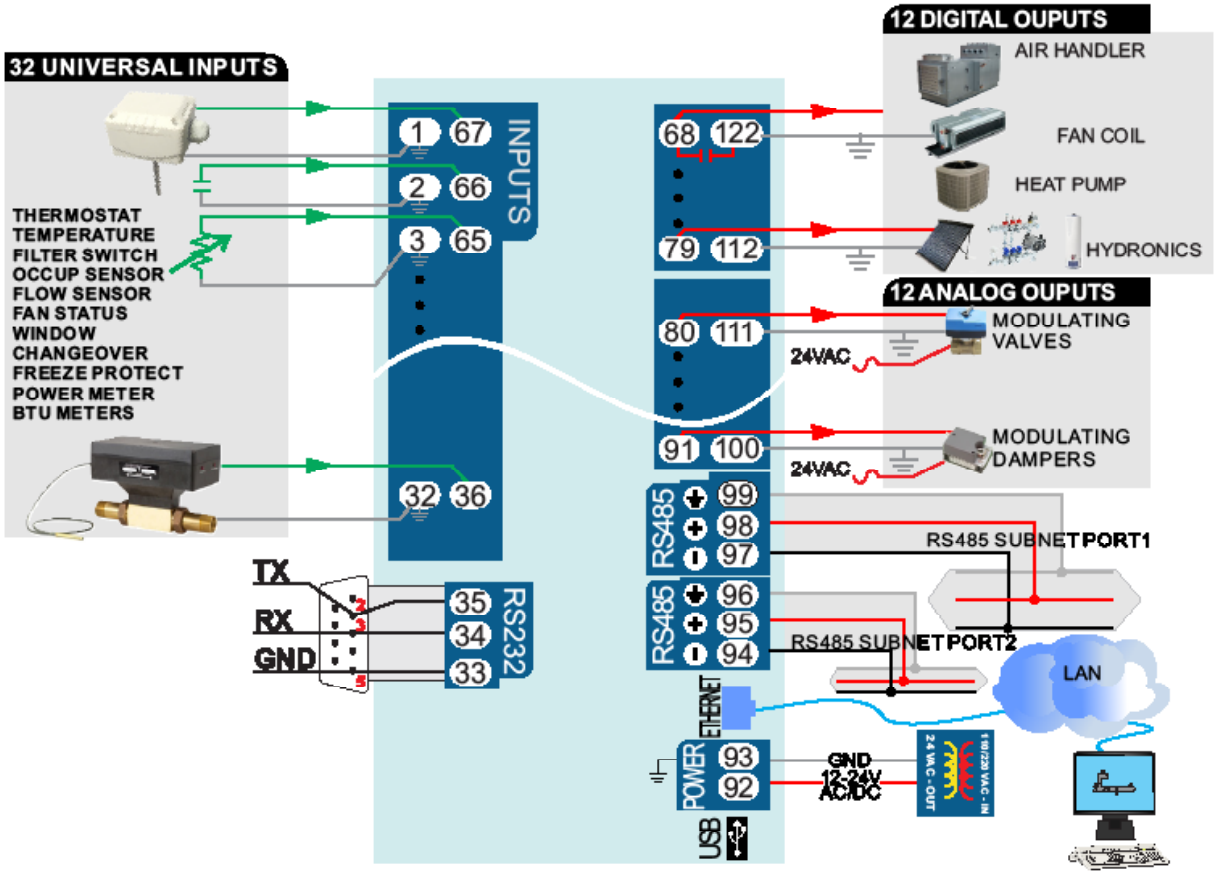


3) T3-TB(Little Brother)

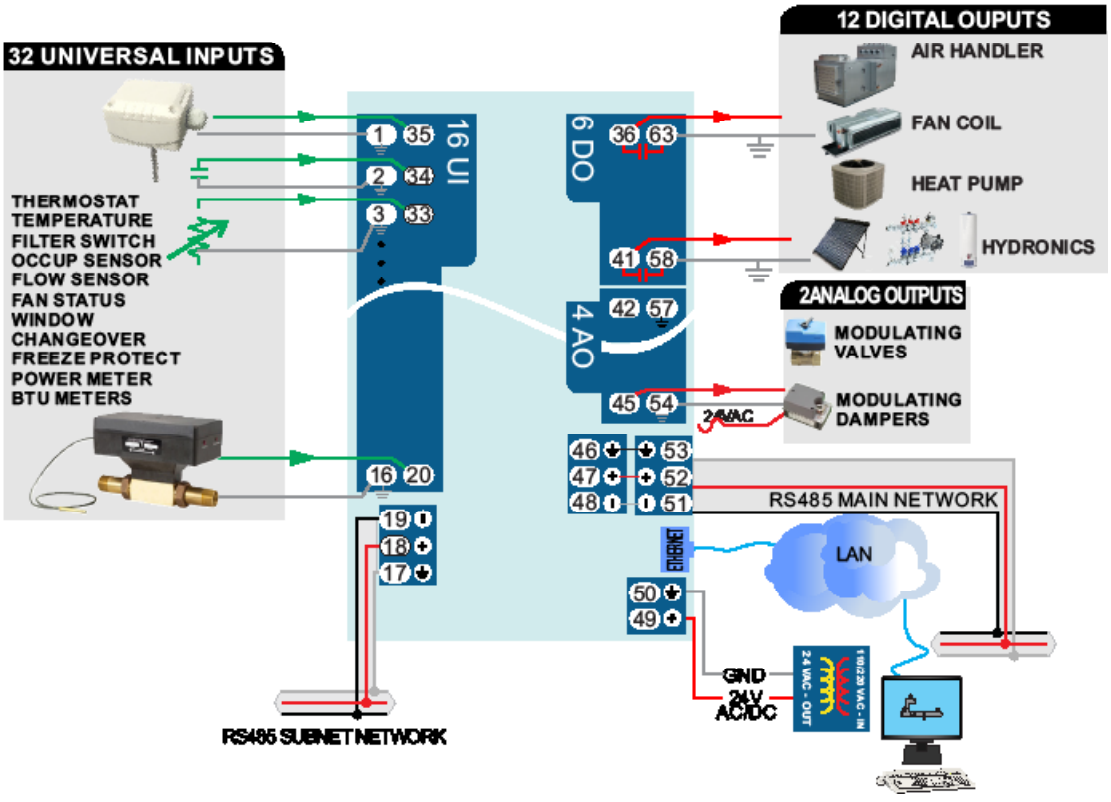


Wiring Diagram

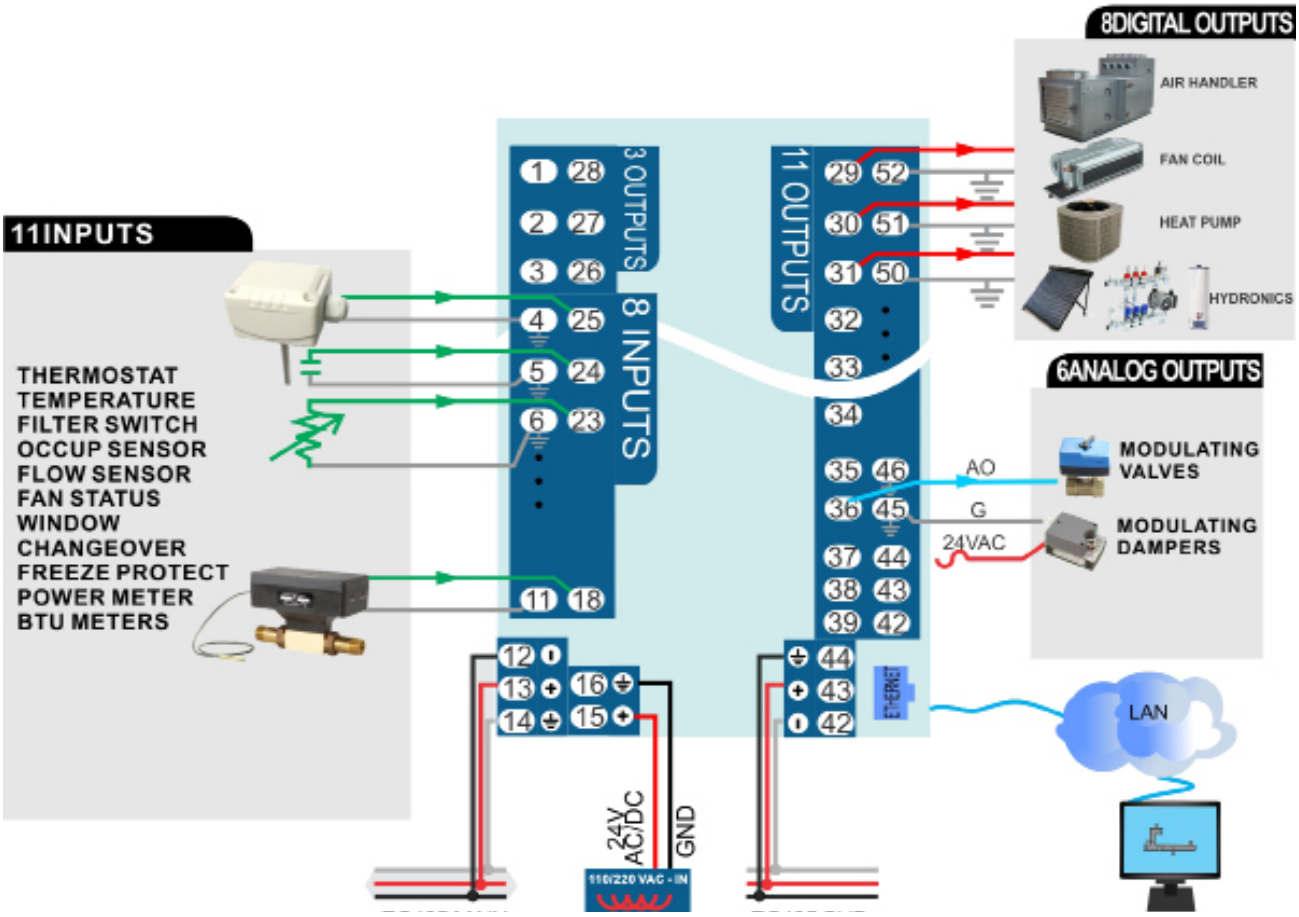
T3-BB WIRING DIAGRAM



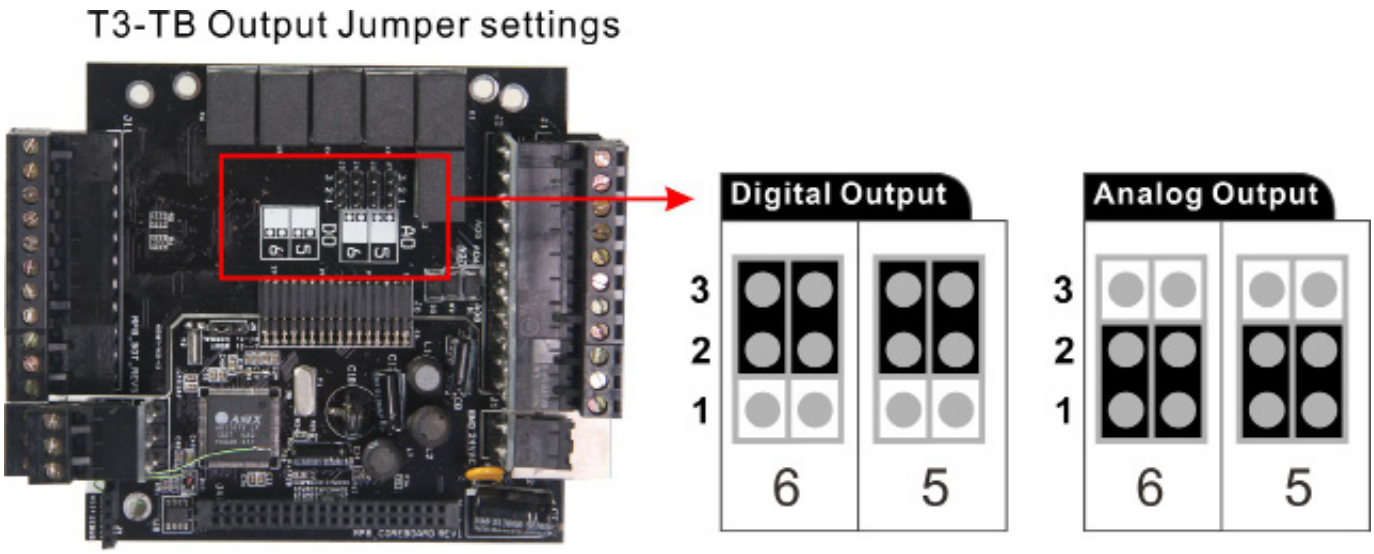
T3-LB WIRING DIAGRAM



T3-TB WIRING DIAGRAM



T3-TB Output Jumper Settings



Highlights

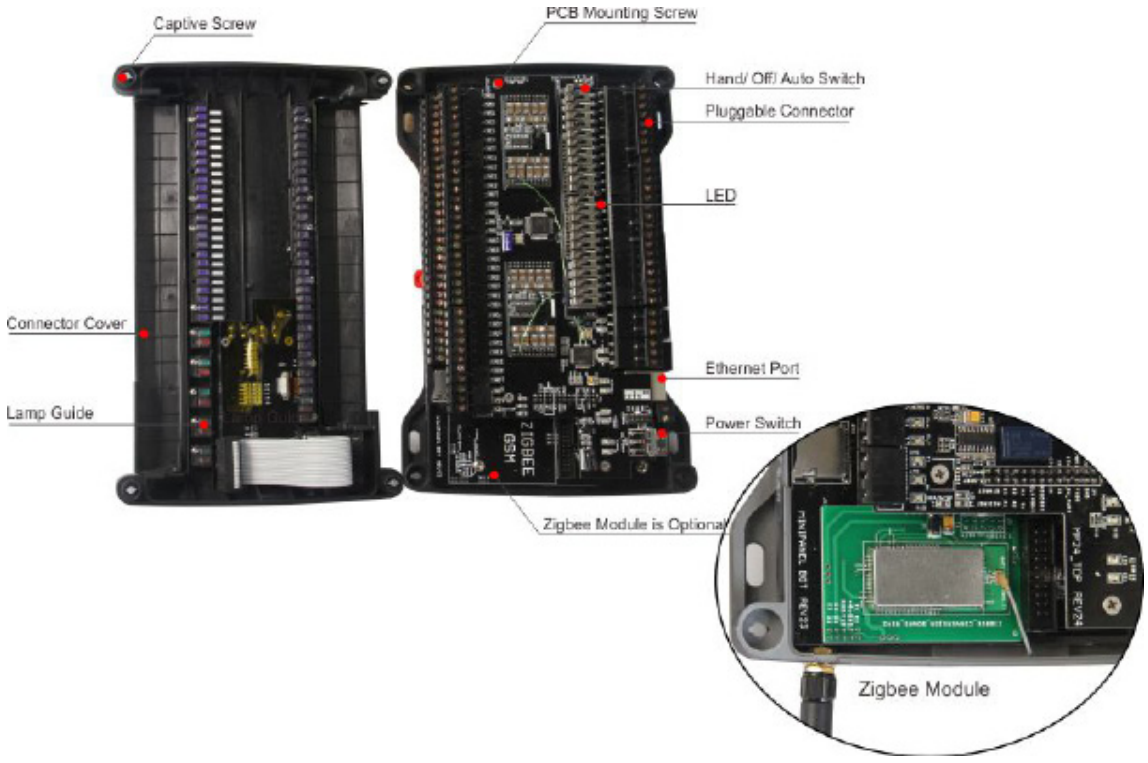
	Controller		
	T3-BB Big Brother	T3-LB Little Brother	T3-TB Tiny Brother
Total Channels:	56	26	22
Universal Input	32	16	8
Analog Output	12	4	6
Relay Output	12	6	8
Comm ports:			
RS485	2	2	2
RS232	1	0	0
Ethernet	1	1	1
USB	1	1	0
Option port**	1	1	0

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

** zigbee module.

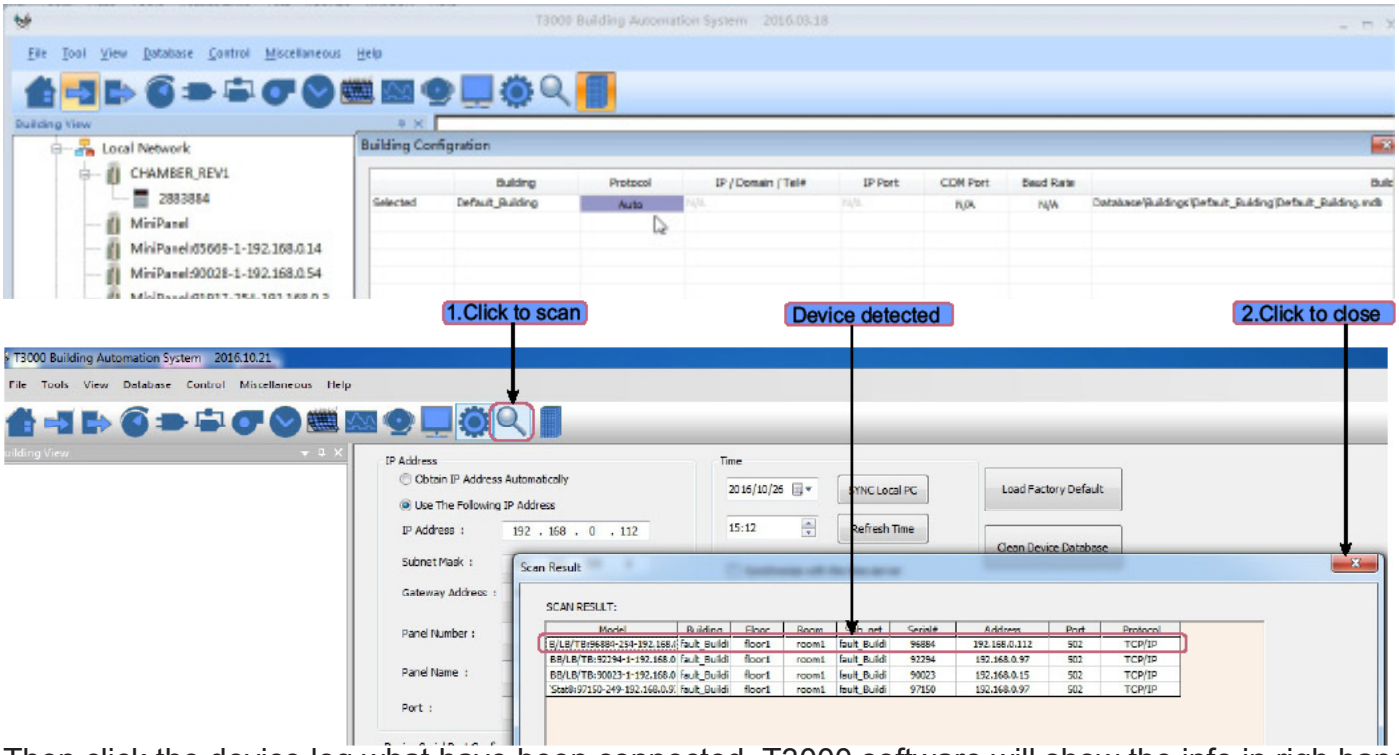
Transportation methods of these units are RS485, Ethernet, USB, Zigbee ,at the same time, they support Modbus and Bacnet. The T3-BB unit features 32 channels input and 24 channels output including 12 channels analog output and 12 channels digital output. As for the T3-LB, there are 16 channels input 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

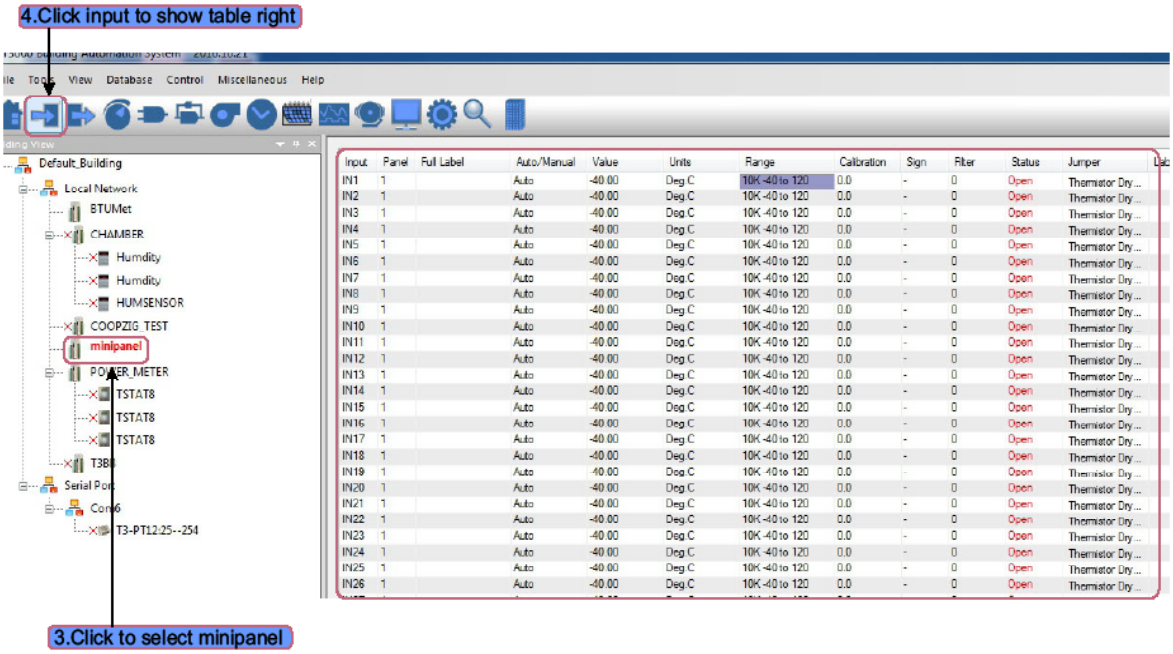


T3000 Operation Instructions

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.



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

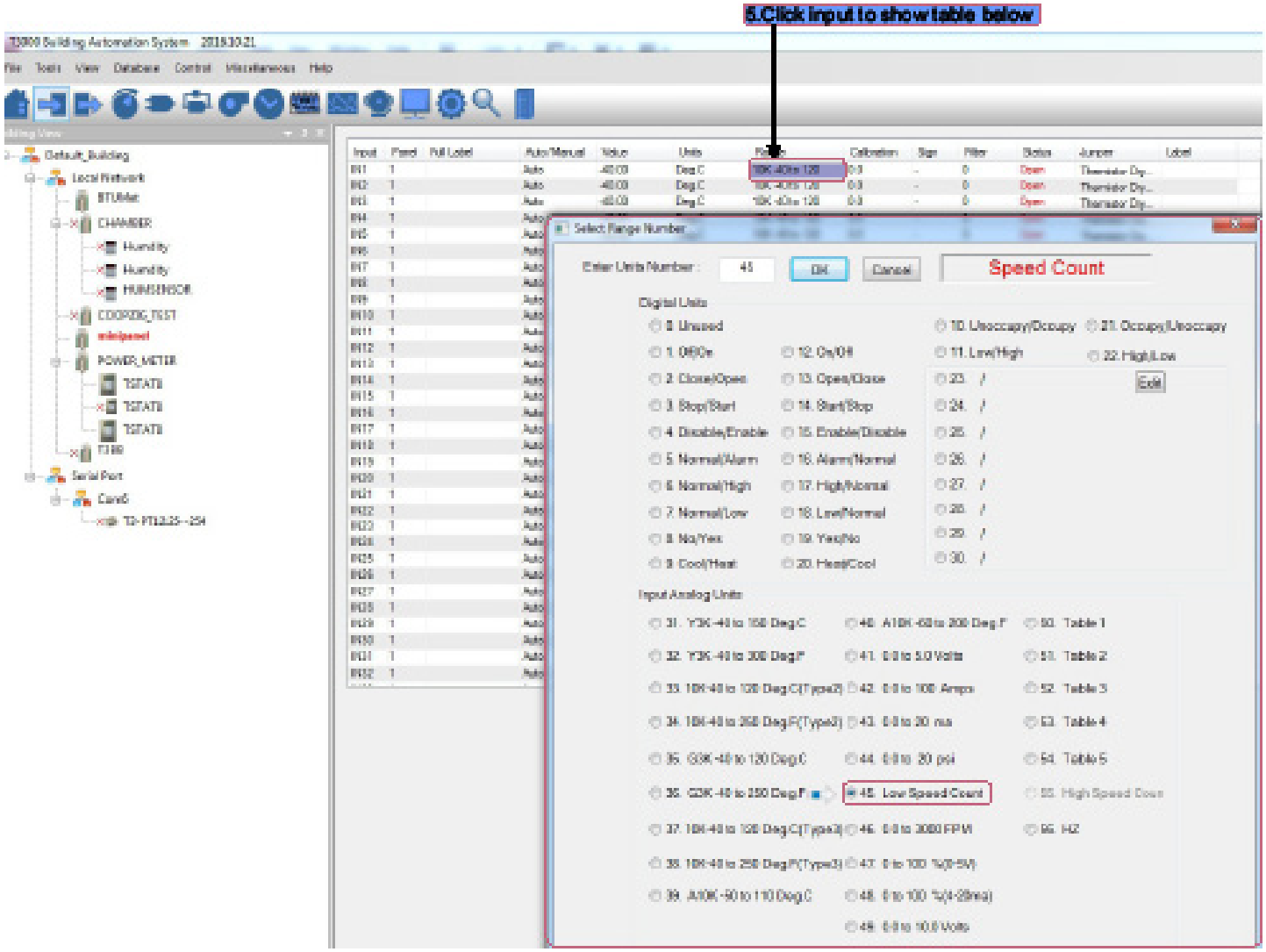


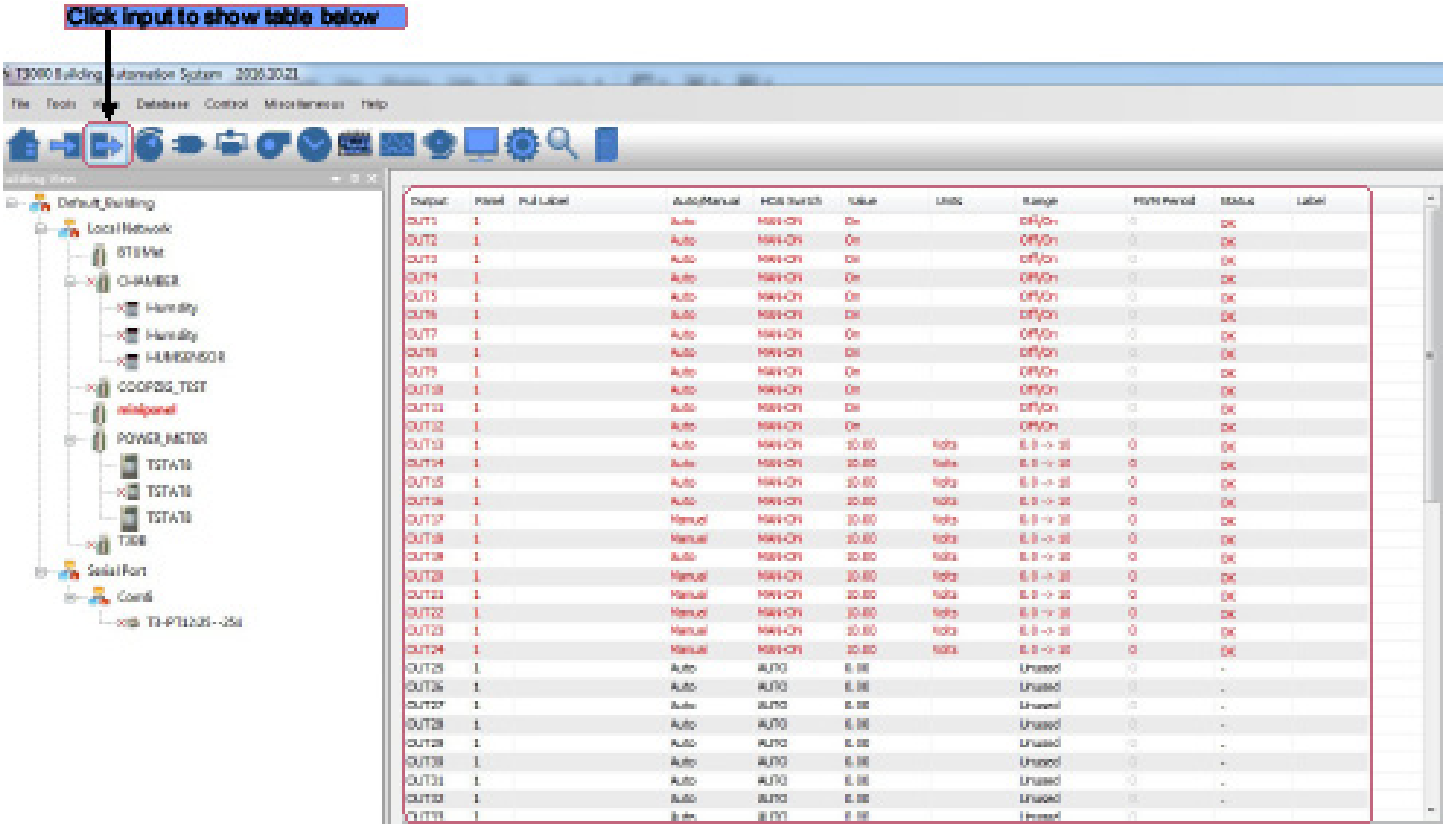
4. Click input icon, it will show all inputs in T3000 software.

	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	/	1KHz

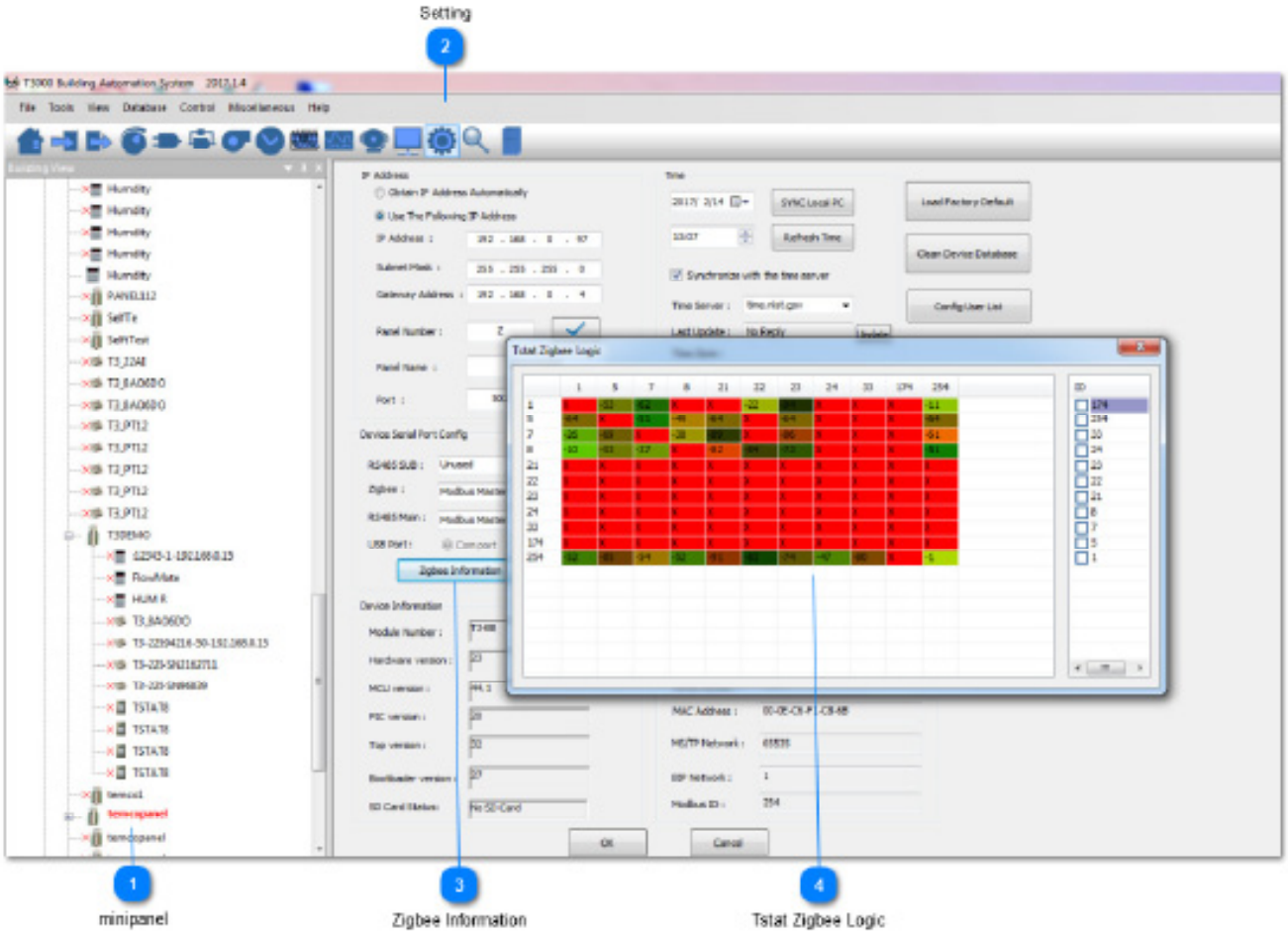
For T3-BB, T3-LB, T3-TB, all the inputs channels have pulse counters. High speed counters capable of 1M Hz. Low speed inputs channels reach to 1 hz per channel.

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




Click input to show table below

*6.Steps to get zigbee information by T3000.



1 **minipanel**

temcopanel

Click to select minipanel

2 **Setting**

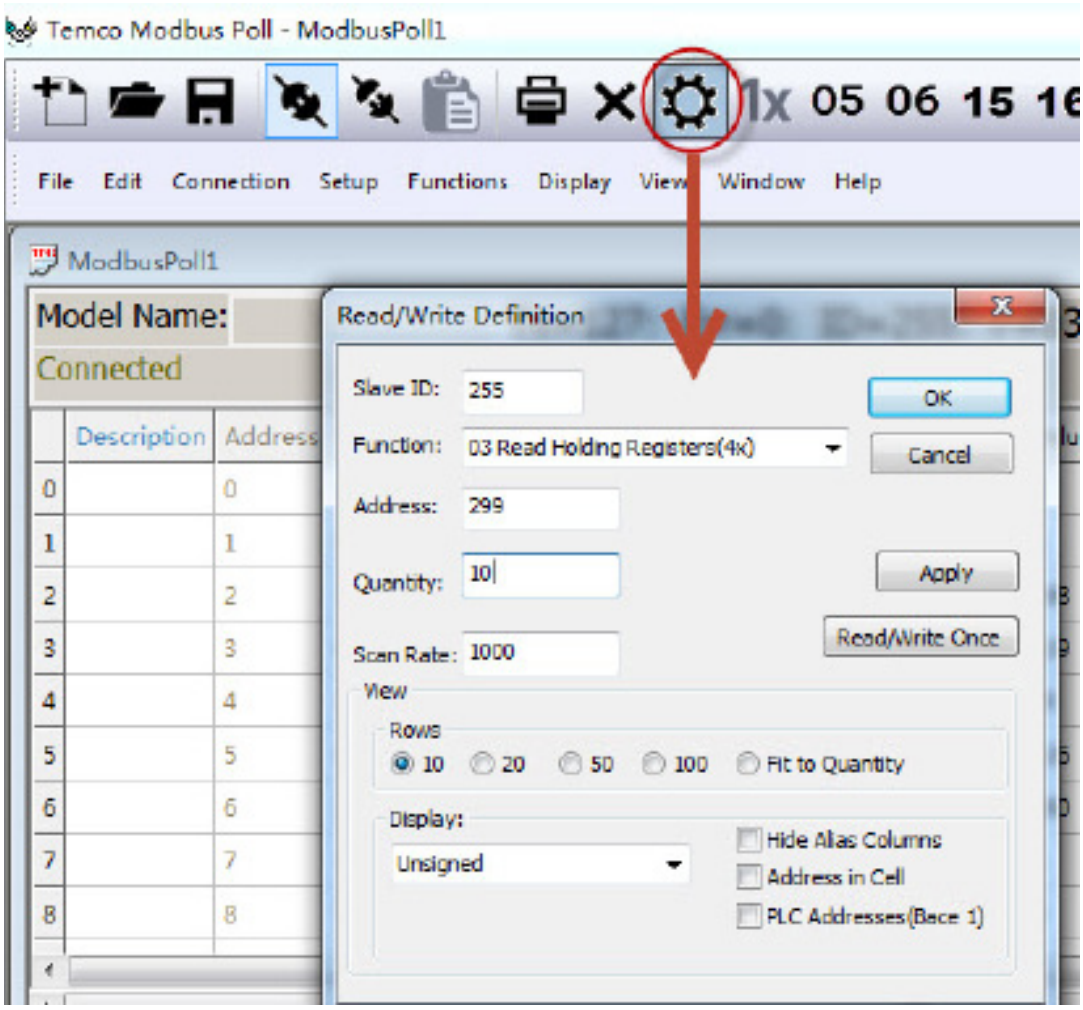
Click to show tab below

3 **Zigbee Information**

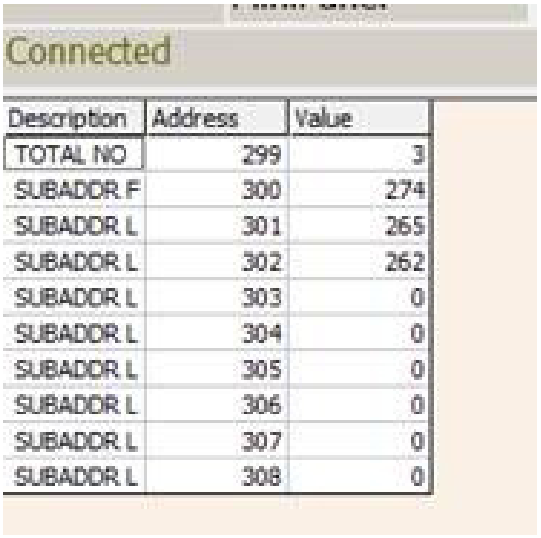
Zigbee Information

Click to show Tstat Zigbee Logic

4 **Tstat Zigbee Logic**



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.



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

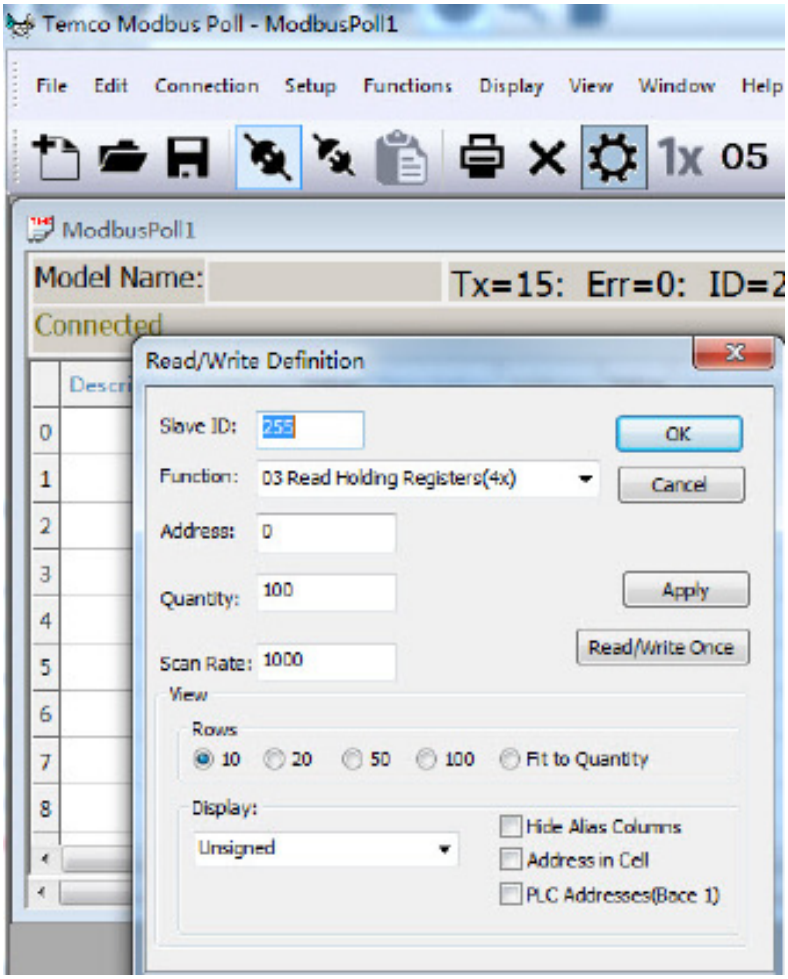
For debugging:

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

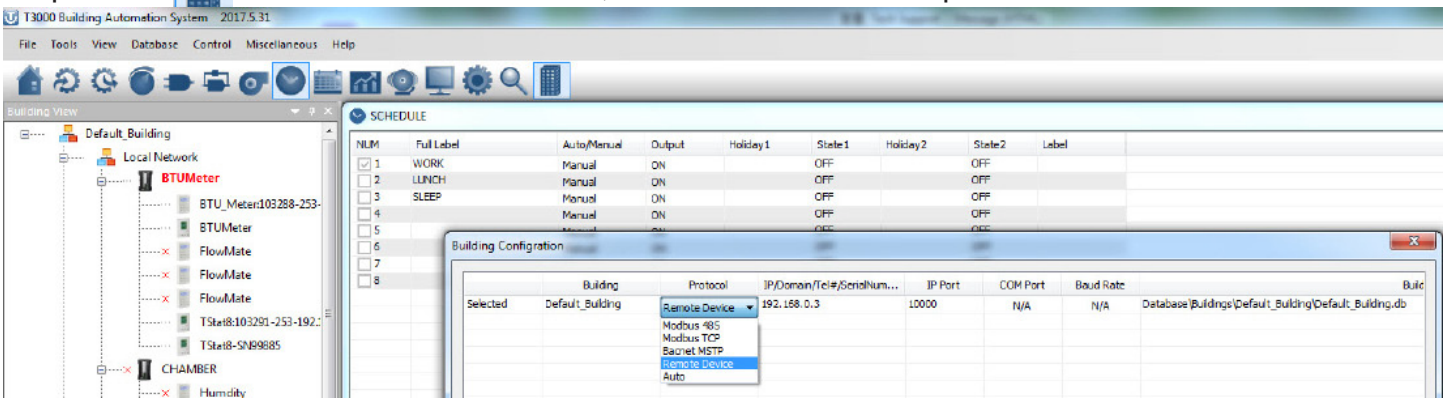


Port Forwarding

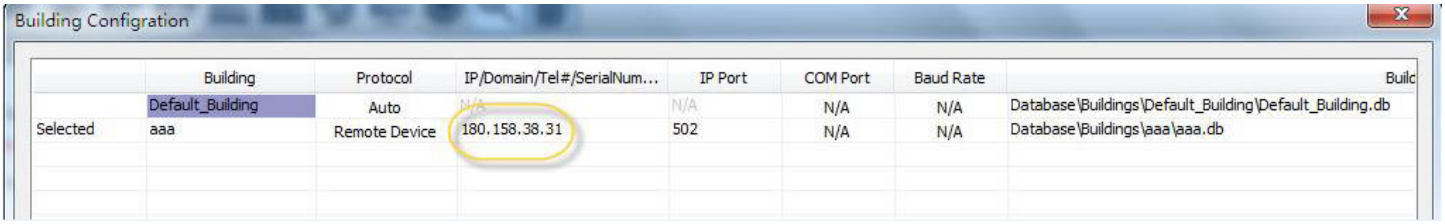
Following are steps for port forwarding:

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

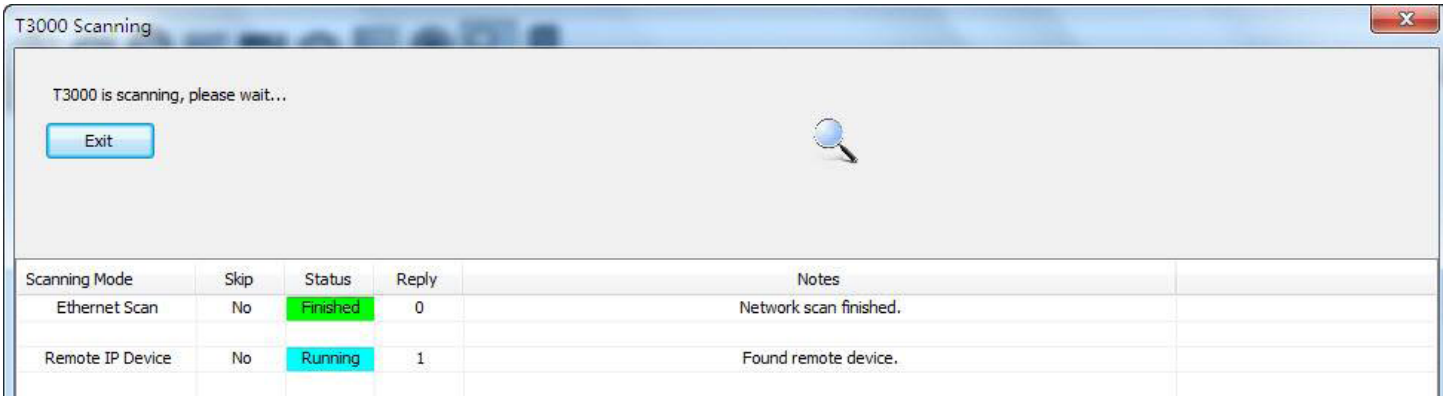
Step2.Click  to show the tab as below,select “Remote Device”protocol.

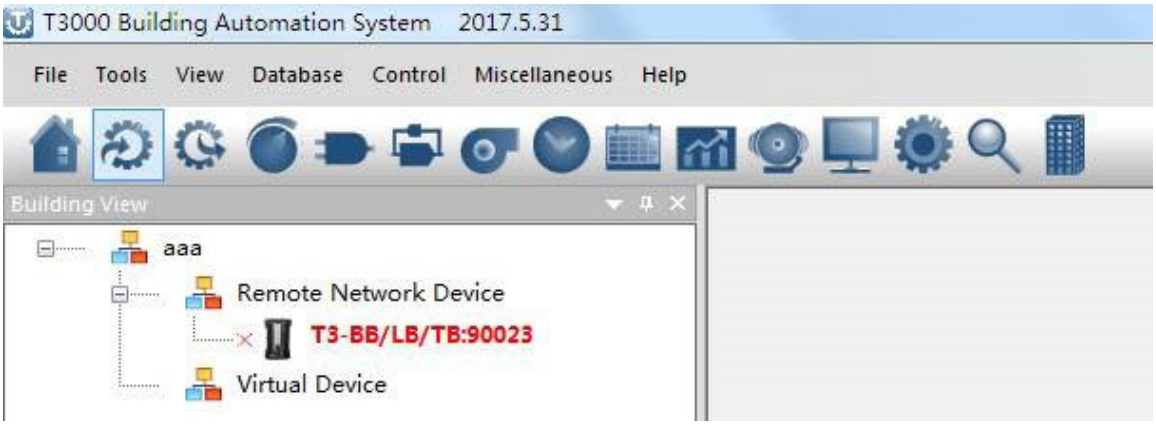


Step3.It will show the tab as below, click to fill outer net IP or domain name.



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

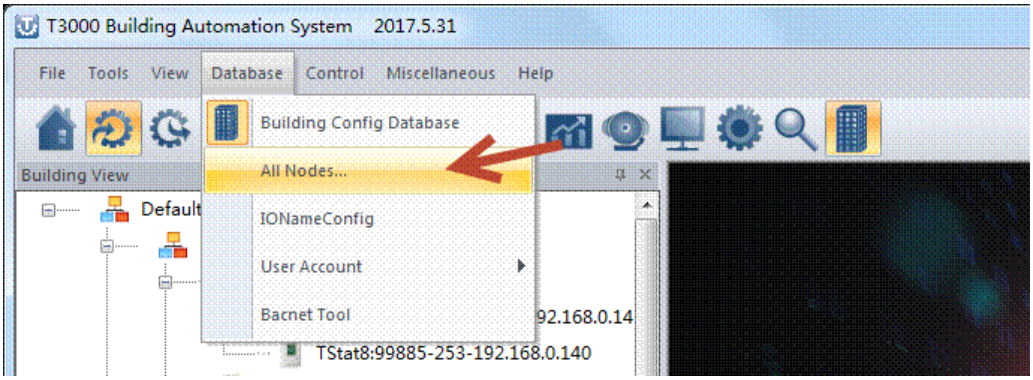




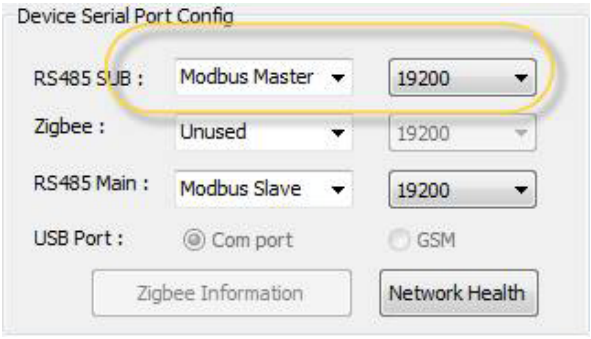
**** Adding Custom Devices***

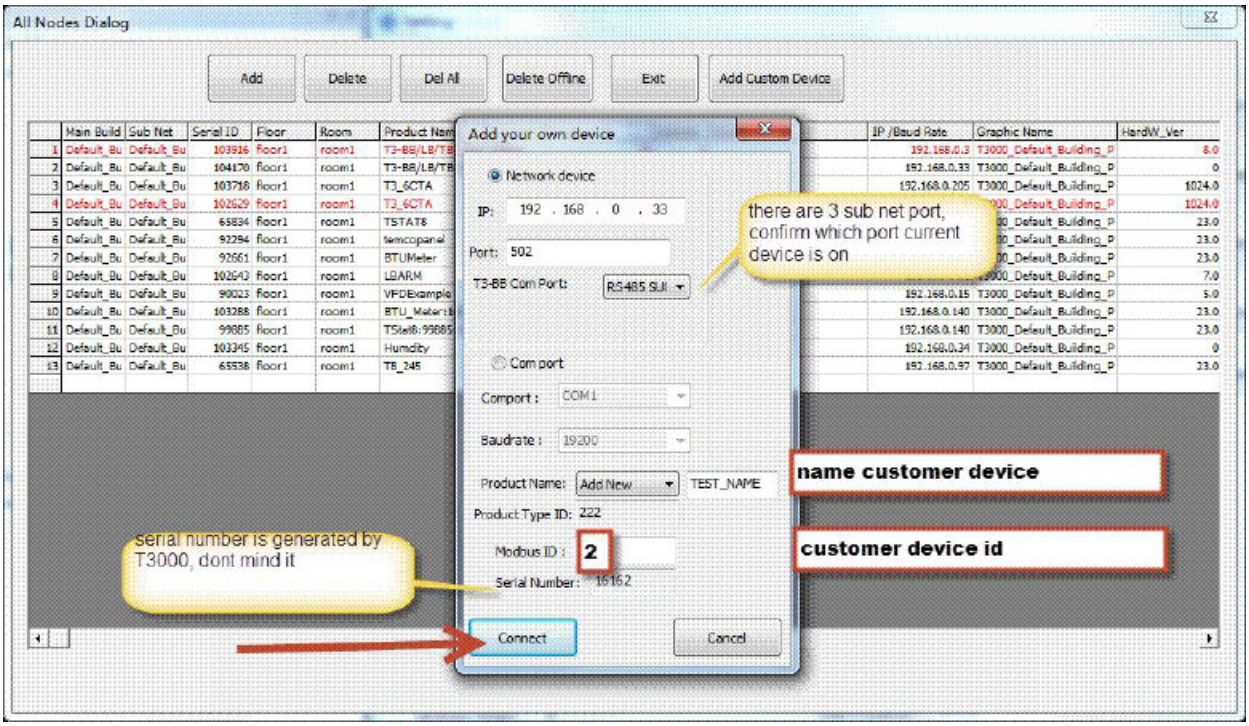
Only Temco's device can be discovered by T3-BB serial controller automatically,so we have to add custom device manually. Following are the steps to add custom devices:

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

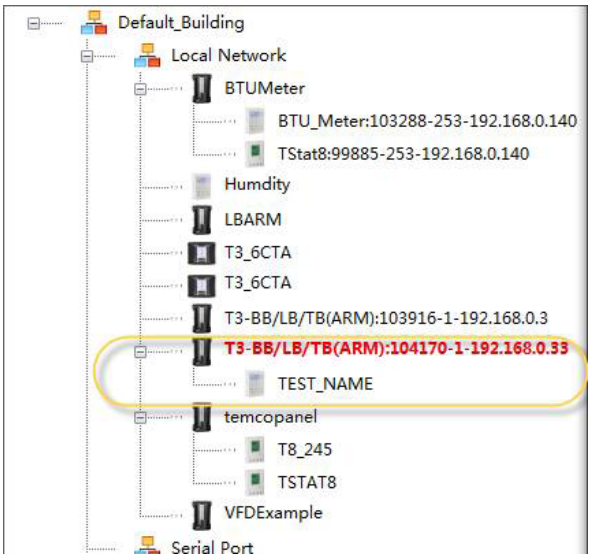


Sep2.If the customer would like to add a device in sub RS485 port,the protocol is Modbus/TCP to Modbus/RS485,we need to confirm which RS485 port to select;If custom device is on RS485 SUB PORT,you need to confirm which port from the three sub net ports current device is on.Then add a new name and ID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

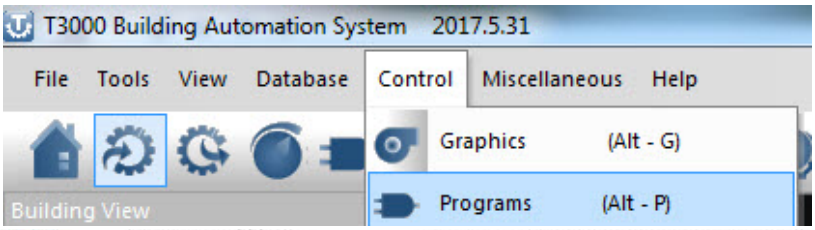


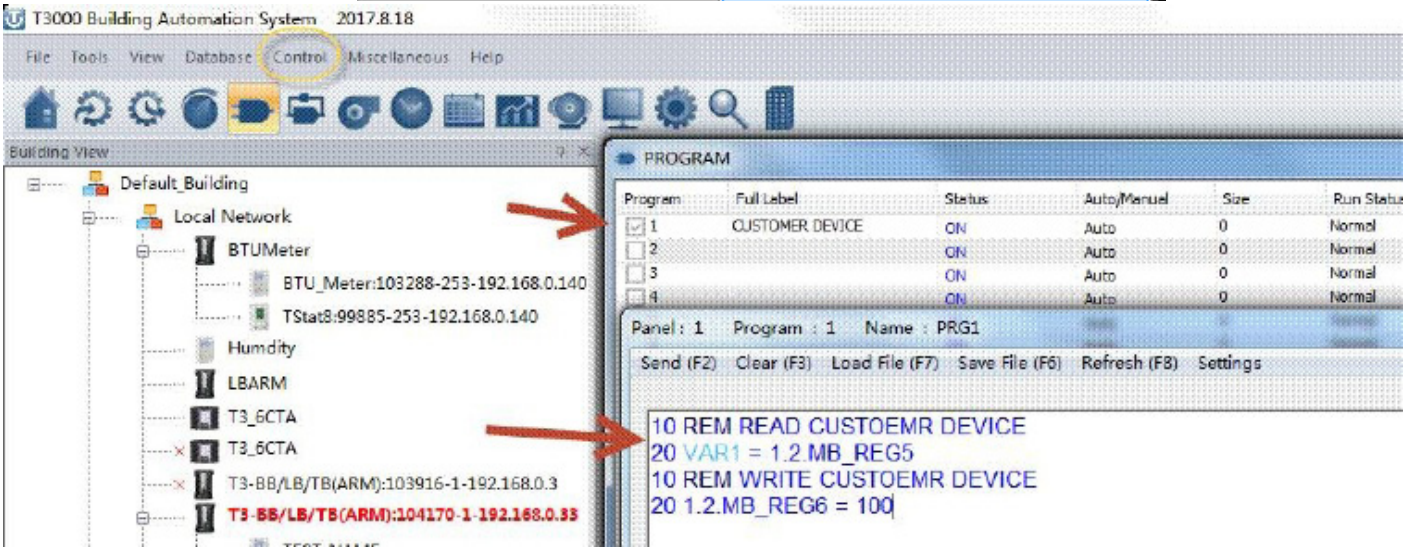


Step3.The custom device will appear in the tree node as below.

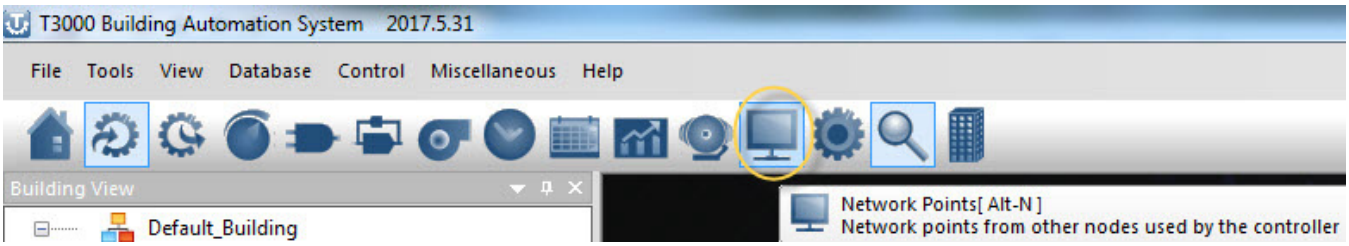


Step4. Choose Control->Program,then we can make a program to read and write custom device's register.





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 ponts.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 base1.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

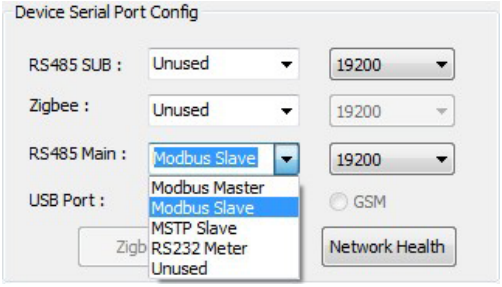
In Panel1:

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



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*

Fully Programmable Bacnet Boiler Room Controller

Description



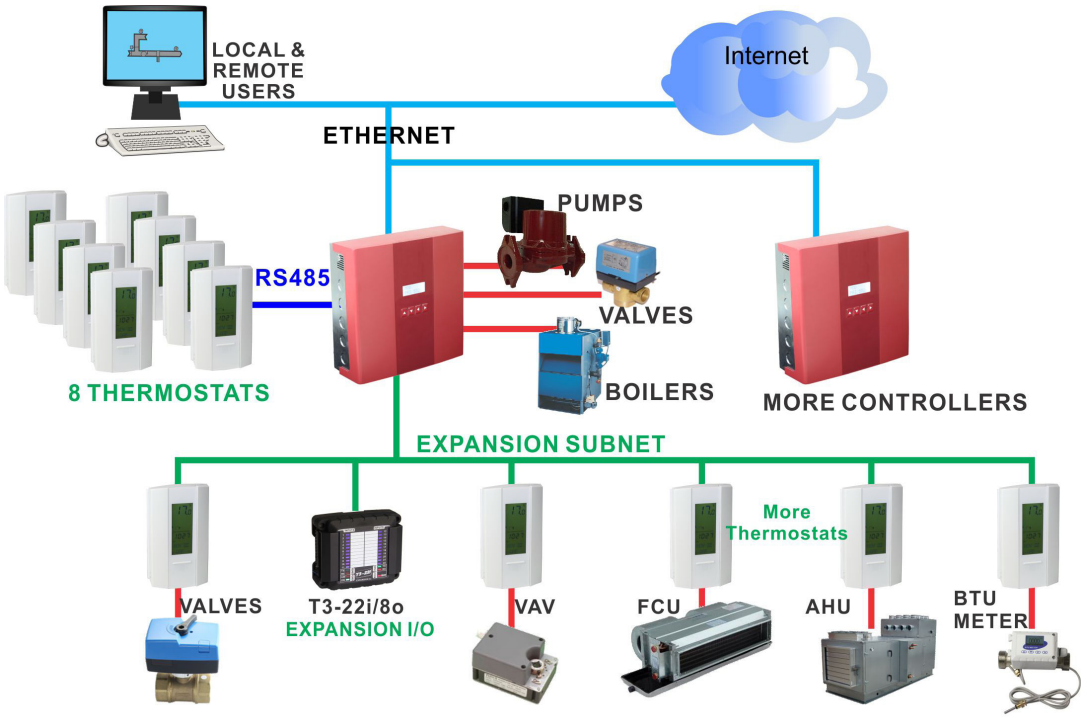
Bacnet boiler controller is a full featured heating system solution for radiant heating and more. The unit can manage up to eight zones in a simple stand alone application or can be networked into much larger systems.

The sets a new benchmark in the price/performance bringing full fledged building automation features to a whole new class of smaller buildings.

Access homes & buildings from a PC or over the net to monitor performance, increase comfort all while saving energy.

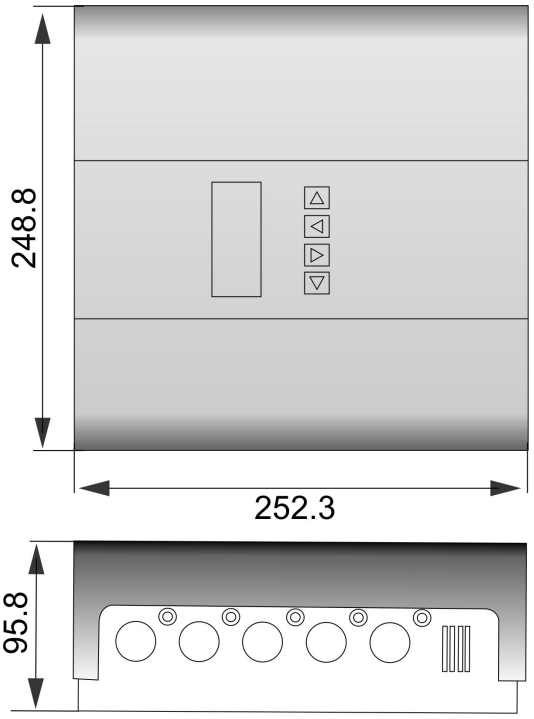
Network System

1. Contractor friendly installation
2. Screwless terminals for low voltage i/o
3. High voltage pumps connect directly no external relays to install & wire
4. Transformer, fuse & termination all in one box
5. Baseplate is passive all electronics are in the removable lid
6. No messy connections, 94 terminals total
7. 10 pluggable relays for low or line voltage switching
8. 16 universal inputs for sensors. 8 digital inputs or 8 tstats which can be choosed by adjust jumper
9. 8 thermostats direct connect over RS485, more via subnet or by adding more boiler controller.
10. LCD display for alarms and setup
11. Open source front end software, free download and no licensing fees
12. The boiler controller supports bacnet and modbus over all of the ports
13. Bacnet over ethernet TCP and RS485 MSTP, Modbus over IP and RS485 RTU

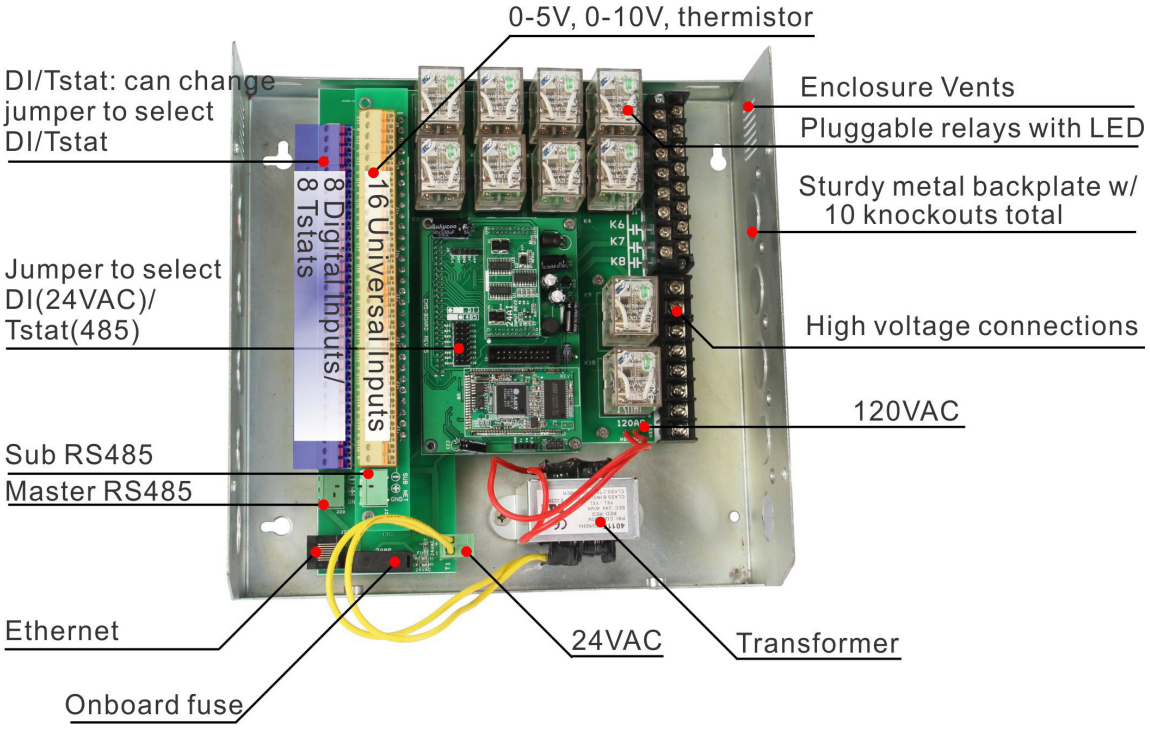


Fully Programmable Bacnet Boiler Room Controller

Zones	8 thermostats; 8 zone valves/pumps; 2 equipment relays
Dimensions	250mm wide x 250 mm tall (10 x 10in)
Enclosure Base Material	Galvanized steel
Enclosure Cover Material	PC, UL flame rated
Approvals	CE, FCC part15, UL(C) coming soon
Temp Rating	0-50C, 32-122F
Power Supply	120V+/- 10%, 60Hz
Power Consumption	1va for ZC101
Aux Power Output for valves & stats	XX va with standard 17 va transformer XX va with optional 40 va transformer
Relay Ratings	8 Zones 220VAC @ 10A each, max 20A combined. 2 Equipment relays, 220VAC @ 10A each
Inputs	-8 zone thermostats (RS485)/8 ditigal inputs(24VAC), adjusted by jumper. -16 universal inputs, configured by software 5V, 10V, thermistor
Communications	Main net: Rs485, 19.2k baud; Subnet Rs485 port, 19.2k baud
Ethernet	Requires optional T3-NC router
Protocol	Modbus RTU, well documented for integrators
Front End	Windows application; Written in MS Visual Studio 2010 C++; Open source
Warranty:	1 year



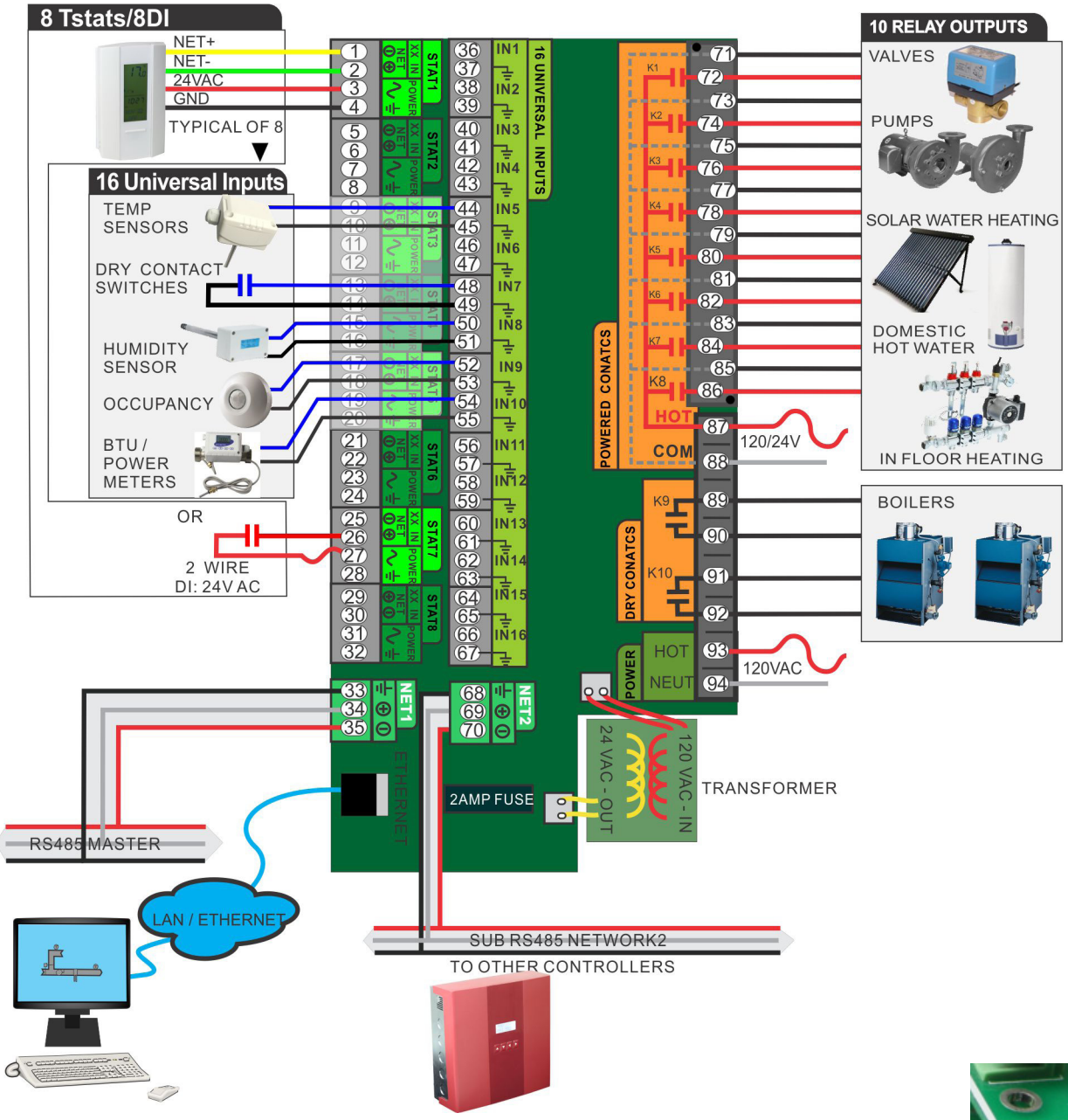
Equipment Features



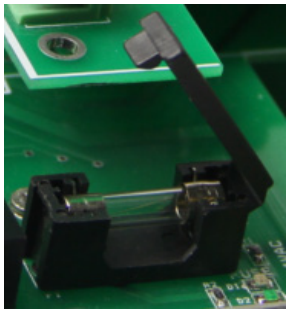
Fully Programmable Bacnet Boiler Room Controller

Typical Wiring Diagram

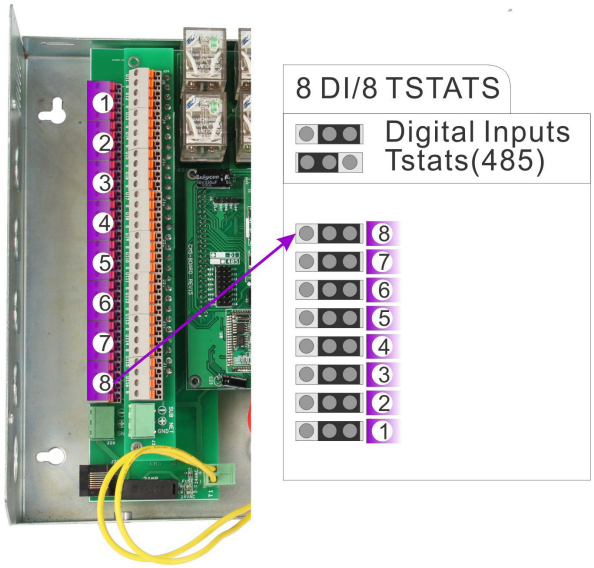
Boiler controllers have many applications. There are 8 thermostats(over RS485) or 8 digital inputs(24VAC) from terminal 1 to 32 which can be adjusted by jumper. Also there are16 universal inputs from terminal 36 to 67 which can be configured by software to the signal of 0-5V, 0-10V or therminster. it can operate many functions. What's more, not only meet your needs, also exceed your expectations.



2AMP fuse is long lasting and easy to re-place. Simply detach the plastic enclosure and change fuse.

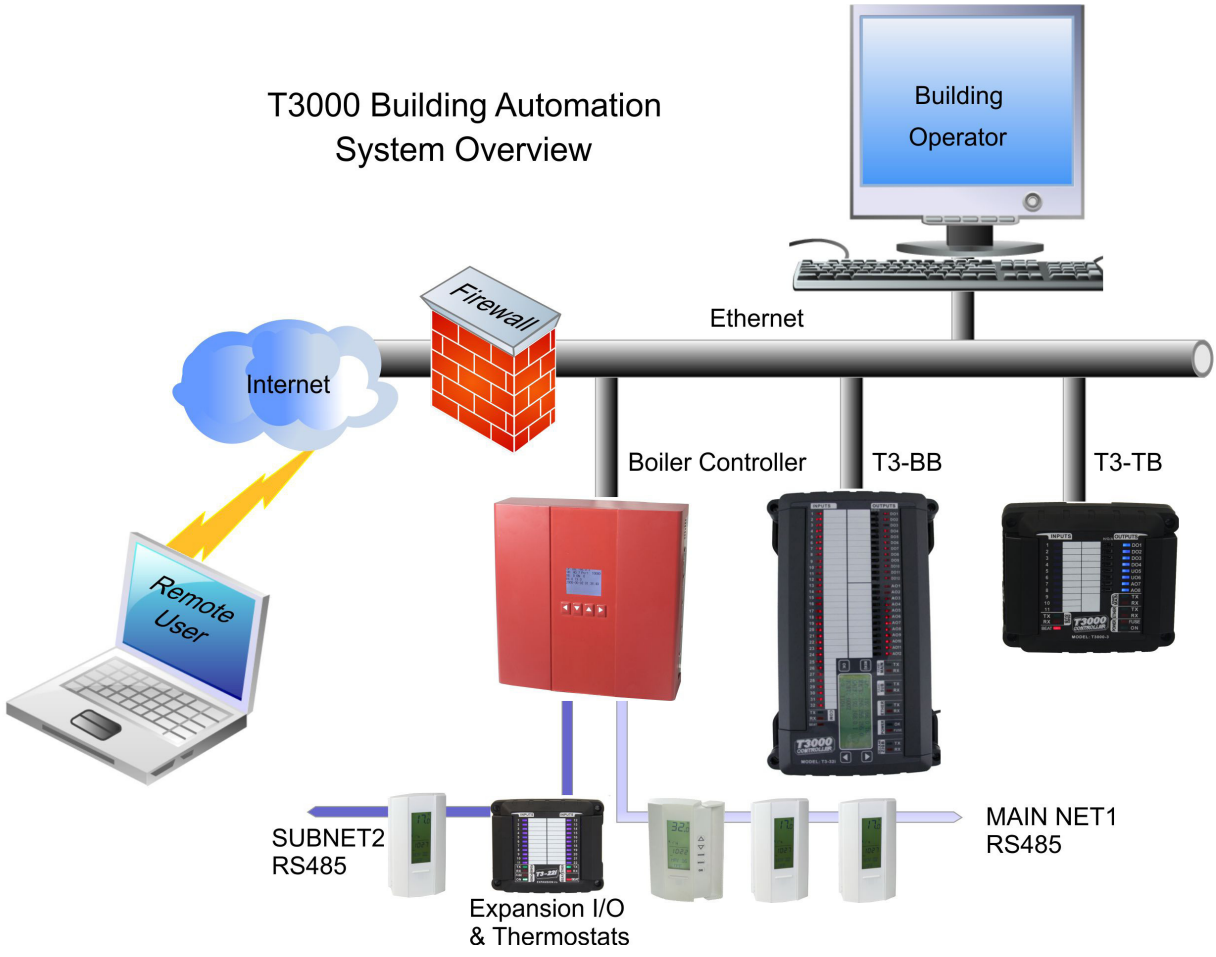


4-wire tstat(over 485) or 2-wire DI(24VAC) can be adjusted by each jumper as right the diagram displayed.



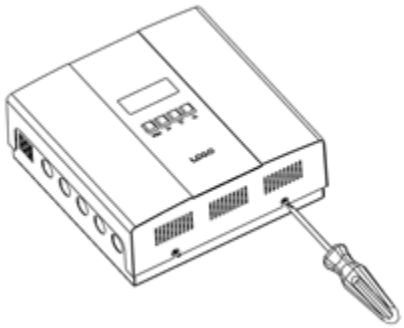
T3000 Building Automation System Overview

This diagram shows a typical small scale system with three controllers joined together over Ethernet. There is no practical limit to the number of devices that can be on this network, vast systems can be constructed using industry standard network gear. The system also supports legacy RS485 backbone cabling though the communications will be much slower than with Ethernet.

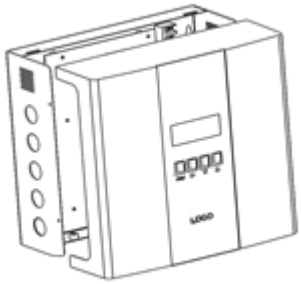


Installation Mounting

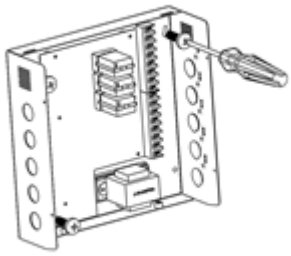
1)Unfasten screws at base.



2)Remove top plate from bottom.



3)Screw into mounted area.



4)Re-attach top plate.



5)Re-fasten screws at base.



T3-6CT

Description

The T3-6CT is general purpose input / ouput modules for building integrators. Available in several input/ output configurations, the T3 module provide convenient termination for field devices and interfacing to your HVAC, lighting, temperature sensors, and other typical building automation applications. Each of the analog inputs can be jumper configured for signals of either 0-5V, 0-20mA, or dry contact. The outputs are available in dry contacts 1amp/output, 0-10V analog, and PNP sinking. The modules are slave devices that can be easily controlled via the RS485 serial interface using the industry standard Modbus Protocol.



Highlights:

• Surge-Protected Analog Inputs with 10-bit Resolution
• Outputs can Individually be switched to ON, OFF, AUTO
• High Impact Plastic Enclosure provides durability in commercial environments
• Standard Modbus Protocol allows for up to 254 unique devices on one RS485 Network

Specifications

Inputs	General purpose 13 Analog Inputs
Outputs	2 Relay Outputs
Operating Temperature	-30~70°C (-22~158°F)
Supply Voltage	12~24VAC/DC ±10%, 50-60Hz
Power Consumption	100mA at 12VDC
Communication	RS485 network
Relay Contacts Rating	Max 2A
Ambient Humidity	10-90 %Rh
Plastic Housing	Flammability Rating UL 94HB
Enclosure	ABS with rubberized texture
Temperature Sensor	10K Thermistor ±0.5°C
Color	Black

T3-6CT

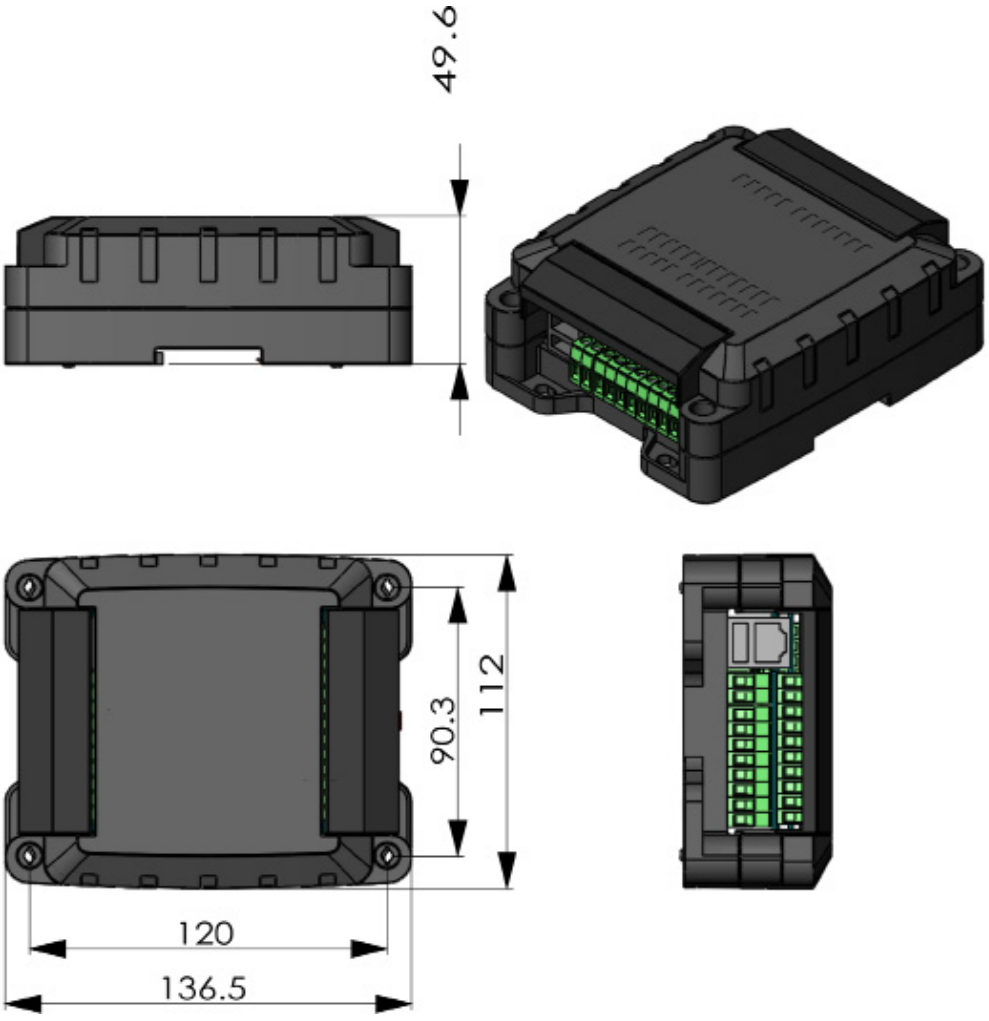
***Wireless Module**

Power Output Capability	+20 dBm - 100 mW
Sensitivity	down to -120 dBm at 1.2 kbps
Selectivity	16-tap FIR Channel Filter
Bullet-proof front end	IIP3 = -18 dBm, IIP2 = +35 dBm,80 dB Blocking Immunity, no Image Frequency response
Current	Rx = 16 mA, 100nA register retention
Programmable Pout	-18 to +20 dBm in 1dB steps
FSK Bit rates	300 kb/s
Synthesizer Resolution	61 Hz
Module Size	16X16mm



Dimension

Unit:mm



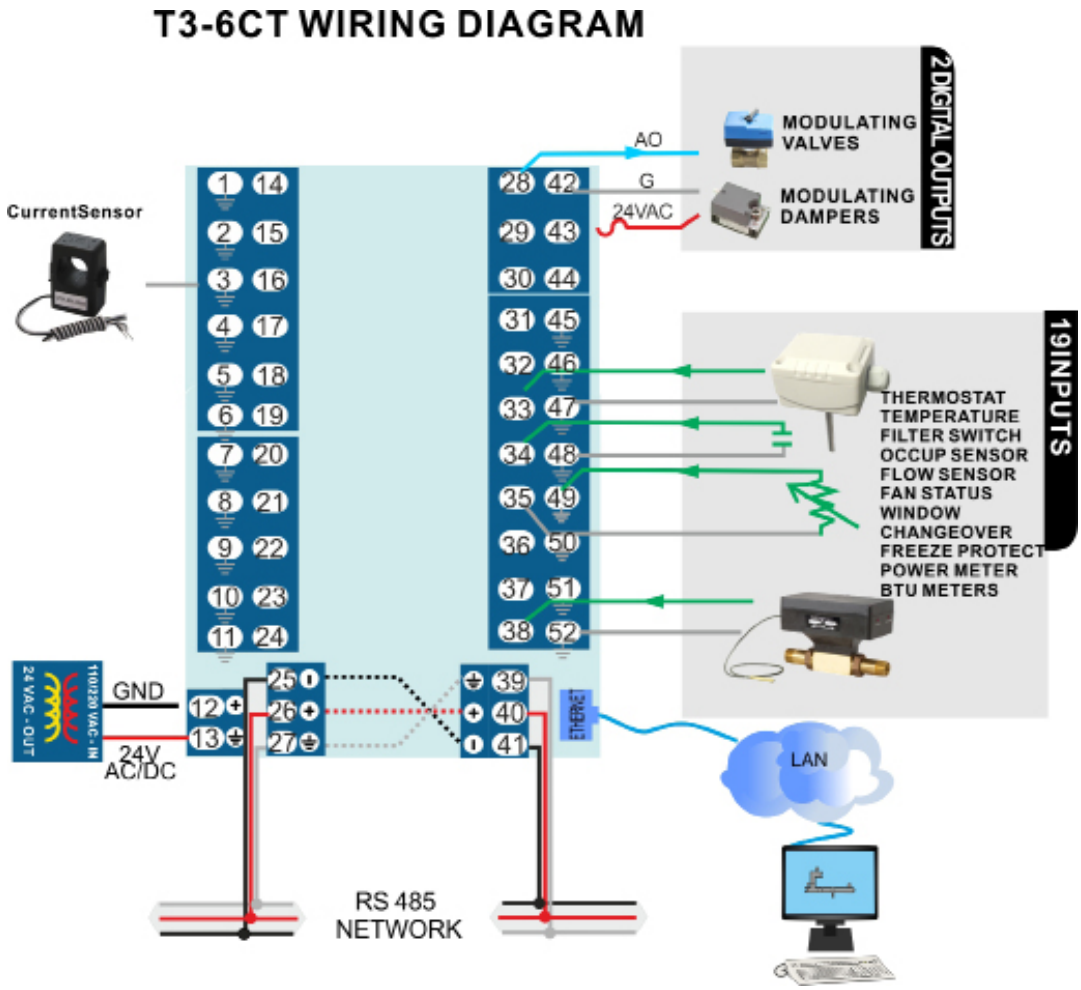
Wiring Diagram

Accessing T3-6CT Registers Via Serial Communications

T3-6CT has a built-in serial interface for communication over an RS485 Network. Communication is currently implemented using Modbus Protocol. However, future version of the T3-6CT will work with both BACnet and TCP/IP Protocols. For detailed information on Modbus Protocol, see the chapter entitled Modbus Serial Communications.

Connecting the T3-6CT to a computer

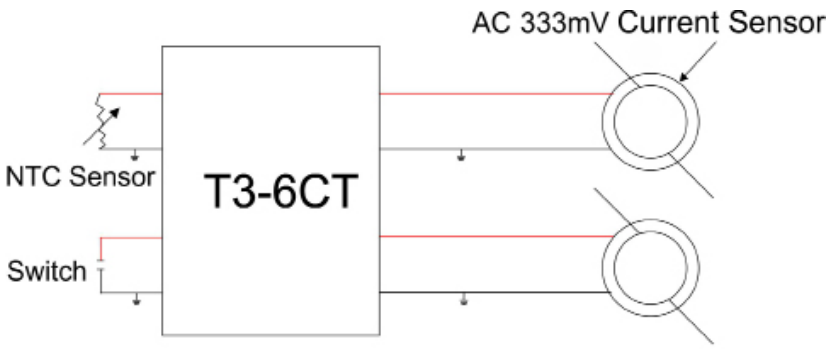
T3-6CT can be connected to a computer serial port via the RS485 interface.Below picture shows how the T3-6CT should be connected to the serial port of a PC.



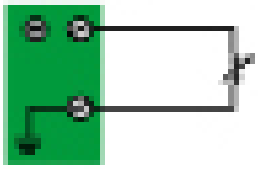
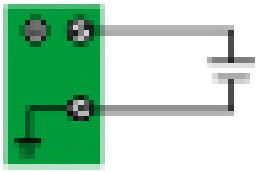
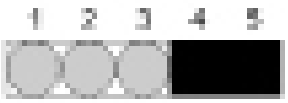
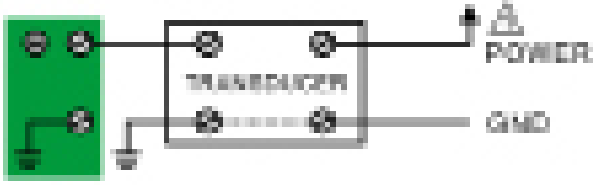
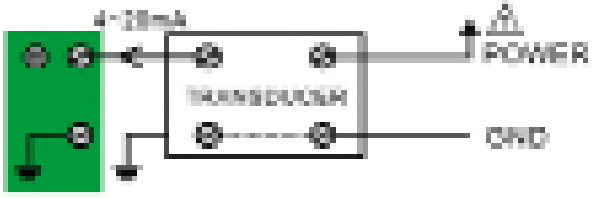


USB RS485

T3-CT connect with current sensor

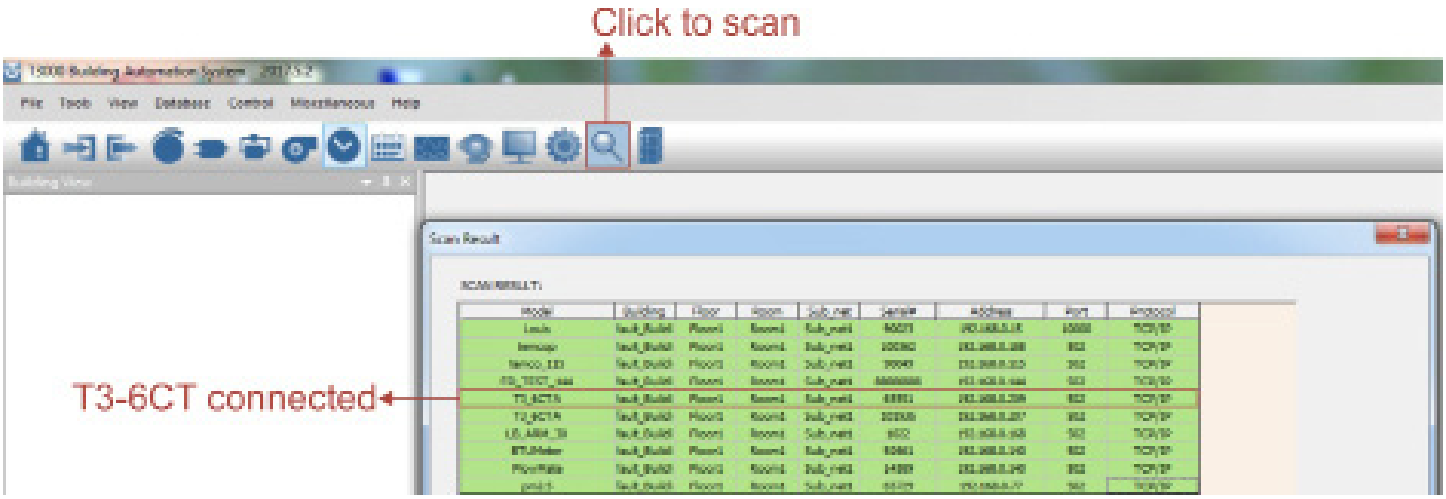


Typical Sensor Inputs

Title	Typical Wiring Diagram	Jumper
Thermistors		
Dry Contacts		
Transducer Signal 0-10V 0-5V		
Transducer 4-20mA		

T3000 Operation

1.Visit https://temcocontrols.com/ftp/software/T3000.zip, download T3000 software and install it;
2.Plug T3-6CT in power,connect it to a PC via RS485 or Ethernet;
3.Start the T3000 software,click to scan,the following view will appear. Close after the scan is completed.

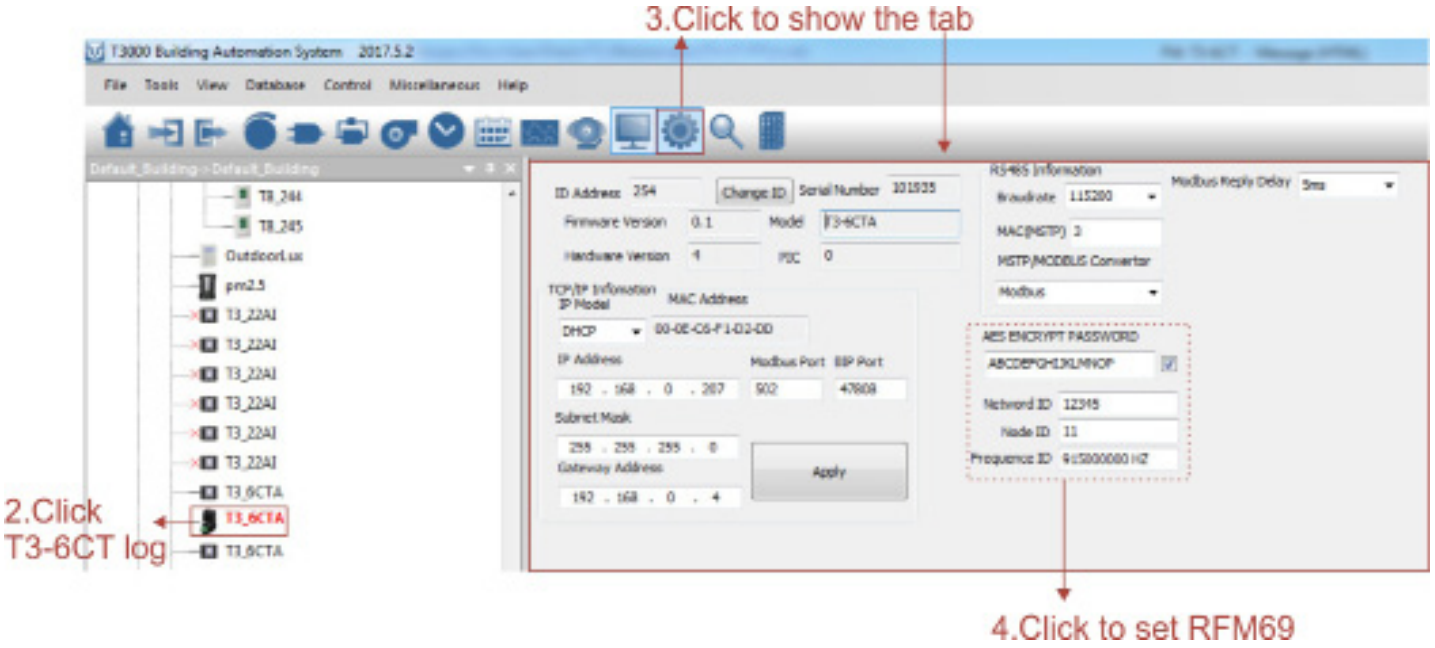


4.Click  to get the INPUT information as below.

INPUT

Input	Panel	Full Label	Auto/Manual	Value	Units	Range	Calibration	Sign	Filter	Status	Jumper	Label
IN1	3	AI0	Auto	3.00		Unused		+	1	Normal	Thermistor Dry...	AI0
IN2	3	AI1	Auto	2.99		Unused			1	Normal	Thermistor Dry...	AI1
IN3	3	AI2	Auto	2.99		Unused			1	Normal	Thermistor Dry...	AI2
IN4	3	AI3	Auto	2.99		Unused			1	Normal	Thermistor Dry...	AI3
IN5	3	AI4	Auto	2.99		Unused			1	Normal	Thermistor Dry...	AI4
IN6	3	AI5	Auto	2.99		Unused			1	Normal	Thermistor Dry...	AI5
IN7	3	AI6	Auto	2.98		Unused			1	Normal	Thermistor Dry...	AI6
IN8	3	AI7	Auto	2.98		Unused			1	Normal	Thermistor Dry...	AI7
IN9	3	AIR FLOW	Auto	0.00		Unused			1	Normal	Thermistor Dry...	Air Flow
IN10	3	ACCELEROMETER	Auto	0.00		Unused		-	1	Normal	Thermistor Dry...	Accelerom
IN11	3	CT1	Auto	0.10		Unused		+	1	Normal	Thermistor Dry...	CT1
IN12	3	CT2	Auto	0.10		Unused		+	1	Normal	Thermistor Dry...	CT2
IN13	3	CT3	Auto	0.10		Unused		+	1	Normal	Thermistor Dry...	CT3
IN14	3	CT4	Auto	0.09		Unused		+	1	Normal	Thermistor Dry...	CT4
IN15	3	CT5	Auto	0.09		Unused		+	1	Normal	Thermistor Dry...	CT5
IN16	3	CT6	Auto	0.10		Unused			1	Normal	Thermistor Dry...	CT6
IN17	3		Auto	0.00		Unused			0	Normal	Thermistor Dry...	
IN18	3		Auto	0.00		Unused			0	Normal	Thermistor Dry...	
IN19	3		Auto	0.00		Unused			0	Normal	Thermistor Dry...	

5.Click to to edit advanced settings.RFM69 ID can be set in the tab.



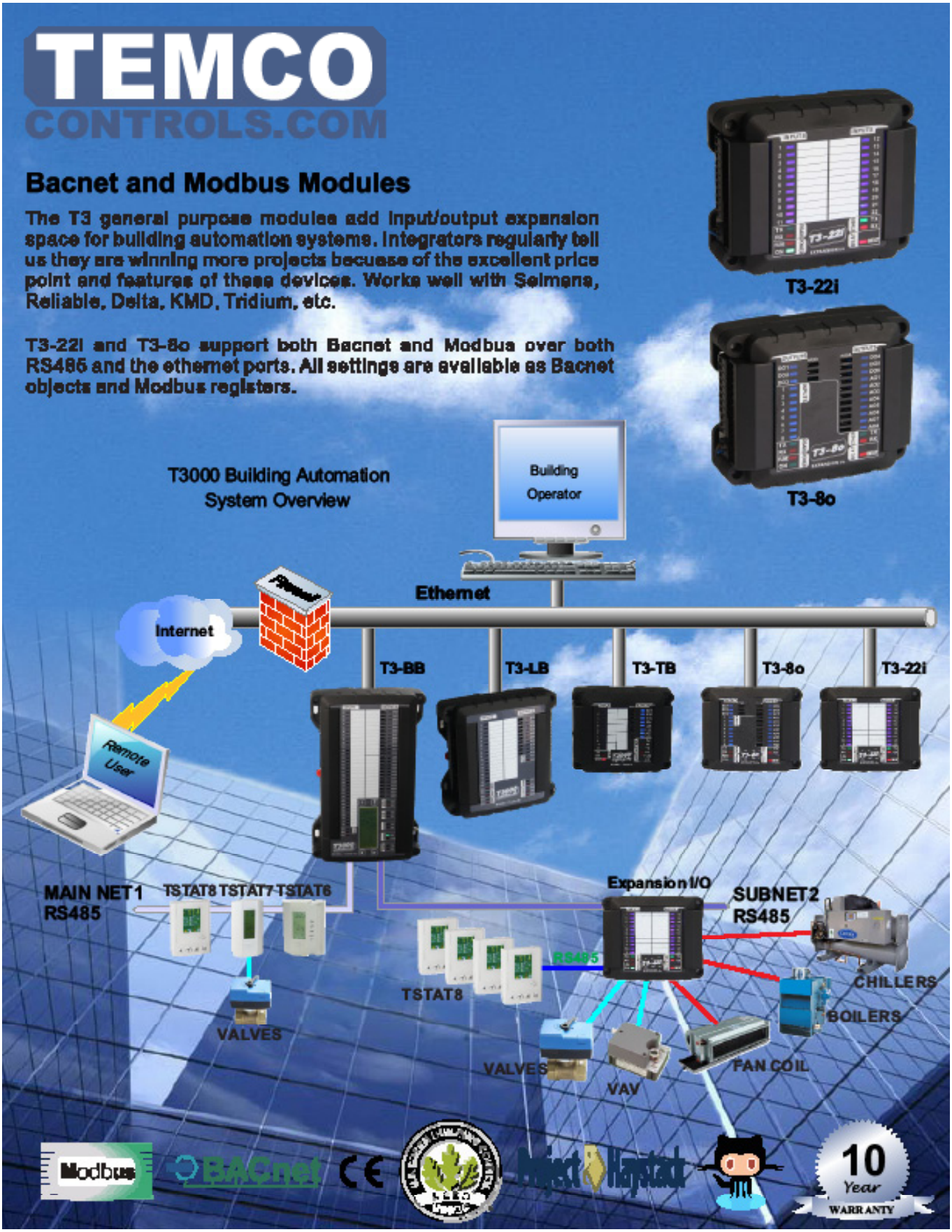
Register list

Address	Bytes	Register and Description
0 to 3	4	Serial Number, 4 byte value
4	1	EEPROM Hardware Version Number
5	1	Firmware Version Number
6	1	ADDRESS. Modbus Device Address
7	1	Product Model
8	1	Hardware Revision
9	1	PIC Version Number
10-12		Reserved
13	1	Calibration Register-Used to calibrate the outputs
14		Reserved
15	1	Baudrate Setting: 0 = 9600bps, 1 = 19200bps
19	1	MODBUS RESPONSE DELAY DEFAULT 0 = 2.5MS 1 = 7.5MS
22~99		Reserved
100	2	Output 1 Register
101	2	Output 2 Register
102	2	Output 1 Switch Bank
103	2	Output 2 Switch Bank
104	2	Analog Input 1 High Byte
105	2	Analog Input 1 Low Byte
106	2	Analog Input 2 High Byte
107	2	Analog Input 2 Low Byte
108	2	Analog Input 3 High Byte
109	2	Analog Input 3 Low Byte
110	2	Analog Input 4 High Byte
111	2	Analog Input 4 Low Byte
112	2	Analog Input 5 High Byte
113	2	Analog Input 5 Low Byte
114	2	Analog Input 6 High Byte
115	2	Analog Input 6 Low Byte
116	2	Analog Input 7 High Byte
117	2	Analog Input 7 Low Byte
118	2	Analog Input 8 High Byte
119	2	Analog Input 8 Low Byte
120	2	Analog Input 8 Low Byte
121	2	Analog Input 9 Low Byte
122	2	Analog Input 10 High Byte
123	2	Analog Input 10 Low Byte
124	1	Analog Input 11 High Byte

Address	Bytes	Register and Description
125	2	Analog Input 11 Low Byte
126	2	Analog Input 12 High Byte
127	2	Analog Input 12 Low Byte
128	2	Analog Input 13 High Byte
129	2	Analog Input 13 Low Byte
501	1	RFM69 RegOpMode
502	1	RFM69 RegDataModul
503	1	RFM69 RegBitrateMsb
504	1	RFM69 RegBitrateLsb
505	1	RFM69 RegFdevMsb
506	1	RFM69 RegFdevLsb
507	1	RFM69 RegFrfMsb
508	1	RFM69 RegFrfMid
509	1	RFM69 RegFrfLSB
510	1	RFM69 RegOsc1
511	1	RFM69 RegAfcCtrl
512	1	RFM69 Reserved0C
513	1	RFM69 RegListen1
514	1	RFM69 RegListen2
515	1	RFM69 RegListen3
516	1	RFM69 RegVersion
517	1	RFM69 RegPaLevel
518	1	RFM69 RegPaRamp
519	1	RFM69 RegOcp
524	1	RFM69 RegLna
525	1	RFM69 RegRxBw
526	1	RFM69 RegAfcBw
527	1	RFM69 RegOokPeak
528	1	RFM69 RegOokAvg
529	1	RFM69 RegOokFix
530	1	RFM69 RegAfcFei
531	1	RFM69 RegAfcMsb
532	1	RFM69 RegAfcLsb
533	1	RFM69 RegFeiMsb
534	1	RFM69 RegFeiLsb
535	1	RFM69 RegRssiConfig
536	1	RFM69 RegRssiValue
537	1	RFM69 RegDioMapping1
538	1	RFM69 RegDioMapping2
539	1	RFM69 RegIrqFlags1
540	1	RFM69 RegIrqFlags2

Address	Bytes	Register and Description
541	1	RFM69 RegRssiThresh
542	1	RFM69 RegRxTimeout1
543	1	RFM69 RegRxTimeout2
544	1	RFM69 RegPreambleMsb
545	1	RFM69 RegPreambleLsb
546	1	RFM69 RegSyncConfig
547	1	RFM69 RegSyncValue1
548	1	RFM69 RegSyncValue2
549	1	RFM69 RegSyncValue3
550	1	RFM69 RegSyncValue4
551	1	RFM69 RegSyncValue5
552	1	RFM69 RegSyncValue6
553	1	RFM69 RegSyncValue7
554	1	RFM69 RegSyncValue8
555	1	RFM69 RegPacketConfig1
556	1	RFM69 RegPayloadLength
557	1	RFM69 RegNodeAdrs
558	1	RFM69 RegBroadcastAdrs
559	1	RFM69 RegAutoModes
560	1	RFM69 RegFifoThresh
561	1	RFM69 RegPacketConfig2
562-577	1	RFM69 RegAesKey1 - RFM69 RegAesKey16
578	1	RFM69 RegTemp1
579	1	RFM69 RegTemp2
599	1	RFM69 Module Exist
600	2	RFM69 Module Encrypt Key 1
601	2	RFM69 Module Encrypt Key 2
602	2	RFM69 Module Encrypt Key 3
603	2	RFM69 Module Encrypt Key 4
604	2	RFM69 Module Encrypt Key 5
605	2	RFM69 Module Encrypt Key 6
606	2	RFM69 Module Encrypt Key 7
607	2	RFM69 Module Encrypt Key 8
608	2	RFM69 Module Network ID
609	2	RFM69 Module Node ID
610	2	RFM69 Module Mode
611	2	RFM69 Module Frequnce High Byte
612	2	RFM69 Module Frequnce Low Byte
613	1	RFM69 Module Encryption Enable
614	2	RFM69 Module Deadmaster Value (5 means 0.5ms)

Address	Bytes	Register and Description
671	2	CT Input 1 Current
672	2	CT Input 2 Current
673	2	CT Input 3 Current
674	2	CT Input 4 Current
675	2	CT Input 5 Current
676	2	CT Input 6 Current
679	2	Accelero X-axis value
680	2	Accelero Y-axis value
681	2	Accelero Z-axis value
682	2	Accelero Sensitivity Low Line
683	2	Accelero Sensitivity High Line (1023 is biggest)
1002	2	Air Flow Pressure filter(1-10)
1003	2	ad value
1004	2	prssure(0.01inWC)
1005	1	Air Flow Pressure Table Select(0 = factory table, 1 = user table)
1008	2	Air Flow Pressure Calculate Point number
1009~1028		the factory calibrate point
1029	2	Air Flow Pressure User Calculate Point number
1030~1049	2	the user calibrate table point
1052	1	flow Rate (0.1 m/s or 0.1 fps)
1053	1	Air Flow value,float type High Byte(m^3/s or cfm)
1054	1	Air Flow Value ,float type Low Byte(m^3/s or cfm)
1055	1	Air Flow Unit(0 = metric, 1 =Imperial units)
1056	1	Duct Area($0.001m^2$or $0.001ft^2$)
10000-10022		output 1 block
10023-10045		output 2 block
11472-11494		input 1 block
11495-11517		input 2 block


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 because 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
Ethernet
Firewall
Internet
Remote User
T3-BB
T3-LB
T3-TB
T3-8o
T3-22i
MAIN NET1 RS485
TSTAT8 TSTAT7 TSTAT6
VALVES
TSTAT8
RS485
Expansion I/O
SUBNET2 RS485
CHILLERS
BOILERS
VALVES
VAV
FAN COIL
Modbus
BACnet
CE
10 Year WARRANTY

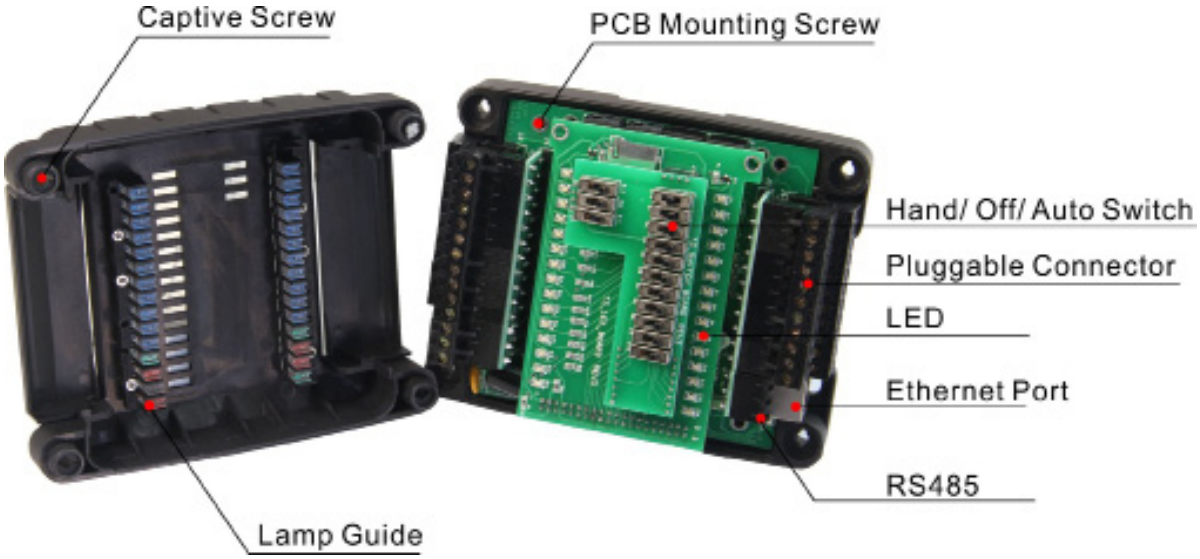
Features

- 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

- 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



Bacnet and Modbus I/O Modules

Part Number Scheme

T3 - 22i

Code	Description
T3	T3 Bacnet Modbus Module

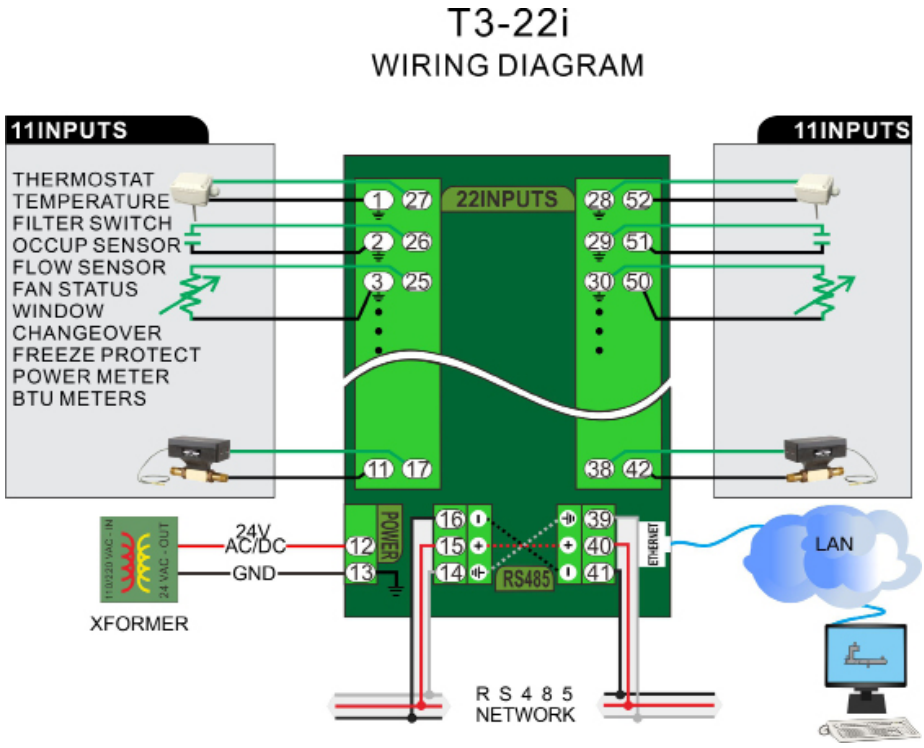
Code	Option
22i	22 Universal Inputs
8o	8 Universal Inputs, 8 Analog Outputs, 6 Relays

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.



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.*

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

Inputs

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

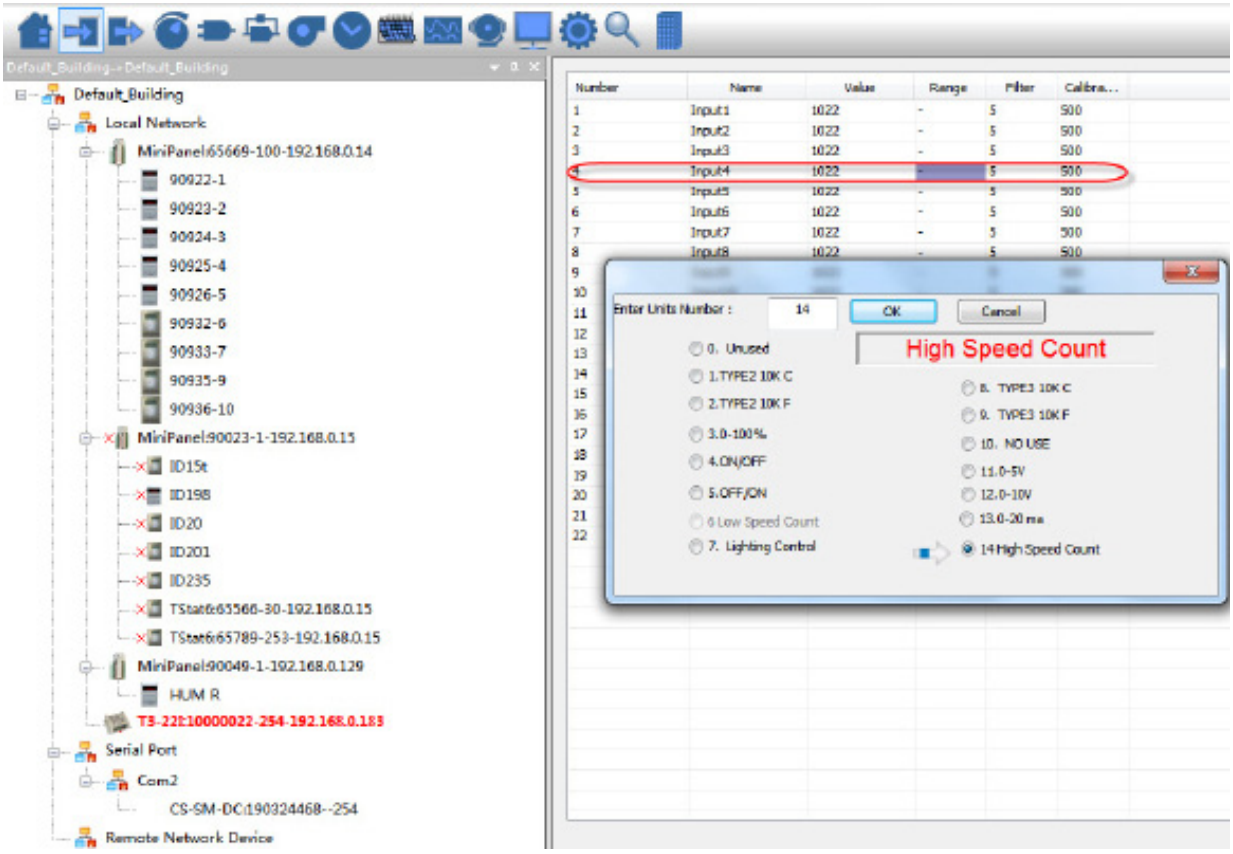
0-5V
0-10V
4-20mA
10K type2 NTC
pulse counter

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 1KHz pulse input
		12-22	122-143	Low Speed: Support up to 10Hz pulse input
T3-8o	8		116-131	Low Speed: Support up to 10Hz 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

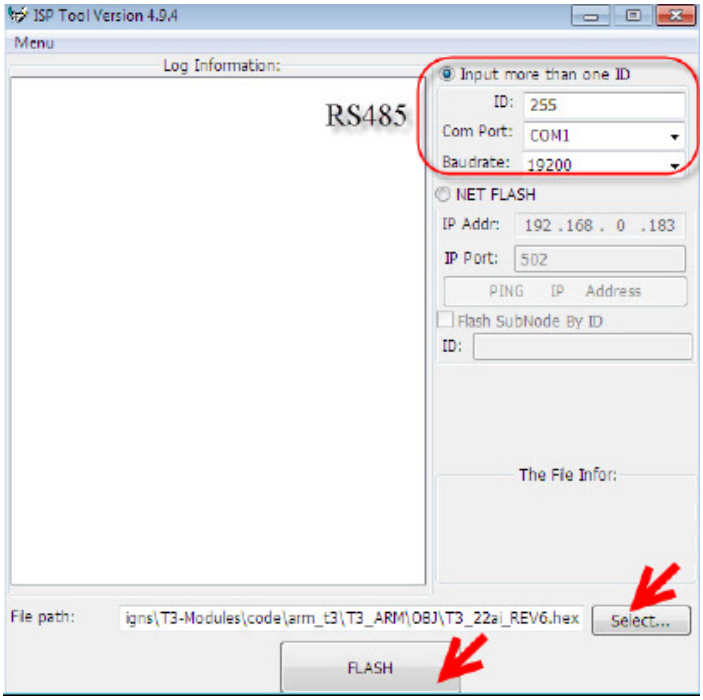


There are two ways to update the firmware, T3000 and ISPTool. For ISPTool, it also contains RS485 network and Ethernet.
Download T3000 software http://tinyurl.com/y7uyu9n3 and install it.
Then you will see two icons on your desktop, T3000 and ISPTool.

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.

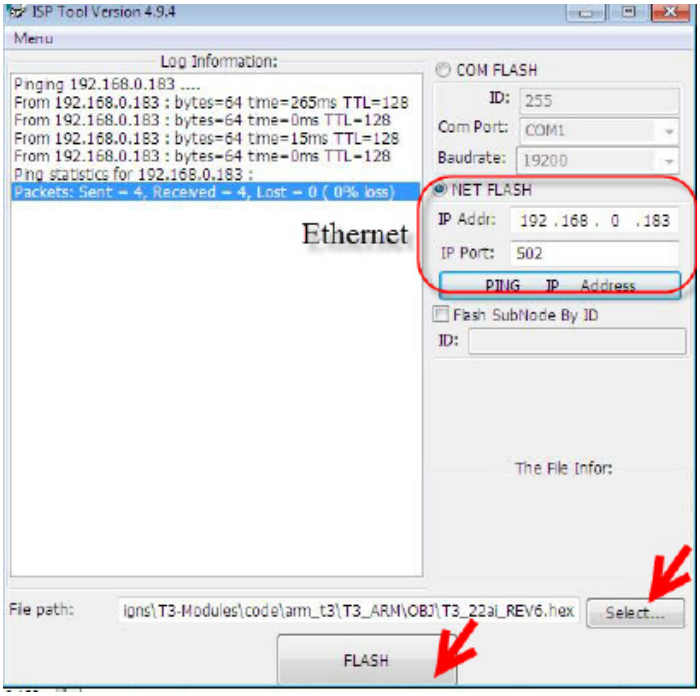
1) Start ISPTool software, as below photo shows, you will see RS485 setting, click and choose it.
2) Set broadcast ID 255 or module Modbus ID.
3) Choose the com port what you used and click select to choose the file you prepare to program.
4) Turn on the power of the T3-8o, within the first 10 seconds of powerd on, click flash.

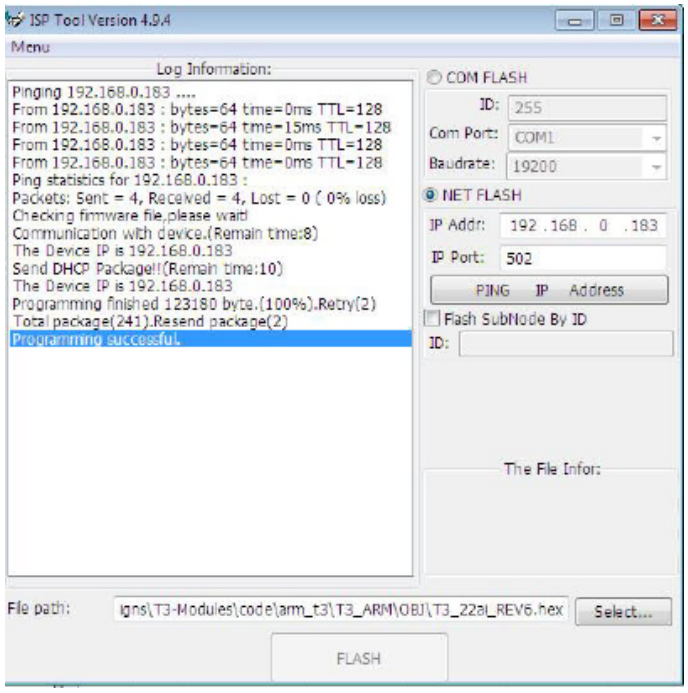


2. Use ISPTool Ethernet to Update

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.

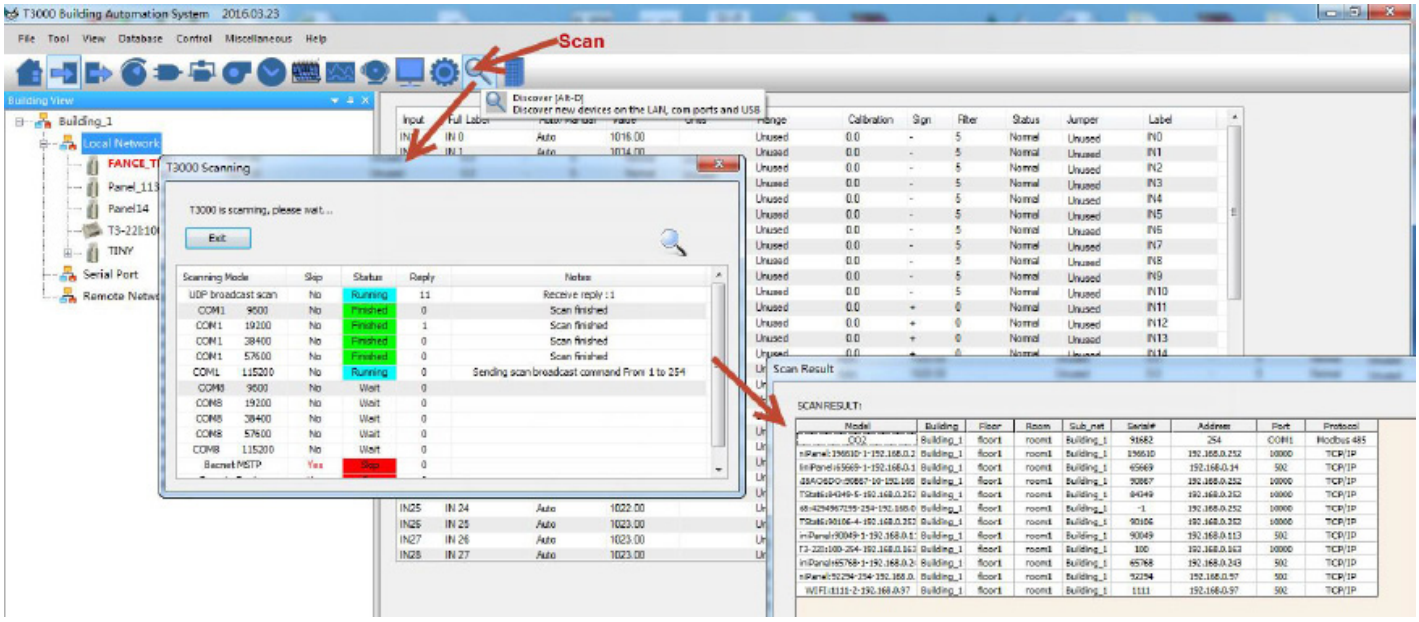
1) Start ISPTool software, as below photo shows, you will see Ethernet setting.
2) Set IP address, ensure that the IP address of the module and the IP address of the computer must in the same subnet.
3) Set IP port to 502.
4) Click “PING IP Address” to check whether the communication is good. If not, then check the wire and setting. If it’s good as below the screen shot, after you choose the file, click FLASH to program.



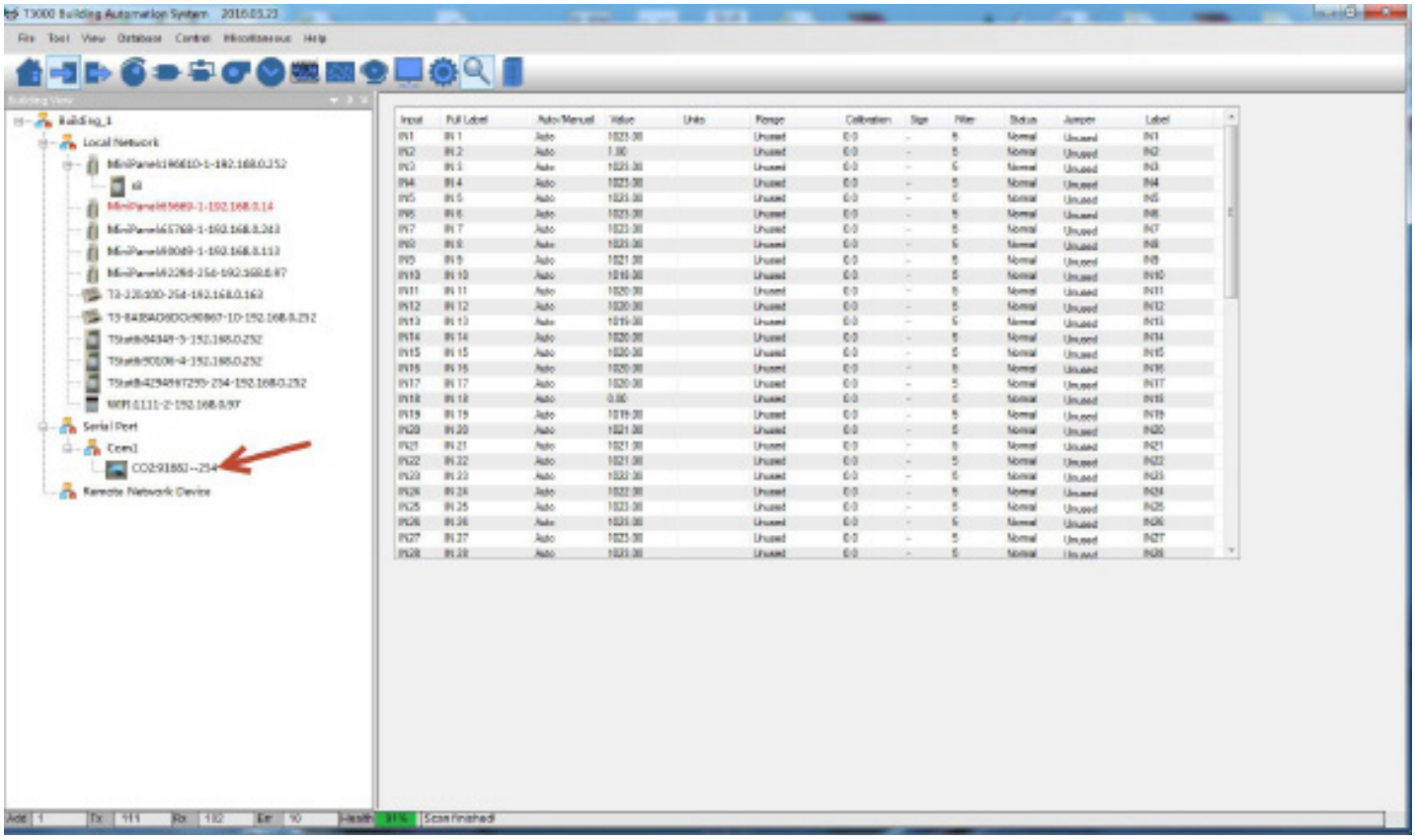


3. Use T3000 to Update

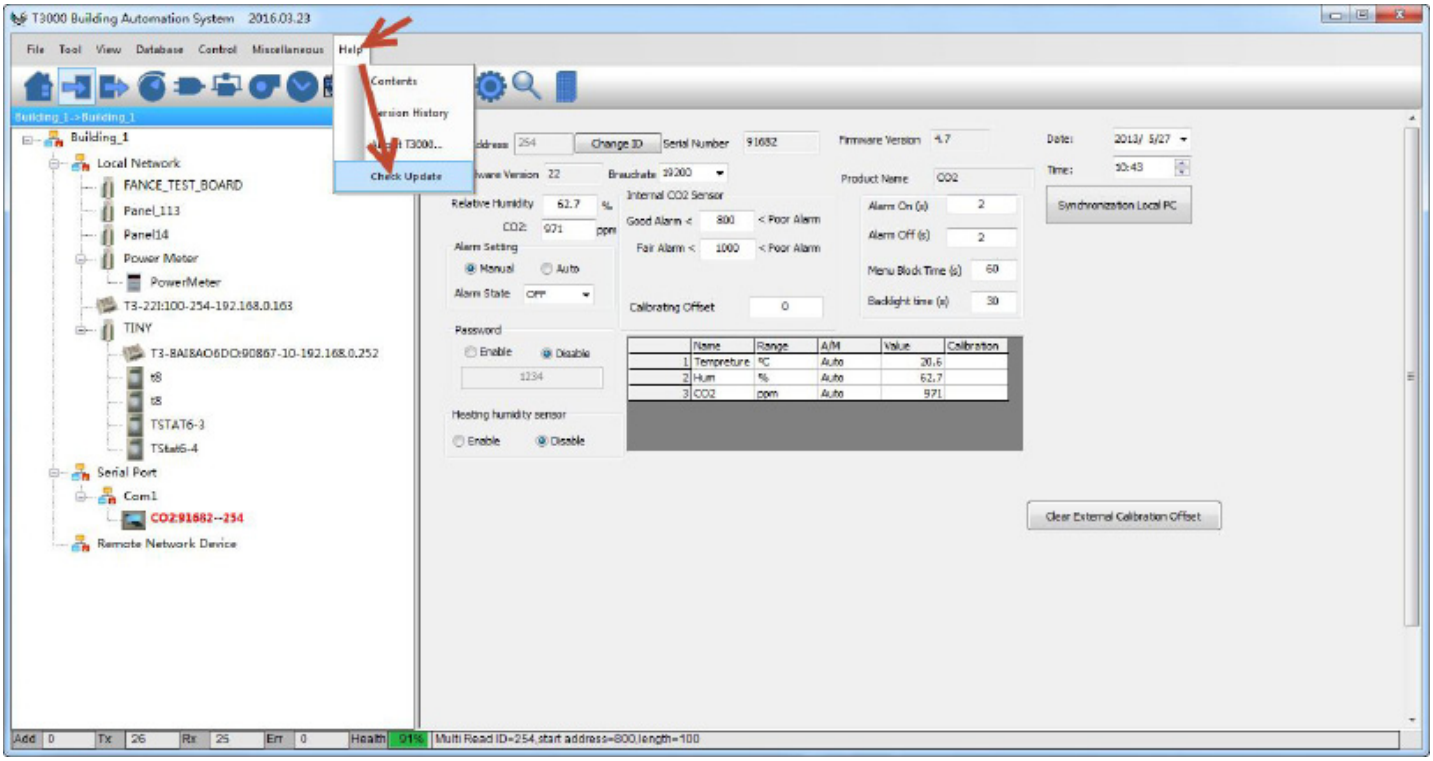
1). Connect your device to PC via RS485 or Ethernet cable, then start T3000 software and click the 'Scan'.

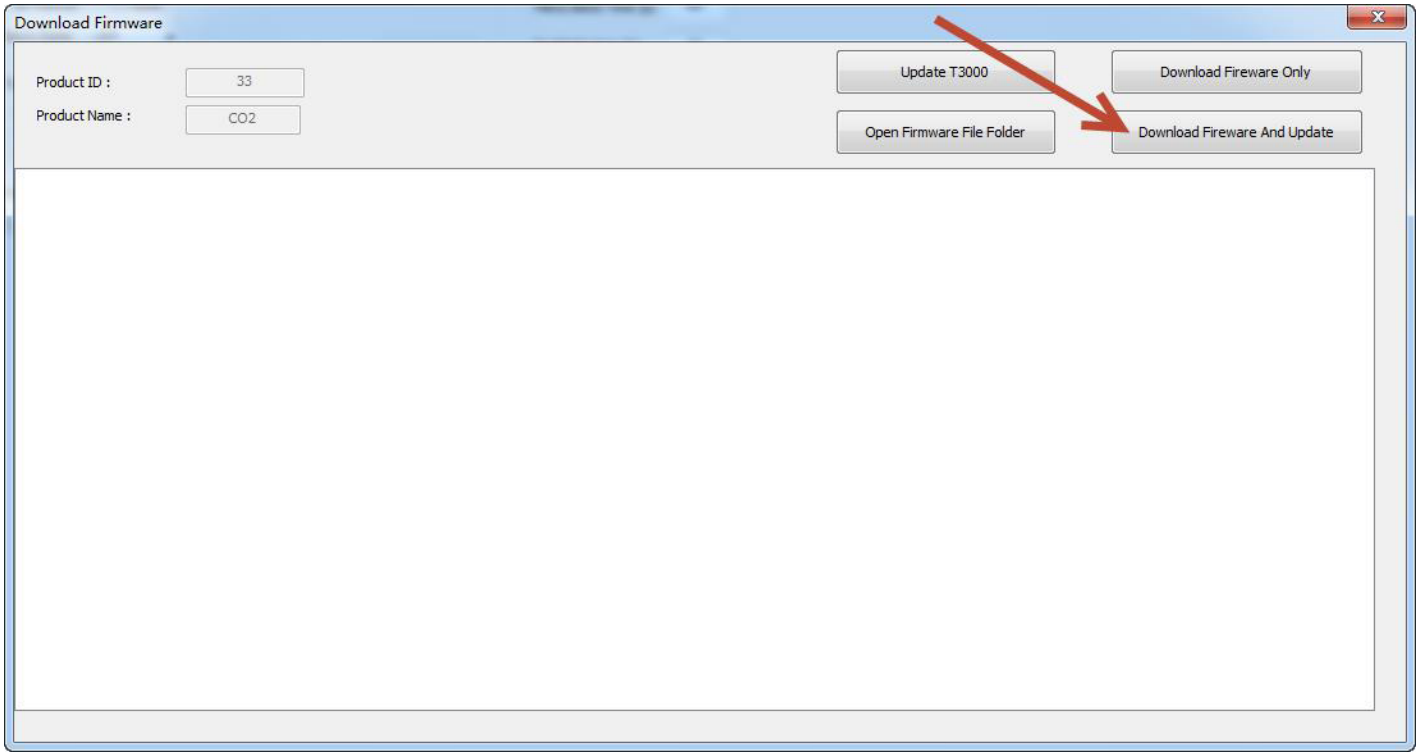


2). You will get the devices on the left device tree.

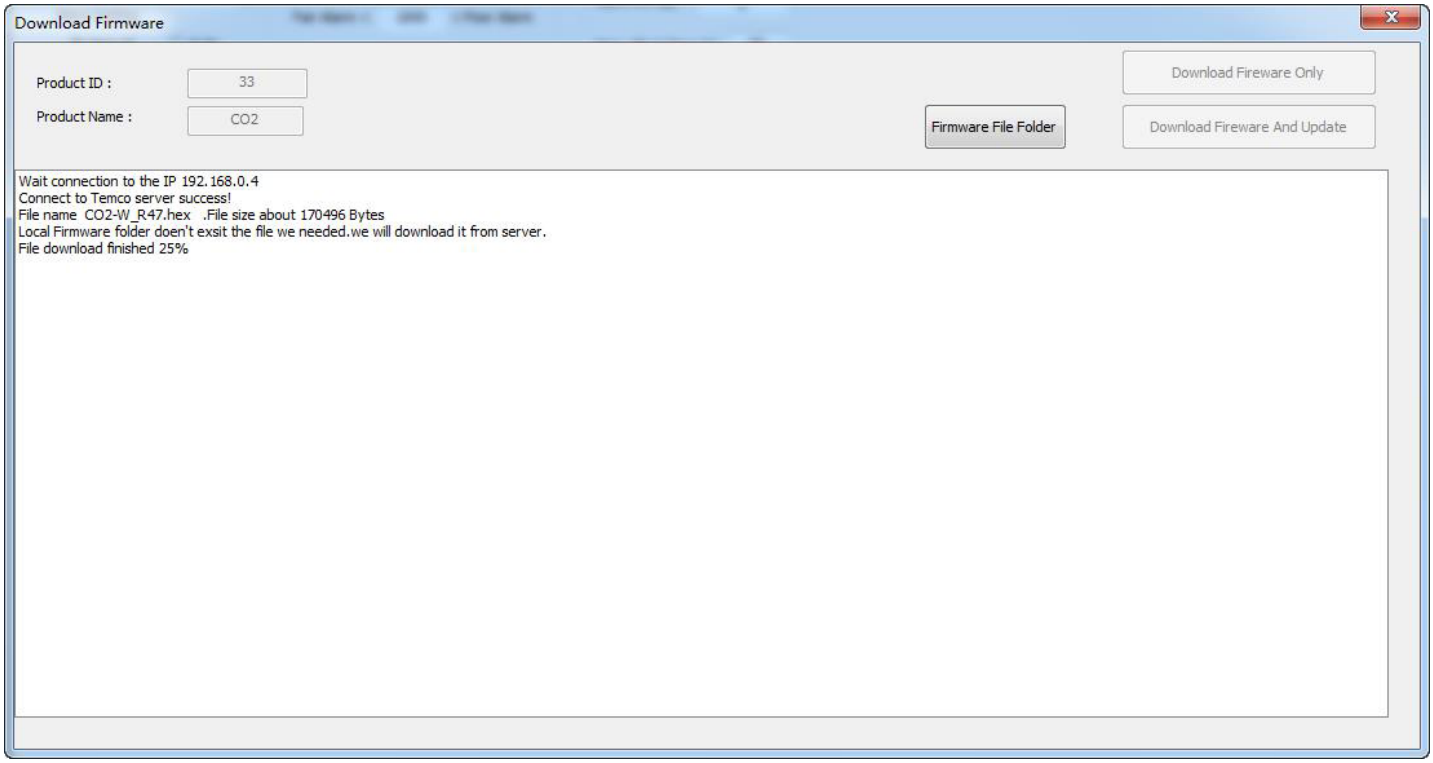


3). Update the firmware online.

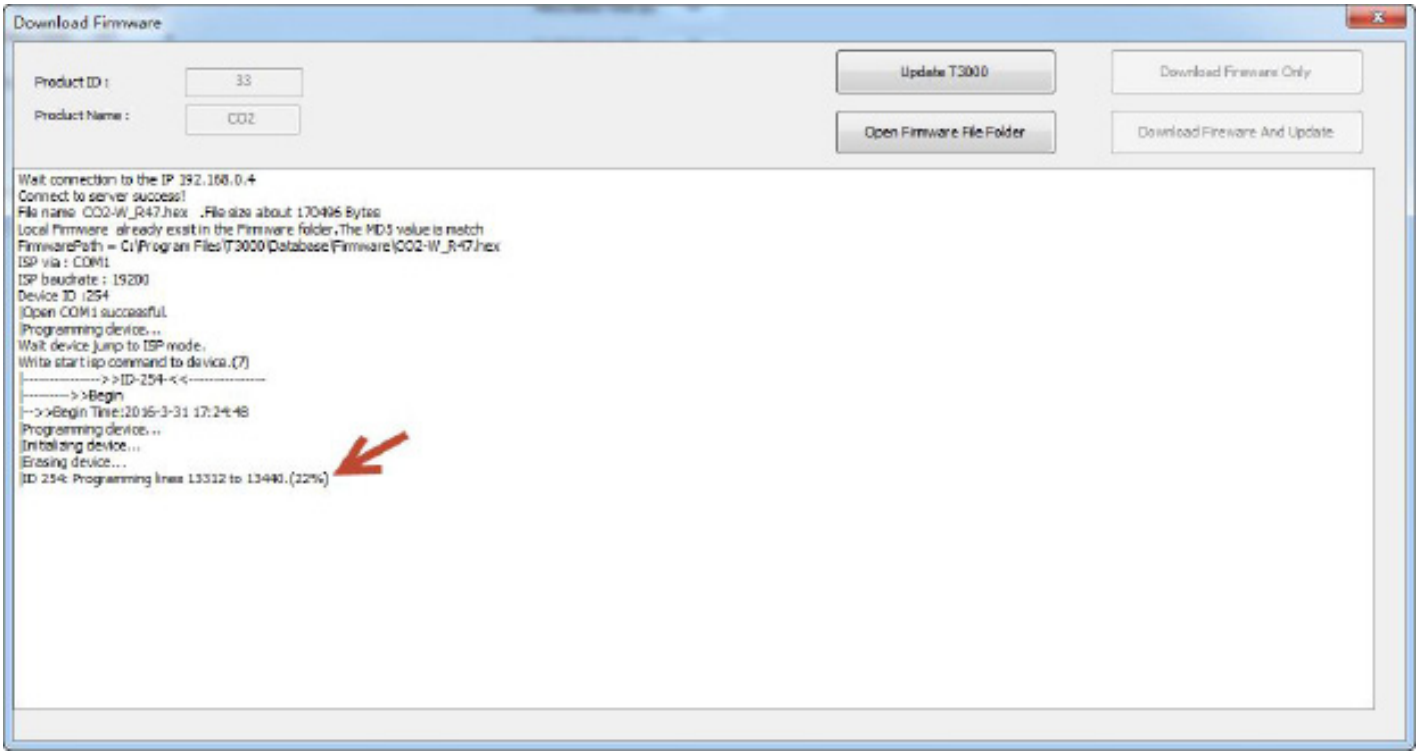




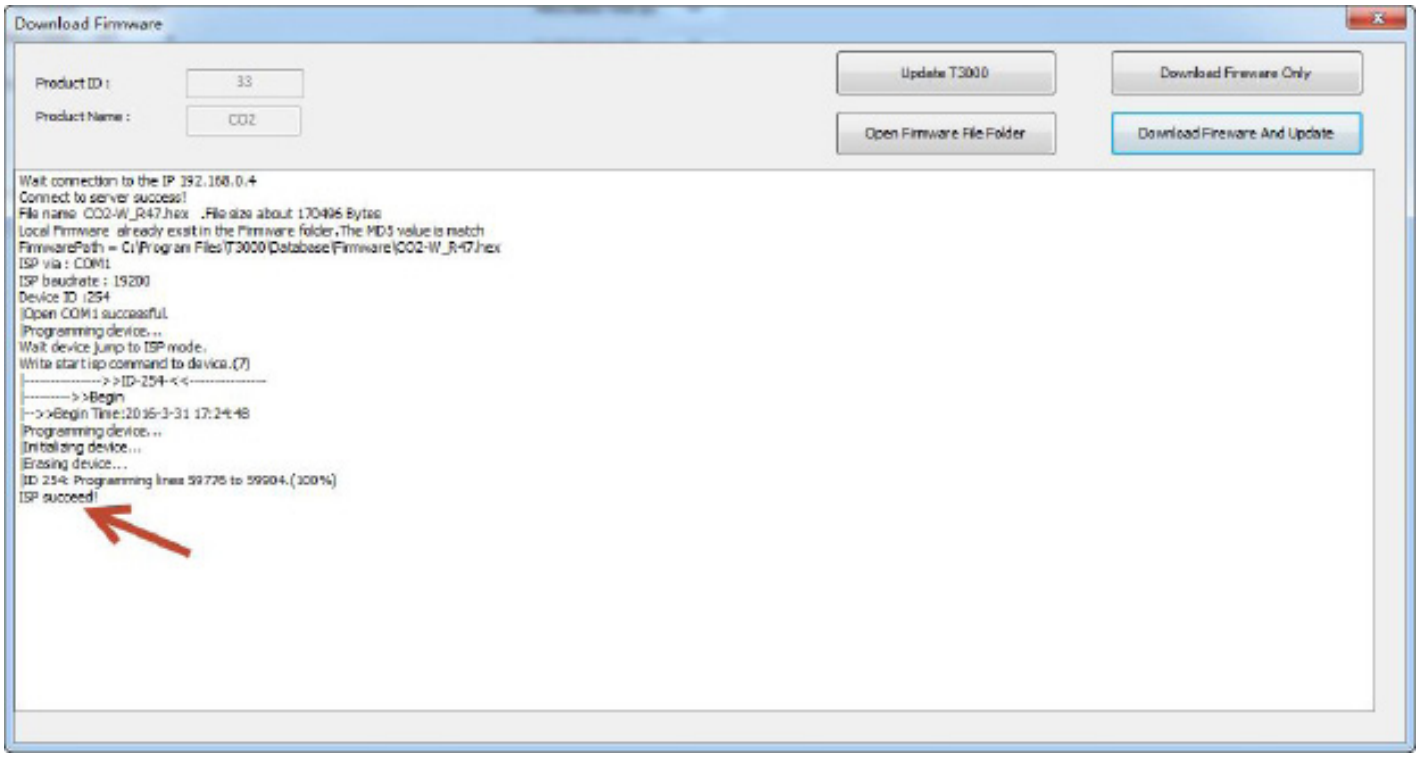
Downloading the firmware:



Updating the firmware:

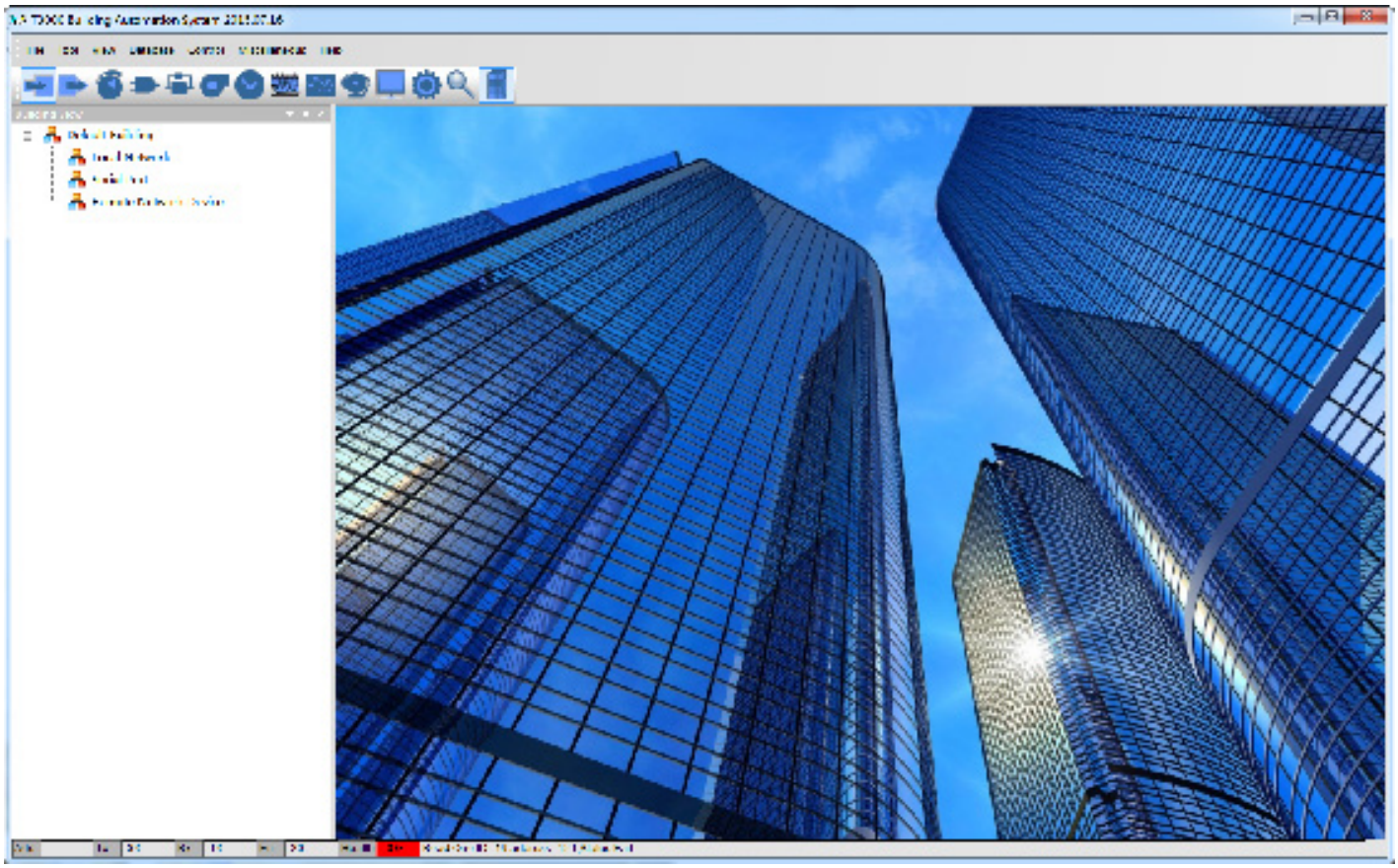


Update done.

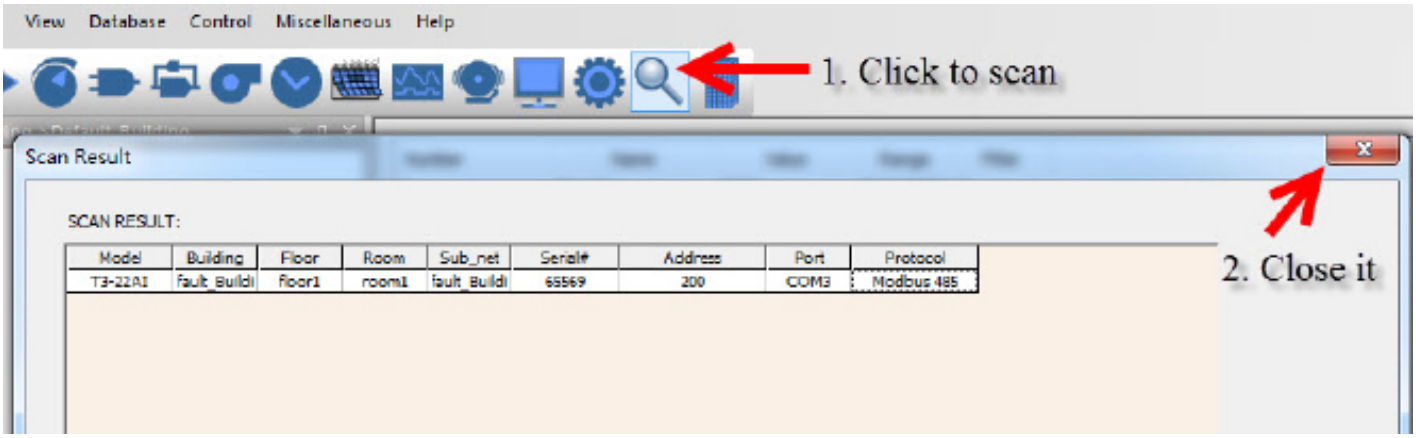


T3000 Software Introductions

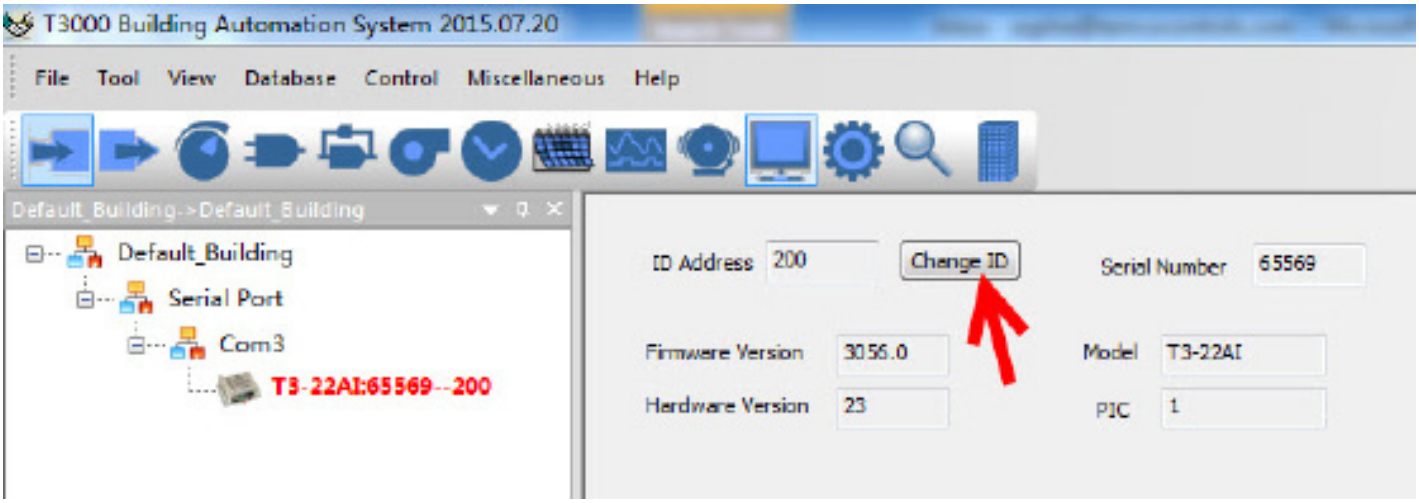
1. Visit https://temcocontrols.com/ftp/software/09T3000Software.zip, download T3000 software and install it;
2. Connect T3-22i to PC via RS485 at pin 14, 15 and 16 or Ethernet. Open the software T3000, it will



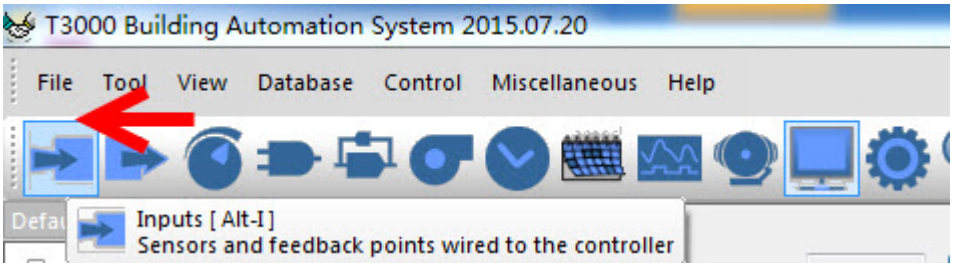
3. Click scan, it will open below the window view, then close it.

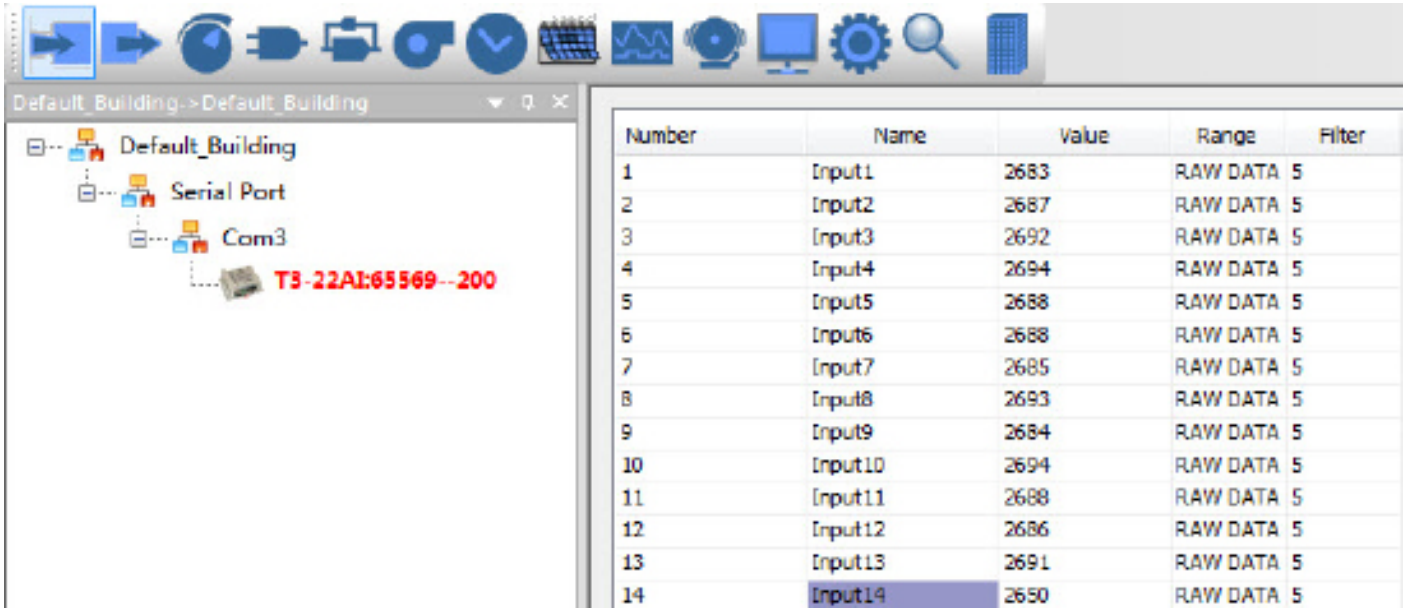


4. Click T3-22i log, it will show all the information of it.

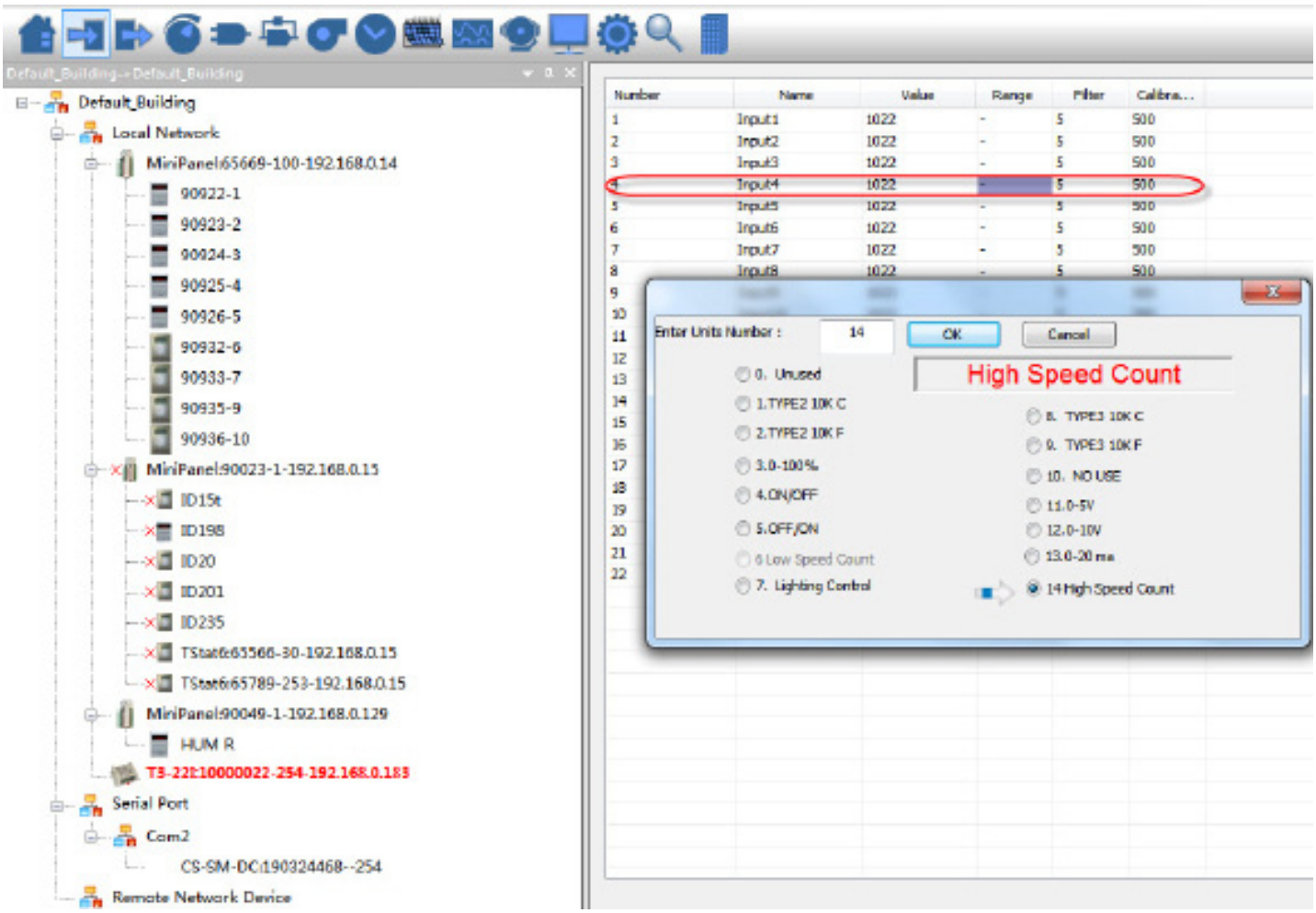


5. Click input, it will show the view of all inputs. For T3-22i, from input channel 1-11, it's high speed pulse counters. From input channel 12-22, it's low speed pulse counters.

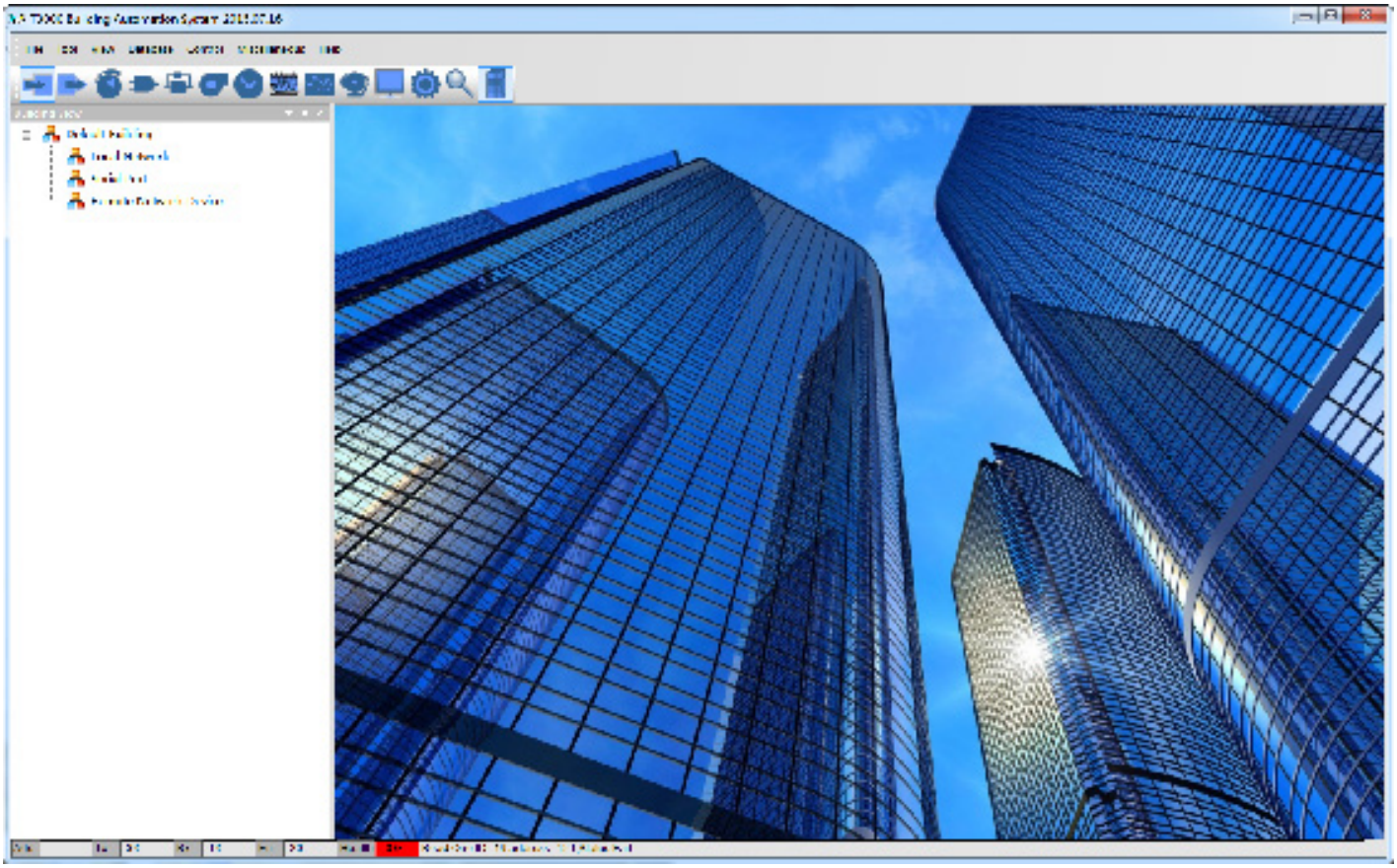




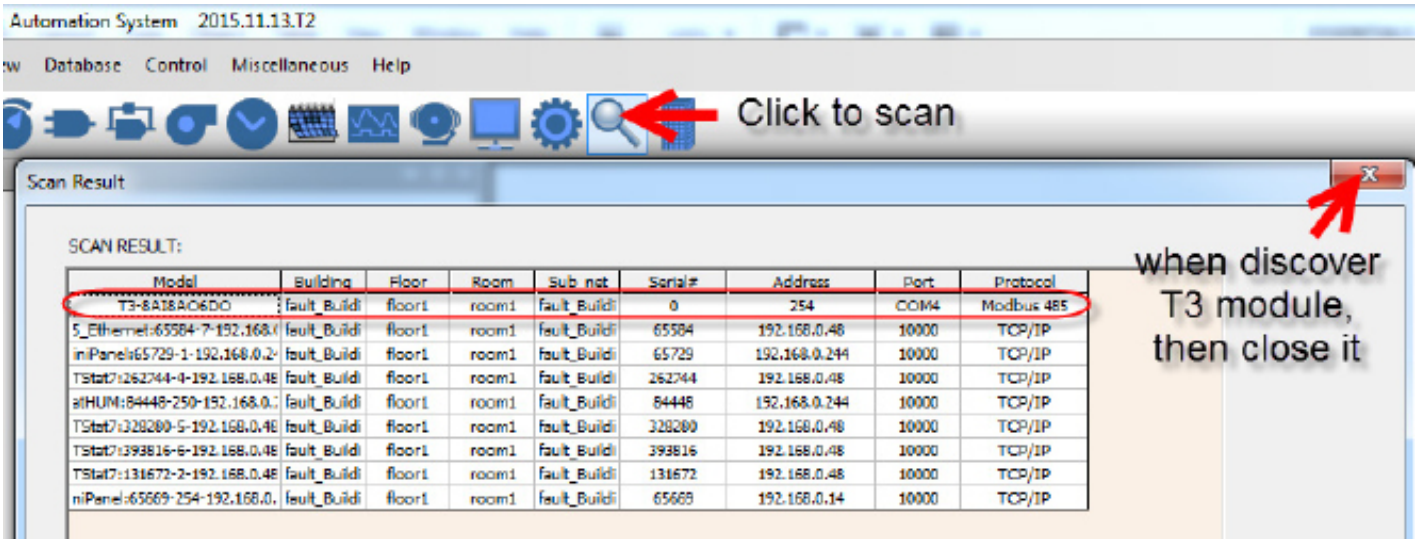
Bacnet and Modbus I/O Modules



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

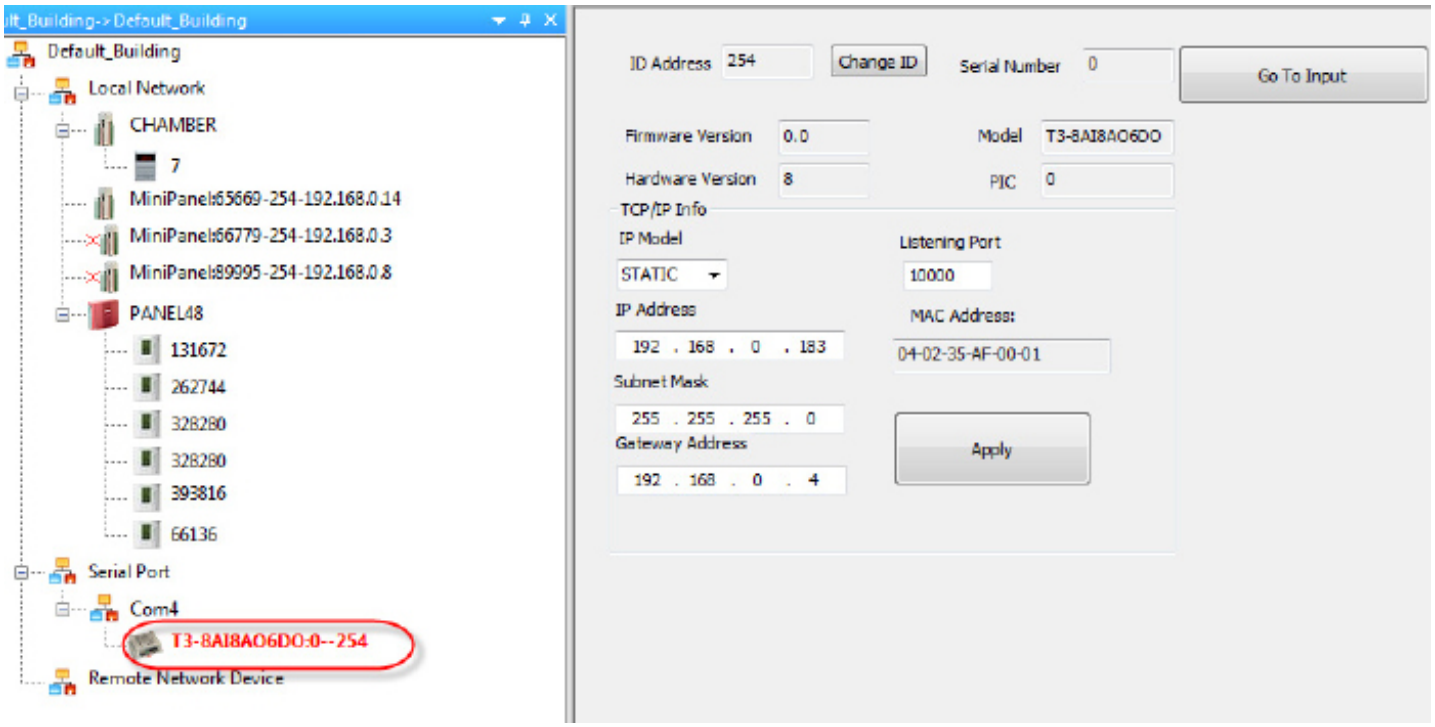


3. Click scan, it will appear one pop up window.

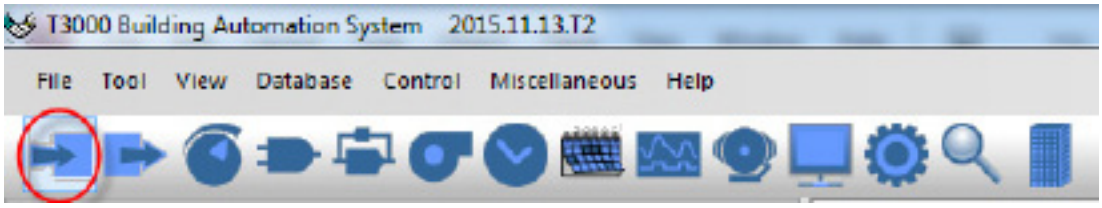


Model	Building	Floor	Room	Sub_net	Serial#	Address	Port	Protocol
T3-8AI8AO6DO	fault_Build	floor1	room1	fault_Build	0	254	COM4	Modbus 485
5_Ethernet:65584-7-192.168.(	fault_Build	floor1	room1	fault_Build	65584	192.168.0.48	10000	TCP/IP
niPanel:65729-1-192.168.0.2	fault_Build	floor1	room1	fault_Build	65729	192.168.0.244	10000	TCP/IP
TStat7:262744-4-192.168.0.48	fault_Build	floor1	room1	fault_Build	262744	192.168.0.48	10000	TCP/IP
atHUM:84448-250-192.168.0.2	fault_Build	floor1	room1	fault_Build	84448	192.168.0.244	10000	TCP/IP
TStat7:328280-5-192.168.0.48	fault_Build	floor1	room1	fault_Build	328280	192.168.0.48	10000	TCP/IP
TStat7:393816-6-192.168.0.48	fault_Build	floor1	room1	fault_Build	393816	192.168.0.48	10000	TCP/IP
TStat7:131672-2-192.168.0.48	fault_Build	floor1	room1	fault_Build	131672	192.168.0.48	10000	TCP/IP
niPanel:65669-254-192.168.0.	fault_Build	floor1	room1	fault_Build	65669	192.168.0.14	10000	TCP/IP

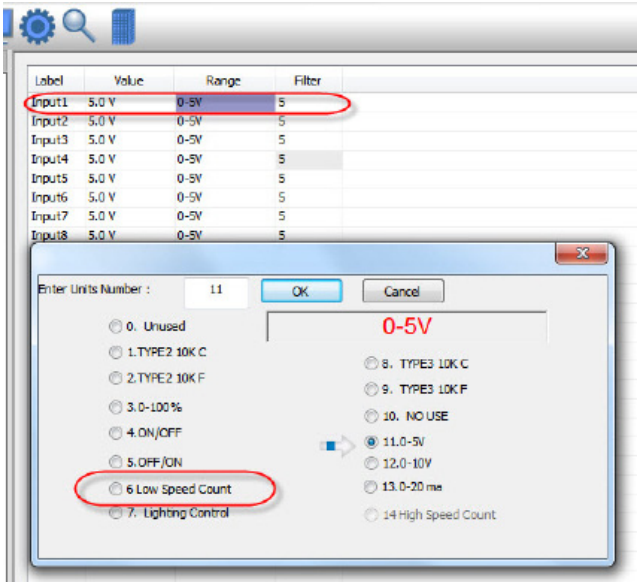
4. Click T3-8o log, it will show all the information of it.



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

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

Precision Pt Temperature Sensor Module

Description



The T3-PT12 is a precision temperature measurement module which can accept up to twelve instrument grade sensors. The unit accepts platinum Pt elements, either 100 ohm or 1k ohm variety. It also can accept 10k thermistors, Type II and Type III. Cabling can be accomplished using two , three or four wire connections. Communications is supported over Bacnet and Modbus over both RS485 and the Ethernet ports. All readings and the various settings are available as Bacnet objects and Modbus registers.

Highlights:

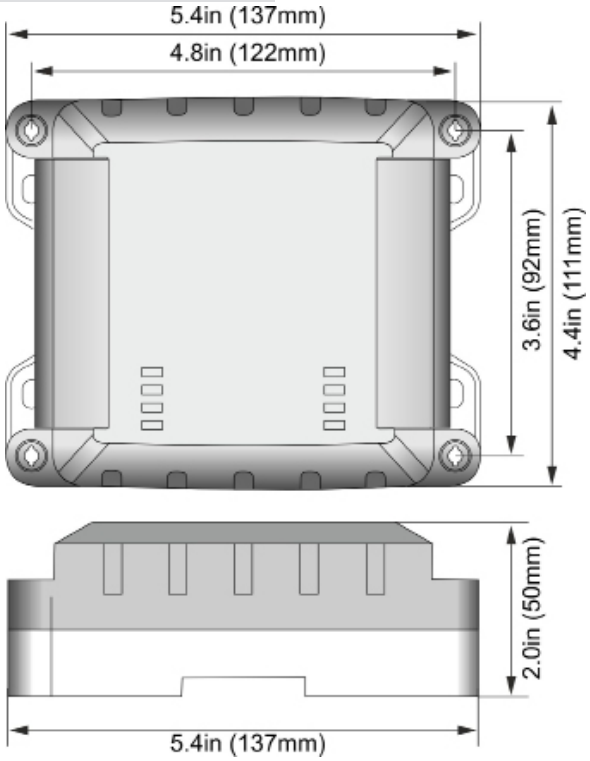
- 12 Analog PT100 or PT1000 Inputs
- Serial RS485 Standard
- Light-weight and Compact
- Probe Connection: 2, 3 and 4 wires
- Communications: Bacnet and Modbus protocol Supports both MSTP and IP connections
- UL listed ABS enclosure with rubberized texture creates a high end feel
- The RS485 port has separate upstream and a downstream connectors to make troubleshooting easier
- 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
- T3000 front end is free and open source: http://tinyurl.com/hgxavu5

Specifications

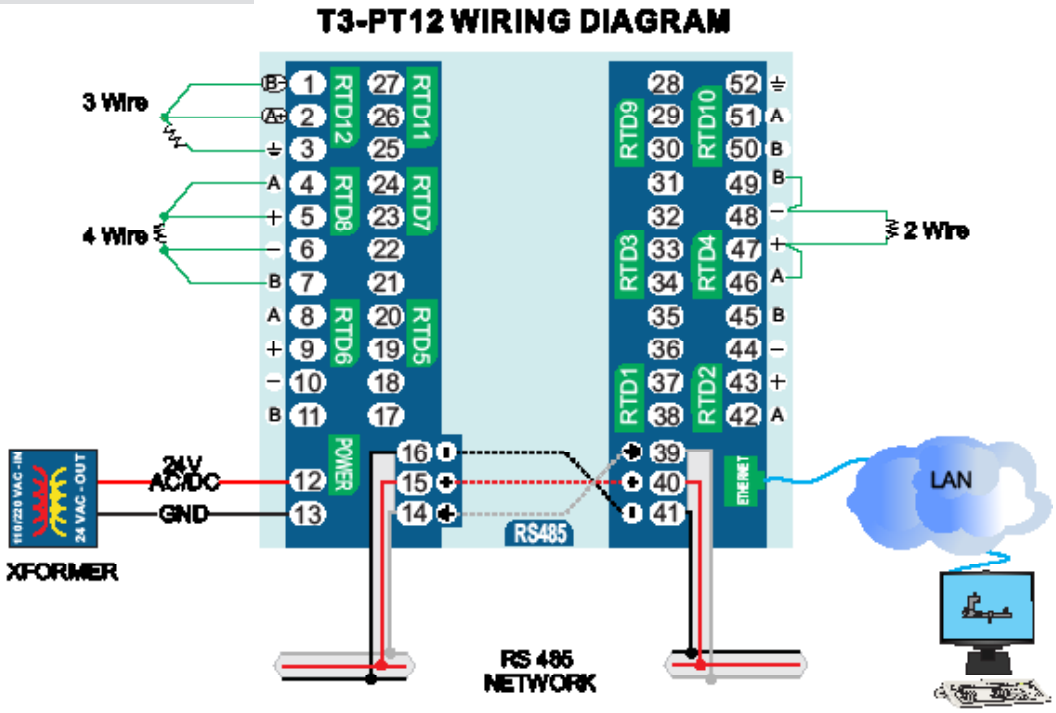
Sensor Type	PT100 or PT1000	
	Accuracy	**Temperature Range**
PT100	+/- 0.01°C	-200°C to 300°C
PT1000	+/- 0.01°C	-200°C to 300°C
Probe Connection	2, 3 and 4 wires	
Communications	Bacnet and Modbus protocol, supports both MSTP and IP connections	
Power Supply	12~24VAC/DC ±10%, 50-60Hz	
Baudrate	9600, 19.2k, 38.4k, 57.6k, 115.2kBaud	

Precision Pt Temperature Sensor Module

Dimension



Wiring Diagram

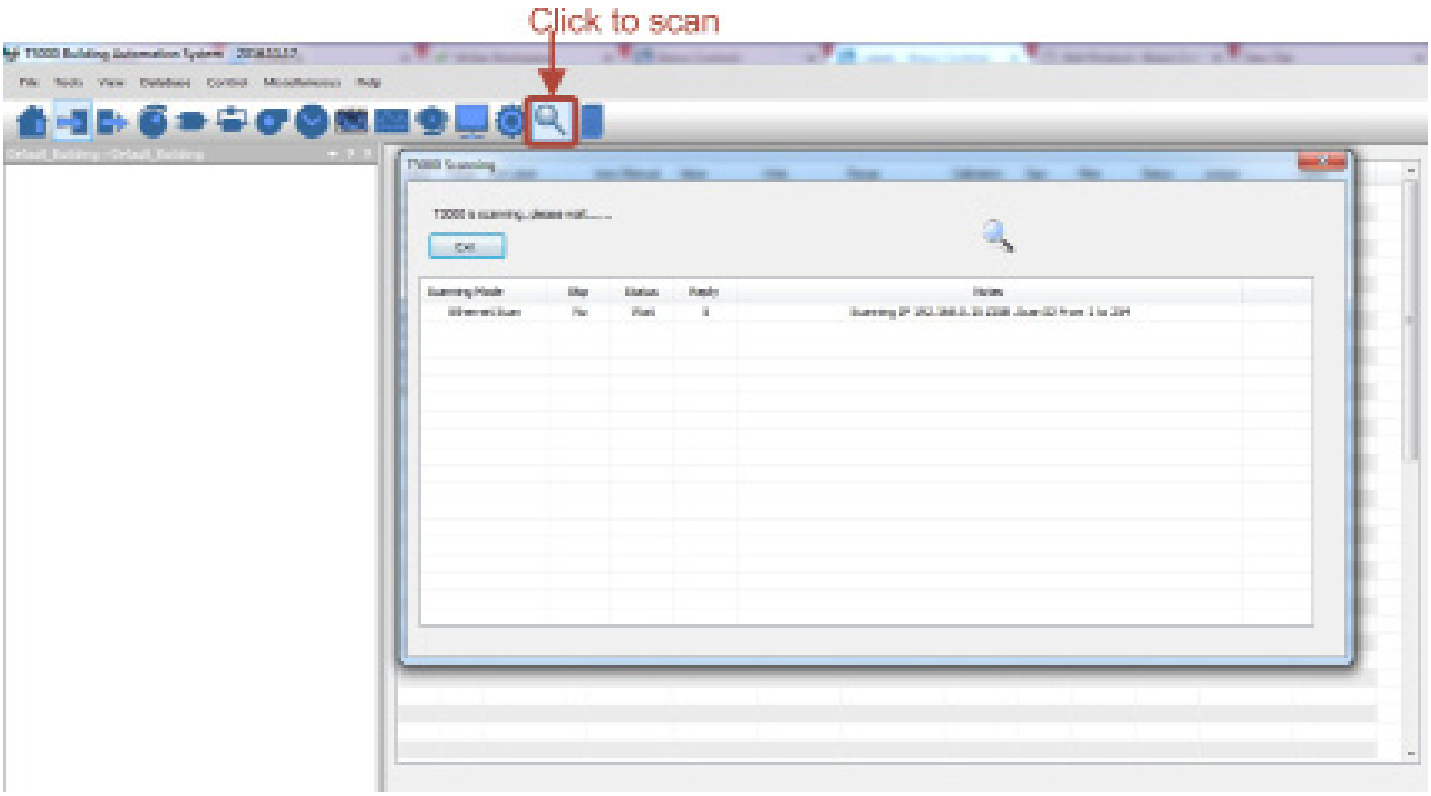


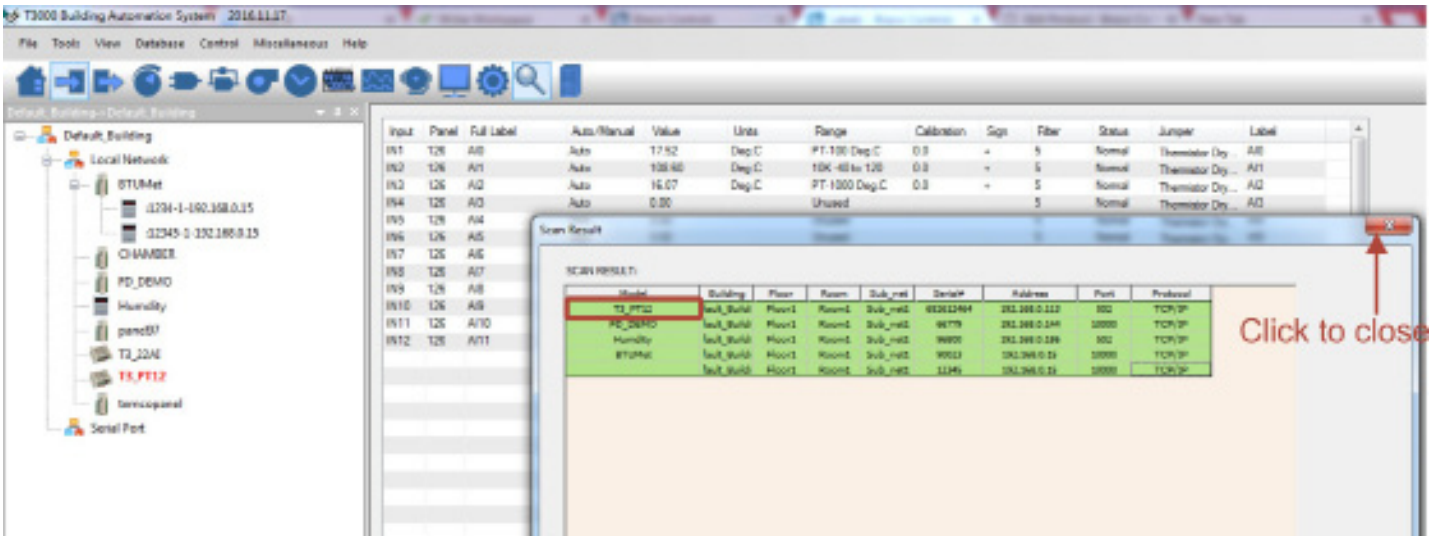
1: There are eight connectors including RTD1 to RTD8 which support 2, 3 and 4 wire sensors.
2: Due to limitations on the space, the four other connectors including RTD9 to RTD 12 only support 2 and 3 wire connections.
3: The RS485 port has two connectors, one typiocally for upstream devices and the other for down-stream devices. These two connectors are internally tied together.

T3000 Operation

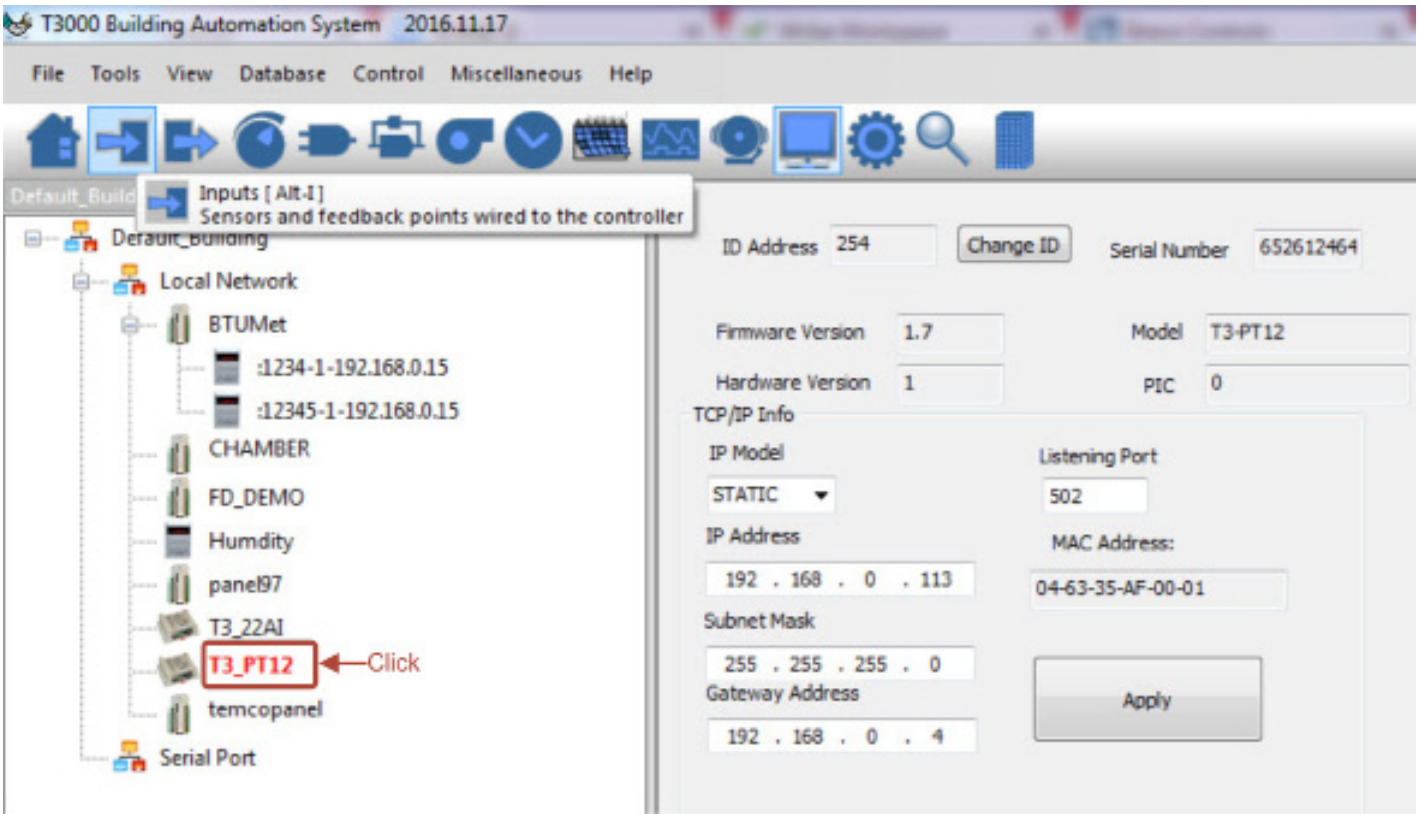
1). Connect sensor T3-PT12 to PC by RS485.

2). OPEN T3000 and click the button to scan. The following view will appear then close it as the picture shows.

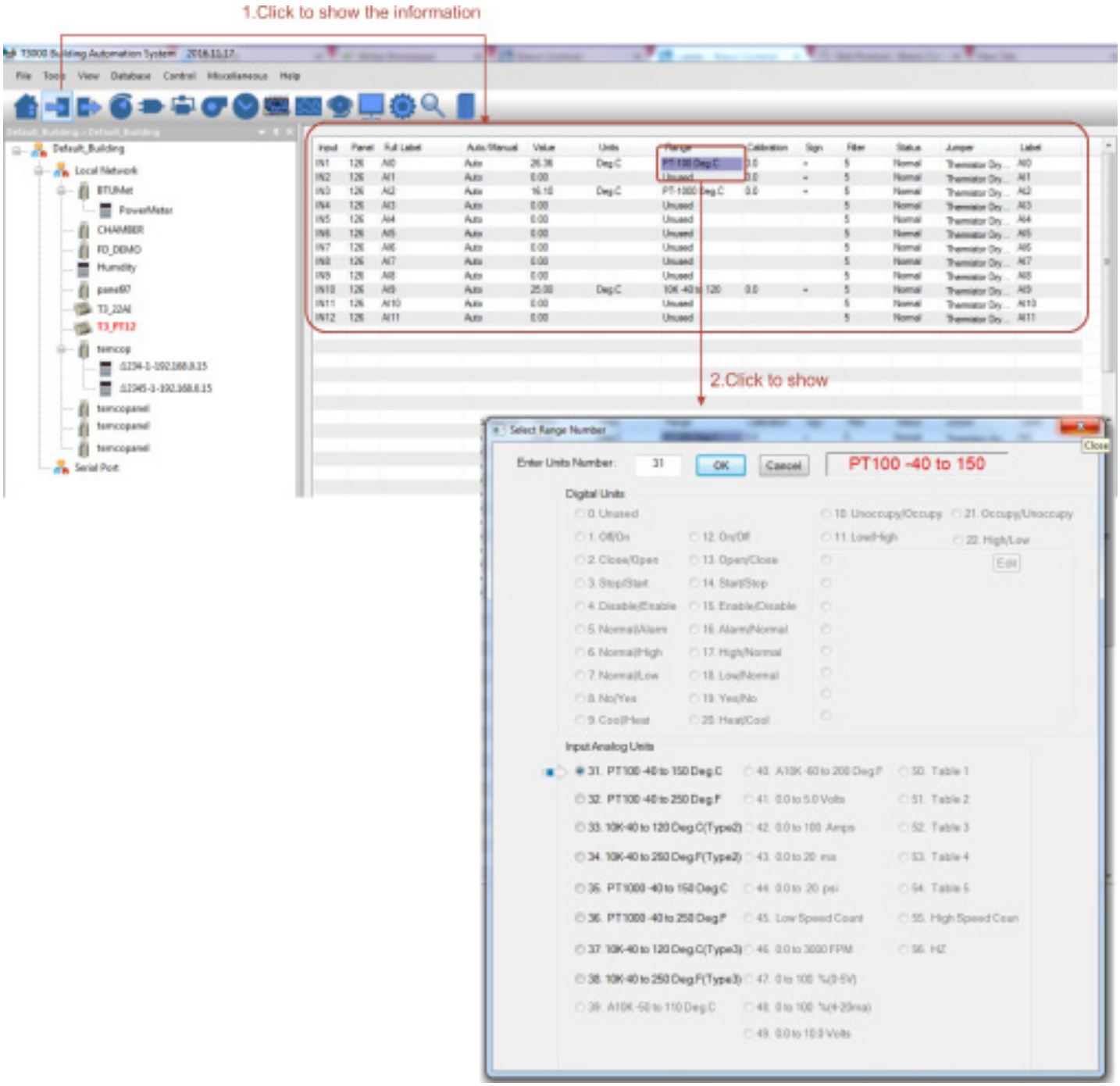




3). Click T3-PT12 log and the T3000 will show all the information.



4). Click the Range ‘PT-100Deg.C’ log and the T3000 will show the information.



User's Manual



T3-8AI8AO: 8 Universal Input
8 analog output



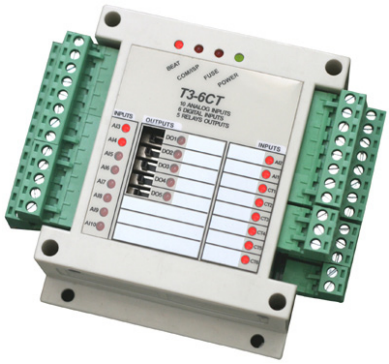
T3-4AO: 10 Universal Inputs
4 Analog Outputs
8 dry-contact relay outputs



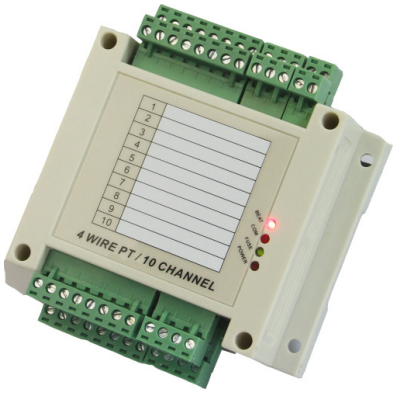
T3-32I: 32 Universal Inputs



T3-8I13O: 8 Universal Inputs
13 relay outputs



T3-6CT: 10 Universal Inputs
6 AC Current Inputs (6 CTs)
5 Relay Outputs



T3-PT10: 10 Universal PT100 Inputs

T3 Series Modbus I/O Modules

1 Introduction

1.1 About this manual

The purpose of this manual is to provide instructions to simply and quickly install and operate the T3 Module equipment. The manual begins with a general description of the product followed by the instructions for correct hardware installation. Its configuration and operation of the device are described in detail later in the manual.

1.2 General Description

The T3 Series are general purpose input / ouput modules for building integrators. Available in several input/output configurations, the T3 Series modules provide convenient termination for field devices and interfacing to your HVAC, lighting, temperature sensors, and other typical building automation applications. Each of the analog inputs can be jumper configured for signals of either 0-5V, 0-20mA, or dry contact. The outputs are available in dry contacts 1amp/output, 0-10V analog, and PNP sinking. The modules are slave devices that can be easily controlled via the RS485 serial interface using the industry standard Modbus Protocol.

Highlights:

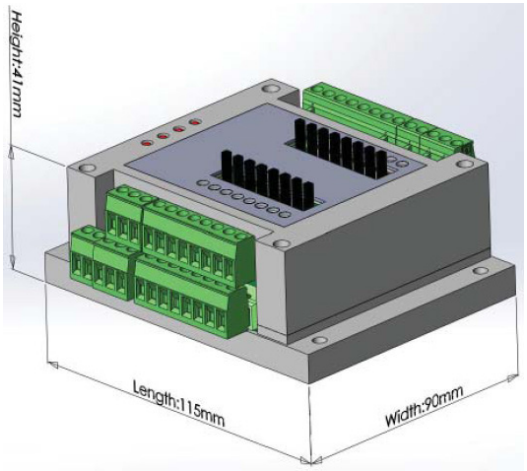
- Surge-Protected Analog Inputs with 10-bit Resolution
- Outputs can Individually be switched to ON, OFF, AUTO
- High Impact Plastic Enclosure provides durability in commercial environments
- Standard Modbus Protocol allows for up to 254 unique devices on one RS485 Network

1.3 Technical Data

T3-8AIAO	8 Analog Outputs @ 0-10VDC 200mA total, 8 Analog Inputs @ 0-5V, 0-20mA, Dry
T3-32I	32 Analog Inputs @0-5V, 0-10V, 0-20mA, Dry
T3-8I13O	13 Dry-contact relay outputs x 2amps @120V, 8 analog inputs @0-5V, 0-20mA, dry
T3-4AO	8 dry-contact relay outputs x2amps @120V, 4 analog outputs @0-10V, 10 analog input @ 0-5V, 0-10V, 0-20mA, dry
T3-6CT	T3 series, general purpose 10 Analog Inputs, 6 Digital Inputs, 5 Relay Outputs, RS485 network
T3-PT10	T3 series, 10 Universal PT100 Input module, with 2-3 or 4 wire connections, RS485 network
Operating Temperature	-30~70°C (-22~158°F)
Supply Voltage	12~24VAC/DC ±10%, 50-60Hz
Power Consumption	100mA at 12VDC
Relay Contacts Rating	Max 2A
Ambient Humidity	10-90 %Rh
Plastic Housing	Flammability Rating UL 94V0 File E194560
Enclosure Rating	IP31
Temperature Sensor	10K Thermistor ±0.5°C
Color	White/Off-White

T3 Model	Universal Inputs		AO	DO
--	0-5V 0-20mA	0-5V 0-10V 0-20mA	--	--
T3-8AI8AO	8	--	8	--
T3-32I	--	32	--	--
T3-8I13O	8	--	--	13 Relay 120VAC, 2A
T3-4AO	--	10	4	13 Relay 120VAC, 2A
T3-6CT	10 Universal Inputs, 6 AC Current Inputs (6CTs), 5 Relay Outputs			
T3-PT10	10 x PT100 inputs, 2-3-4 wire			

Dimensions: 115(L) x 90(W) x 40mm(H)



T3 Series Modbus I/O Modules

T3-4AO

Description

The T3 Series are general purpose input / output modules for building integrators. Available in several input/output configurations, the T3 Series modules provide convenient termination for field devices and interfacing to your HVAC, lighting, temperature sensors, and other typical building automation applications. Each of the analog inputs can be jumper configured for signals of either 0-5V, 0-20mA, or dry contact.The outputs are available in dry contacts 2amp/output, 0-10V analog, and PNP sinking. The modules are slave devices that can be easily controlled via the RS485 serial inter face using the industry standard Modbus Protocol.



Highlights:

- Surge-Protected Analog Inputs with 10-bit resolution.
- Outputs can individually be switched to ON, OFF or AUTO.
- High Impact Plastic Enclosure Provides durability in commercial environments.
- Standard modbus protocol allows for up to 254 unique devices on one RS485 network.

Special Features

The T3-4AO has a few additional features which the other T3 series do not have due to a more advanced CPU. For example the faster scan rates for the inputs In on/off mode, inputs 3 through 10 can count pulses up to 1 khz on each channel.
In analog mode, inputs 3thru 10 are 12 bits compared to the previous 12 bits, inputs 1 and 2 remain as 8 bits and slower at pulse counting.
For developers there is a significant improvement with the larger rom and ram space: 128k versus 64k for the flash space and 3k ram versus 1k of ram space compared to the earlier models. This gives more room for developers to add features such as Bacnet, PLC type logic, logging, etc. Secondly there's an additional serial port, currently the port is unused but developers will be able to use the second port to manage a subnet of local sensors, keypads and displays for example, or use it in repeater mode to extend and isolate the RS485 main network.

Technical Data

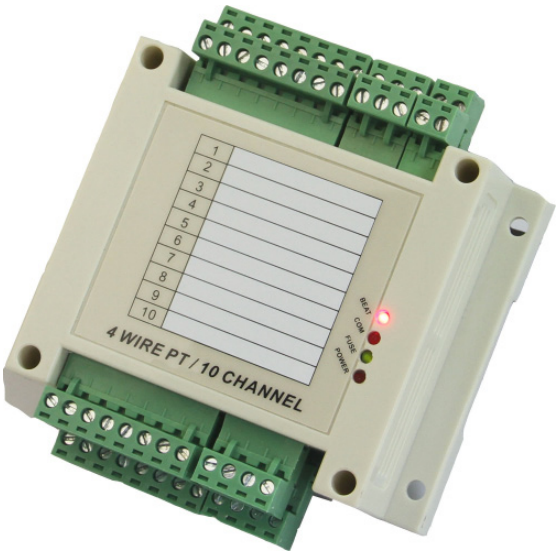
T3-4AO	8 Dry-Contact Relay Outputs x 2amps @120V, 4 Analog Outputs @0-10V, 10 Analog Input @ 0-5V, 0-10V, 0-20mA, Dry
Operating Temperature	-30~70°C (-22~158°F)
Supply Voltage	12~24VAC/DC ±10%, 50-60Hz
Power Consumption	100mA at 12~24VAC/DC
Relay Contacts Rating	Max 2A
Ambient Humidity	10-90 %Rh
Plastic Housing	Flammability Rating UL 94V0 File E194560
Enclosure Rating	IP31
Temperature Sensor	10K Thermistor ±0.5°C
Color	White/Off-white
Dimensions	115 x 90 x 40mm

T3 Series Modbus I/O Modules

PT-10

Description

The PT-10 is a low-cost, high-accuracy digital thermometer read out designed with 10 Univeral PT100 Inputs. Its combination of features makes this instrument well suited for a wide variety of industrial applications.



Highlights:

- 10 Universal PT 100 Inputs
- Serial RS 485 Standard
- Light-weight and Compact
- Usable with 2, 3 or 4 Wire connections

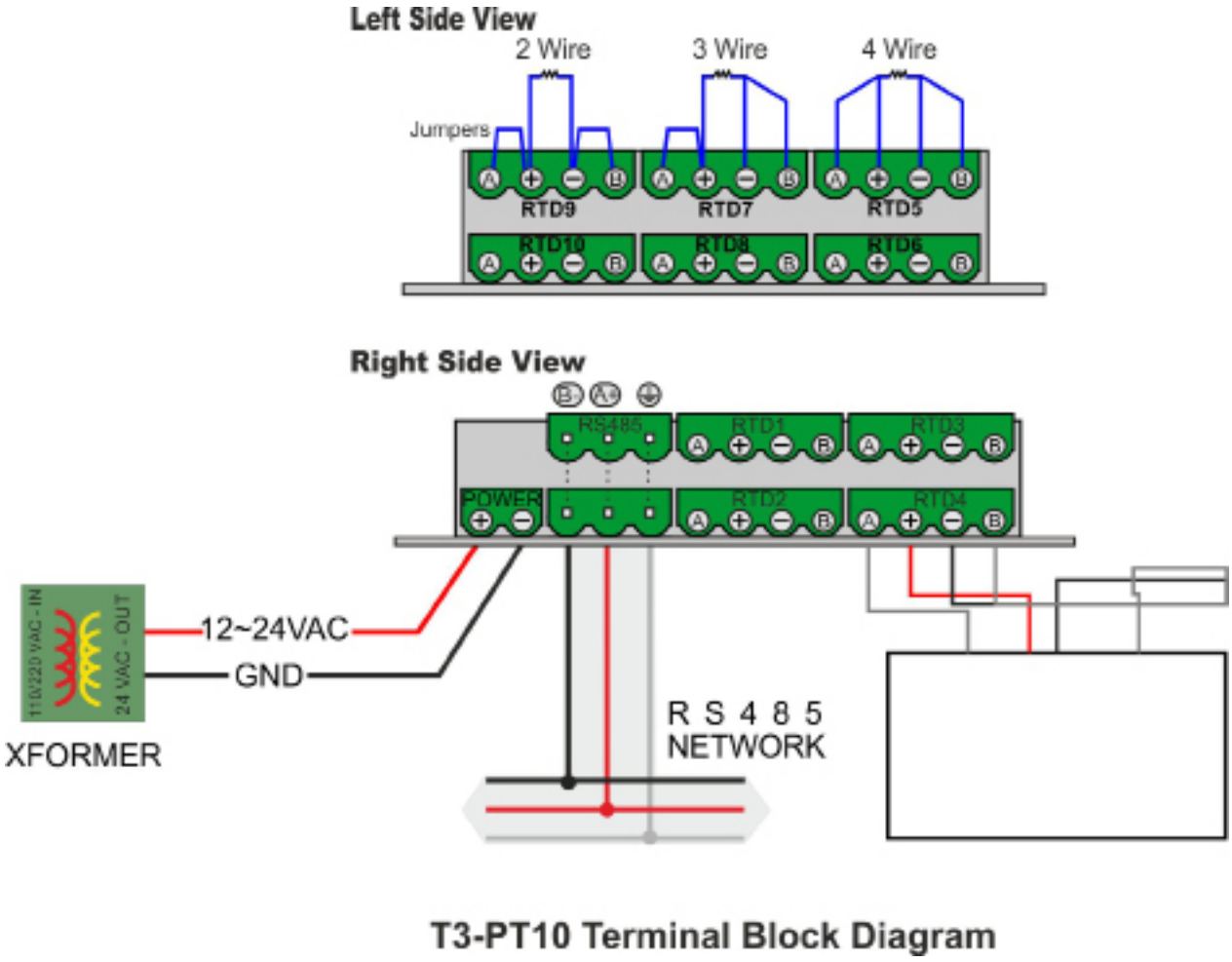
Technical Data

Resistance Range	0Ω to 400Ω, auto-ranging
Resistance Accuracy, One year	0Ω to 20Ω: 0.01Ω 20Ω to 400Ω: 0.05% (15 ppm) of reading
Resistance Accuracy, Short-Term	0Ω to 30Ω: 0.005Ω 30Ω to 400Ω: 0.03% (15 ppm) of reading
Resistance Resolution	Adjustable to .001Ω (See Register List)
Temperature Range	-200°C to 962°C (-328°F to 1764°F)
Temperature Coefficient of Resistance	10 ppm/°C
Temperature Accuracy	0.01°C
Temperature Resolution	Adjustable to .001°C (See Register List)
Probe Connection	4-wire with shield, 5-pin DIN connector (2 & 3 - Wire Connection also possible)
Maximum Acceptable Lead Resistance	100Ω
Probe Excitation Current	PRT 1 mA
Communications	RS-485 Serial Standard
AC Power	12~24 VAC/DC ±10, 50/60 Hz, 10 W, Nominal, 1A Maximum

Environmental Conditions

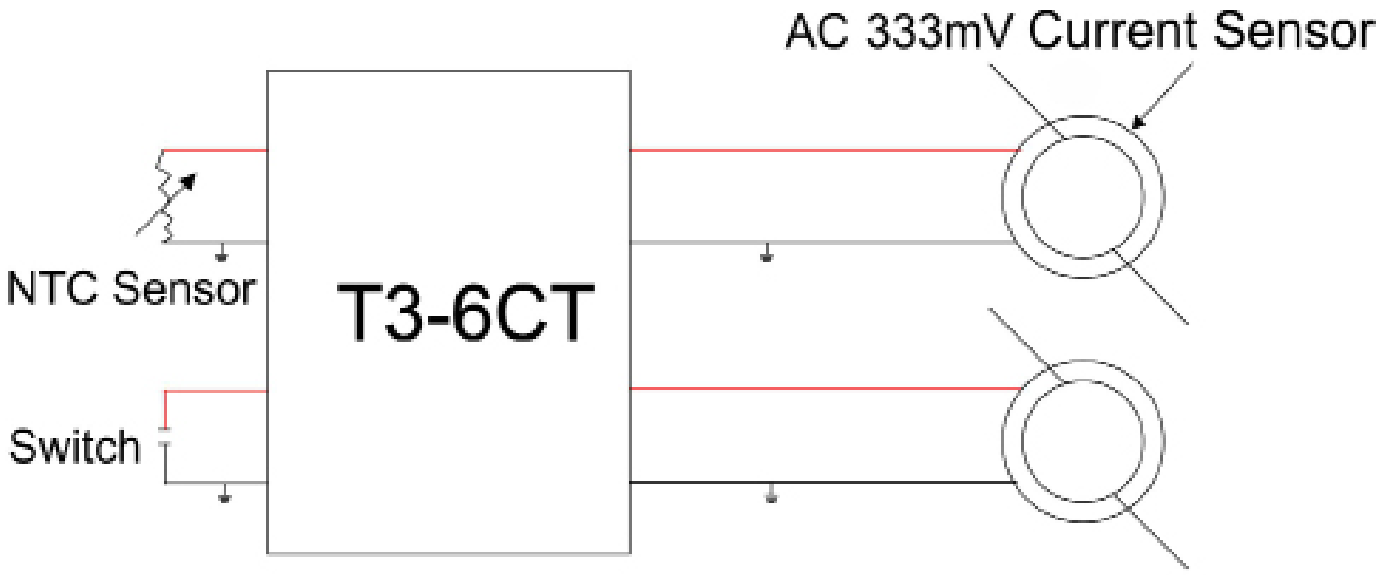
Ambient Temperature Range	0-55°C (32-131°F); [Full Accuracy 16-30°C (61-86°F)]
Ambient Relative Humidity	Maximum 80% for Temperature < 31°C, Decreasing Linearly to 50% at 40°C
Pressure	75kPa - 106kPa
Main Voltage within ±10% of Nominal	
Vibrations Should be Minimized	
Altitude Less than 2,000 Meters	
Indoor Use Only	

Wiring Diagram



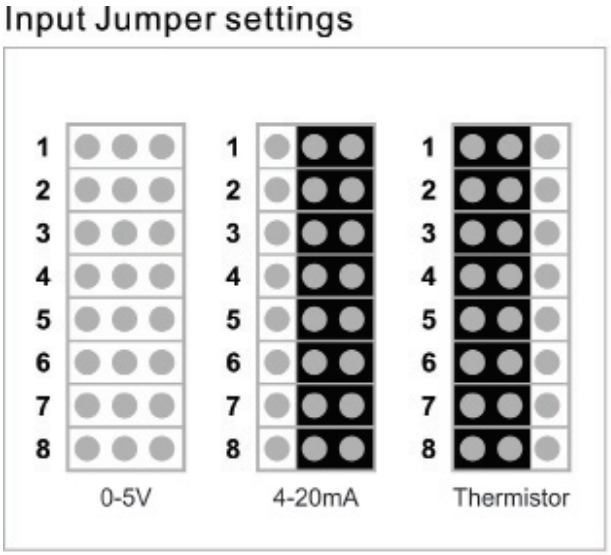
T3-PT10 Terminal Block Diagram

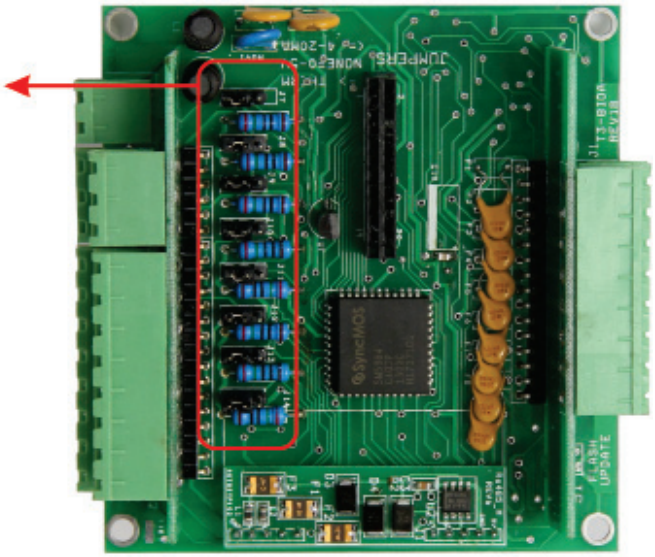
T3-6CT connect with current sensor



T3-8IO Jumper Settings

There are 8 inputs, each input has a jumper, all you need to do is to set the single jumper to the appropriate signal type: 0-5V, 4-20mA, thermistor as below the picture displayed.





1.5 Standard Operation

1.5.1 Inputs

Each input of a T3 Module can be jumper-configured in 1 of 3 ways:

- 0-5V Signal
- 0-20mA Signal
- Dry Contact, Thermistor

The value of each input is stored as a 10-bit number in the respective modbus register. The registers addresses are as follows:

T3 Model	Number of Inputs	Register Addresses
T3-8AIAO	8	108-115
T3-32I	32	100-131
T3-8I13O	8	118-133
T3-4AO	10	190-199

Table1: Input Register Addresses

A 5V, or 20mA, would give a reading of 1024. Each input has a corresponding LED which will light up if the value of the input is greater than 512. For more info on reading the input registers, see the section on Serial Communications.

T3-4AO is 5V, or 20mA, and would give a reading of 4095. Each input has a corresponding LED which will light up if the value of the input is greater than 2047. For more info on reading the input registers, see the section on Serial Communications.

1.5.2 Outputs

The state of each output is determined by its corresponding switch position. The switches have 3 states – 'hand', 'off', and 'auto'. When switched to 'hand', the corresponding output will be switched on - 10V for analog, contacts closed off from the relay, or 0V for sinking outputs. When switched to 'off', the output will be set to 0V for analog, open contact for relay, or open circuit for sinking outputs. When switched to 'auto', Analog outputs will be set to the level stored in the corresponding MODBUS output registers. For Digital or Sinking outputs, a register value 0 is deactivate and register value 1000 is activated.

The output registers are as follows:

T3 Model	Number of Outputs	Register Addresses
T3-8AIAO	8	100-107
T3-32I	0	--
T3-8I13O	13	100-112
T3-4AO	12	100-111

Table 2: Output Register Addresses

These registers can be changed using the RS485 serial interface. For analog outputs, a 0 corresponds to 0V. Likewise, a 1024 corresponds to 10V. For relay or sinking outputs, the output will be activated by any number greater than 512. 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 512 (5V). For more info on writing the output registers, see the section on Serial Communications.

1.5.3 Analog Output Calibration

The T3-8IO-A has an output calibration feature that allows for an adjustment of +/- 1.28V. Calibration is controlled via the calibration register located at registery address 13. By default, this is 128, which corresponds to 0V calibration. A value of 0 would give a –1.28V offset. A value of 255 would give a +1.28V offset. It is recommended that the calibration be determined while the output is set to 5V. The calibration value is located in flash memory and will be restored upon power-up.

1.5.4 Baudrate

All T3-Modules have adjustable Baudrates set by MODBUS registery 15. By default baud is set to 19.2kbps.
Value 1 will set the baud to 19200 bps.
Value 0 will set the baud to 9600 bps.

1.6 Accessing T3 Series Registers Via Serial Communications

The T3-Modules have a built-in serial interface for communication over an RS485 Network. Communication is currently implemented using Modbus Protocol. However, future versions of the T3-Modules will work with both BACnet and TCP/IP Protocols. For detailed information on Modbus Protocol, see the chapter entitled Modbus Serial Communications.

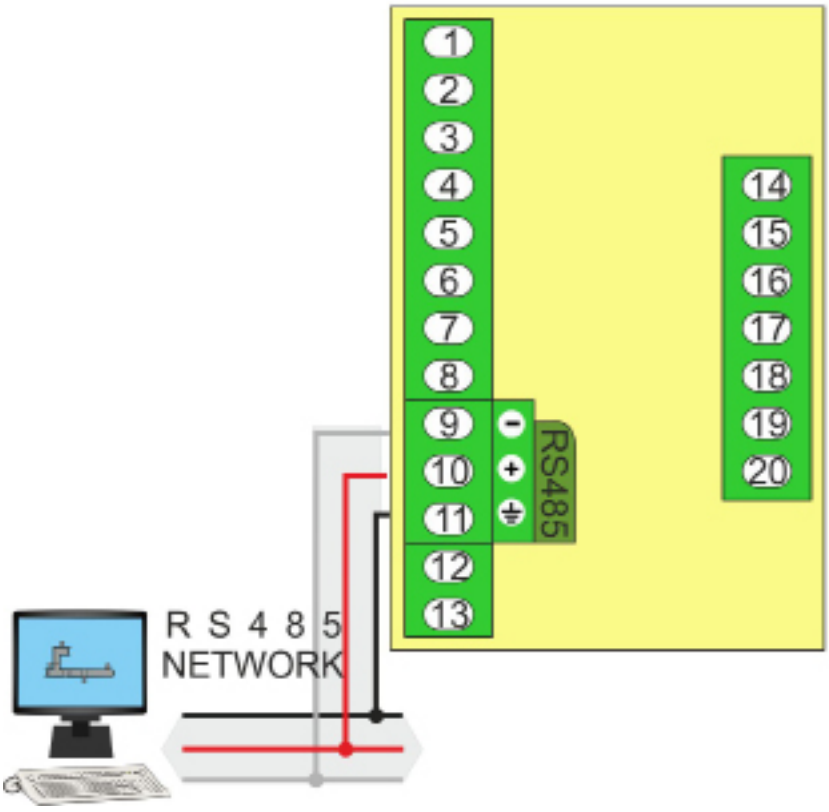
1.6.1 Connecting the T3 module to a computer

The T3-Modules connect to a computer serial port via the RS485 interface. Figure 14 shows how the T3-Module should be connected to the serial port of a PC.

USB RS485



T3- COMPUTER CONNECTION



How to set up pulse counting features

1.T3-4AO

You can change the number to choose which chanel as pulse. For example, when you need the 3 chanel as pulse chanel,you can change 6=Pulse Input to 3= Pulse Input.

Address	T3-4AO	
	Bytes	Details
200	1	Range Setting for each input.
201	1	200 correspond to input1,
202	1	201 correspond to input2, etc.
203	1	0 = raw data,
204	1	1 = 10K Celsius,
205	1	2 = 10K Fahrenheit,
206	1	3 = 0-100%
207	1	4 = ON/OFF,
208	1	5 = OFF/ON
209	1	6 = Pulse Input
		7 = Lighting Control 8 = type3 10K Celsius, 9=TYPE 3 10K Fahrenheit,10 = No use, 11 =V0_5,12= V0_10,13 = I0_20ma.

2.T3-8I13O

You can change the number to choose which chanel as pulse. For example, when you need the 3 chanel as pulse chanel,you can change 6=Pulse Input to 3= Pulse Input.

Address	T3-8I13O	
	Bytes	Details
183	1	Range Setting for each input.
184	1	183 correspond to input1,
185	1	184 correspond to input2, etc.
186	1	0 = raw data,
187	1	1 = 10K Celsius,
188	1	2 = 10K Fahrenheit,
189	1	3 = 0-100%
190	1	4 = ON/OFF,
		5 = OFF/ON
		6 = Pulse Input
		7 = Lighting Control 8 = type3 10K Celsius, 9=TYPE 3 10K Fahrenheit,10 = No use, 11 =V0_5,12= V0_10,13 = I0_20ma.

3.T3-28IN

You can change it by jumper.

Address	T3-8I13O	
	Bytes	Details
130	2	Pulse input1 high byte
131	2	Pulse input1 low byte
132	2	Pulse input2 high byte
133	2	Pulse input2 low byte
134	2	Reset Pulse1 number
135	2	Reset Pulse2 number

4.Pulse speed detail for all T3 Module

Module	Frequency
T3-4AO	<1KHZ
T3-8I13O	<10HZ
T3-28IN	≤10KHZ

1.6.2 List of registers in the T3-8AIAO

Note: When using the Modbus Poll software, addressing should be set to “Protocol Addresses (Base 0)” under the “Display” menu.

Address	Bytes	Register and Description
0 to 3	4	Serial Number, 4 byte value
4	1	EEPROM Hardware Version Number
5	1	Firmware Version Number
6	1	ADDRESS. Modbus Device Address
7	1	Product Model
8	1	Hardware Revision
9	1	PIC Version Number
13	1	Calibration Registery – used to calibrate the outputs.
15	1	Baudrate Setting: 0 will set 9600bps, 1 will set 19200bps
22	1	Heartbeat register:It will increase every min from 0 to 255 and cycle the roution
100	2	Output 1 Register
101	2	Output 2 Register
102	2	Output 3 Register
103	2	Output 4 Register
104	2	Output 5 Register
105	2	Output 6 Register
106	2	Output 7 Register
107	2	Output 8 Register
108	2	Input 1 Register
109	2	Input 2 Register
110	2	Input 3 Register
111	2	Input 4 Register
112	2	Input 5 Register
113	2	Input 6 Register
114	2	Input 7 Register
115	2	Input 8 Register
116	2	Register 116 , 117 and 118 hold the position information on each of the hand-off-auto switches on the T3 modules Each switch has three positions and therefore each switch requires 2 bits to hold the state. Modbus registers are 16 bits wide so we can hold the status of 8 switches in register 116, the next 8 are held in register 117 and so on, up to the number of switches on the particular T3 module. The switch states are as follows: 00= Off , the switch is in the center position 10= Auto, the switch is positioned towards the terminal block 01= Hand, manually on. The switch is positioned towards the center of the module (away from the terminal block).
117	2	
118	2	
119 - 125	1	Range for each Input, 118 Correspond to ch1.0 = raw data,1 = 10K Celsius, 2 = 10K Fahrenheit ,3 = 0 - 100%,4 = ON/OFF, 5 = OFF/ON
126-133	1	Filter Coefficient for Input 1 to 8, value is 0 through 100,default is 20.

Example: Registery 118 reads 5 (hex 05)
Registery 119 reads 138 (hex 8A)
The Pulse Count for Channel 1 is then 1418 pulse (hex 058A)

Writing to registery 134 will clear registeries 118 and 119. Subsequent registeries 135 to 138 are optional memory to

1.6.3 Lits of Registers in the T3-32I

Note: Addressing should be set to “Protocol Addresses (Base 0)” under the “Display” menu.

Address	Bytes	Register and Description
0 to 3	4	Serial Number, 4 byte value
4	1	EEPROM Hardware Version Number
5	1	Firmware Version Number
6	1	ADDRESS. Modbus Device Address
7	1	Product Model
8	1	Hardware Revision
9	1	PIC Version Number
13	1	Calibration Register – used to calibrate the outputs.
15	1	Baudrate Setting: 0 will set 9600bps, 1 will set 19200bps
22	1	Heartbeat register: It will increase every min from 0 to 255 and cycle the roution
100	2	Input 1 Register
101	2	Input 2 Register
102	2	Input 3 Register
103	2	Input 4 Register
104	2	Input 5 Register
105	2	Input 6 Register
106	2	Input 7 Register
107	2	Input 8 Register
108	2	Input 9 Register
109	2	Input 10 Register
110	2	Input 11 Register
111	2	Input 12 Register
112	2	Input 13 Register
113	2	Input 14 Register
114	2	Input 15 Register
115	2	Input 16 Register
116	2	Register 116 , 117 and 118 hold the position information on each of the hand-off-auto switches on the T3 modules Each switch has three positions and therefore each switch requires 2 bits to hold the state. Modbus registers are 16 bits wide so we can hold the status of 8 switches in register 116, the next 8 are held in register 117 and so on, up to the number of switches on the particular T3 module. The switch states are as follows: 00= off , the switch is in the center position 10=auto, the switch is positioned towards the terminal block 01= hand, manually on. The switch is positioned towards the center of the module (away from the terminal block).
117	2	
118	2	
119	2	Input 20 Register
120	2	Input 21 Register
121	2	Input 22 Register
122	2	Input 23 Register
123	2	Input 24 Register
124	2	Input 25 Register
125	2	Input 26 Register
126	2	Input 27 Register
127	2	Input 28 Register
128	2	Input 29 Register
129	2	Input 30 Register
130	2	Input 31 Register
131	2	Input 32 Register
228-259	1	Range for each input, 228 correspond to ch1.0 = raw data, 1 = 10K Celsius, 2 = 10K Fahrenheit ,3 = 0 - 100%,4 = ON/OFF, 5 = OFF/ON
260-291	1	Filter coefficient for input 1 to 32,value is 0 through 100,default is 20.

1.6.4 List of Registers in the T3-8I13O

Address	Bytes	Register and Description
0 to 3	4	Serial Number, 4 byte value
4	1	EEPROM Hardware Version Number
5	1	Firmware Version Number
6	1	ADDRESS. Modbus Device Address
7	1	Product Model
8	1	Hardware Revision
9	1	PIC Version Number
13	1	Calibration Register – used to calibrate the outputs.
15	1	Baudrate Setting: 0 will set 9600bps, 1 will set 19200bps
16-21	1	Reserved
22	1	Heartbeat register:It will increase every min from 0 to 255 and cycle the roution
23-99	1	Reserved
100	2	Output 1 Register
101	2	Output 2 Register
102	2	Output 3 Register
103	2	Output 4 Register
104	2	Output 5 Register
105	2	Output 6 Register
106	2	Output 7 Register
107	2	Output 8 Register
108	2	Output 9 Register
109	2	Output 10 Register
110	2	Output 11 Register
111	2	Output 12 Register
112	2	Output 13 Register
113 - 115	1	Reserved
116	2	Register 116 and 117 hold the position information on each of the hand-off-auto switches on the T3 modules Each switch has three positions and therefore each switch requires 2 bits to hold the state. Modbus registers are 16 bits wide so we can hold the status of 8 switches in register 116, the next 8 are held in register 117 and so on, up to the number of switches on the particular T3 module. The switch states are as follows: 00= off , the switch is in the center position 10=auto, the switch is positioned towards the terminal block 01= hand, manually on. The switch is positioned towards the center of the module (away from the terminal block).
117	2	
118	2	IN1 high word
119	2	IN1 low word
120	2	IN2 high word
121	2	IN2 low word
122	2	N3 high word
123	2	IN3 low word
124	2	IN4 high word
125	2	IN4 low word
126	2	IN5 high word
127	2	IN5 low word
128	2	IN6 high word
129	2	IN6 low word
130	2	IN7 high word
131	2	N7 low word
132	2	IN8 high word
133	2	IN8 low word

1.6.4 List of Registers in the T3-8I13O (continued)

Address	Bytes	Register and Description
134-138	5	Date stamp of Channel 1: Year, Month, Day, Hour, Minute respectively.
139-143	5	Date stamp of Channel 2: Year, Month, Day, Hour, Minute respectively
144-148	5	Date stamp of Channel 3: Year, Month, Day, Hour, Minute respectively.
149-153	5	Date stamp of Channel 4: Year, Month, Day, Hour, Minute respectively.
154-158	5	Date stamp of Channel 5: Year, Month, Day, Hour, Minute respectively.
159-163	5	Date stamp of Channel 6: Year, Month, Day, Hour, Minute respectively.
164-168	5	Date stamp of Channel 7: Year, Month, Day, Hour, Minute respectively.
169-173	5	Date stamp of Channel 8: Year, Month, Day, Hour, Minute respectively.
174	1	Spare
175-182	2	Analog reading from each channel, whatever the channel be set as analog or pulse mode. 175 correspond to ch1
183-190	1	Range for each input, 183 correspond to ch1.0 = raw data, 1 = 10K Celsius, 2 = 10K Fahrenheit ,3 = 0 - 100%,4 = ON/OFF, 5 = OFF/ON
191	1	Filter coefficient for input 1, 0 through 100, default is 20.
192	1	Filter coefficient for input 2, 0 through 100, default is 20.
193	1	Filter coefficient for input 3, 0 through 100, default is 20.
194	1	Filter coefficient for input 4, 0 through 100, default is 20.
195	1	Filter coefficient for input 5, 0 through 100, default is 20.
196	1	Filter coefficient for input 6, 0 through 100, default is 20.
197	1	Filter coefficient for input 7, 0 through 100, default is 20.
198	1	Filter coefficient for input 8, 0 through 100, default is 20.
199	1	Timer for input 1, how long time the lighting control take over the outputs
200	1	Timer for input 2, how long time the lighting control take over the outputs
201	1	Timer for input 3, how long time the lighting control take over the outputs
202	1	Timer for input 4, how long time the lighting control take over the outputs
203	1	Timer for input 5, how long time the lighting control take over the outputs
204	1	Timer for input 6, how long time the lighting control take over the outputs
205	1	Timer for input 7, how long time the lighting control take over the outputs
206	1	Timer for input 8, how long time the lighting control take over the outputs
207	1	Input1 timer Left, how much time left for the lighting control
208	1	Input 2 timer Left, how much time left for the lighting control
209	1	Input 3 timer Left, how much time left for the lighting control
210	1	Input 4 timer Left, how much time left for the lighting control
211	1	Input 5 timer Left, how much time left for the lighting control
212	1	Input 6 timer Left, how much time left for the lighting control
213	1	Input 7 timer Left, how much time left for the lighting control
214	1	Input 8 timer Left, how much time left for the lighting control
215	1	light control disable/enable, each bit correspond to one output,output1 correspond to least significant bit, 0 = disable,1 = enable
216	1	Select which input as lighting control trigger, 0 = disable lighting control,1= input1,2=input2
217	1	Select which input as lighting control trigger, 0 = disable lighting control,1= input1,2=input2
218	1	Select which input as lighting control trigger, 0 = disable lighting control,1= input1,2=input2
219	1	Select which input as lighting control trigger, 0 = disable lighting control,1= input1,2=input2
220	1	Select which input as lighting control trigger, 0 = disable lighting control,1= input1,2=input2
221	1	Select which input as lighting control trigger, 0 = disable lighting control,1= input1,2=input2
222	1	Select which input as lighting control trigger, 0 = disable lighting control,1= input1,2=input2
223	1	Select which input as lighting control trigger, 0 = disable lighting control,1= input1,2=input2

1.6.4 List of Registers in the T3-8I13O (continued)

Address	Bytes	Register and Description
224	1	Select which input as lighting control trigger,0 = disable lighting control,1= input1,2=input2
225	1	Select which input as lighting control trigger,0 = disable lighting control,1= input1,2=input2
226	1	Select which input as lighting control trigger,0 = disable lighting control,1= input1,2=input2
227	1	Select which input as lighting control trigger,0 = disable lighting control,1= input1,2=input2
228	1	Select which input as lighting control trigger,0 = disable lighting control,1= input1,2=input2

1.6.6 List of Registers in the T3-4AO

Address	Bytes	Register and Description
0 - 3	4	Serial Number 4 Bytes value
4	1	Firmware Version , low byte
5	1	Firmware Version, hi byte
6	1	Modbus Device Address
7	1	Product Model
8	1	Hardware Revision
9	1	PIC Version Number
10-12		Reserved
13	1	Calibration Register-Used to calibrate the outputs
14		Reserved
15	1	Baudrate Setting: 0 = 9600bps, 1 = 19200bps
16	1	Firmware Update Register, used to show the status of firmware updates
17-21		Reserved
22	1	Heartbeat register: It will increase every min from 0 to 255 and cycle the roution
23-99		Reserved
100	2	Output 1 Register
101	2	Output 2 Register
102	2	Output 3 Register
103	2	Output 4 Register
104	2	Output 5 Register
105	2	Output 6 Register
106	2	Output 7 Register
107	2	Output 8 Register
108	2	Output 9 Register
109	2	Output 10 Register
110	2	Output 11 Register
111	2	Output 12 Register
112	0	Reserved
113	0	Reserved
114	0	Reserved
115	0	Reserved
116	2	Register 116 , 117 and 118 hold the position information on each of the hand-off-auto switches on the T3 modules Each switch has three positions and therefore each switch requires 2 bits to hold the state. Modbus registers are 16 bits wide so it can hold the status of 8 switches in register 116, the next 8 are held in register 117 and so on, up to the number of switches on the particular T3-Module. The switch states are as follows: • 00= OFF, the switch is in the center position • 10= AUTO, the switch is positioned towards the terminal block • 01= HAND, manually on. The switch is positioned towards the center of the module (away from the terminal block).
117	2	
118	2	
119	2	Input 1 Register, high word
120	2	Input 1 Register, low word

1.6.5 List of Registers in the T3-4AO (Continued)

Address	Bytes	Register and Description
121	2	Input 2 Register, high word
122	2	Input 2 Register, low word
123	2	Input 3 Register, high word
124	2	Input 3 Register, low word
125	2	Input 4 Register, high word
126	2	Input 4 Register, low word
127	2	Input 5 Register, high word
128	2	Input 5 Register, low word
129	2	Input 6 Register, high word
130	2	Input 6 Register, low word
131	2	Input 7 Register, high word
132	2	Input 7 Register, low word
133	2	Input 8 Register, high word
134	2	Input 8 Register, low word
135	2	Input 9 Register, high word
136	2	Input 9 Register, low word
137	2	Input 10 Register, high word
138	2	Input 10 Register, low word
139-143	5	Date Stamp of Input 1, YEAR, MONTH, DAY, HOUR, MINUTE respectively
144-148	5	Date Stamp of Input 2, YEAR, MONTH, DAY, HOUR, MINUTE respectively
149-153	5	Date Stamp of Input 3, YEAR, MONTH, DAY, HOUR, MINUTE respectively
154-158	5	Date Stamp of Input 4, YEAR, MONTH, DAY, HOUR, MINUTE respectively
159-163	5	Date Stamp of Input 5, YEAR, MONTH, DAY, HOUR, MINUTE respectively
164-168	5	Date Stamp of Input 6, YEAR, MONTH, DAY, HOUR, MINUTE respectively
169-173	5	Date Stamp of Input 7, YEAR, MONTH, DAY, HOUR, MINUTE respectively
174-178	5	Date Stamp of Input 8, YEAR, MONTH, DAY, HOUR, MINUTE respectively
179-183	5	Date Stamp of Input 9, YEAR, MONTH, DAY, HOUR, MINUTE respectively
184-188	5	Date Stamp of Input 10, YEAR, MONTH, DAY, HOUR, MINUTE respectively
189	1	Assign each input sample type. 0 = analog; 1 = pulse. Input 1;correspond to Bit0, input 2;correspond to bit1 and so on.
190	2	Analog Input1 original data
191	2	Analog Input2 original data
192	2	Analog Input3 original data
193	2	Analog Input4 original data
194	2	Analog Input5 original data
195	2	Analog Input6 original data
196	2	Analog Input7 original data
197	2	Analog Input8 original data
198	2	Analog Input9 original data
199	2	Analog Input10 original data
200	1	Range Setting for each input.
201	1	200 Correspond to input1
202	1	201 Correspond to input2, etc.
203	1	0 = Raw Data
204	1	1 = 10K Celsius
205	1	2 = 10K Fahrenheit

1.6.5 List of Registers in the T3-4AO (Continued)

Address	Bytes	Register and Description
206	1	3 = 0 - 100%
207	1	4 = ON/OFF
208	1	5 = OFF/ON
209	1	6 = Pulse Input, 7 = Lighting Control
210	1	Filter Coefficient for input 1, 0 through 100, default is 20.
211	1	Filter Coefficient for input 2, 0 through 100, default is 20.
212	1	Filter Coefficient for input 3, 0 through 100, default is 20.
213	1	Filter Coefficient for input 4, 0 through 100, default is 20.
214	1	Filter Coefficient for input 5, 0 through 100, default is 20.
215	1	Filter Coefficient for input 6, 0 through 100, default is 20.
216	1	Filter Coefficient for input 7, 0 through 100, default is 20.
217	1	Filter Coefficient for input 8, 0 through 100, default is 20.
218	1	Filter Coefficient for input 9, 0 through 100, default is 20.
219	1	Filter Coefficient for input 10, 0 through 100, default is 20.
220	1	Timer for Input 1, how long time the lighting control take over the outputs
221	1	Timer for Input 2, how long time the lighting control take over the outputs
222	1	Timer for Input 3, how long time the lighting control take over the outputs
223	1	Timer for Input 4, how long time the lighting control take over the outputs
224	1	Timer for Input 5, how long time the lighting control take over the outputs
225	1	Timer for Input 6, how long time the lighting control take over the outputs
226	1	Timer for Input 7, how long time the lighting control take over the outputs
227	1	Timer for Input 8, how long time the lighting control take over the outputs
228	1	Timer for Input 9, how long time the lighting control take over the outputs
229	1	Timer for Input 10, how long time the lighting control take over the outputs
230	1	Input 1 Timer Left, how much time left for the lighting control
231	1	Input 2 Timer Left, how much time left for the lighting control
232	1	Input 3 Timer Left, how much time left for the lighting control
233	1	Input 4 Timer Left, how much time left for the lighting control
234	1	Input 5 Timer Left, how much time left for the lighting control
235	1	Input 6 Timer Left, how much time left for the lighting control
236	1	Input 7 Timer Left, how much time left for the lighting control
237	1	Input 8 Timer Left, how much time left for the lighting control
238	1	Input 9 Timer Left, how much time left for the lighting control
239	1	Input 10 Timer Left, how much time left for the lighting control
240	2	Light Control Disable/Enable, each bit correspond to one output, output1 correspond to least significant bit, 0 = disable, 1 = enable
241	1	Select which input as lighting control trigger, 0 = disable lighting control, 1= input1, 2=input2
242	1	Select which input as lighting control trigger, 0 = disable lighting control, 1= input1, 2=input2
243	1	Select which input as lighting control trigger, 0 = disable lighting control, 1= input1, 2=input2
244	1	Select which input as lighting control trigger, 0 = disable lighting control, 1= input1, 2=input2
245	1	Select which input as lighting control trigger, 0 = disable lighting control, 1= input1, 2=input2
246	1	Select which input as lighting control trigger, 0 = disable lighting control, 1= input1, 2=input2
247	1	Select which input as lighting control trigger, 0 = disable lighting control, 1= input1, 2=input2
248	1	Select which input as lighting control trigger, 0 = disable lighting control, 1= input1, 2=input2

List of Registers for the T3-PT10		
Address	Bytes	Register and Description
0~3		Serial number
4		Firmware version number
5		software version number
6		modbus service address
7		product model
8		hardware model
9		baudrate
10		spare
11		spare
12		hardware Calibration flag write 2 to this register to hardware calibration.
13		set modbus float int 0= float 1 = int. when set INT, 250 = 25.0C. When set float, show temperature directly 25.0000C
18		Resolution (Resol:XXX.XXX): - Set the period for serial transmission
18~21		spare
22		Heartbeat register:It will increase every min from 0 to 255 and cycle the roution
23~99		spare
100~101	4	When set INT, 100 will show 0 and 101 show the temperature for channel 1, 250= 25.0C when set flaot,100 and 101 show 25.0000C
102~103	4	When set INT, 102 will show 0 and 103 show the temperature for channel 2, 250= 25.0C when set float, 102 and 103 together show 25.0000C
104~105	4	When set INT, 104 will show 0 and 105 show the temperature for channel 3, 250= 25.0C when set float, 104 and 105 together show 25.0000C
106~107	4	When set INT, 106 will show 0 and 107 show the temperature for channel 4, 250= 25.0C when set float, 106 and 107 together show 25.0000C
108~109	4	When set INT, 108 will show 0 and 109 show the temperature for channel 5, 250= 25.0C when set float, 108 and 109 together show 25.0000C
110~111	4	When set INT, 110 will show 0 and 111 show the temperature for channel 6, 250= 25.0C when set float, 110 and 111 together show 25.0000C
112~113	4	When set INT, 112 will show 0 and 113 show the temperature for channel 7, 250= 25.0C when set float, 112 and 113 together show 25.0000C
114~115	4	When set INT, 114 will show 0 and 115 show the temperature for channel 8, 250= 25.0C when set float, 114 and 115 together show 25.0000C
116~117	4	When set INT, 116 will show 0 and 117 show the temperature for channel 9, 250= 25.0C when set float, 116 and 117 together show 25.0000C
118~119	4	When set INT, 118 will show 0 and 119 show the temperature for channel 10, 250= 25.0C when set float, 118 and 119 together show 25.0000C
120~129		spare
130~136	6	real time .second, minute, hour, day, week, month,year
140~159	20	Temperature offset. 140~141 for channel 1 offset 142~143 for channel2 offset ect when set float , 140 and 141 default is 100.000. when set int,140 and 141 default is 100 .
160~167	8	four point calibration raw AD data. (long type)
168~173	6	channel 1 RTD parameter.
174~179	6	channel 2 RTD parameter.
180~185	6	channel 3 RTD parameter.
186~191	6	channel 4 RTD parameter.
192~197	6	channel 5 RTD parameter.
198~203	6	channel 6 RTD parameter.
204~209	6	channel 7 RTD parameter.
210~215	6	channel 8 RTD parameter.

List of Registers for the T3-PT10 Continued		
Address	Bytes	Register and Description
216~221	6	channel 9 RTD parameter.
222~227	6	channel 10 RTD parameter.
228	1	range for channel1 0 =C 1=F 2 = ohm.
229	1	range for channel2 0 =C 1=F 2 = ohm.
230	1	range for channel3 0 =C 1=F 2 = ohm.
231	1	range for channel4 0 =C 1=F 2 = ohm.
232	1	range for channel5 0 =C 1=F 2 = ohm.
233	1	range for channel6 0 =C 1=F 2 = ohm.
234	1	range for channel7 0 =C 1=F 2 = ohm.
235	1	range for channel8 0 =C 1=F 2 = ohm.
236	1	range for channel9 0 =C 1=F 2 = ohm.
237	1	range for channel10 0 =C 1=F 2 = ohm.
238	1	filter for channel 1 default = 20
239	1	filter for channel 2 default = 20
240	1	filter for channel 3 default = 20
241	1	filter for channel 4 default = 20
242	1	filter for channel 5 default = 20
243	1	filter for channel 6 default = 20
244	1	filter for channel 7 default = 20
245	1	filter for channel 8 default = 20
246	1	filter for channel 9 default = 20
247	1	filter for channel 10 default = 20

List of Registers for the T3-6CT

Address	Bytes	Register and Description
0 to 3	4	Serial Number, 4 byte value
4	1	EEPROM Hardware Version Number
5	1	Firmware Version Number
6	1	ADDRESS. Modbus Device Address
7	1	Product Model
8	1	Hardware Revision
9	1	PIC Version Number
10-12		Reserved
13	1	Calibration Register-Used to calibrate the outputs
14		Reserved
15	1	Baudrate Setting: 0 = 9600bps, 1 = 19200bps
16		Reserved
17	1	Deadmaster time unit:minute defult:10
18	1	Set the realy status when deadmaster time is finish.0:nochange. 1:on .2:off.
22	1	Heartbeat register:It will increase every min from 0 to 255 and cycle the roution
100	2	Output 1 Register
101	2	Output 2 Register
102	2	Output 3 Register
103	2	Output 4 Register
104	2	Output 5 Register
105	2	Reserved
106	2	Reserved
107	2	Reserved
108	2	CT Input 1 Register
109	2	CT Input 2 Register
110	2	CT Input 3 Register
111	2	CT Input 4 Register
112	2	CT Input 5 Register
113	2	CT Input 6 Register
114	2	Analog Input 1 Register
115	2	Analog Input 2 Register
116	2	Analog Input 3 Register
117	2	Analog Input 4 Register
118	2	Analog Input 5 Register
119	2	Analog Input 6 Register
120	2	Analog Input 7 Register
121	2	Analog Input 8 Register
122	2	Analog Input 9 Register
123	2	Analog Input 10 Register
124	1	Switch Bank 1 Register

List of Registers for the T3-6CT Continued

Address	Bytes	Register and Description
125	1	Switch Bank 2 Register
126	1	Range Setting for each input
127	1	126 correspond to input1
128	1	127 correspond to input2, etc.
129	1	0 = raw data,
130	1	
131	1	1 = 10K Celsius,
132	1	
133	1	
134	1	2 = 10K Fahrenheit
135	1	
136	1	
137	1	3 = 0-100%
138	1	
139	1	4 = ON/OFF
140	1	
141	1	5 = OFF/ON
142	1	Filter coefficient for input 1,0 through 100,default is 20.
143	1	Filter coefficient for input 2,0 through 100,default is 20.
144	1	Filter coefficient for input 3,0 through 100,default is 20.
145	1	Filter coefficient for input 4,0 through 100,default is 20.
146	1	Filter coefficient for input 5,0 through 100,default is 20.
147	1	Filter coefficient for input 6,0 through 100,default is 20.
148	1	Filter coefficient for input 7,0 through 100,default is 20.
149	1	Filter coefficient for input 8,0 through 100,default is 20.
150	1	Filter coefficient for input 9,0 through 100,default is 20.
151	1	Filter coefficient for input 10,0 through 100,default is 20.
152	1	Filter coefficient for input 11,0 through 100,default is 20.
153	1	Filter coefficient for input 12,0 through 100,default is 20.
154	1	Filter coefficient for input 13,0 through 100,default is 20.
155	1	Filter coefficient for input 14,0 through 100,default is 20.
156	1	Filter coefficient for input 15,0 through 100,default is 20.
157	1	Filter coefficient for input 16,0 through 100,default is 20.

For example, if we would like to read the input 2 register at module node address #1,

Slave Address	Function	Starting Address Hi	Starting Address Lo	No. of Points Hi	No. of Points Lo	CRC Hi Byte	CRC Hi Byte
1	3	0	109	0	1	xx	xx

Or we read 8 values after input 2 in module 1,

Slave Address	Function	Starting Address Hi	Starting Address Lo	No. of Points Hi	No. of Points Lo	CRC Hi Byte	CRC Hi Byte
1	3	0	109	0	8	xx	xx

Or we write 600 to output 4 in module 1,

Slave Address	Function	Starting Address Hi	Starting Address Lo	No. of Points Hi	No. of Points Lo	CRC Hi Byte	CRC Hi Byte
1	6	0	103	0	600	xx	xx

More details can be found in Modbus Secial Communication Section below.

1.6.7 Note About Registers When Updating the Firmware

There are two registers that will tell the CPU information about the model and hardware of the T3-Module.

NOTE: after updating the firmware you MUST setup these registers first or the module may not function properly.

Product Model is Register Address 7. The model number is already configured and it's a fixed number when it leaves the factory. There is no need for the customer to do anything.

The corresponding values are as follows:

- T3-4AO = 28
- T3-8AIAO = 21
- T3-8I13O = 20
- T3-32AI = 22
- T3-6CT = 29
- T3-PT10 = 26

Hardware revision is register address 8. The hardware revision can be found by removing the front cover of the module. It is written in white silkscreen on the edge of the board.

1.7 Lighting Control with the T3-8I-13O Module

It is possible to use the T3-Module as a lighting control module. The logic is embedded directly in the T3-Module to make light switching response faster and reduce the polling required for lighting applications. The idea is that each input can be configured as a lighting switch input. Any or all of the inputs can be configured this way. Each input corresponds to one lighting zone.
Next, any or all of the outputs can be assigned to any of the zones. Finally, each zone has a timer which allows the operator to set how long the zone will go to “occupied mode”.

An additional set of timers show how much time is left for a particular override event, these are read/write registers so that the Master can initiate events and override events already under way. Finally, there is an auto/manual bit for each output to override the local T3 logic, for example during commissioning or special events.

1. • The “Range” for each input is configured in registers 183 thru 190,
   set any input to act as a lighting switch by setting the range to 7.
   • Each input corresponds to one zone,
   • Short circuit the input to GND and this will trigger an event
   • If the zone was previously on, it will flip to off and vice versa.

2. • Each Zone has an ‘override time’ setting which sets how long the lights will be triggered on for a particular hit of the switch.
   • The values are in minutes, they are read/write and are stored in registers 199 thru 206 ,
   • 199 is the time for zone 1 which is controlled by input1
   • 200 for zone2 and so on..

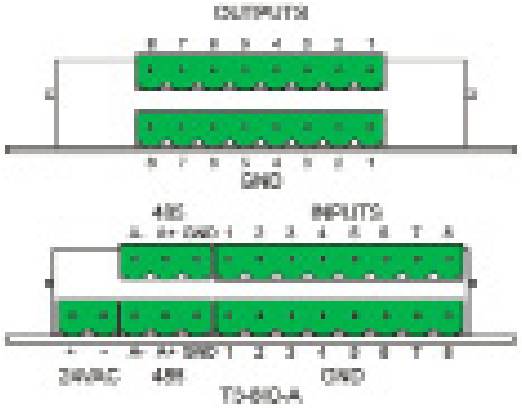
3 • Each zone has a ‘time left’ register which shows the remaining time left after a particular hit on the switch.
   • These are read/write values in ‘minutes’ and are stored in registers 207 thru 214
   • Each time there is a hit on a particular hit on a light switch, the ‘time left’ register will be filled in with this ‘over ride time’ setting.
   • For example, a hit on switch 1 will trigger a copy of register 199 to register 207.
   • Then Register 207 will start counting down.

4 • Each output has an auto/manual bit so that the lighting control logic (and any other future logic embedded in the module) can be disabled.
   • Register 215 , auto/manual register, 2 byte length.
   • 0 = manual (lighting control disabled),
   • 1 = auto (lighting control enabled).
   • Each bit corresponds to one output with output 1 starting at the least significant bit
   • Output 13 corresponds to the 13th bit.

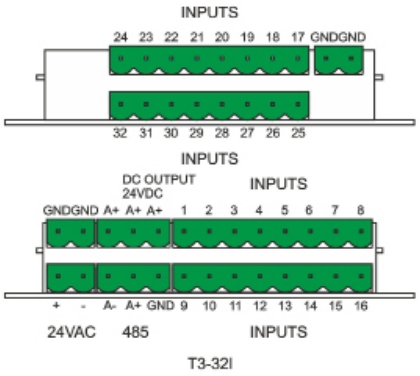
5 • Assign Outputs to Zones in registers 216 thru 228
   • 13 outputs, one register for each output which assigns that particular output to a particular zone.
   • Since there are 8 zones, the these registers will accept a value from 1 to 8,
   • 0 = n/a,
      • 1 = means this output will be linked to zone1 (and controlled by input1).
      • 2 = means this output will be linked to zone2 (and controlled by input2).
   • ETC

1.8 Installation

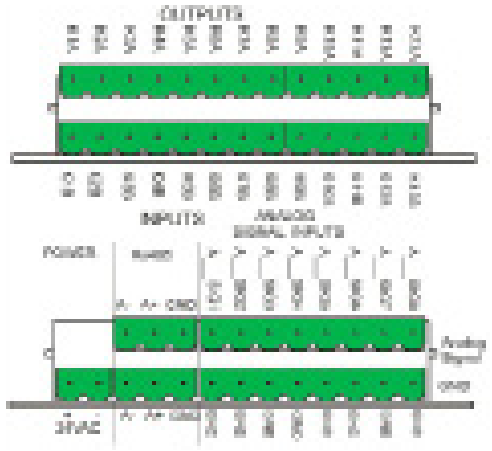
1.8.1 Terminal Block Connections (T3-8IO)



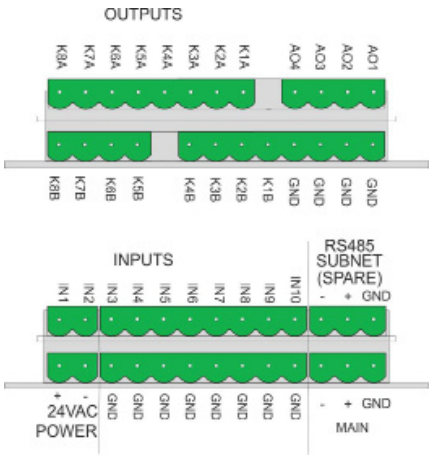
1.8.2 Terminal Block Connections (T3-32I)



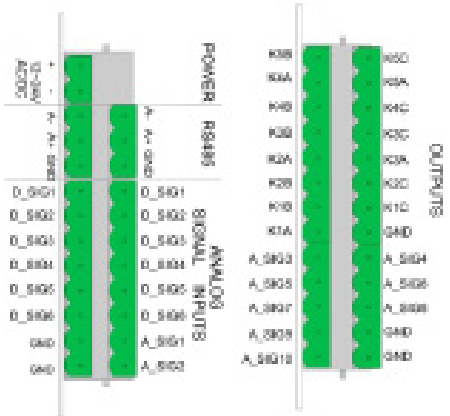
1.8.3 Terminal Block Connections (T3-8-13



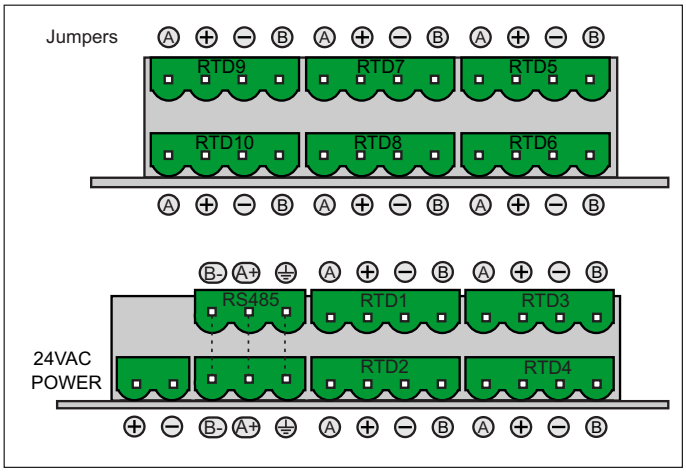
1.8.4 Terminal Block Connections (T3-4AO)



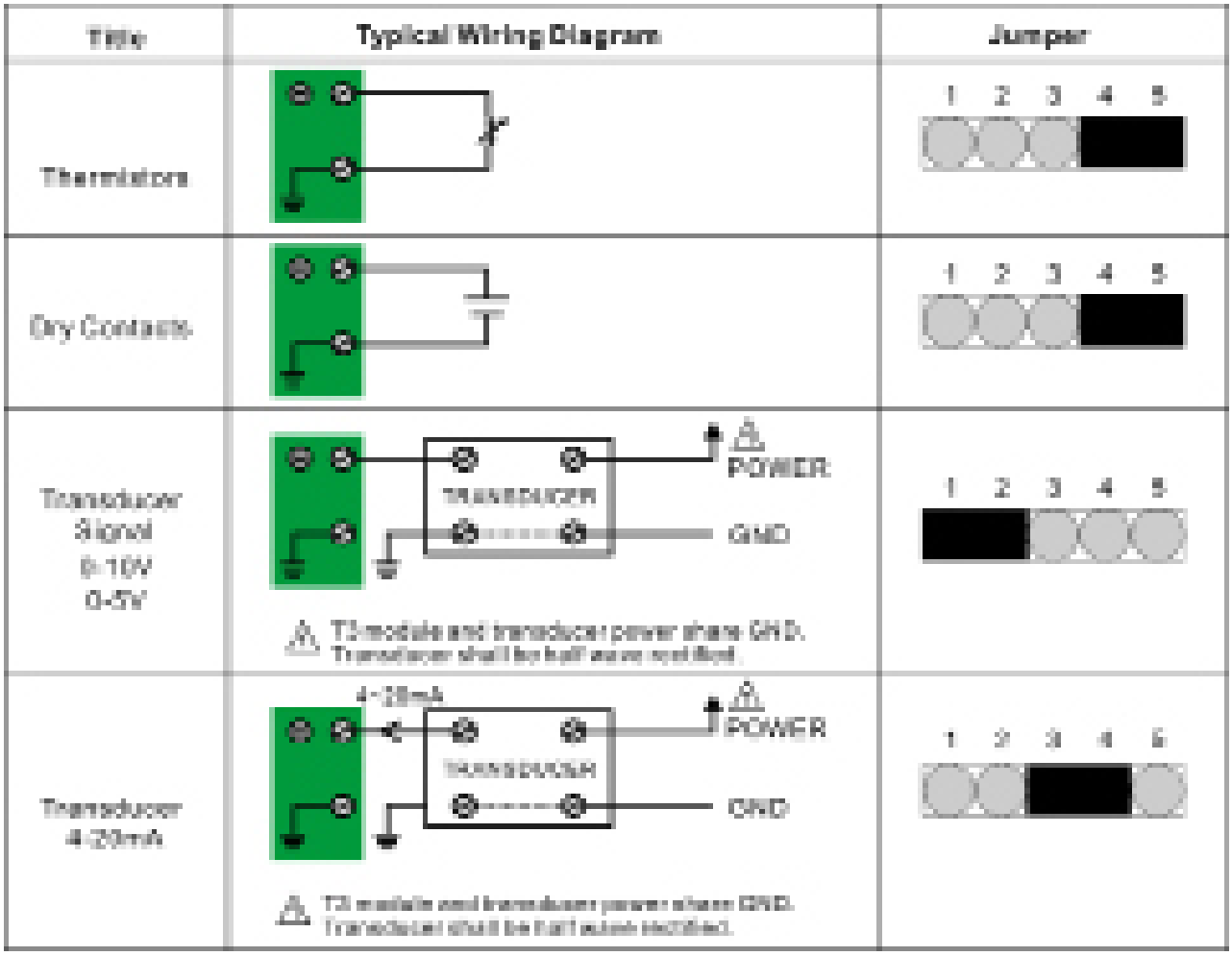
1.8.5 Terminal Block Connections (T3-6CT)



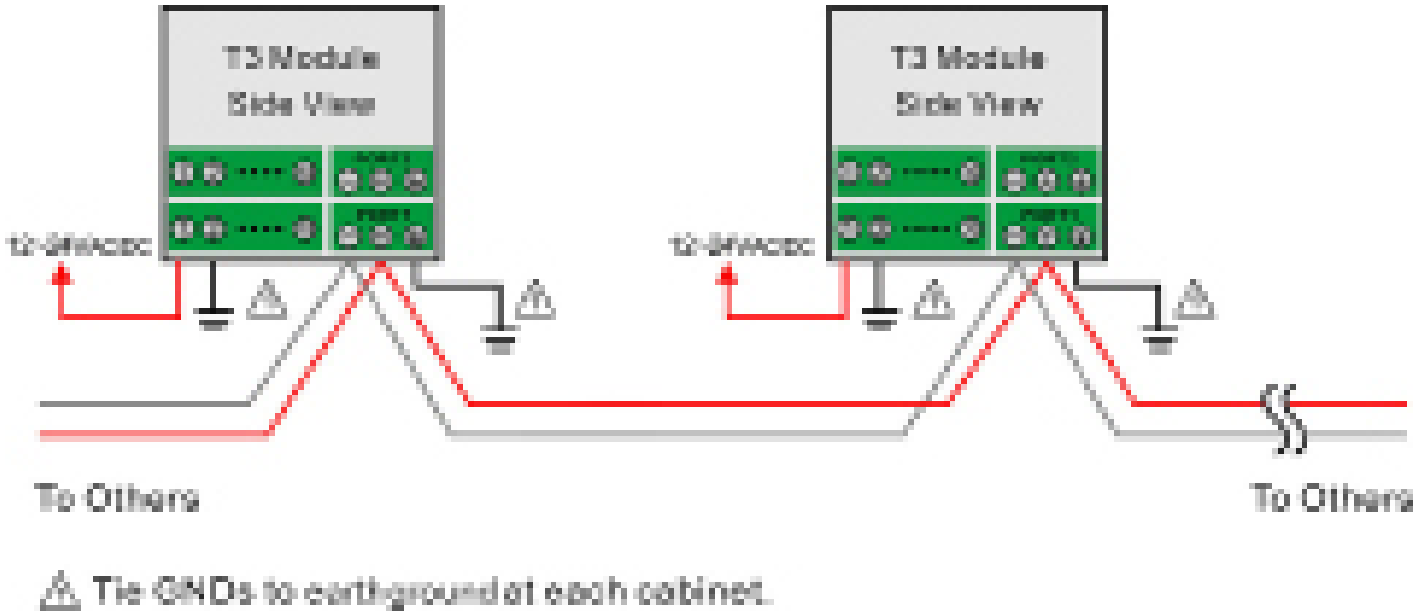
1.8.6 Terminal Block Connections (T3-PT10)



1.9 Typical Sensor Inputs

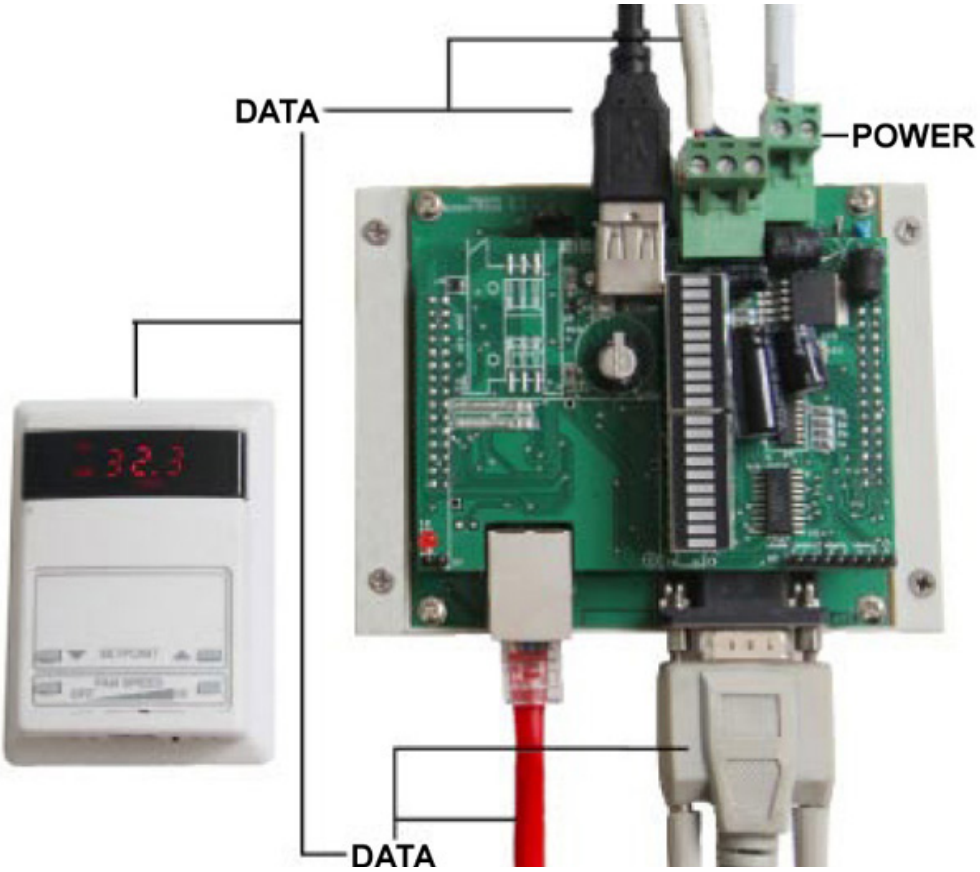


2.0 Network Diagram

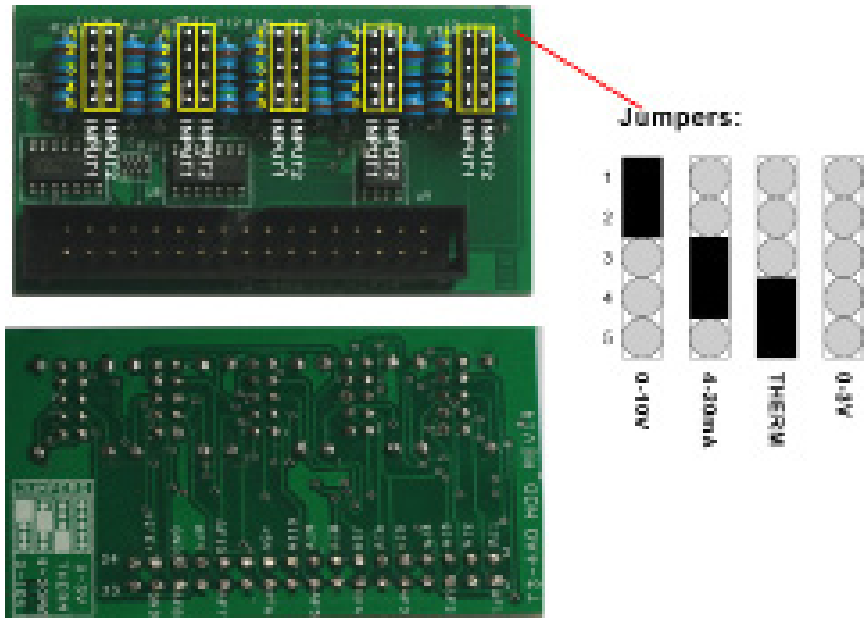


1.9.6 Mounting

- External wiring is connected to a terminal block on the circuit board
- The enclosure is comprised of a base section and a cover
- The base section can be mounted directly on a wall or on a wall box
- Length of cables : No practical limitation on cable length



1.9.7 T3-4AO Jumper Settings



2 Modbus Serial Communications

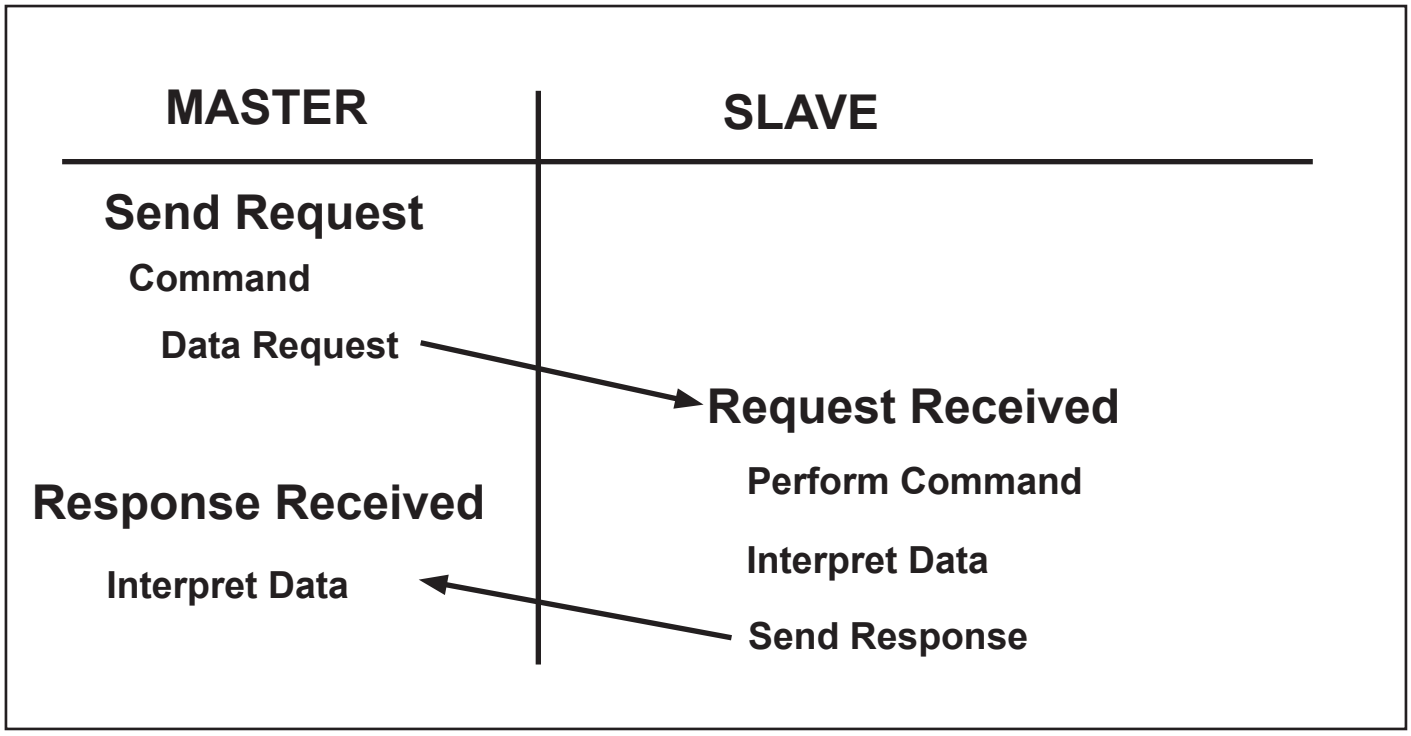
2.1 Overview

Modbus protocol is a widely used and well-documented communication method. It provides simple and effective means of programming our various products.

A typical Modbus packet looks like this:

Byte1 Modbus ID, the destination address for a particular message
Byte2 Function
Byte3 Starting address of the particular storage registers) to be read or written, hi byte,
Byte4 Starting address low byte
Byte5 No. of registers to read/write (hi byte)
Byte7 CRC hi byte
Byte8 CRC low byte

During normal operation, the slave will immediately send a response to the master request.



[Notice]: Most errors during message transfer are timeout errors. This is because bytes being distorted or missing will not trigger a response, resulting in a timeout error.

Software tools can be found at: http://www.modbustools.com/modbus_poll.asp If your application can read & write bytes to a separate PC running the 'Modbus Slave' application, you will be able to read & write bytes to theTstat5. Note: When using the Modbus Poll software, addressing should be set to "Protocol Addresses (Base 0)" under the "Display" menu.

2.2 Modbus Examples

2.2.1 READ Command (0x03)

This function is used to read the contents of multiple memory registers. The master to the Modbus must specify, the Modbus ID, it's starting register and quantity of register desired. By convention if a data were to contain 2 byte, we would first send the Hi byte and then the Lo byte. You can change the Modbus ID whatever you want by writing register 6.

The master to the Modbus network will issue a read command:

- Modbus ID=11
- Read 6 bytes of data
- Starting at register number 107 (6Bh)

Byte #	Field Name (Hex)	Data	Description
Byte1	Slave Address	11	Tstat with ID11 will be read
Byte2	Function	03	Read operation
Byte3	Starting Address Hi	00	
Byte4	Starting Address Lo	6B	Reading starting from register #6B
Byte5	No. of Register to read Hi	00	
Byte6	No. of Register to read Lo	03	Read a total of 3 registers
Byte7	Error Check (CRC) HI byte	XX	The CRC is calculated using the CRC
Byte8	Error Check (CRC) LO byte	XX	Routine described below

The slave device with ID=11 will answer the master within a few milliseconds with the following response.

Byte #	Field Name (Hex)	Data	Description
Byte1	Slave Address	11	Slave with ID11 is responding
Byte2	Function	03	We're responding to a read command
Byte3	Byte Count	06	6 bytes are coming
Byte4	Data1 Hi	02	Byte1 of the data
Byte5	Data1 Lo	2B	Byte2 of the data
Byte6	Data2 Hi	00	Byte3 of the data
Byte7	Data2 Lo	00	Byte4 of the data
Byte8	Data3 Hi	00	Byte5 of the data
Byte9	Data3 Lo	64	Byte6 of the data
Byte10	Error Check (CRC) HI byte	XX	The CRC is calculated using the CRC
Byte11	Error Check (CRC) LO byte	XX	Routine described below

Example of the Read Command:
The Master sends the Read querie:

Slave Address	Function	Starting Address Hi	Starting Address Lo	No. of Points Hi	No. of Points Lo	CRC Hi Byte	CRC Lo Byte
11	3	0	(6Bh) 107	0	3	xx	xx

The device node sends back the following response:

Slave Address	Function	Byte Count	Data1 Hi	Data1 Lo	Data2 Hi	Data2 Lo
11	3	6	(02h) 2	(2Bh) 43	(00h) 0	(00h) 0

Data3 Hi	Data3 Lo	CRC Hi Byte	CRC Lo Byte
(00h) 0	(64h) 100	xx	xx

2.2.2 WRITE command (0x06)

This function is used to write to a single memory register. The master of the Modbus must specify the Modbus ID, its register address to be written and the data desired.

The master to the Modbus network will issue a write command:

- Modbus ID=11
- Write to address 11
- Enter data 3 (03h)

Byte #	Field Name (Hex)	Data	Description
Byte1	Slave Address	11	Destination address
Byte2	Function	06	This is a write command
Byte3	Register Address Hi	00	Address which will be written to, hi byte
Byte4	Register Address Lo	01	Address which will be written to, low byte
Byte5	Data Hi	00	Data that we are writing, hi byte
Byte6	Data Lo	03	Data we are writing, low byte
Byte7	Error Check (CRC) HI byte	XX	The CRC is calculated using the CRC
Byte8	Error Check (CRC) LO byte	XX	Routine described below

The slave device with ID=11 will answer the master within a few milliseconds with the following response.

Byte #	Field Name (Hex)	Data	Description
Byte1	Slave Address	11	Destination address
Byte2	Function	06	This is a write command
Byte3	Register Address Hi	00	Address which will be written to, hi byte
Byte4	Register Address Lo	01	Address which will be written to, low byte
Byte5	Data Hi	00	Data that we are writing, hi byte
Byte6	Data Lo	03	Data we are writing, low byte
Byte7	Error Check (CRC) HI byte	XX	The CRC is calculated using the CRC
Byte8	Error Check (CRC) LO byte	XX	Routine described below

[Notice]: In this case the Slave device just sends back the message to let the Master know the query has been prop erly received.

Example of the Write Command

The Master sends the Write Query:

Slave Address	Function	Starting Address Hi	Starting Address Lo	Data Hi	Data Lo	CRC Hi Byte	CRC Lo Byte
11	6	0	(01h) 1	0	3	xx	xx

The device node sends back the following response:

Slave Address	Function	Starting Address Hi	Starting Address Lo	Data Hi	Data Lo	CRC Hi Byte	CRC Lo Byte
11	6	0	(01h) 1	0	3	xx	xx

2.2.3 MULTIPLE-WRITE Command (0x10)

This function is used to write to multiple memory registers. The master of the Modbus must specify the Modbus ID, its starting address register, the amount of register desired and the data. NOTE: This is used for firmware update only. It is not used to write device registers.

The master to the Modbus network will issue a multiple-write command:

- Modbus ID=11
- Write to address 291 (123h)
- Number of Registers 3
- Data 1 = 10 (000Ah)
- Data 2 = 11(000Bh)
- Data 3 = 12 (000Ch)

Byte #	Field Name (Hex)	Data	Description
Byte1	Slave Address	11	Destination address ID 11
Byte2	Function	10	This is a multiple write command
Byte3	Register Start Address Hi	01	This is the address we are currently writing to in the code space of the device
Byte4	Register Start Address Lo	23	In this case we want to write to register address 0x0123
Byte5	Quantity of Registers to write Hi	00	We will be writing a variable amount of bytes at a time
Byte6	Quantity of Registers to write LOW	10	in this case we want to write to 10H or 16 registers
Byte7	Byte Count	20	If byte count is the same as number of Registers, dealing with 8 bits. If byte count is the same as number of Registers, dealing with 16 bits.

Byte #	8 bits	Byte #	16 bits
Byte8	Data 1	Byte8	Data1 Hi
Byte9	Data 2	Byte9	Data1 Lo
Byte10	Data 3	Byte10	Data2 Hi
Byte11	Data 4	Byte11	Data2 Lo
[…]		[…]	
Byte22	Data 15	Byte38	Data16 Hi
Byte23	Data 16	Byte39	Data16 Lo
Byte 24	Error Check HI	Byte40	Error Check HI
Byte 25	Error Check LO	Byte41	Error Check LO

[Notice]: Byte 7 is used as a byte count. Thus if the byte count is the same as the number of registers to write then we know we are dealing with 1 byte registers. Similarly, if the byte count is double the number of registers, we are dealing with 2 byte registers.

The slave device with ID=11 will answer the master within a few milliseconds with the following response.

Byte #	Field Name (Hex)	Data	Description
Byte1	Slave Address	11	Destination node ID
Byte2	Function	10	This is a multiple write command
Byte3	Register Start Address Hi	00	Starting address we are writing to, hi byte
Byte4	Register Start Address Lo	01	Start address low byte
Byte5	Quantity of Registers Hi	00	Number of registers to be written to, hi byte
Byte6	Quantity of Registers Lo	0A	Number of registers, low byte
Byte7	Error Check (CRC) HI byte	XX	The CRC is calculated using the CRC
Byte8	Error Check (CRC) LO byte	XX	Routine described previously

Example of the Multiple-Write Command
The Master sends the Multiple-Write querie:

Slave Address	Function	Starting Address Hi	Starting Address Lo	Quantity. of Regs Hi	Quantity. of Regs Lo	Byte Count
11	(10h) 16	(01h) 1	(23h) 35	0	3	6

Data 1 Hi	Data 1 Lo	Data 2 Hi	Data 2 Lo	Data 3 Hi	Data 3 Lo	CRC Hi Byte	CRC Lo Byte
(00h) 00	(0Ah) 10	(00h) 00	(0Bh) 12	(00h) 00	(0Ch) 13	xx	xx

Slave Address	Function	Starting Address Hi	Starting Address Lo	Quantity. of Regs Hi	Quantity. of Regs Lo	CRC Hi Byte	CRC Lo Byte
11	10	(01h) 1	(23h) 35	0	3	xx	xx

2.3 CRC Error Correcting Details

The following is a collection of code snippets to get your application started:

static unsigned char auchCRCHi[ ] = {
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01,
0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81,
0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01,
0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01,
0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01,
0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40
} ;

/* Table of CRC values for low–order byte */

static unsigned char auchCRCLo[ ] = {
0x00, 0xC0, 0xC1, 0x01, 0xC3, 0x03, 0x02, 0xC2, 0xC6, 0x06, 0x07, 0xC7, 0x05, 0xC5, 0xC4,
0x04, 0xCC, 0x0C, 0x0D, 0xCD, 0x0F, 0xCF, 0xCE, 0x0E, 0x0A, 0xCA, 0xCB, 0x0B, 0xC9, 0x09,
0x08, 0xC8, 0xD8, 0x18, 0x19, 0xD9, 0x1B, 0xDB, 0xDA, 0x1A, 0x1E, 0xDE, 0xDF, 0x1F, 0xDD,
0x1D, 0x1C, 0xDC, 0x14, 0xD4, 0xD5, 0x15, 0xD7, 0x17, 0x16, 0xD6, 0xD2, 0x12, 0x13, 0xD3,
0x11, 0xD1, 0xD0, 0x10, 0xF0, 0x30, 0x31, 0xF1, 0x33, 0xF3, 0xF2, 0x32, 0x36, 0xF6, 0xF7,
0x37, 0xF5, 0x35, 0x34, 0xF4, 0x3C, 0xFC, 0xFD, 0x3D, 0xFF, 0x3F, 0x3E, 0xFE, 0xFA, 0x3A,
0x3B, 0xFB, 0x39, 0xF9, 0xF8, 0x38, 0x28, 0xE8, 0xE9, 0x29, 0xEB, 0x2B, 0x2A, 0xEA, 0xEE,
0x2E, 0x2F, 0xEF, 0x2D, 0xED, 0xEC, 0x2C, 0xE4, 0x24, 0x25, 0xE5, 0x27, 0xE7, 0xE6, 0x26,
0x22, 0xE2, 0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0, 0xA0, 0x60, 0x61, 0xA1, 0x63, 0xA3, 0xA2,
0x62, 0x66, 0xA6, 0xA7, 0x67, 0xA5, 0x65, 0x64, 0xA4, 0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F,
0x6E, 0xAE, 0xAA, 0x6A, 0x6B, 0xAB, 0x69, 0xA9, 0xA8, 0x68, 0x78, 0xB8, 0xB9, 0x79, 0xBB,
0x7B, 0x7A, 0xBA, 0xBE, 0x7E, 0x7F, 0xBF, 0x7D, 0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5,
0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71, 0x70, 0xB0, 0x50, 0x90, 0x91,
0x51, 0x93, 0x53, 0x52, 0x92, 0x96, 0x56, 0x57, 0x97, 0x55, 0x95, 0x94, 0x54, 0x9C, 0x5C,
0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E, 0x5A, 0x9A, 0x9B, 0x5B, 0x99, 0x59, 0x58, 0x98, 0x88,
0x48, 0x49, 0x89, 0x4B, 0x8B, 0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C,
0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42, 0x43, 0x83, 0x41, 0x81, 0x80,
0x40
} ;

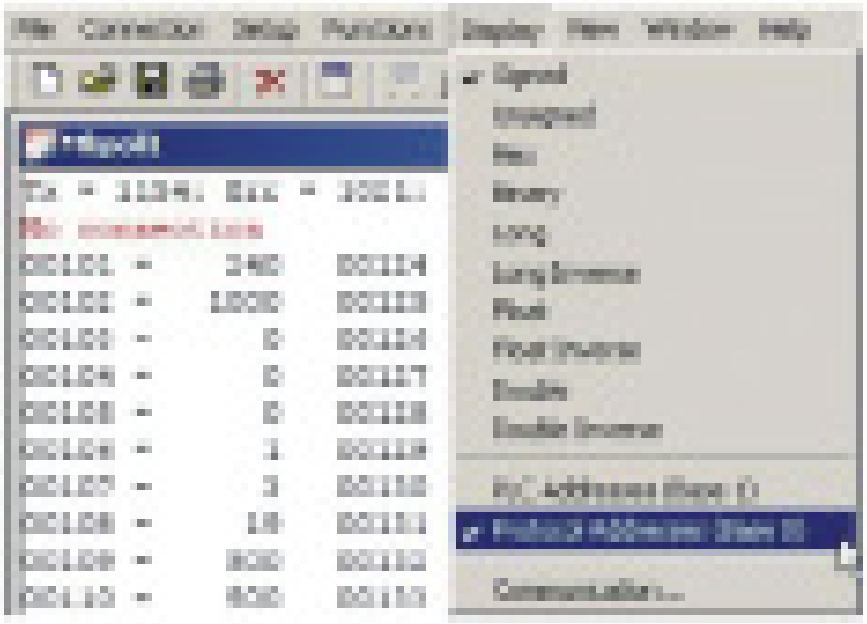
For example: to calculate the crc of the data in the message stored in memory location *puchMsgunsigned short CRC16 (unsigned char *puchMsg, unsigned char usDataLen

```
{
    unsigned char uchCRCHi = 0xFF ; /* high byte of CRC initialized */
    unsigned char uchCRCLo = 0xFF ; /* low byte of CRC initialized */
    unsigned uIndex ; /* will index into CRC lookup table */
    while (usDataLen--) /* pass through message buffer */
{
        uIndex = uchCRCHi ^ *puchMsg++ ; /* calculate the CRC */
        uchCRCHi = uchCRCLo ^ auchCRCHi[uIndex] ;
        uchCRCLo = auchCRCLo[uIndex] ;
    }
    return (uchCRCHi << 8 | uchCRCLo) ;
}
```

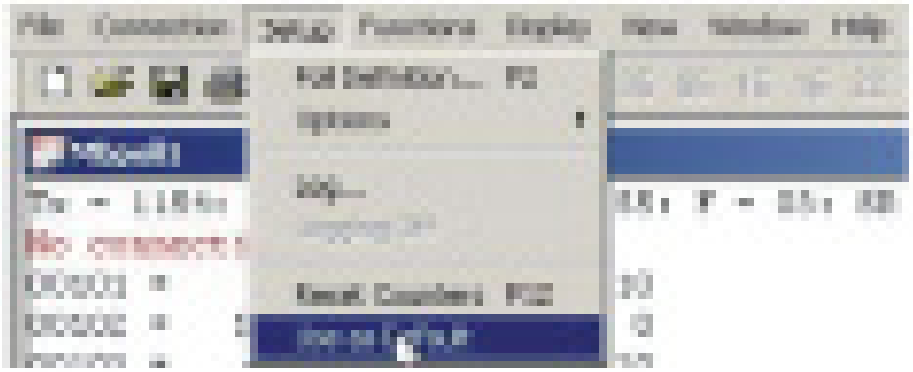
2.4 Modbus Poll Software

Modbus Poll is a simple modbus communications tool developed by Witte Communications http://www.modbustools.com/modbus_poll.asp that can be used to read and write registers of modbus devices. The following is a brief set of instructions for communicating with a device.

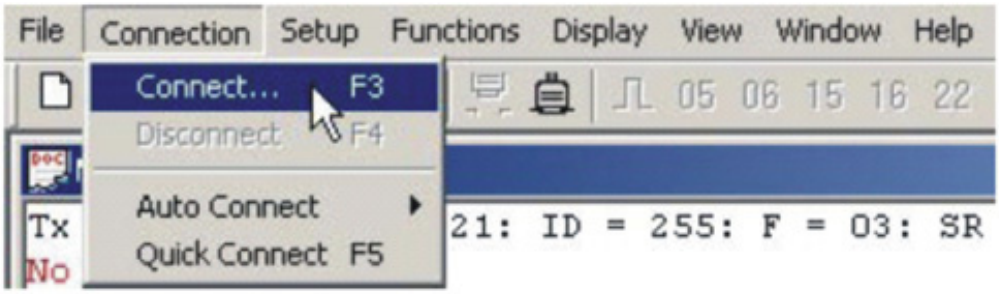
The first time Modbus Poll is used, it should be set to base 0 addressing. This is done by selecting “Protocol Addressing (Base 0) “ from the Display menu:



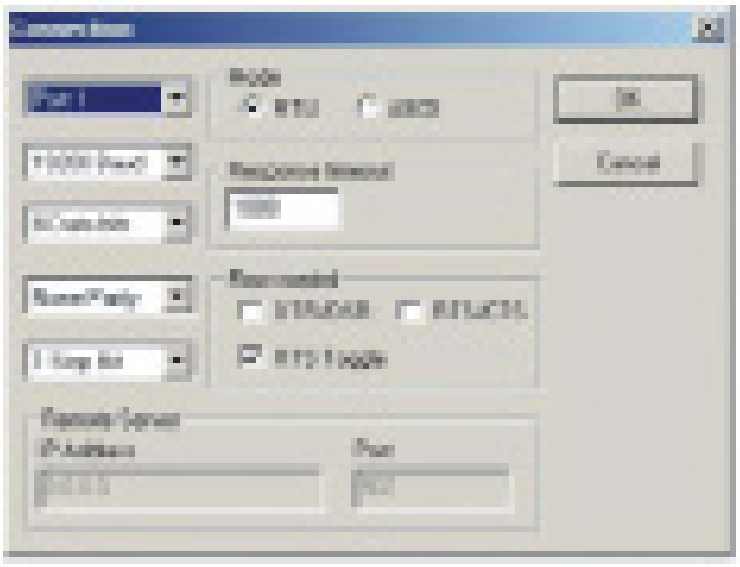
The Setup menu:



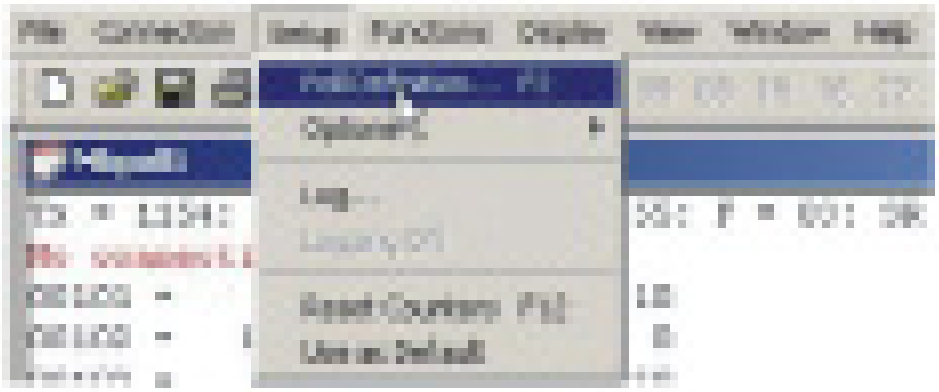
At this point, the connection to the device needs to be established. Select “Connect...” from the Connection menu:



Unless the device has specifically been setup for 9600 baud, the default connections settings should be as follows:

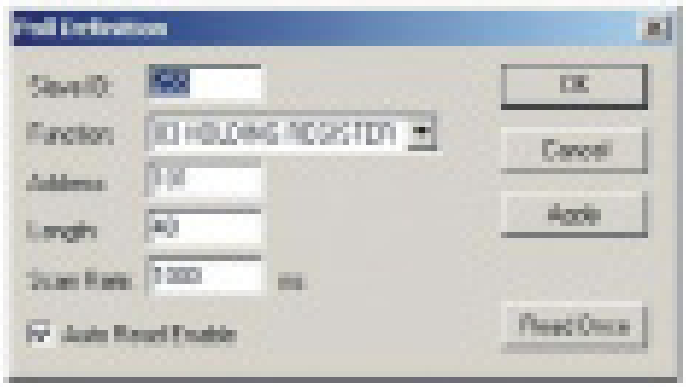


After the connection is established, it is necessary to setup the poll definitions. This is done by selecting "Poll Definition..." from the Setup menu:

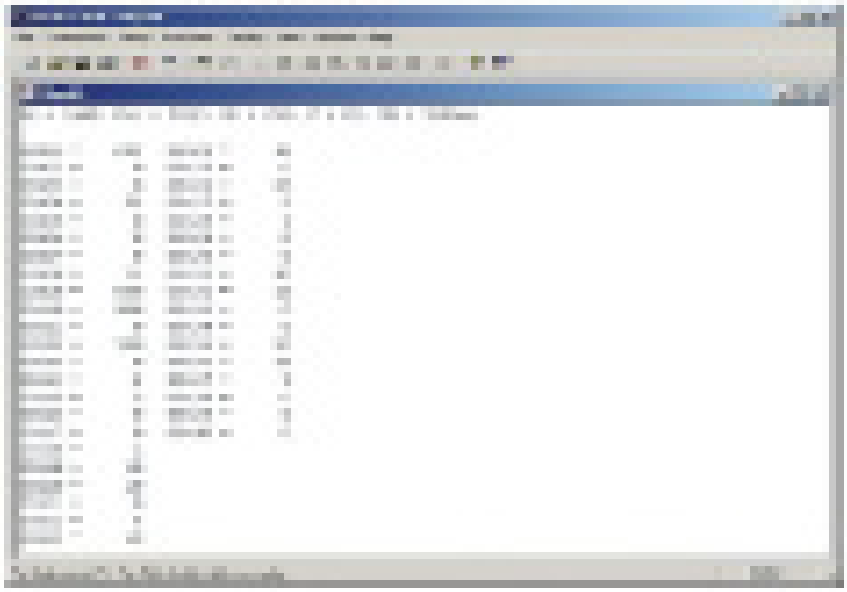


Within the Poll Definitions dialog window, there are several parameters that need to be set.

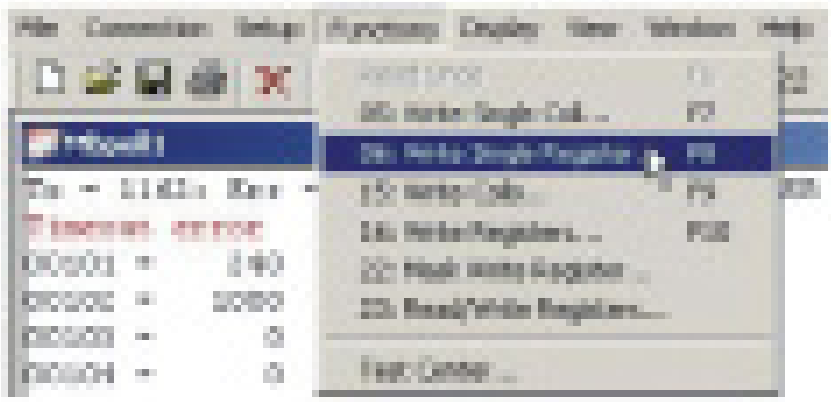
- Slave ID is the modbus address of the device being read or written. (255 is the generic address to which all devices will respond.)
- Function should be set as 03 HOLDING REGISTER.
- Address is the starting address of the registers to be read.
- Length is the number of registers to be read.
- Scan Rate is the frequency with which the device will be polled.



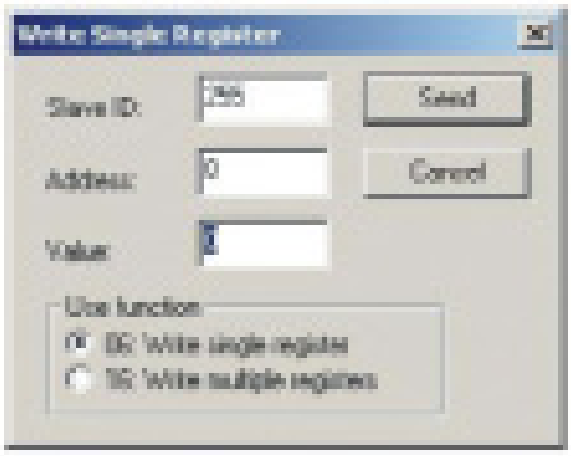
Once the Poll Definitions have been setup and applied, the main window will show a list of each register address and its corresponding value.



In order to write a value to a specific register, select “06 Write Single Register...” from the Functions menu:



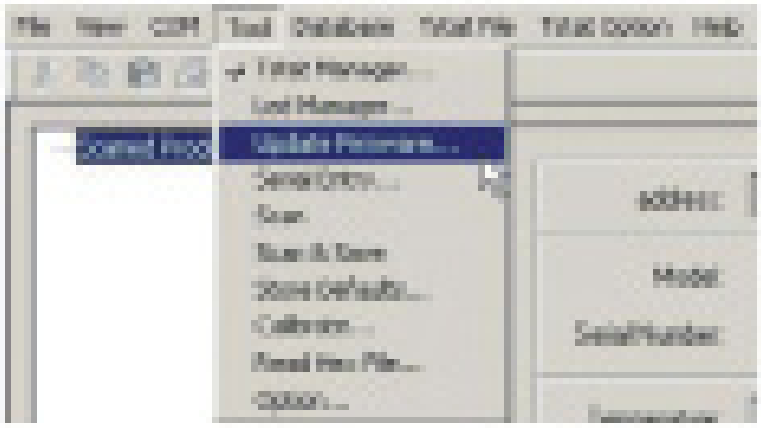
Slave ID is the modbus address of the device. Address is the address of the register that will be written. Value is the value being written.



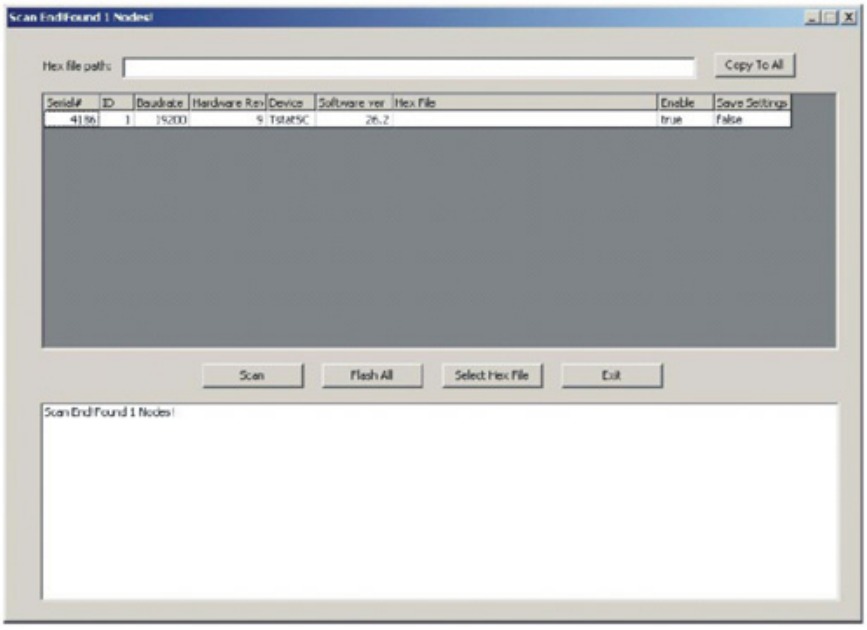
3 Instructions for Updating Devices with Temco ISP

For TEMCO devices that utilize the Temco ISP, the flash update must be done using the provided NWT3000. To perform a firmware update, follow these instructions:

1.) Download and install the NWT3000 software: http://www.temcocontrols.com/ftp/software/9TstatSoftware.zip
2.) Connect the device to the serial port of your computer using the RS232-485 converter included in the package.
3.) Power up the device.
4.) Open the NWT3000 software and select Update Firmware from the Tool menu:



5.) The software will now open the Update Firmware window and will scan for available devices.



6.) For each device that is found, you can specify the hex file to be used for the update. Do this by clicking in the Hex File column of the row you wish to specify. Alternatively you can click Select Hex File and then “Copy to All” if all devices are to receive the same file. You can also choose to save the current settings or to load the default settings by selecting True or False from the Save Settings column.
7.) At this point simply click Flash All and the software will update each device one by one.

3.1 Protocol for Developers Wanting to Update Devices with Temco ISP

All devices programmed with Temco ISP are capable of being updated over the RS485 network. The master on the network sends a command to a particular device, which forces it to go into a 'flash update mode'. The device first resets itself and then jumps to the 'In System Programming' (ISP) code section. Note that all non-volatile parameters should be read and saved prior to this for safe keeping.

NOTE: Multiple-Write Command of the Modbus protocol is used.

3.1.1 Protocol

In order for the front end to communicate with the ISP flash, a series of registers have been defined, which are used as control registers for the Update functions. Reading and writing to these registers will allow the Front end to monitor the status of the update process. They are stored in the non-volatile memory space to keep track of the steps attempted and completed. Below is a description of these control status registers.

Register	Register address	Description
EEPROM_VERSION_NUMBER	4	Software Version
EEP_ADDRESS	6	ID number of the device
EEP_UPDATE_STATUS	16	Update Register state

Table 1. Flash Update Function Registers

It is important to note 'EEP_UPDATE_STATUS' which is located at register address 16. Writing to this register will cause the device to either reset itself, erase its flash or start programming depending on the action being taken. Below is a description of the values and explanation of the EEP_UPDATE_STATUS register.

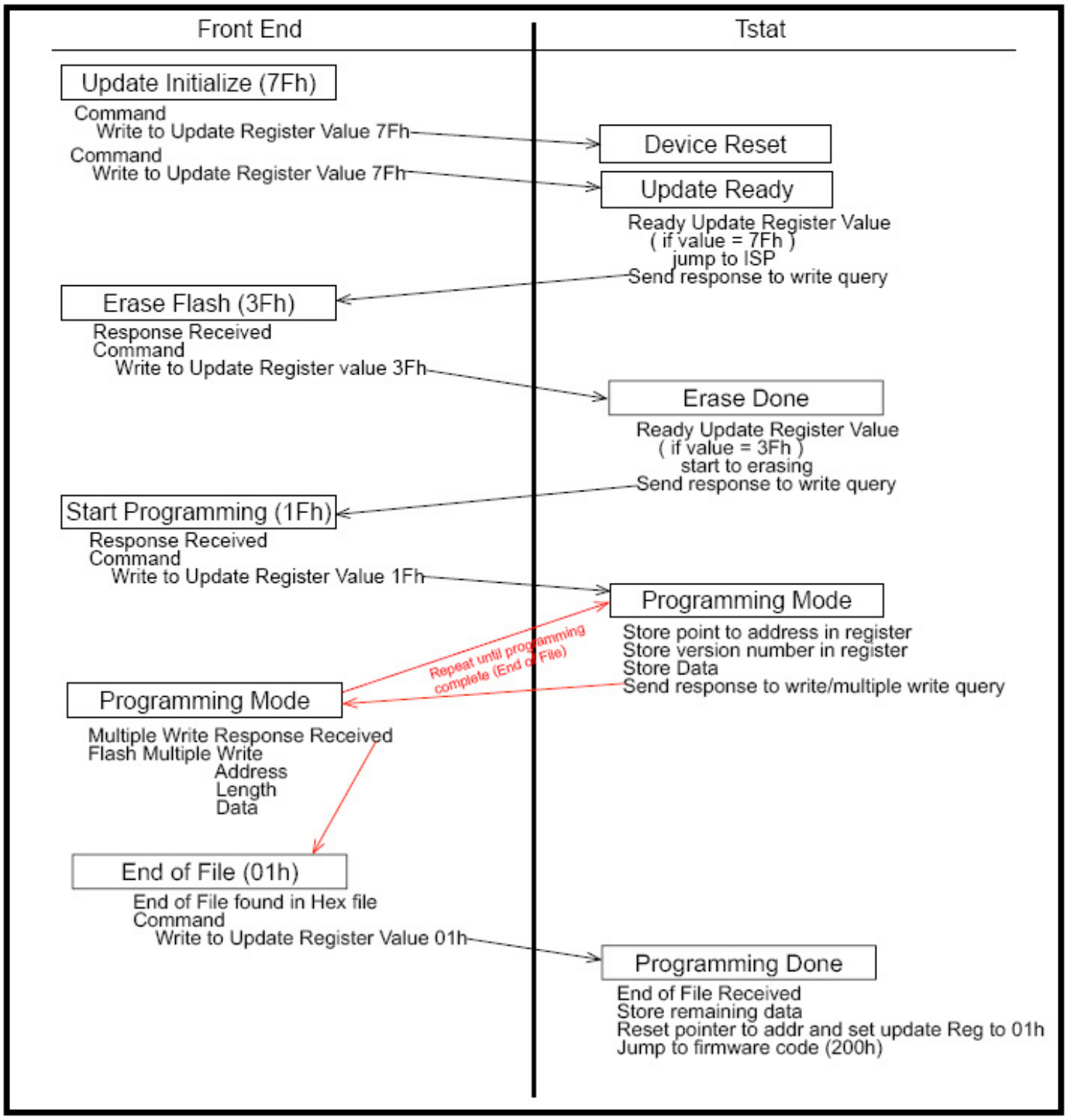
Function	Value	Description of EEP_Update_Status
Update initialize	7Fh	Tell the Tstat to reset and jump into the ISP to be in update mode
Update ready		Tstat is in the ISP and ready to update
Erase flash	3Fh	Tell the Tstat to erase Flash Memory
Erase done		Erase Flash Memory done
Start Programming	1Fh	Start Programming - In upload state
Normal State	01h	Update is complete, tstat reboots with new flash image

Table 2. EEP_UPDATE_STATUS register value description

- For the device to jump into update mode, a write command of value 7Fh must be sent to the EEP_UPDATE_STATUS. The device will then reset itself and run in ISP mode.
  Note: The device will not send any response in this step. To verify the T3-Module is in ISP mode, the same write command must be sent again (write 7Fh to register #16), at which point the T3-Module will respond with a regular modbus response. This is necessary for clearing the Interrupt vectors and making sure all RAM memory is cleared.
- All Modbus communication commands are followed by a response. This Flash Update Protocol makes use of that criteria and thus only sends a response once the action has been completed. Therefore the 'update initialize' and 'erase flash' step require a longer timeout period than the 'programming' step. (250ms and 500ms respectively)
- Sending a write command of value 3Fh to EEP_UPDATE_STATUS will force the device to erase its entire flash memory. Once the response is received, the device is ready to download the data of the new firmware.
- Sending a write command of value 1Fh to EEP_UPDATE_STATUS will let the device know it is about to receive new firmware. The device is now ready to accept the new hex file and will maintain a running tally of the current programming location in the EEP_UPDATE_PTR.
- At this point, the data must be sent using the multiple-write command. Packets can be of size 1 data byte to a maximum of 128 data bytes.
- In the event of an interrupted flash update, the Master can poll the EEP_UPDATE_PTR and begin programming from this location.

3.1.2 Example of a Programming Routine

The ISP has been designed using polling vectors rather than Interrupt vectors in order to free up as many interrupts for the program itself. Given that polling is now used, communications are more susceptible to timing and response delay problems. Therefore, when sending a write function or multiple write function to the ISP device, a short timeout delay is required before receiving a response (≈20ms). If a response was not received during that period of time the FRONT END would need to resend the data once again. Below is a diagram representation of the Flash-Update Protocol.



3.1.5 Intel Hex File

All firmware files produced by our compilers are saved under the Intel Hex file format. This format of record can be broken down in its different fields as described below.

3.1.5.1 Example of an Intel Hex file

Take for instance a typical message such as the following:

```
:ll  aaaa  tt  D1D2D3D4  D5D6D7D8  D9D0D1D2  D3D4D5D6  ee
:10 0080 00 AF5F67F0  602703E0  322CFA92  007780C3  61
```

- The first character (:) indicates the start of a record.
- The next two characters indicate the record length (10h).
- The next four characters give the load address (0080h).
- The next two characters indicate the record type. (00)
- Then we have our data
- The last two characters are a checksum (sum of all bytes + checksum = 00).

Record types:

- 00 - Data record
- 01 - End of file record
- 02 - Extended segment address record
- 03 - Start segment address record
- 04 - Extended linear address record
- 05 - Start linear address record

3.1.6 Intel Hex File

In the case where the device is locked, there is still a possibility to reboot the device and upload a new firmware. This requires to physically link the jumpers of the Flash Update Jumper pins during restart:

- Power down the device
- Link the jumpers of the Flash Update Jumpers
- Power up the device

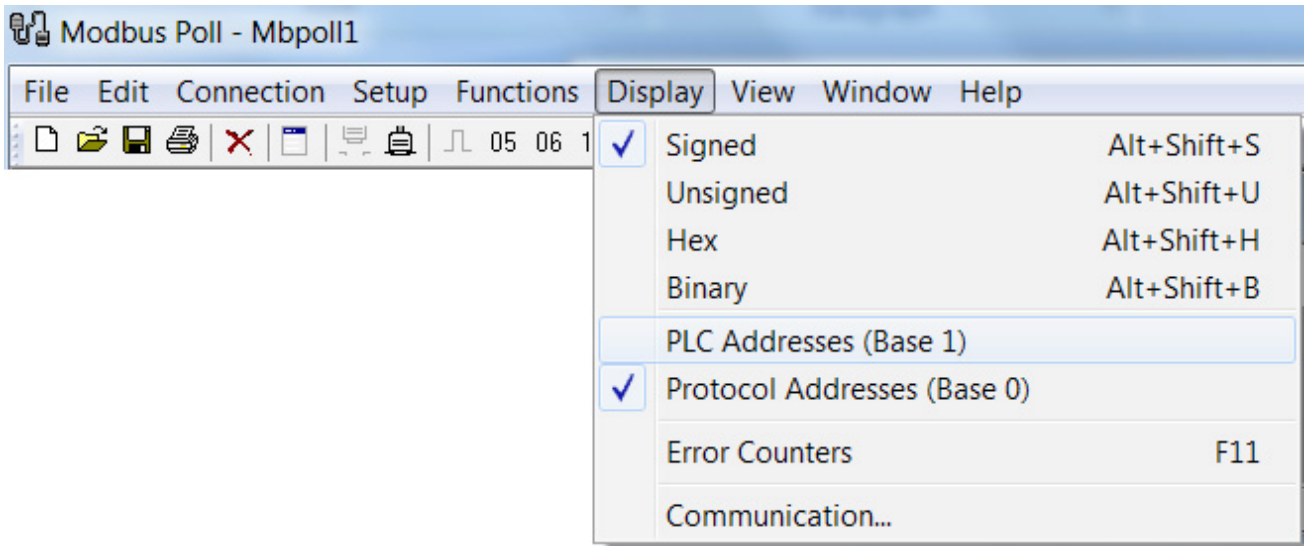
Doing the above steps will force the device to be in ISP mode so that new firmware can be loaded. In order to return to normal operation once the upload has been done the Jumper needs to be removed and power need to be recycled.

4 Getting Started and Installing T3 - Module

4.1 Getting Started:

When setting up your T3-Module please check and set the following settings, and read the following instructions in order to have the module function according to your specific needs.

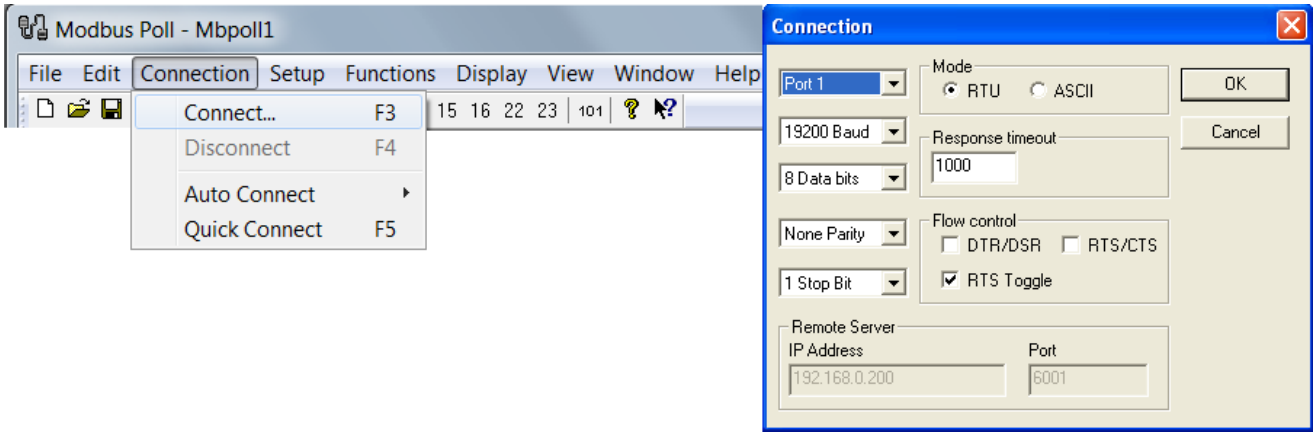
1. Connect 2-Holed power adapter into the 2-Pin port marked “Power” on the T3-Module.
2. Plug the 24 V power cable into the wall.
3. Connect 3-Hole RS485 cableinto the 3-Pin port marked “RS485” on the T3-Module.
4. Connect the other end of the RS485 Cable into an empty Com Port in your computer.
5. If you have not installed Modbus Poll on your system, please do so now
   i. Double click the file “ModbusPollSetup.exe”
   ii. Accept the terms of the licence agreement and press “Next”
   iii. Select your desired location to install the product and press “Next”
   iv. Select the components you wish to install and press “Install”
   v. Once the installation has completed press “Next”
   vi. Press “Finish” to complete
6. On your computer open ModBus Poll
7. Before you start collecting data you must decide if you want to run your module in Base 1 or Base 0
   - Scroll over the “Display” tab and click to see the drop down menu
   - Select “Base 1” or “Base 0” from the drop down menu



- If you use “Base 0” the Registers will be set to those stated below
- If you use “Base 1” the Registers below will be modified by adding 40001
  - Ex. Base 0 Register 00186 = Base 1 Register 40187
  ValueBase1 = ValueBase0 + 40001

8. Baud Rate controls the speed at which information is retrieved from the T3-Module. All T3-Modules can be set to either 19200 or 9600, 19200 being the faster speed.

- To define the Baud Rate go to “Connections -> Connect” and define your Baud Rate.

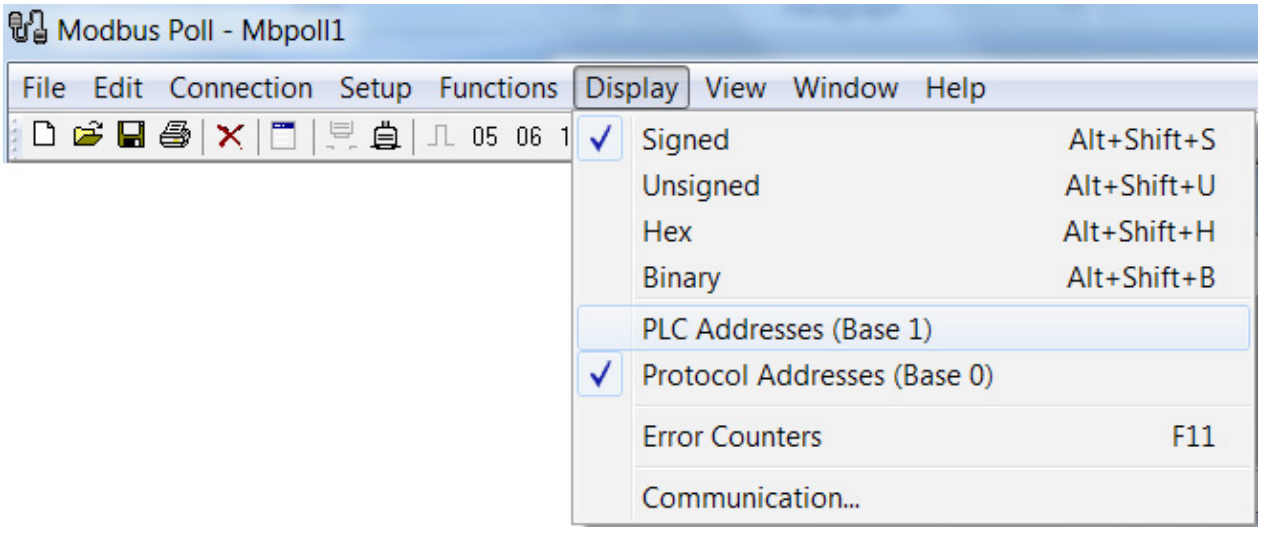


- If the Baud Rate is set to 19200 then “Double-Click” Register 15 and set the “Value” to “1”

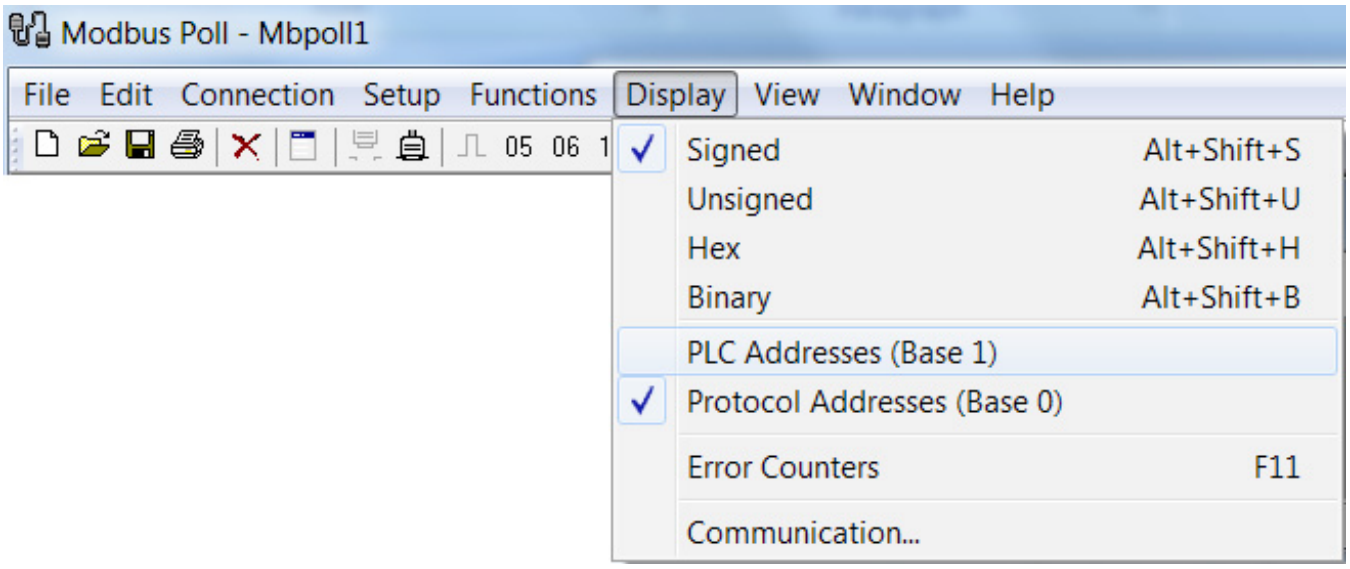
9. Your Com Port must be set before your device can retrieve the information from the T3-Module.

- Different computers use different Com Ports, so you must first see which Com Port your device is using.

1. To do this Open Device manager and see which Com Port your T3-Module uses



2. Then set your Com Port within Mbpoll1



10. Press “OK” to connect to your T3-Module
    - If you do not need to change these settings before beginning you may simply press the  (quick connect) icon.

3.2 Instructions

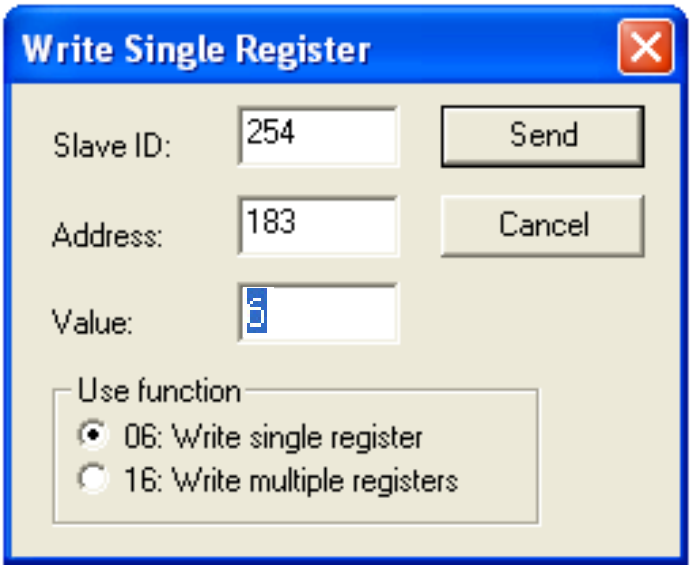
Input Registers Reference Table

Set Range Register	Pulse Counting Register	Date Stamp Register
00183 = Input 1	00118 – 00119 = Input 1	00134 - 00138 = Input 1
00184 = Input 2	00120 – 00121 = Input 2	00139 - 00143 = Input 2
00185 = Input 3	00122 – 00123 = Input 3	00144 - 00148 = Input 3
00186 = Input 4	00124 – 00125 = Input 4	00149 - 00153 = Input 4
00187 = Input 5	00126 – 00127 = Input 5	00154 - 00158 = Input 5
00188 = Input 6	00128 – 00129 = Input 6	00159 - 00163 = Input 6
00189 = Input 7	00130 – 00131 = Input 7	00164 - 00168 = Input 7
00190 = Input 8	00132 – 00133 = Input 8	00169 - 00173 = Input 8

To change Input Method please read and follow these steps:

We will use Input 1 for our example

1. Connect T3 Device to Serial Port
2. Open the program
3. Double-Click register “00183”
4. This will open a pop-up window titled “Write Single Register”



5. Set “Value” to “6” for Pulse Counting
6. Click “Send” to Confirm
7. When asked “Request OK?” - Click OK
8. Pulses will now be counted on Register 00118 and 00119

- Register 00118 counts “1” for every “65535” pulses
- Register 00119 counts single pulse

Ex. 70,000 pulses will be appear as
00118 = 1
00119 = 4465
Total Pulses = Value00118 x 65535 + Value00119

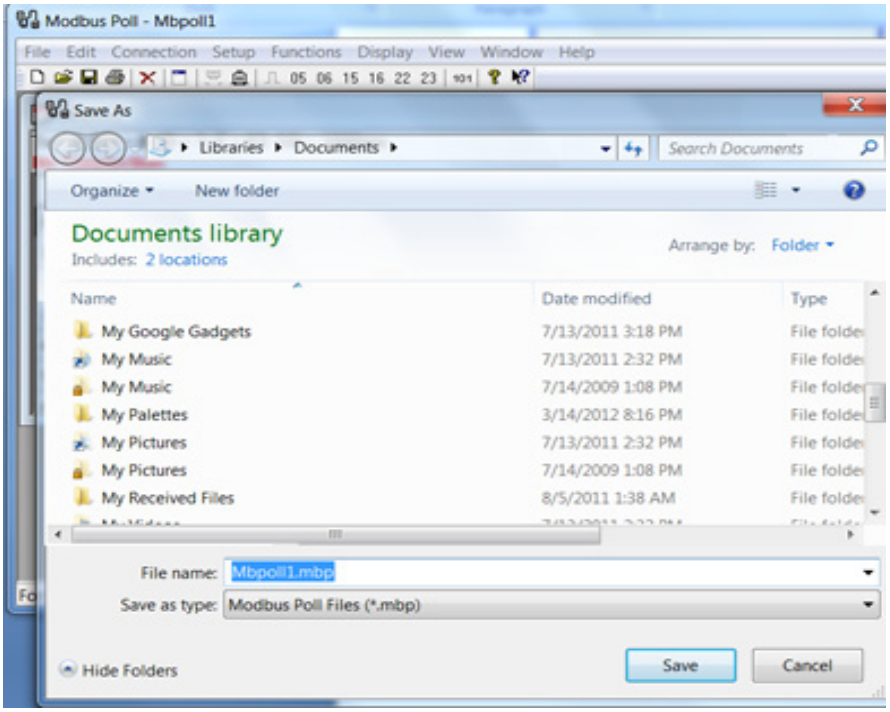
9. In order to save the data collected in Mbpoll1, the first step in using the T3-Module is to set the Date Stamp Register

   CAUTION: Range Counter will reset immediately after writing date

   • Before you begin counting pulses follow these instructions

   1. Set Value of Register “00134” to the last 2 digits of the current year
      - Ex. 2012 = Register Value of “12”
   2. Set Value of Register “00135” to the current month using 2 places
      - Ex. March = Register Value of “03”
      November = Register Value of “11”
   3. Set Value of Register “00136” to the current day using 2 places
      - Ex. 5th = Register Value of “05”
      28th = Register Value of “28”
   4. Set Value of Register “00137” to the current Hour using 2 places
      - Ex. 8:00 am = Register Value of “08”
      8:00 pm = Register Value of “20”
   5. Set Value of Register “00138” to the current Minute using 2 places
      - Ex. 0:07 = Register Value of “07”
      0:24 = Register Value of “24”

10. To save your information simply click the Button (or select Save As from the File Menu) and select the directory in which to save your file



11. To clear the Range Registers (00118-00119), Right-Click Register “00134”
    • Set the “Value” to any single Integer (1-999)
    • This will subsequently, also act as the creation of a new testing file

Wireless Modbus USB Converter

Description

The Zigbee Dongle is a lowcost, low consumption, and wireless mesh network targeted at wide development of long life devices in wireless control and monitoring applications.It provides a simple method of integrating ZigBee into computers, gateways and/or bridge devices. The Zigbee drivers allow the dongle to operate within a Zigbee network.



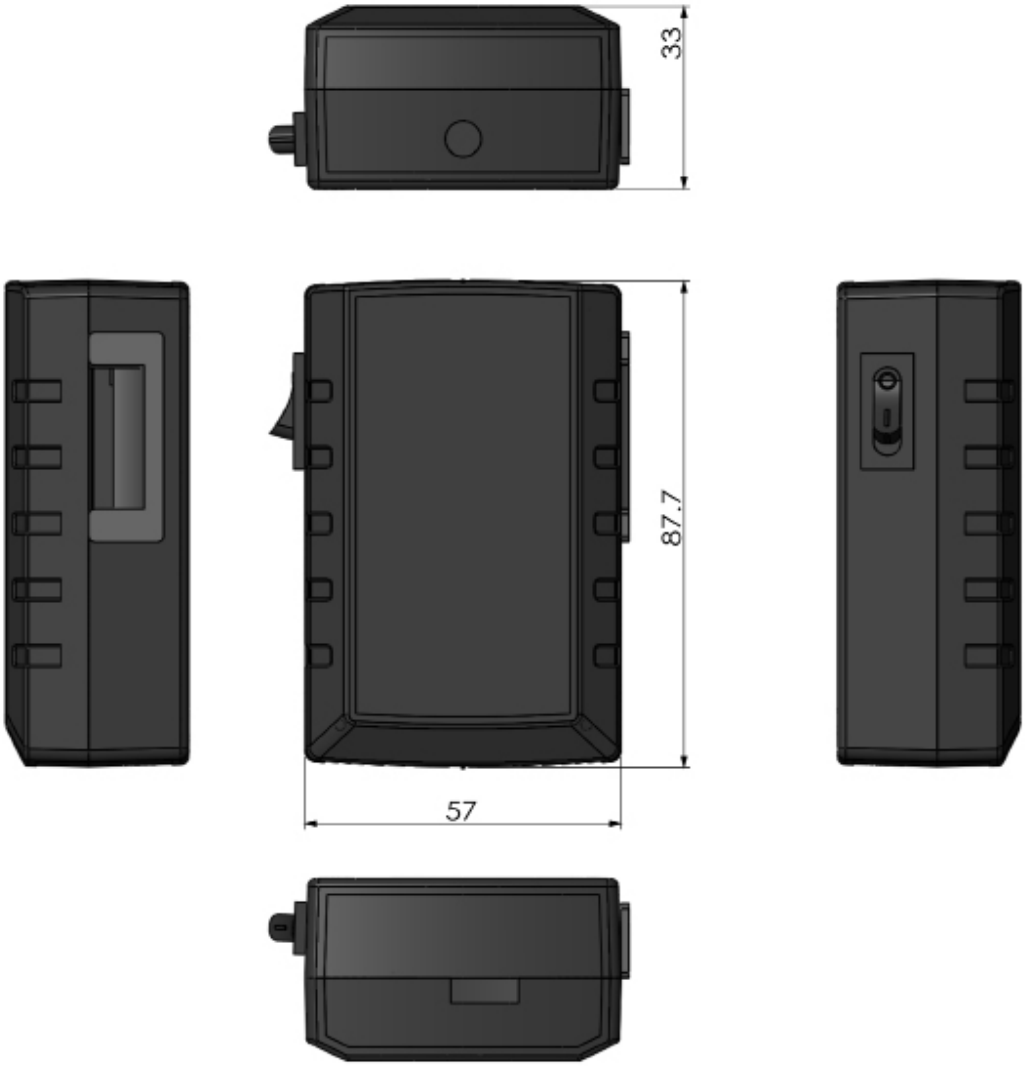
Zigbee Dongle

Specifications

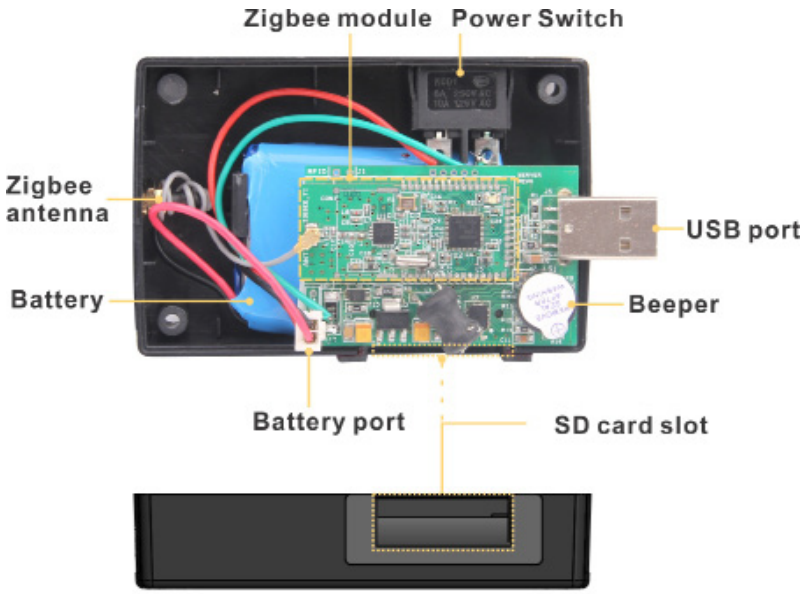
Supple Voltage	2.1 to 3.6V
Communication	USB, Zigbee
Antenna	RPSMA Connector,50Ω
Transmission Range	Penetrate a wall inside room; 200m wide open outside space
Max Current	<20mA @24VAC
Transmit Power	100mW(+20dBm)
Receiver	-101 dBm
Data Rate	RF 250 Kbps,Serial up to 1Mbps
Frequency Band	ISM 2.4 GHz
Operating Temperature	-40º C to +85º C
Memory	Standard: N/A Programmable: 256KB Flash/4 KB RAM
IDS	PAN ID and addresses, cluster IDs and endpoints
Channels	16 channels
Transmit Current	Standard: 120 mA @ 3.3 VDC Programmable: 120 mA @ 3.3 VDC
Receive Current	Standard: 31 mA @ 3.3 VDC Programmable: 45 mA @ 3.3 VDC
Power-down Current	<3 µA at 25º C

Dimension

Unit:mm



Internal View



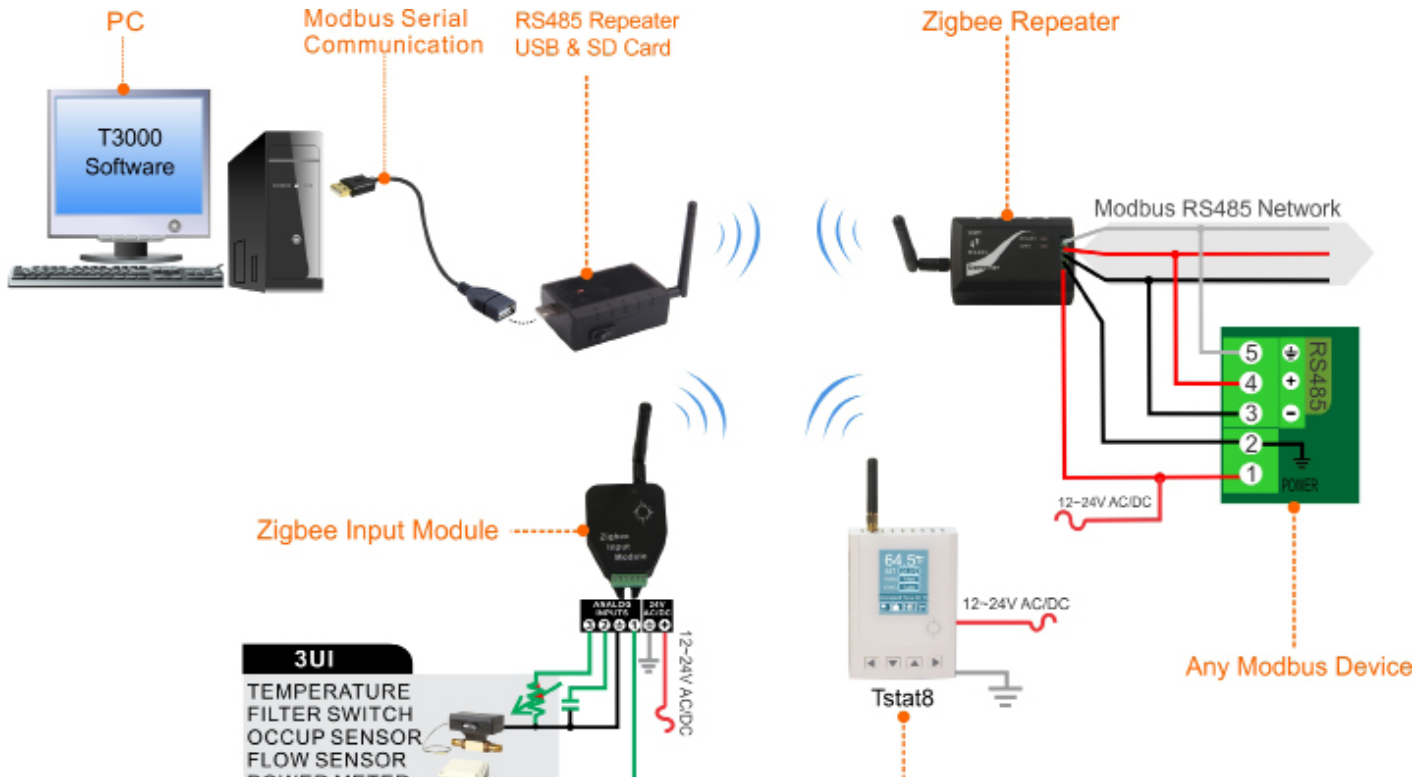
Note:

1.The SD card is only for trend logs. On the upcoming hardware, Arm based units, there's a flash chip on board the module so those can do logging without messing around with SD card.

2.The power switch is a simple on-off switch. The device can be powered through the USB port. The battery will keep the unit alive for a short period during power outages.

Application

The dongle instantly enables a wireless Zigbee connection for existing equipment such as desktops, notebooks to monitor and control Zigbee devices with plug and play convenience.The dongle can be configured as a network coordinator to start a new network.The diagram below will show you how to properly set up a Zigbee Dongle.



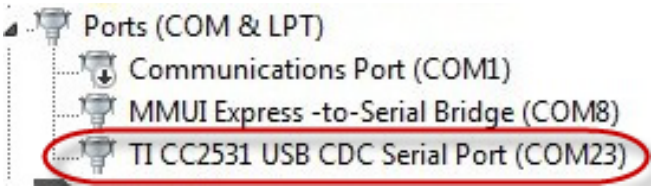
T3000 Operation

This example will show you how the unit will properly work with T3000 software when connecting any Modbus module to a Zigbee Dongle.

Step1.

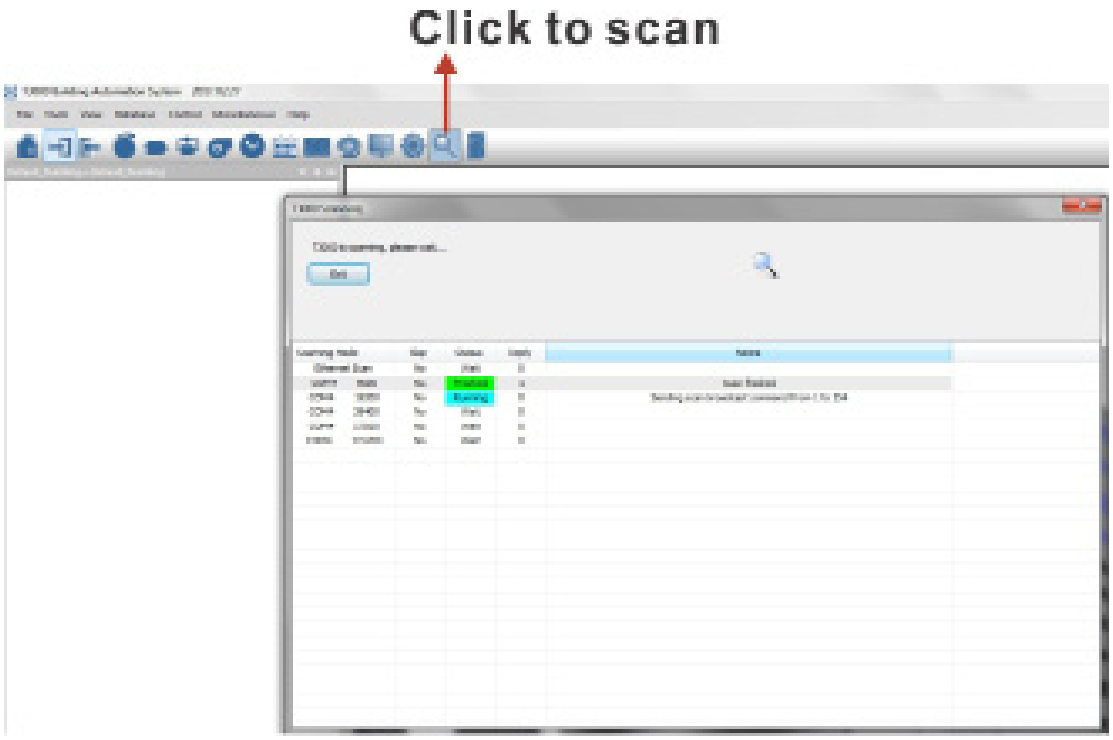
Visit https://temcocontrols.com/ftp/software/T3000.zip,download and install the software;

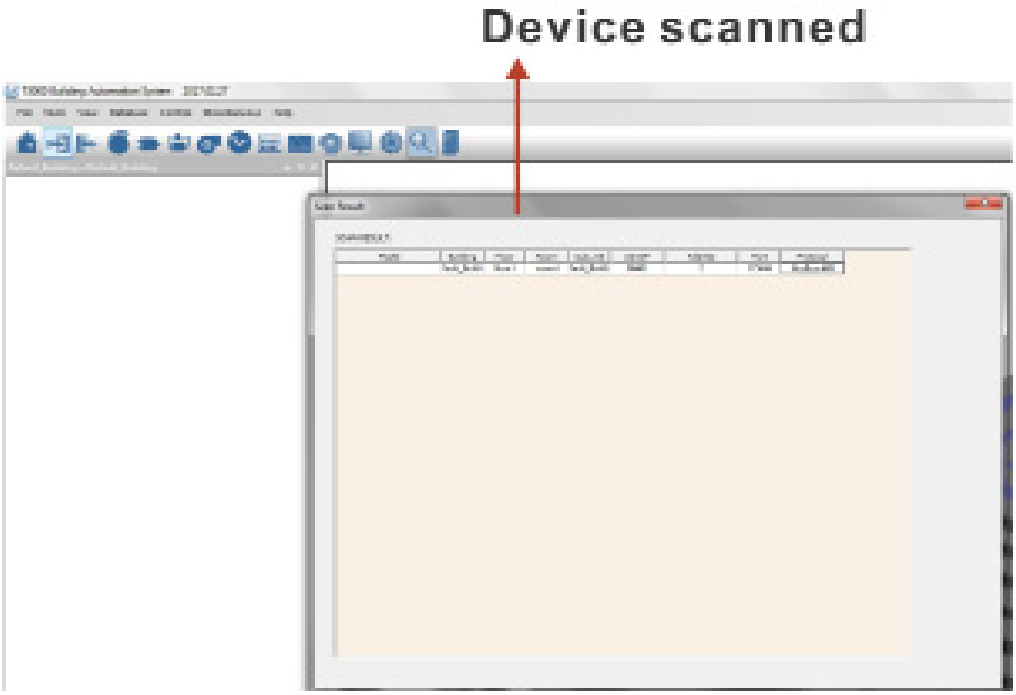
Visit https://temcocontrols.com/ftp/software/15CC2531 Driver.zip,download and install the software.



Step2.

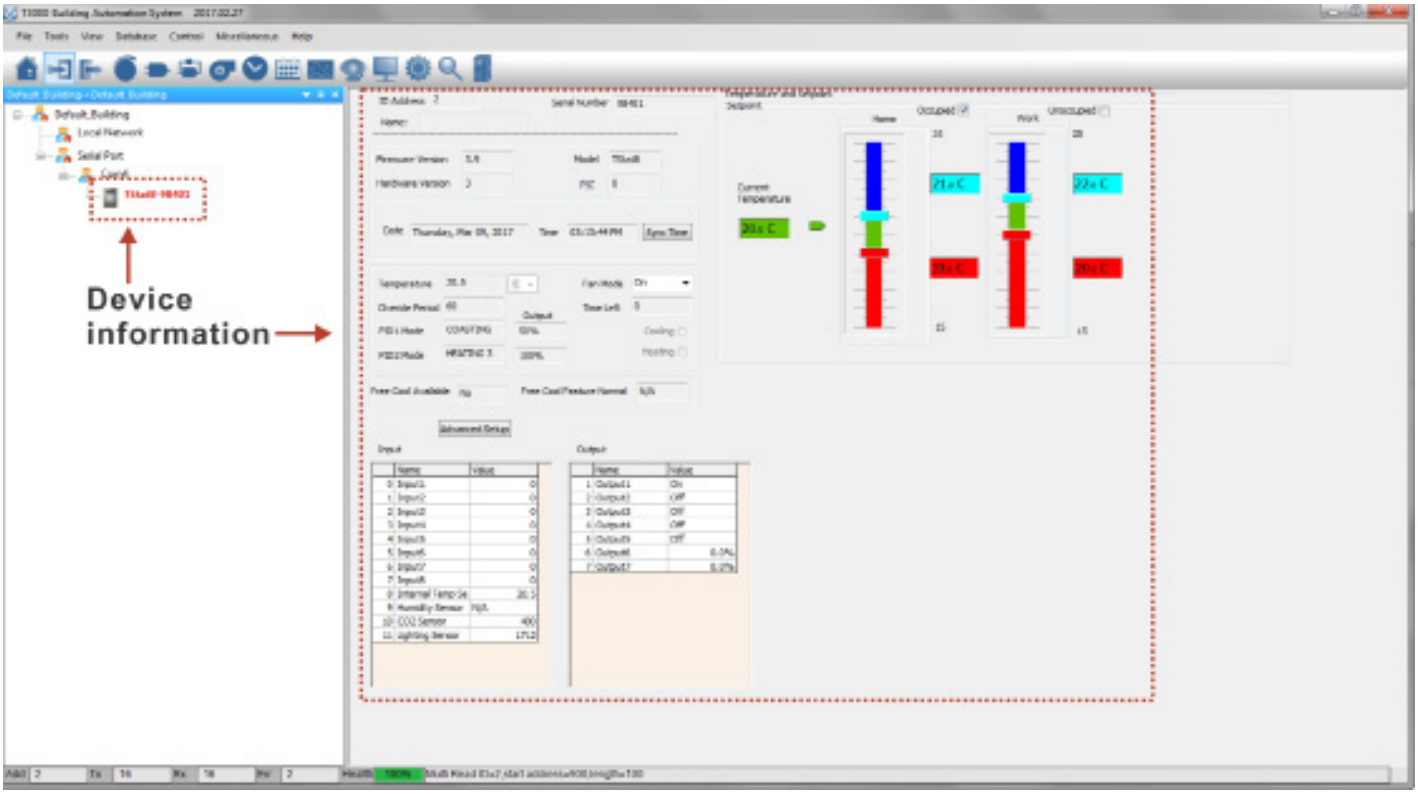
Plug the Zigbee Dongle and any modbus device(for example,Tstat8) in power,then start them.Connect the Zigbee Dongle to a PC USB port.





Step3.

Start T3000 software,click to scan,then you can find the device as below



Modbus Register List

Address	Bytes	INTs	Multipler	Length info	Operation info	Register and Description
0 to 3	4	int8	1	Low byte	R	Serial Number - 4 byte value. Read-only
4 to 5	2	int8	0.1	Low byte	R	Software Version – 2 byte value. Read-only
6	1	int8	1	Low byte	W/R	ADDRESS. Modbus device address, default:MainBoard-1
7	1	int8	1	Low byte	R	Product Model. This is a read-only register that is used by the microcontroller to determine the product
8	1	int8	1	Low byte	R	UTC time, hour
9	1	int8	1	Low byte	R	UTC time, minute
10	1	int8	1	Low byte	R	UTC time, second
11	1	int8	1	Low byte	R	UTC time, month
12	1	int8	1	Low byte	R	UTC time, day
13	1	int8	1	Low byte	R	UTC time, year
18 to 20						Blank, for future use
21	1	int8	1	Low byte	R	BaudRate, default 0-9600,1-19200,2-38400,3-57600,4-115200
22	2	int16	1	Full	W/R	PANID for zigbee devices
23	1	int8	1	Full	W/R	Device type of zigbee. 0 means coordinator , 1 means router
24 to 25	4	int16	1	Full	W/R	Channel of Zigbee, default channel is channel 13, 0x00002000
26	1	int8	1	Low byte	R	Zigbee module software revision
27-34	8	int8	1	Low byte	R	Zigbee extented address(MAC address)
35	1	int8	1	Low byte	W/R	Set 1 to reboot zigbee module
36-51	16	int8	1	Low byte	W/R	Seurity key

USB to RS485 Converter

Description

RS485 is perfect for transferring small blocks of information over long distances, so it is often the interface of choice. The network nodes can be PCs, microcontrollers, or any devices capable of asynchronous serial communications. Compared to Ethernet and other network interfaces, RS485's hardware and protocol requirements are simpler and cheaper.

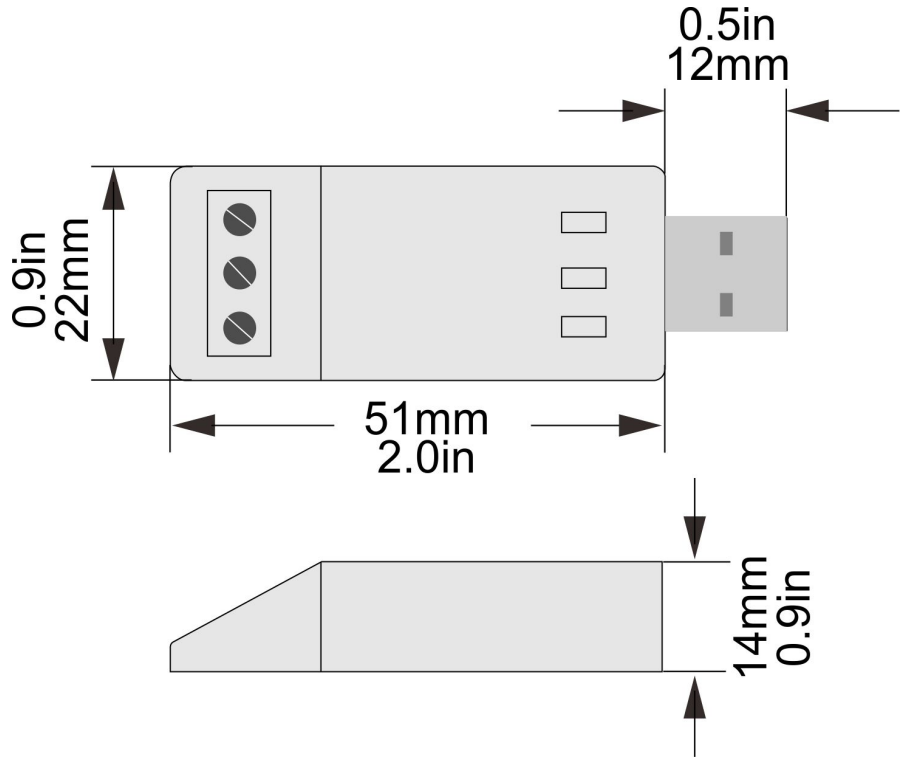


It features 3 LED's: one indicating RS485 transmit data, one for RS485 receive data, and one for error which err lights up on 24VAC crossed.

Features

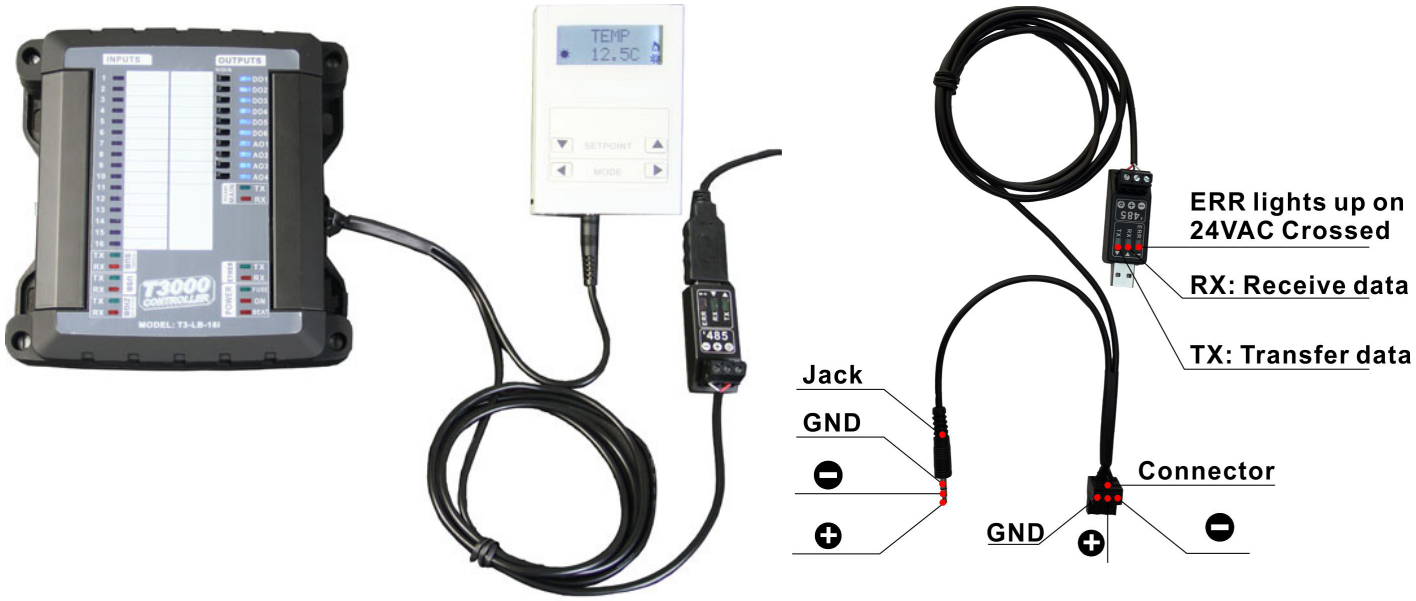
- Low cost RS485 to USB converter.
- RX and TX leds show the communications activity.
- Ground Loop LED lights up when any of the nodes has 24vac and GND crossed over.
- Self resetting fuses protect the PC from wiring mistakes in the field.
- Uses standard FTDI chip(FT232RL) and windows drivers for any protocol and any baud rate.
- Low cost converters, permanently mount them everywhere.
- USB Powered, no separate power supply required.
- Three pin terminal for connecting to the network.
- Auxilliary jack for connecting to RJ style jacks on thermostats, etc.

Dimension



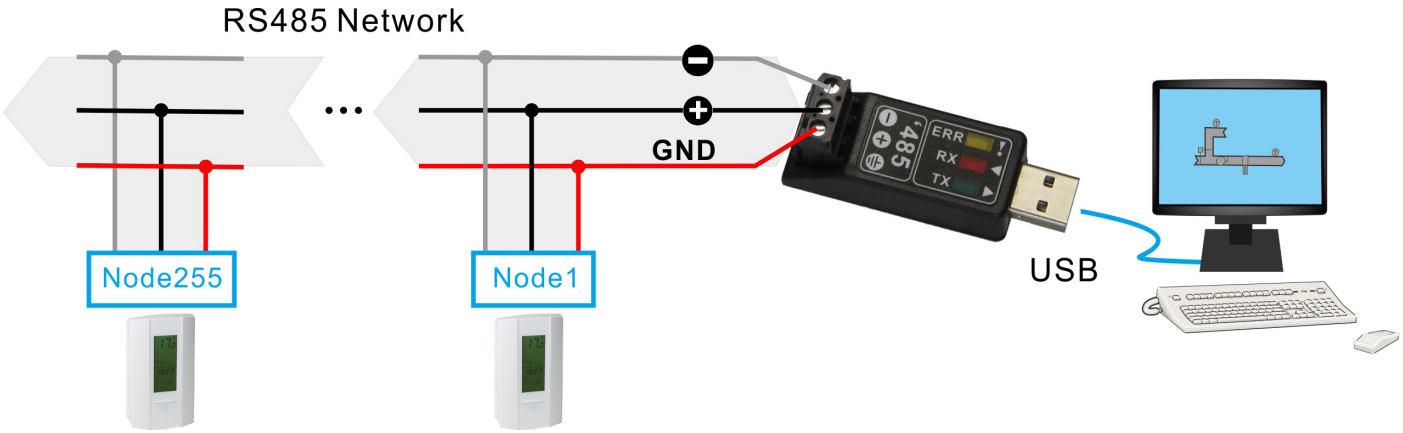
USB to RS485 Converter

Equipment Highlights



Wiring Diagram

RS485 is a multi-drop network, it can connect tstat and controller, perfectly transferring and receiving the data. The devices can be up to 254.



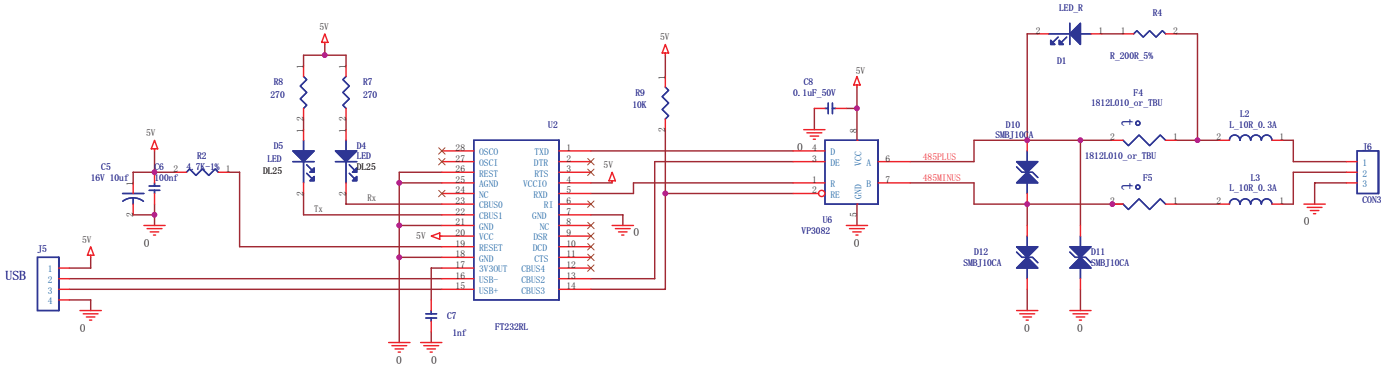
Driver Installation

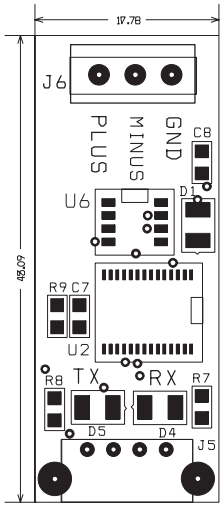
Download the Driver_USB RS485 from website, here following the link.

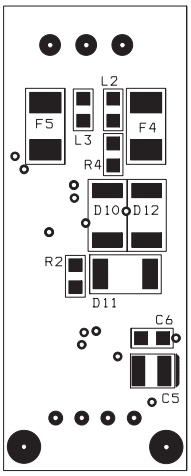
http://www.temcocontrols.com/ftp/driver/

- Driver_USB-RS485.rar

Schematic Diagram







Zigbee to RS485 Repeater ,3 Input Module

Description

Zigbee to RS485 repeater is a kind of lowcost, low consumption, and wireless mesh network targeted at wide development of long life devices in wireless control and monitoring applications. It applies wireless controlling and wireless data transmission. One zigbee to RS485 repeater can work with another or others as one network. As one solution to replace wire connection, it can connect with computer.
The unit can implement the wireless transmission based on RS485,while 3 Input Module connected with equipments such as temperature sensor,power meter,etc.One word,they work together to provide a simple way to integrate mesh technology into application.



Zigbee to RS485 Repeater

Specifications

Supple Voltage	2.1 to 3.6V
Communication	RS485, Zigbee
Antenna	RPSMA Connector,50Ω
Transmission Range	Penetrate a wall inside room; 200m wide open outside space
Max Current	<20mA @24VAC
Transmit Power	100mW(+20dBm)
Receiver	-101 dBm
Data Rate	RF 250 Kbps,Serial up to 1Mbps
Frequency Band	ISM 2.4 GHz
Operating Temperature	-40º C to +85º C
Memory	Standard: N/A Programmable: 256KB Flash/4 KB RAM
IDS	PAN ID and addresses, cluster IDs and endpoints
Channels	16 channels
Transmit Current	Standard: 120 mA @ 3.3 VDC Programmable: 120 mA @ 3.3 VDC
Receive Current	Standard: 31 mA @ 3.3 VDC Programmable: 45 mA @ 3.3 VDC
Power-down Current	<3 µA at 25º C
Maximum carrying capacity	10Pcs ZIM-3I



3 Input Module

Zigbee to RS485 Repeater ,3 Input Module

Highlight





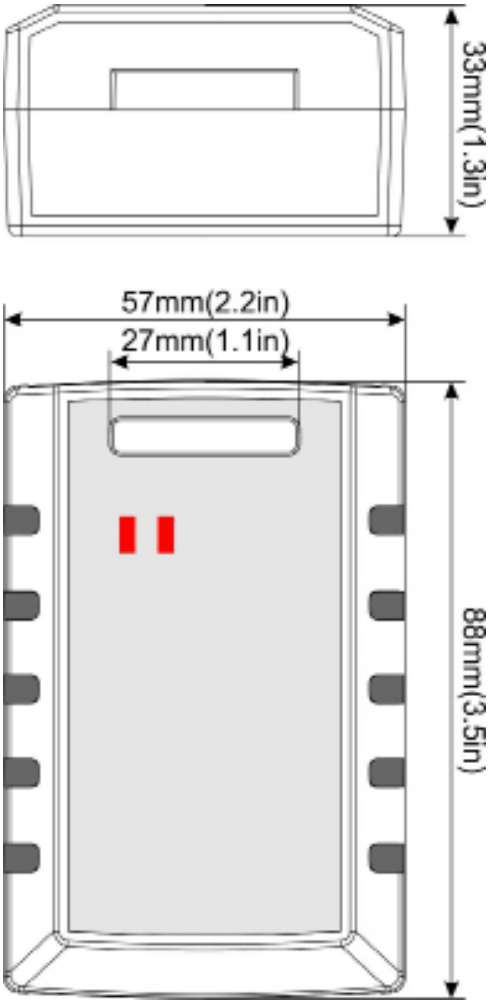


3 Input Module

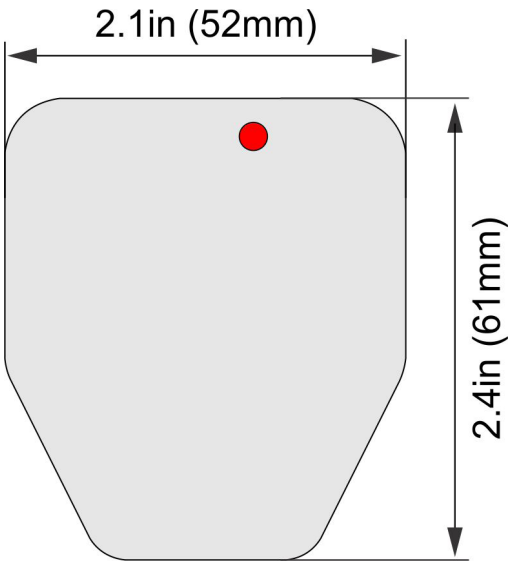
Zigbee to RS485 Repeater ,3 Input Module

Dimension

Zigbee to RS485 Repeater

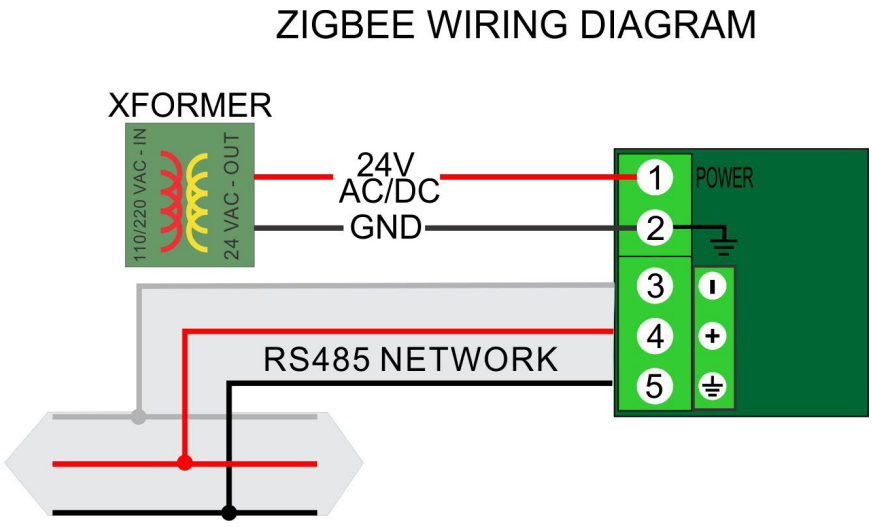


3 Input Module

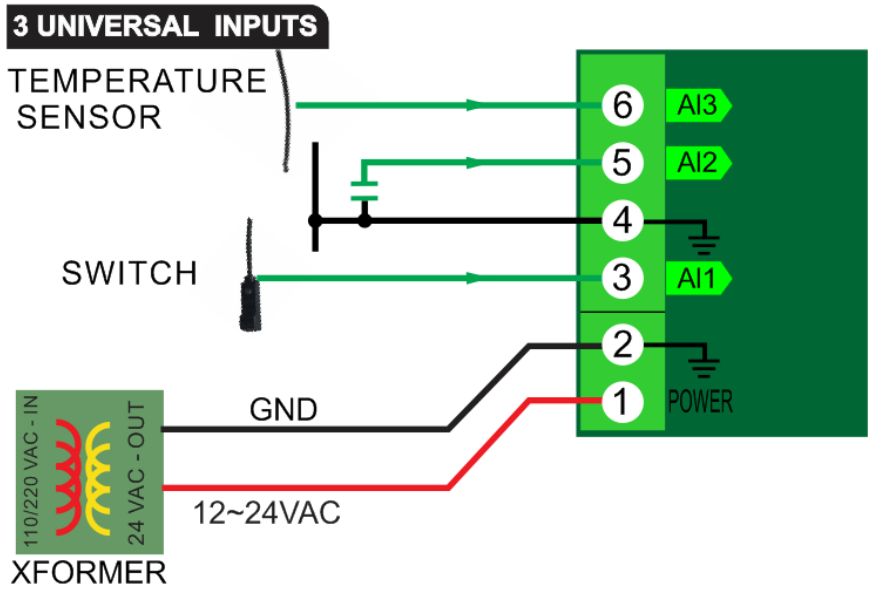


Wiring Diagram

The diagram below will show you how to properly set up a zigbee repeater.

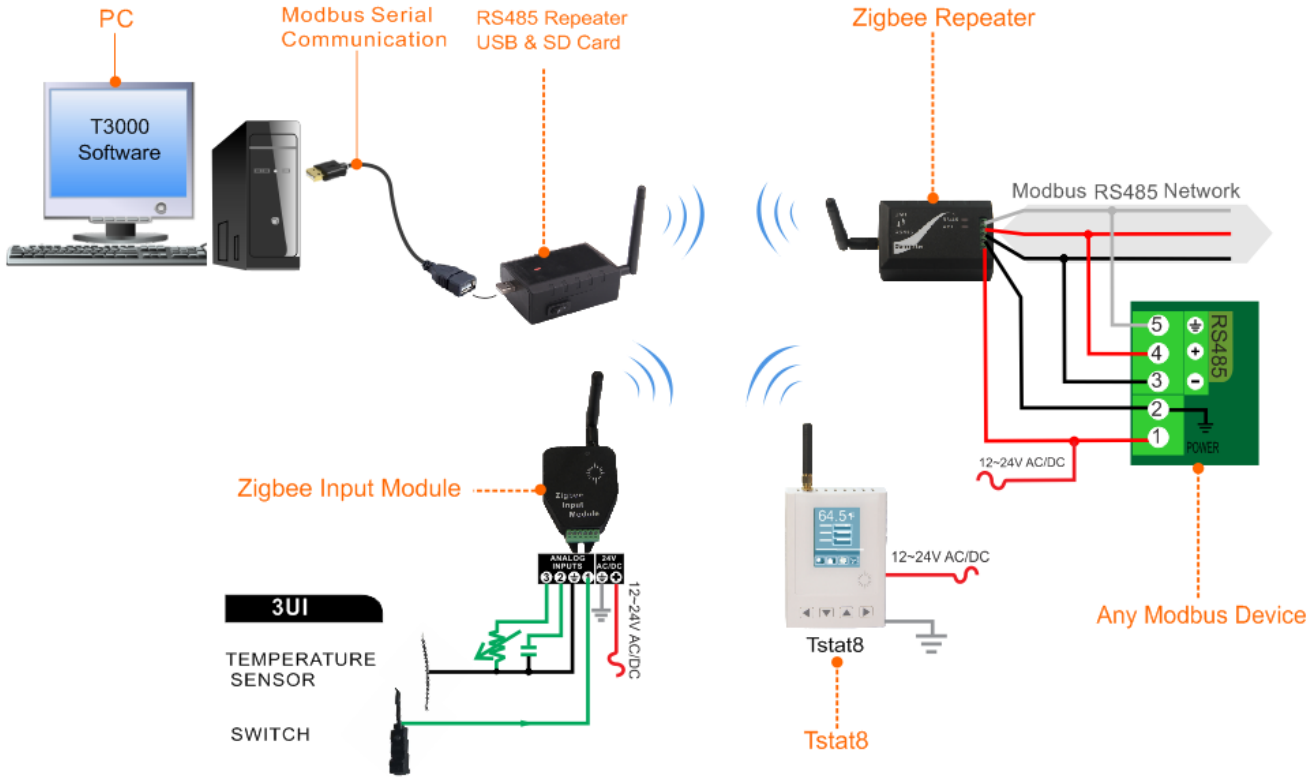


ZIM-3I Wiring Diagram

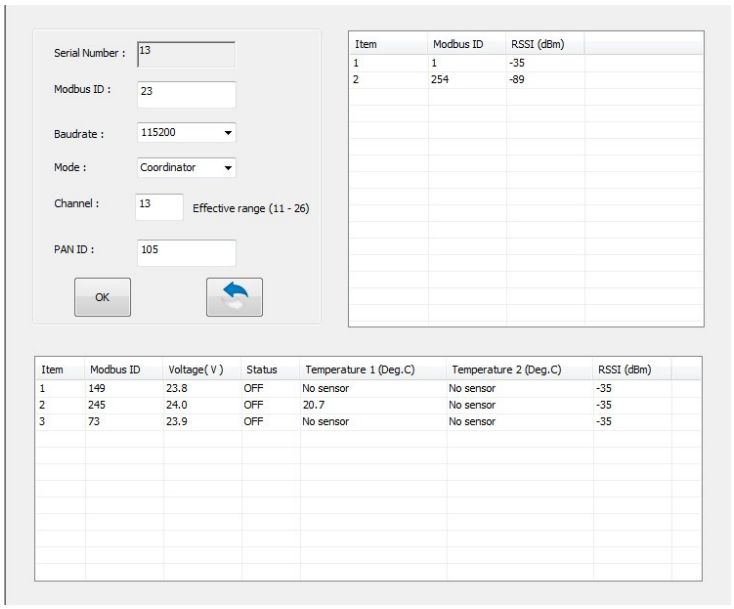


T3000 Operation

This example will show you how the unit will properly work with T3000 software when connecting any Modbus module to a zigbee repeater.

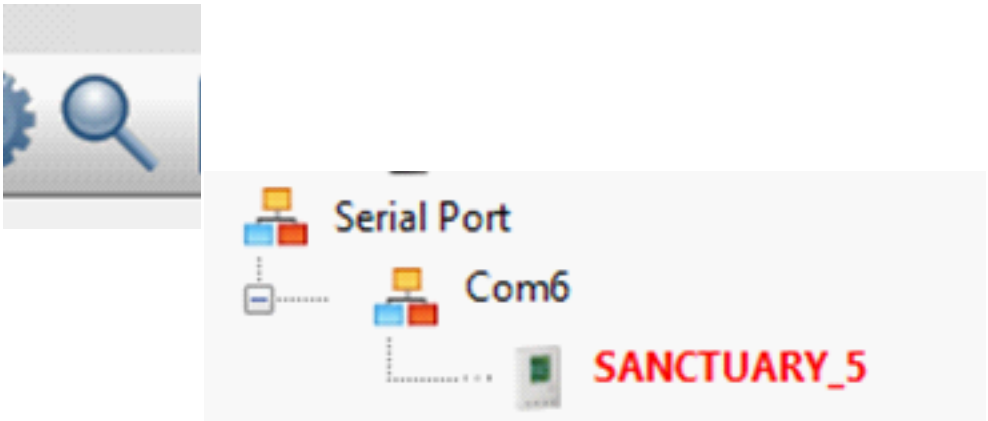


Step1. Connect the Zigbee repeater and Zigbee input module 24VAC power.
Step2. Connect the repeater to the computer via RS485, the baud rate defaults to 115200
Step3. Visit https://temcocontrols.com/ftp/software/T3000.zip,download T3000 software.
Step4. The device type with ZigBee repeater is coordinator, the coordinator is the main device,there is only one ina network,and the router can be multiple form the devices.If try to work with ZIM-3I and tstat8-ZigBee set channel to 13.

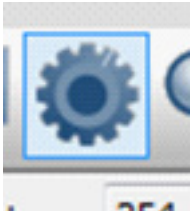


Modify the Tstat8-ZigBee PAN ID

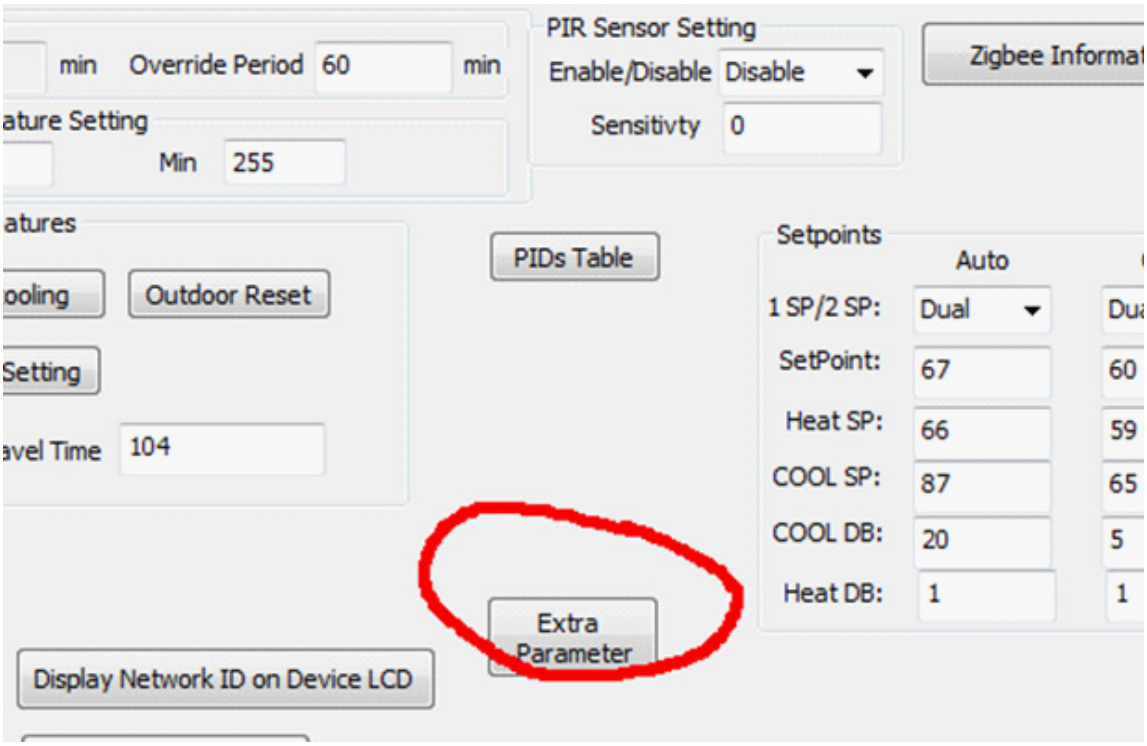
Step1.Connect to PC with serial port RS485.
Step2.Click the scan button of T3000



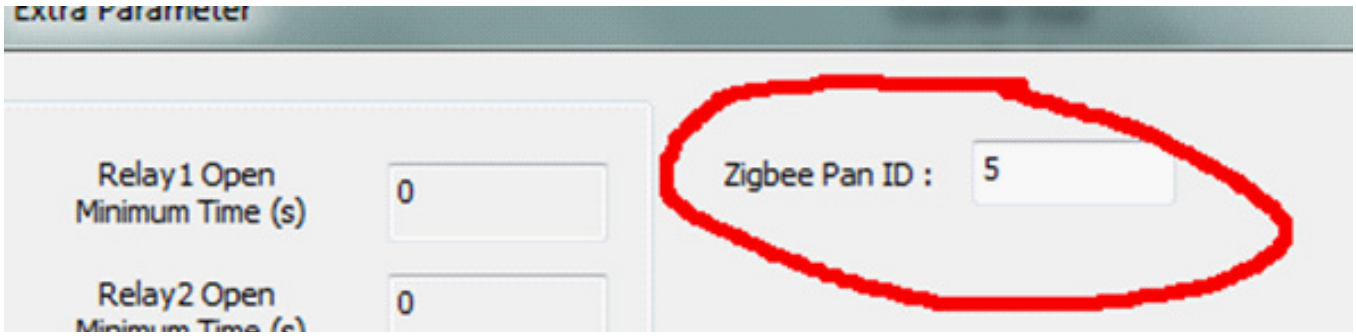
Step3.Click the configuration button of T3000



Step4.Click on the Extra Parameter

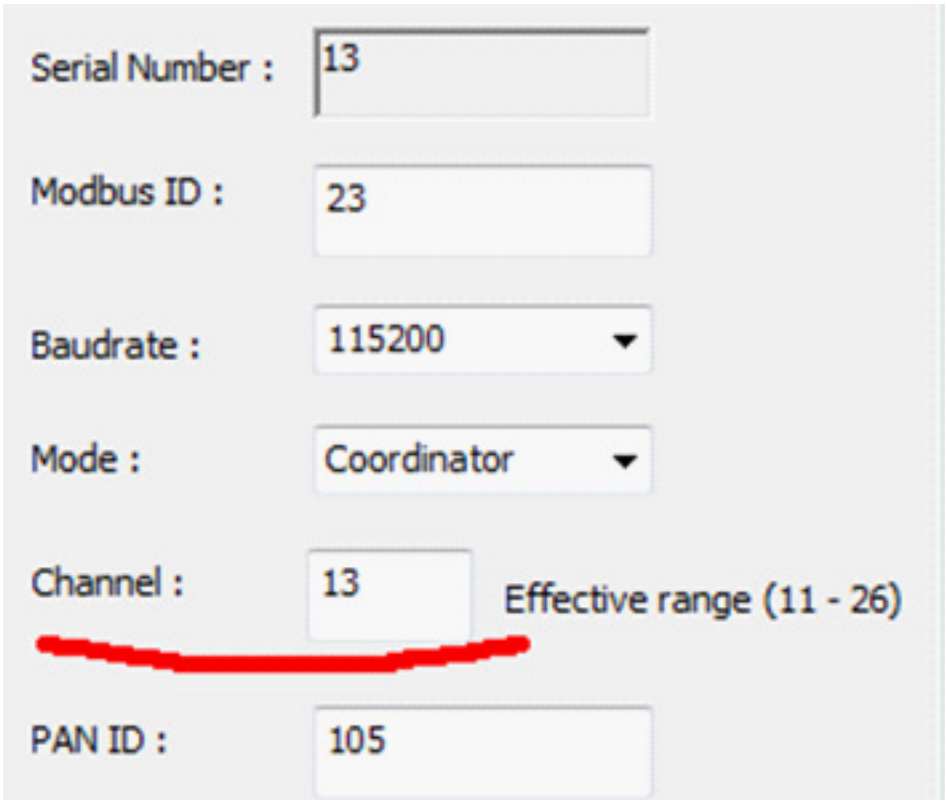


Step5.PAD ID can be changed in the icon position



The use of ZIM-3I

Step1.Set ZigBee channle to 13

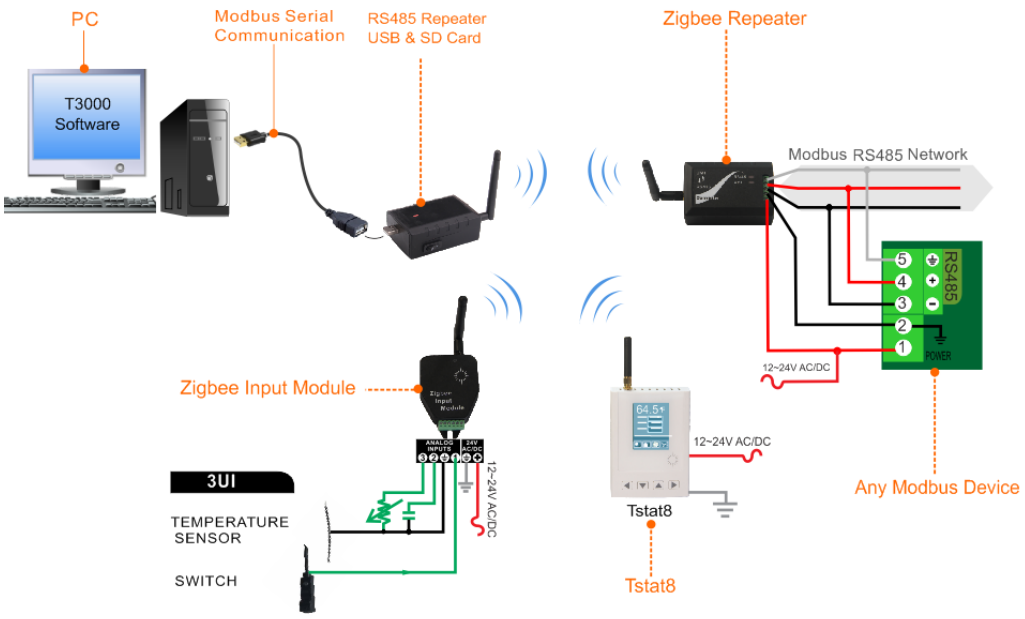


Step2.After ZIM-3I is started ,ZIM-3I information is displayed on the ZigBee repeater page.

Item	Modbus ID	Voltage(V)	Status	Temperature 1 (Deg.C)	Temperature 2 (Deg.C)	RSSI (dBm)
1	149	23.8	OFF	No sensor	No sensor	-35
2	245	24.0	OFF	20.7	No sensor	-35
3	73	23.9	OFF	No sensor	No sensor	-35

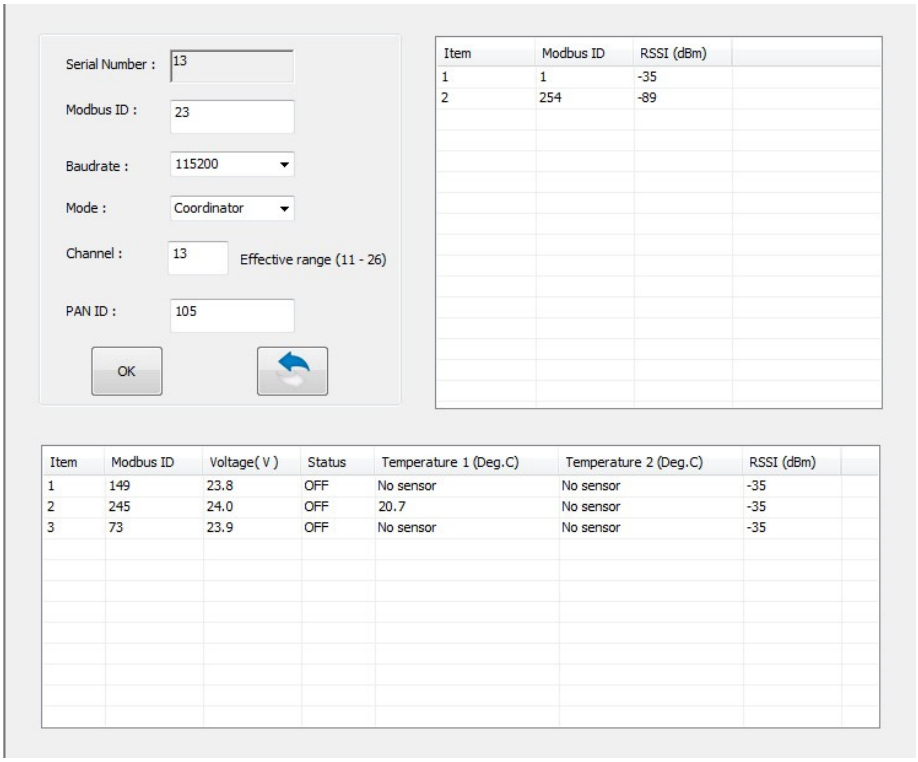
Wireless Modbus RS485 'wire replacement' configuration

The zigbee modules can operate as a transparent wire replacement.



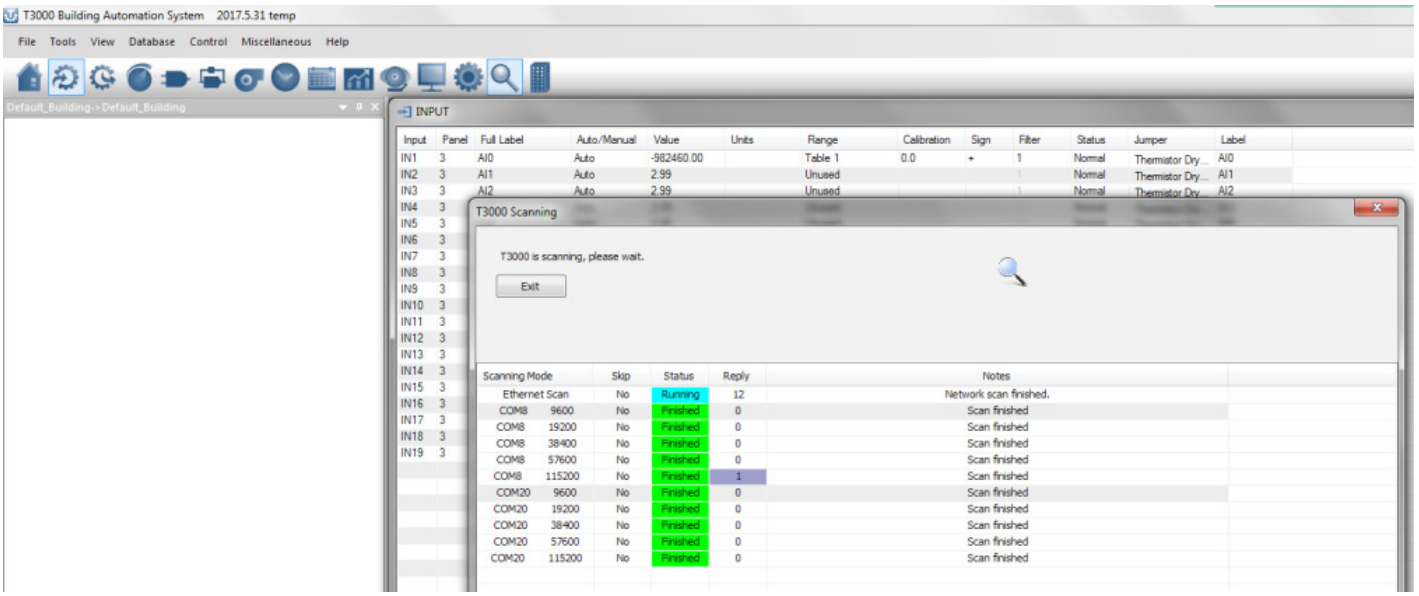
Operation:

Step1.Connect the Zigbee Repeater host-side to PC via RS485.
Step2.The device type with the ZigBee repeater is router,and the baud rate is set as the baud rate of the slave device

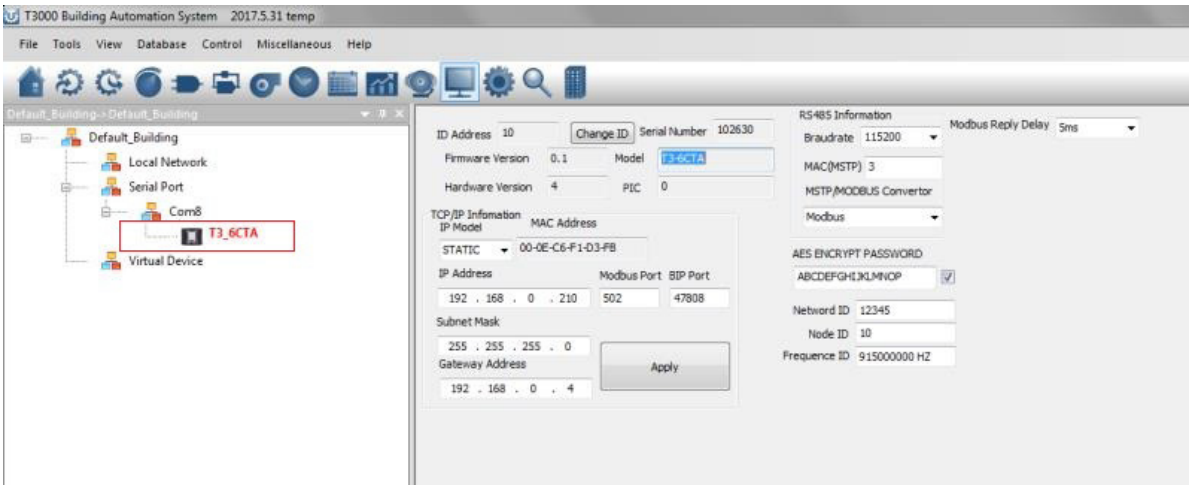


Step3.Connect the Zigbee Repeater device-side to the Modbus device to be connected.

Step4.Start T3000,Click to scan.



Step5.Then you can find the Modbus device connected.



Modbus Register List

Address	Bytes	INTs	Multipler	Length info	Operation info	Register and Description
0 to 3	4	int8	1	Low byte	R	Serial Number - 4 byte value. Read-only
4 to 5	2	int8	0.1	Low byte	R	Software Version – 2 byte value. Read-only
6	1	int8	1	Low byte	W/R	ADDRESS. Modbus device address, default:MainBoard-1
7	1	int8	1	Low byte	R	Product Model. This is a read-only register that is used by the microcontroller to determine the product
8	1	int8	1	Low byte	R	UTC time, hour
9	1	int8	1	Low byte	R	UTC time, minute
10	1	int8	1	Low byte	R	UTC time, second
11	1	int8	1	Low byte	R	UTC time, month
12	1	int8	1	Low byte	R	UTC time, day
13	1	int8	1	Low byte	R	UTC time, year
18 to 20						Blank, for future use
21	1	int8	1	Low byte	R	BaudRate, default 0-9600,1-19200,2-38400,3-57600,4-115200
22	2	int16	1	Full	W/R	PANID for zigbee devices
23	1	int8	1	Full	W/R	Device type of zigbee. 0 means coordinator , 1 means router
24	1	uint8	1	Full	W/R	Channel of Zigbee, default channel is channel 13, range11-26
26	1	int8	1	Low byte	R	Zigbee module software revision
27-34	8	int8	1	Low byte	R	Zigbee extented address(MAC address)
35	1	int8	1	Low byte	W/R	Set 1 to reboot zigbee module
36-51	16	int8	1	Low byte	W/R	Seurity key
52	1	int8	1	Low byte	R	Amount of nodes connected (NUM)
53 to (52+NUM)	1	int8	1	Low byte	R	ZIM-3I modbus ID
53+NUM*2	1	int16	1	Full	R	voltage value (176 means 17.6V)
53+NUM*3	1	int8	1	Low byte	R	Switch status
53+NUM*4	1	int16	1	Full	R	Temperature value (227 means 22.7C)
53+NUM*5	1	int16	1	Full	R	Temperature value (227 means 22.7C)
53+NUM*6	1	int8	1	Low byte	R	ZIM-3I signal strength(RSSI)
300	2	uint16	1	Full	R	Tstat8-ZIG quantity

USB to RS485 Compact Overmolded Converter

Descriptions

This is a USB to RS-422/RS-485 serial port converter which uses the FTDI chipset. Can support with RS-422 / RS-485 interface equipment: surveillance cameras, video collector, fingerprint attendance machine, program-controlled switches, numerical control machine, microcontroller, etc
Support for Win7/Win8/Win10 and the most common operating systems Linux (2.4 and above) / Mac OS (8.9 and above).



Specification

Add an RS-485/RS-422 Port to your PC with USB connection
Standard: USB 2.0, backwards compatible with USB 1.1
Compliant to: RS-422 RS-485 standard
Direction control: Using data flow to the automatic control technology, automatic discrimination and control data transmission direction
Baud rate: 300-9216000 BPS, automatic detection serial signal rate
Load capacity: support point to more, each machine converter allows connection 32 RS-422 or RS-485 interface equipment
Interface protection: surge protection power 600 W, ± 15 kV electrostatic protection
support Windows 10 (32/64) /Windows 8 (32/64) / Windows 7 (32/64) / Vista (32/64) / XP (32/64)

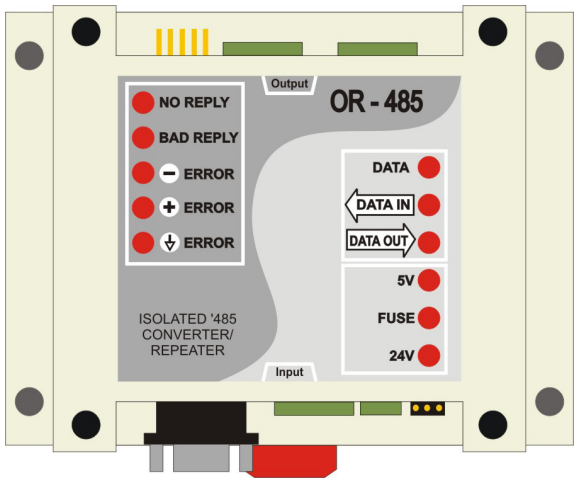
Highlights

Tough rubberized plastic overmolded construction.
Our most compact form factor.
Powerful USB Line Drivers
No external power supply, plug-and-play.
Automatic baud rate detection.
Uses data flow control technology which automatically controls the TX enable data direction on the bus.

OR 485 Isolated Converter/Repeater

Description

The OR-485 is an externally powered isolated converter/repeater with added diagnostic features. There are two input ports which can be jumper selected; one for PC (RS232), the other one is for upper level RS485 bus (RS485). Available are isolated, half-duplex, RS485 output ports to connect to the network. The OR-485 has the capability to detect common wiring mistakes on the output side and report them using MODBUS protocol or LED status.

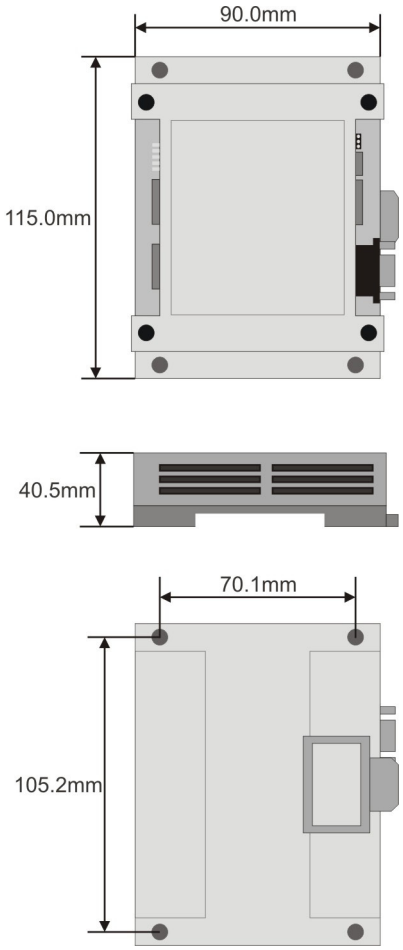


Input: RS-232 or RS485 (jumper selected)
Output: Isolated RS485

Highlight:
- RS485 BUS Diagnostic Function
- MODBUS Communication Protocol
- 2 Baudrate Settings: 9600bps and 19200bps
- Diagnostic Waveform Display
- Communication Status Display
- Isolated Power Supply and Opto Isolated Communication
- In-Circuit Serial Programming™ (ICSP™)

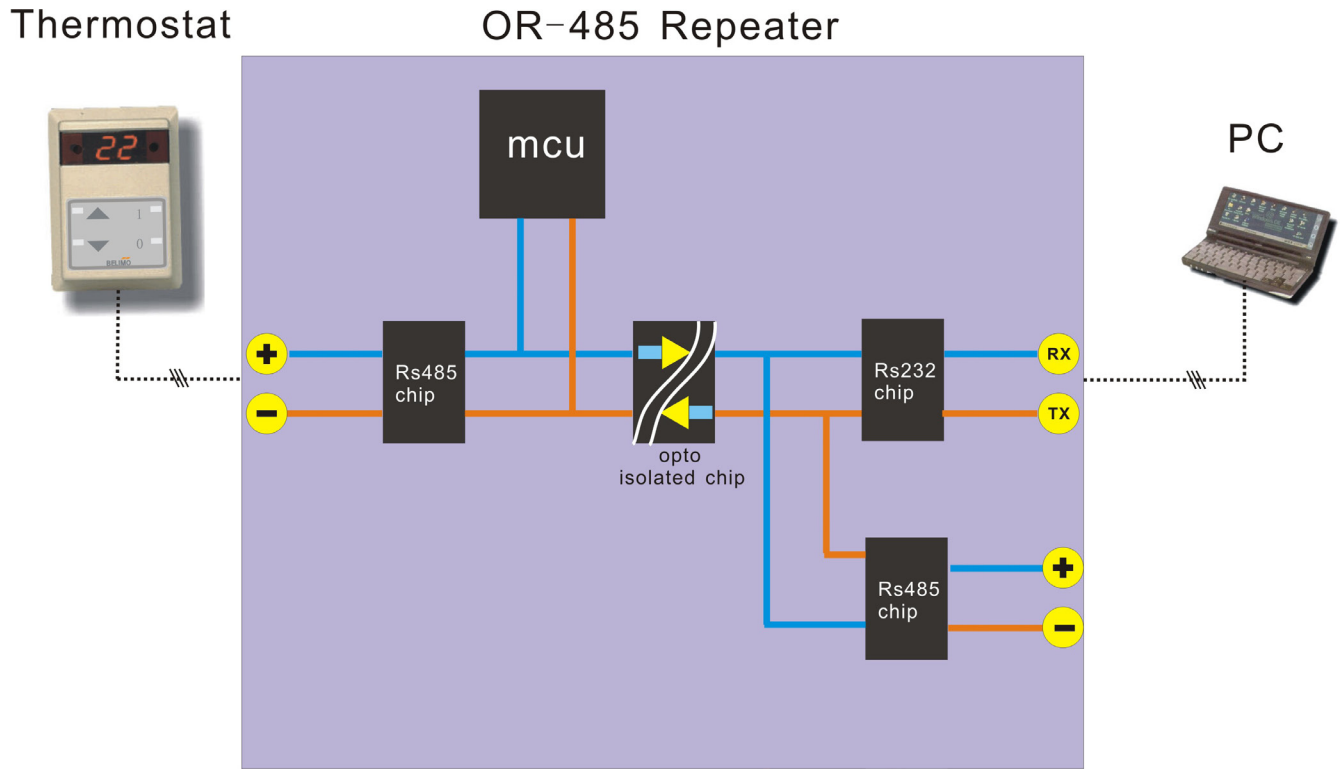
Specification

Supply Voltage	12~24VDC ±20%
Power Consumption	80mA at 24VDC
Power Supply Protection	Polarity Inversion
Dimensions	40.5mm H x 90.0mm W x115.0mm D
	1.59” x 3.54” x 4.53”
Ambient Temperature	
Operation	10-50°C (50-99°F)
Storage	2-50°C (35-120°F)
Material Enclosure	Fire-Proof Plastic
Enclosure rating	IP31
Colour	Gray
Weight	180g

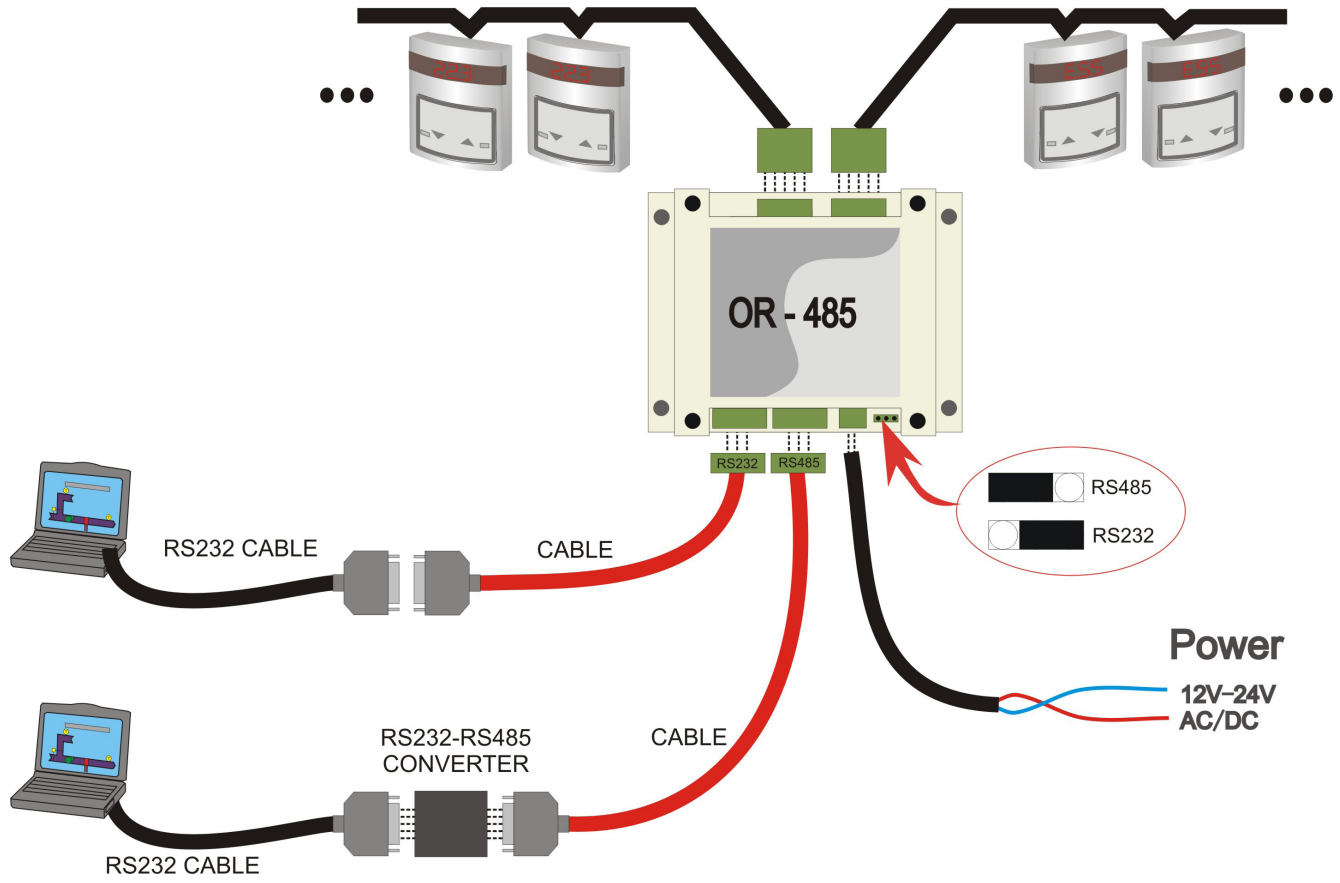


OR 485 Isolated Converter/Repeater

Structure



Wiring Diagram



Diagnose and Displaying Waveform

The OR - 485 can detect the RS485-bus signal and analyze 3 channels(A, B, GND) voltage. Then it will judge it as “normal” or “error” and display the error information to the LED on the panel at the same time. There are many records in the MCU, and the computer can read them through standard MODBUS commands. For example if a computer sends a command (enable retrieving waveform), OR - 485 will sample the data once. When this process finished, it will enable a flag (indicating that the data is Waveform Ready). The computer can then generate the waveform when it finds the flag has been enabled.

Networking Capabilities

The OR - 485 can connect directly to the computer, and the computer also communicates with any thermostat on the RS485 BUS through this device, it could be used like a repeater on the RS485 BUS.

The system use standard Modbus communication protocol. There are several records for the application that can be used for the communication with the computer software.

General Purpose Record List

Note: When using the Modbus Poll software, addressing should be set to “Protocol Addresses (Base 0)” under the “Display” menu.

Address	Bytes	Range	Defaults	Description
0 to 3	4	-	-	Serial Number, 4 byte value, Read-only
4 - 5	2	-	-	Software Version – 2 byte value, Read-only
6	1	0 - 255	46	ADDRESS. Modbus device address
7	1	0 - 255	-	Product Model
8	1	0 - 255	-	Hardware Revision
17-99				Blank, for future use

System Application Record List

Address	Bytes	Range	Defaults	Description
100 - 134	70	0 - 1024	0	Channel A Waveform Sample Data, Read only, 1024 = 5V, 0 = 0V
135 - 169	70	0 - 1024	0	Channel B Waveform Sample Data, Read only, 1024 = 5V, 0 = 0V
170	1	0 , 1	0	Channel A Sample Ready State, 1 is ok , 0 is not ready, Read only
171	1	0 , 1	0	Channel B Sample Ready State, 1 is ok , 0 is not ready, Read only
172	1	0 , 1	0	Channel A Start Sample Data, 1 is enable, 0 is disable
173	1	0 , 1	0	Channel B Start Sample Data, 1 is enable, 0 is disable
174	1	10 - 15	15	RS485 bus state, 10 GND error, 11 channel a error, 12 channel b error, 13 communication error, no input data from RS485 bus, 15 bus state is normal, read only
175	1	96, 192	192	Baud rate setting, 96 is 9600, 192 is 19200

Notes: *Byte format: start + 9 bits data + stop = 11 bits *Baud rate: 19200

Example to start a data capture :

1. Enable the channel flag to seelct the channel for capture (write the register address 172 or 173), only one can be active at a time

2. Read the channel state and wait till the data is ready, (register address 170 or 171 will show a ‘1’ value when the data capture is complete)

3. Read the captured data from the storage registers (100-134 or 135 - 169). The voltage is 1024 for full scale, 5V

4. If you are using the Modbus tool MBPoll, the menu item under ‘display’ should be set to ‘protocol address 0’, as opposed to “PLC address 1”

RS232 to RS485 Converter

Descriptions

Module T3-485-1 can change TXD and RXS signal data of RS232 serial interface to twisted pair RS485. The unti scavenges power from the RS232 lines so there is no need for an external power source. Pin3 (TXD) , Pin7 (RTS) and Pin4 (DTR) provide enough power. Auto flow control means you dont have to install special drivers. The cable provided connects to most Temco controls equipment directly. It can be easily cut and customized in the field or write to us and we'll make a custom version for you at no extra charge.



Specification

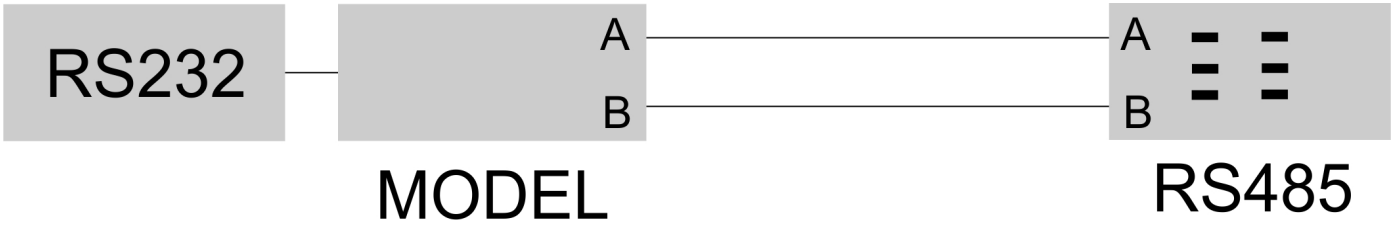
Serial interface: ELA/TIA compatible with RS232/RS485 standard
Conversion mode: Convert EIA-232 data to EIA485
EIA standard: Half duplex EIA485
Programmable signal: No need for RTS flow control
Signal: A, B, GND
Transmission distance/rate: 0~1200m/2.4kbps-57.6kbps
Thunder protection voltage:1500V
Power:Serial port power
Connecting head: DB9 (RS-232 side); DB9 and four terminal standard (RS-485 end)
Size: 34*62*17/mm

Hightlights

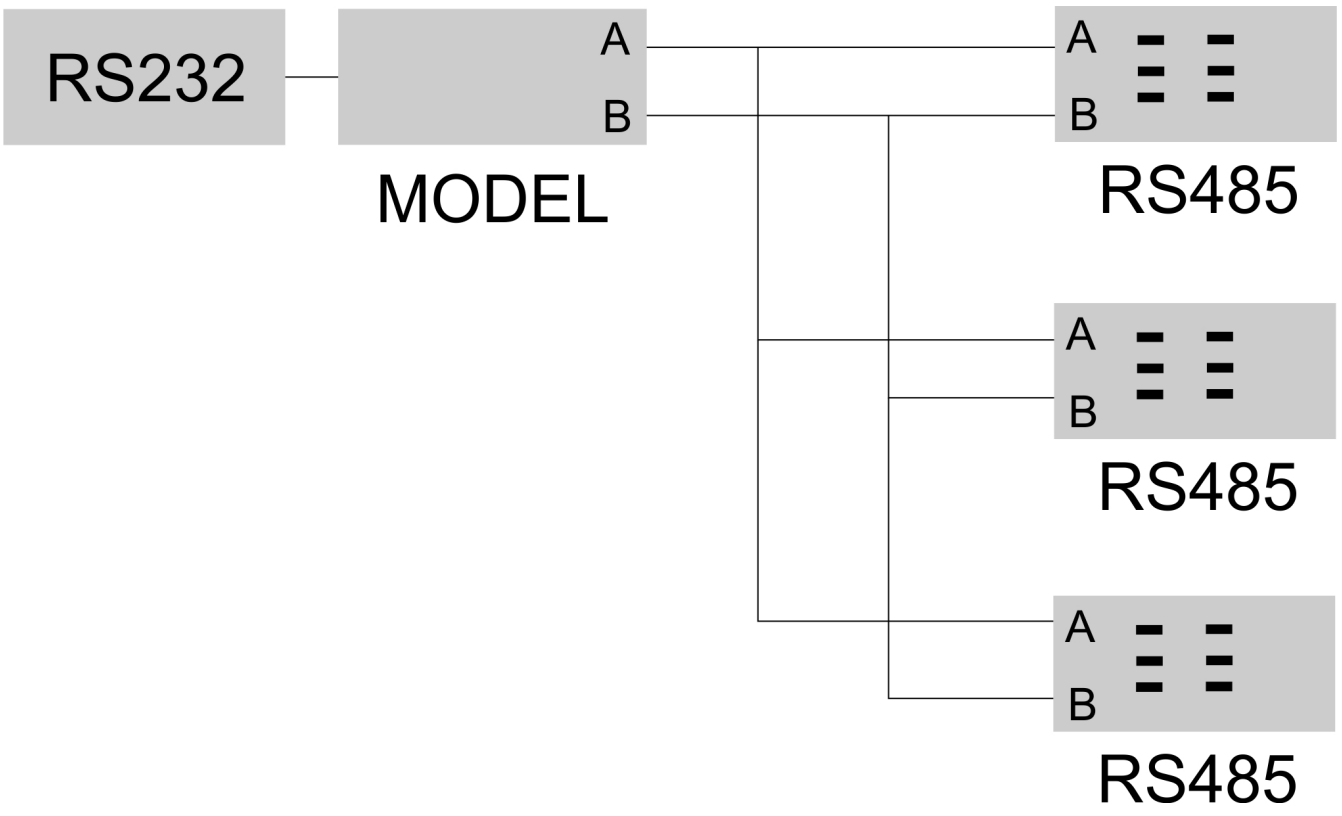
Anti-static function, 485 side to increase lightning protection
Easy to customize cable
Useful for legacy systems with no USB ports
Asynchronous, point-to-point or multipoint
Directly inserted in the serial port

Application

Two point-to-point asynchronous half duplex communication



Two point-to-multipoint asynchronous half duplex communication



Digital Storage Oscilloscope

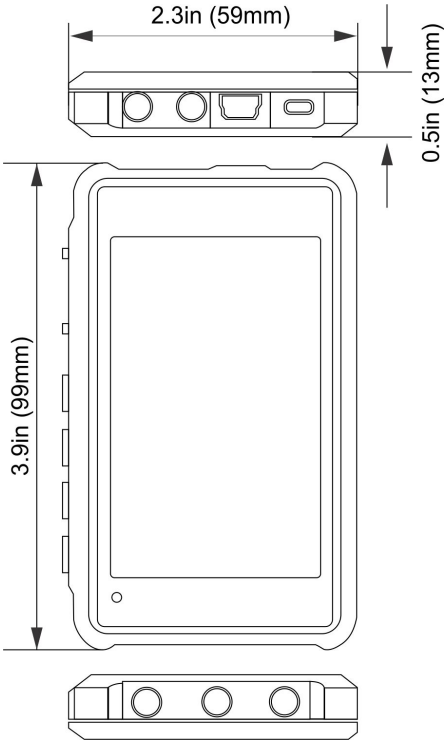
Description

This unit is a 5-trace 4-channel digital oscilloscope for common electronic engineering tasks. Its CPU is based on ARM Cortex M3, adopting FPGA to manage the control & data buffering of ADC. A built-in 2MB USB disk enables users to store waveforms & upgrade firmware. It also provides 4 application areas, convenient for users to load & upgrade at most 4 kinds of application firmware.



Specification

Temperature	Operating Condition	+0°C to +50°C
	Non-operating Condition	-20 °C to +60 °C
Humidity	Operating Condition: high temperature	40 °C to 50 °C, 0% to 60% RH
	Operating Condition: low temperature	0 °C to 40 °C, 10 to 90%RH
	Non-operating Condition: high temperature	40 °C to 60 °C, 5 to 60% RH
	Non-operating Condition: low temperature	0 °C to 40 °C, 5 to 90% RH
Parameters	Max transient-withstanding voltage is ± 400 V peak value. Measure voltage range Measure frequency range Max input voltage of logic probe is ±15 V peak value.	



General safety rules

To ensure your safety & avoid any damage to the device/connected products, please read the follow precautions carefully. To avoid any possible dangers, please use this product according to the rules.

Avoid fire & physical injury.

Use appropriate power cord. Please use dedicated power cord which is certified in the country/region.

Connect & disconnect properly. Do not plug/unplug when the probe(s)/test lead(s) is connected to the voltage source. Before you plug/unplug current probes, please disconnect power to the circuit-under-test.

Observe all terminal ratings. To avoid fire/electric shock, please observe ratings & symbols on the product. Please read the user's manual carefully to know detailed info of the ratings before connecting the device.

Do not operate in humid environment.

Do not operate in inflammable/explosive environment.

Please keep the surface of the product clean & dry.

Digital Storage Oscilloscope

Major functions

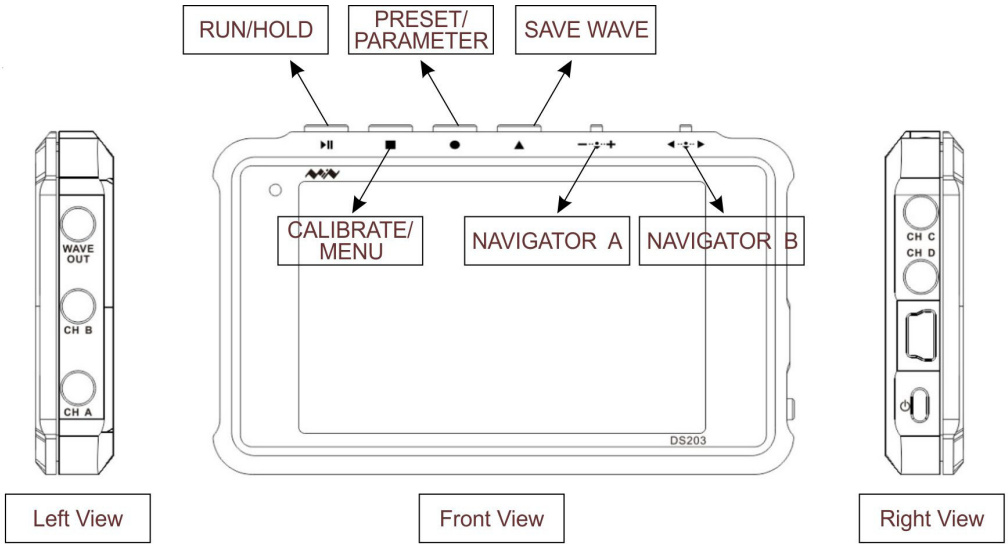
Pocket-size oscilloscope helps you test, adjust & present electronic designs. Its functions include:

▼ 8M Hz bandwidth, 8-bit precision
▼ 2 analog channels: (CH_A, CH_B), 2 digital channels (CH_C, CH_D)
▼ Calculation channels: [CH_A]+[CH_B], [CH_A]-[CH_B], [CH_C]|[CH_D], [CH_C]&[CH_D],REC_A, REC_B, REC_C, REC_D
▼ Sampling rate of any analog channel can reach 72 MS/s
▼ Record length of any channel can reach 4096 bits
▼ Users can save waveforms and upgrade firmware with a built-in 2M USB disk.

Introduction

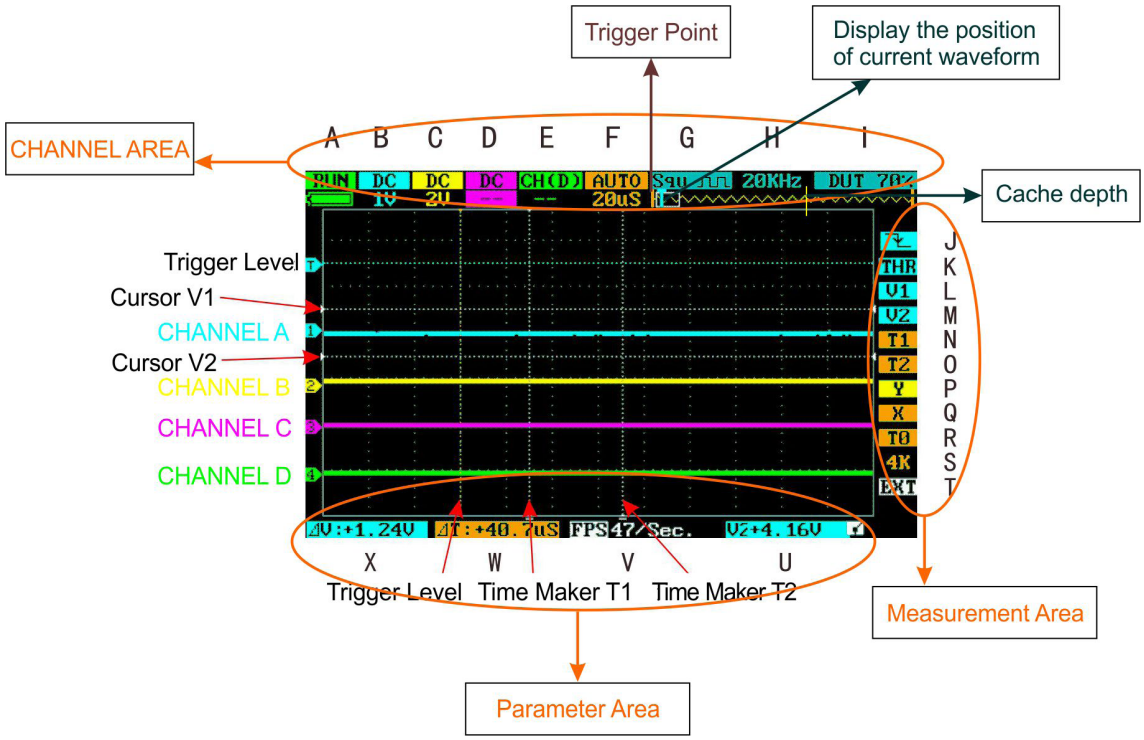
1. Interfaves & buttons

▼ Front view, left→right: RUN/HOLD(||), CALIBRATE (■), PRESET (●), SAVE WAVE(▲), NAVIGATOR A(-…+), NAVIGATOR B(…).
▼ Left view, top→bottom:Wave output[WAVE OUT],analog channel B[CH_B], analog channel A[CH_A].
▼ Right view, top→bottom: Digital channelC [CH_C], digital channelD [CH_D], USB port, power



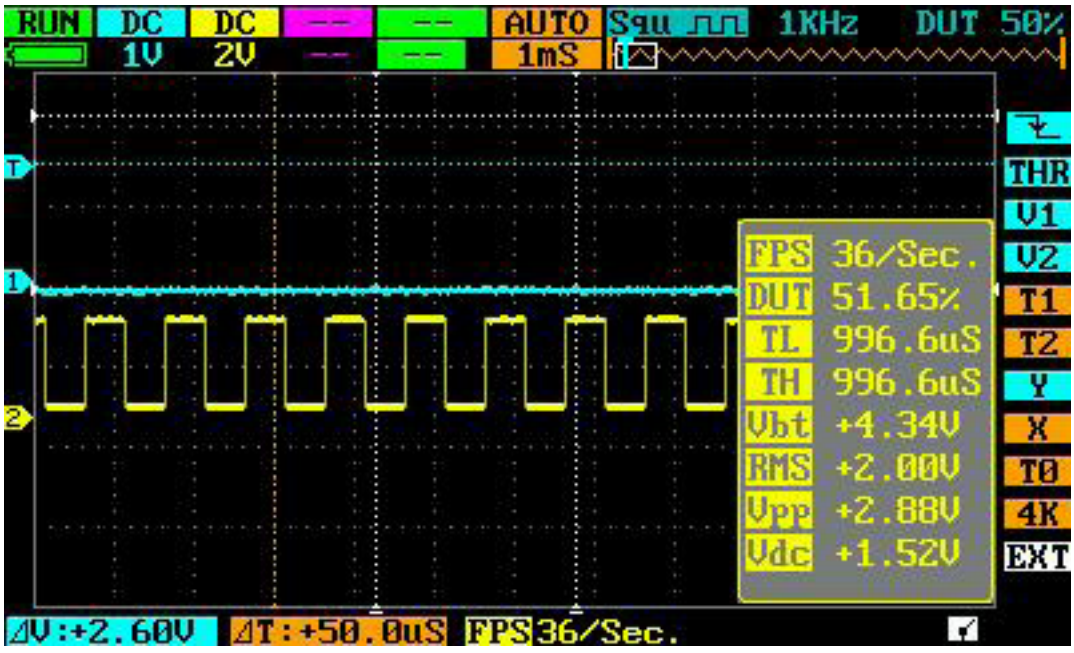
2. Screen

Horizontally A—I is channel area; vertically J—T is measurement area. You can move cursor within A—G by scrolling (…); change selection by scrolling (-…+); move cursor between upper & lower menus by pressing (-…+). When cursor is in G Position, press (-…+) to move it within G—I; and press (▲) to move cursor between channel area & measurement area. Each menu has the same color as its corresponding channel: Channel A (blue), Channel B(yellow), Channel C(purple), Channel D(green), Common menu is orange.
U—X is parameter area, U position shows parameters for THR, V1 & V2 to choose; V position is the preferred parameter of (●) button; W position is T=T2-T1, X position is V=V1-V2

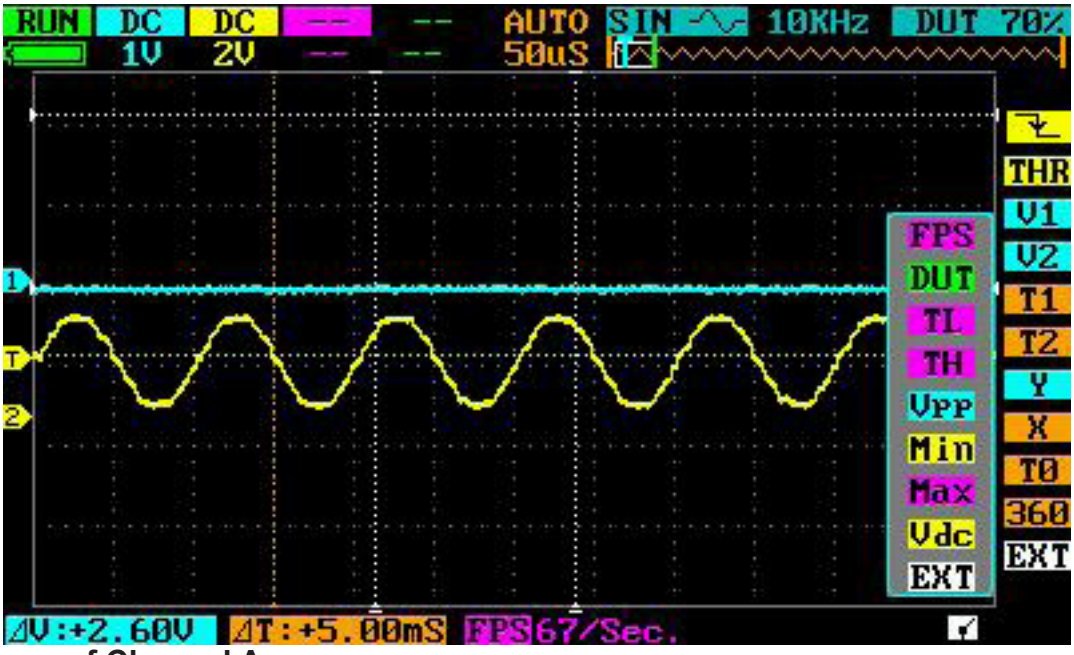


2.1 Parameters

As in figure below, adjust G—I, output 1KHz from [WAVE OUT], input square waveform of 50% duty factor into CH_B, short press (●) to display current parameter. Annotations of parameters are shown in the table below.



FPS	Frames Per Second
Vpp	Peak-to-Peak Voltage
Vdc	Direct Current Voltage
RMS	Average Value of Voltage
Max	Maximum Voltage
Min	Minimum Voltage
FRQ	Signal Frequency
CIR	Signal Cycle
DUT	Duty factor
TH	Monocycle High Level Time
TL	Monocycle Low Level Time
Vbt	Battery Voltage
There are 12 parameters; Short press(●) shows only 8 parameters; Press(●) longer and scroll (-…+)to select parameter, press (-…+) to choose color (channel), press (…)or choose EXT to exit; as below:	



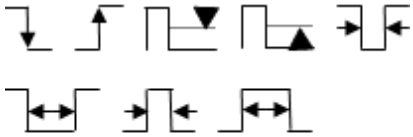
2.2 Functions of Channel Area

The table below shows the detailed introduction of the functions of menus in channel area:

Menu	Item	Function(Operate: Scroll(-…++))
A	RUN/HOLD	(Running Mode) RUN/HOLD, show voltage
B	AC/DC/--	(Channel A)AC coupling/DC coupling/hide
	50mV—10V (stepping in 1-2-5 mode)	voltage per grid
C	AC/DC/--	(Channel B)AC coupling/DC coupling/hide
	50mV—10V (stepping in 1-2-5 mode)	voltage per grid
D	DC/--	(Channel C) DC coupling/hide
	--	----
E	CH_(D)/(A+B)/(A-B)/(C&D)/(C|D)/ REC_A/ REC_B/ REC_C/ REC_D	thru CH_D: Input(A+B), waveforms of CH_A & CH_B sync (A-B): get subtraction of waveforms of CH_A & CHA_B (C&D): get and operation of CH_C & CH_D (C|D): get or operation of CH_C & CH_D REC_A: reload the last waveform saved in CH_A Same for REC_B, REC_C & REC_D
	--	-----
F	AUTO/NORM/	(Trigger M)Auto/Norm/Sgl/slow scan/instant scan
	0.1uS—1S (stepping in 1-2-5 mode)	Unit per second
G	Squ/Sin/Tri/Saw (≈2.8Vpp)	(Waveform output)squ/sin/tri/sawtooth
H	(Squ)10Hz—8MHz	<1MHz, stepping in 1-2-5mode >1MHz, stepping in 2-4-6-8mode
	(Sin/Tri/Saw) 10Hz—20KHz	
I	(Squ)50%—90% (±10%)	adjust duty factor

2.3 Functions of Detection Area

The table below shows detailed illustrations of functions of menus in detection area:

Menu	Item	Function	Operating Instruction
J		Trigger mode: falling edge trigger, rising edge trigger, (>, <) trigger, (<, >) negative pulse width,(<, >)positive pulse width	Scroll(-…+) to choose trigger mode, press (-…+) to choose channel (different colors)
K	THR	Trigger level	Scroll (-…+) to adjust trigger level (U position shows trigger level), press (-…+) to choose channel (CH_A/CH_B/hide)
L	V1	Cursor V1: top limit of visible trigger level	croll (-…+) to select top limit of trigger level, and press (-…+) to choose channel(CH_A/CH_B/ CH_C/CH_D/hide)

M	V2	Cursor V2: bottom limit of visible trigger level	Scroll (-…+) to adjust bottom limit of trigger level(in X position, shows V=V1-V2), press (-…+) to choose channel (CH_A/CH_B/CH_C/CH_D/hide)
N	T1	Time Maker T1	Scroll (-…+) to adjust time maker T1, and press (-…+) to hide time marker
O	T2	Time Marker T2	Scroll (-…+) to adjust time maker T2 (in W position shows T=T1-T2), press (-…+) to hide time marker T2.
P	Y	Horizontal Level of each channel	Scroll(-…+)to adjust horizontal level, press(-…+) to choose channel(CH_A/CH_B/CH_C/CH_D)
Q	X	Choose the window to display waveforms	Scroll(-…+) to choose waveforms of different positions to display on current window
R	T0		
S	360-4K	Memory depth	Scroll (-…+) to choose memory depth
T	EXT/SAV		

2.4 Menus

On screen, press (■) to access the menu, press again to exit. Detailed instructions are listed below:

Item (Up→Down)	Function	Operating Instruction
Save Param	Save current parameter settings	Press (-…+) to confirm, scroll (…) to the next menu
Save Dat	Save dat file to the built-in USB disk	Press (-…+) to confirm, scroll (-…+) to choose file no., scroll (…) to next menu
Save Buf	Save buf file (sample data in buffering area) to built-in USB disk	Press (-…+) to confirm, scroll (-…+) to choose file no., scroll (…) to next menu
Save Bmp	Save bmp file (waveform image) to the built-in USB disk.	Press (-…+) to confirm, scroll (-…+) to choose file no., scroll(…) to next menu.
Save Csv	Save csv file (export sampling data of buffering area) to built-in USB disk	Press (-…+) to confirm, scroll (-…+) to choose file no., scroll(…) to next menu.
Load Dat	Load dat file	Press (-…+) to confirm, scroll (-…+) to choose file no., scroll (…)to next menu.
Load Buf	Load buf file	Press (-…+) to confirm, scroll (-…+) to choose file no., scroll (…)to next menu.
BackLight	Adjust backlight brightness	Press (-…+) to confirm, scroll (-…+) to adjust backlight brightness, scroll (…) to next menu.
Buzzer	Adjust buzzer volume	Press (-…+) to confirm, scroll (-…+) to adjust buzzer volume, scroll (…) to next menu.
Standby	Choose screensaver	Press (-…+) to confirm, scroll (-…+) to choose file no., scroll (…) to next menu.
Calibrat	Instrument calibration (make sure CH_A is ground connected)	Press (-…+) to confirm, press (■) to calibrate.

Operation Example

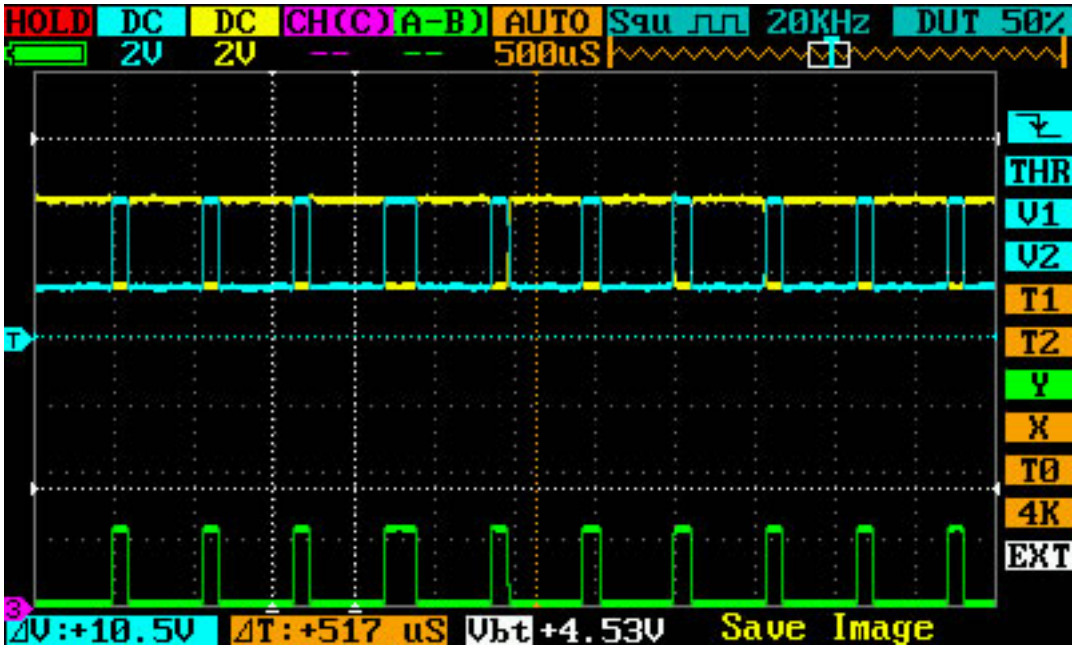
1. Example one: Measure RS485 signal

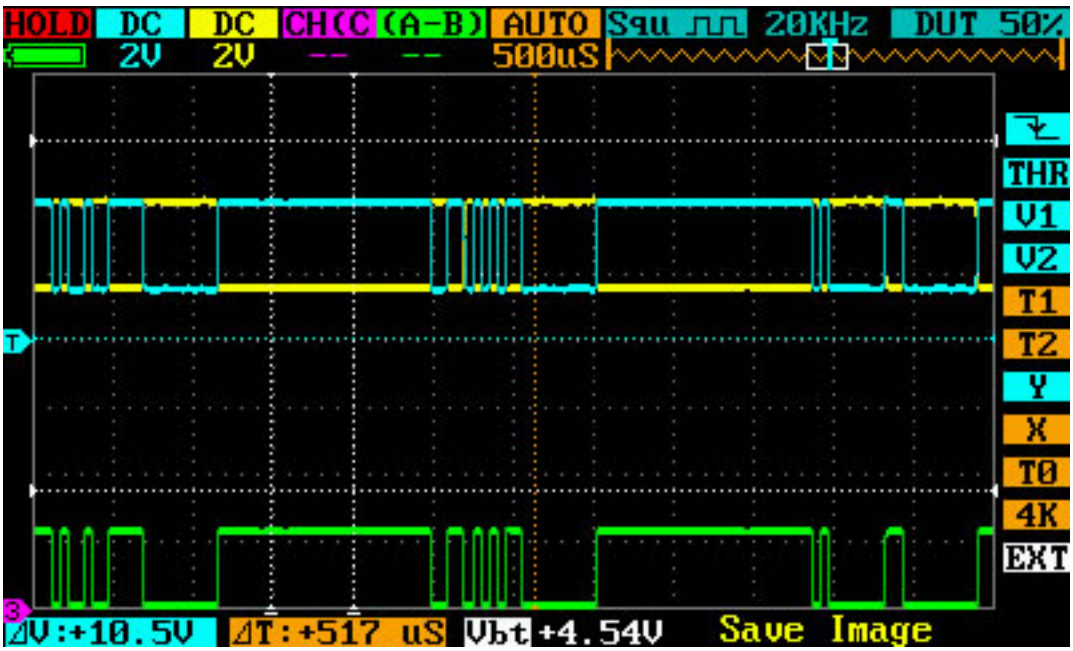
1) Connect the probe of CH_A/CH_B to the detection point of the circuit, CH_A to RS485+, CH_B to RS-, two clips to RS485 GND.

2) Set CH_A to DC 2V, set CH_B to DC 2V, set CH_D to A-B, set squ waveform output.

3) Save the waveform, click menu key, press(...)to choose save bmp.

Here following figure of HUM-D RS485 network signal





PC-W

Descriptions

Using industrial embedded platform, the system is stable and reliable,it has rich inter-face,Wireless communication GPS navigation,fault detection,video capture and other functions,can be extended to provide users with a powerful mobile multimedia information system.



Hightlights

Powerful 1.86GHz dual-core CPU,2G DDR3 RAM
10.4”LED display with resistive touch
RS232X4,COM 2 supports RS485/232/422
3G/WIFI/Bluetooth/GPS for potional
Wide voltage 6-32V for optional
Metal housing design
Fanless cooling system
HDMI&VGA output
Dual Ethenet port
Multiple mount methods

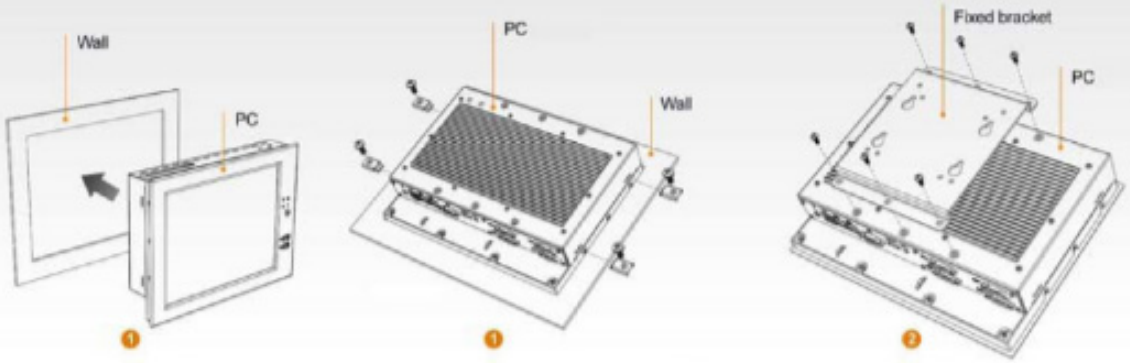

10.4"
ALL-IN-ONE INDUSTRIAL COMPUTER
PC
LED Panel PC for Industrial Application
All hardware and software customized to your requirements
Windows 8
Windows 7
Linux
Start
nathan
Powerful 1.86GHz dual-core CPU, 2G DDR3 RAM
10.4'' LED display with resistive touch
RS232 × 4, COM 2 supports RS485/232/422
3G/WIFI/Bluetooth/GPS for optional
Wide voltage 6-32V for optional
Metal housing design
Fanless cooling system
HDMI & VGA output
Dual Ethernet port
Multiple mount methods

PC-W



MULTIPLE MOUNT METHODS

1. Mount from the front of wall, fixed with lock sheet and srews. It's more convenient for customers to control & maintain the device behind the wall.
2. Screwed with Fixed bracket, It's much more easily to be hung on the wall, also available for 75mm / 100mm VESA standard mount.



SPECIFICATIONS & ACCESSORIES

DISPLAY	Display Screen	10.4" LED backlit
	Resolution	800×600 (1,440,000) pixels
	Touch Panel	5-wire resistive
	Brightness	250cd/m²
	Aspect Ratio	4:3
	Contrast Ratio	500:1
	Viewing Angle	140°/110° (H/V)
SYSTEM	OS (optional)	Windows 7 / 8, Windows Embedded 7, Linux
	CPU	Intel N2800 (dual-core 1.86GHz)
	Memory	2G DDR3, optional: 4GB
	Storage	PCIe mSATA SSD 32G, supports up to 128G
MAINBOARD	Chipset	Intel NM10 chipset
	L2 Cache	1024KB
	Video Card	Integrated on board Intel GMA3650 (128/224MB of share memory)
	Sound Card	4 channels
	Expansion	Built-in Mini PCIe×1, optional for 3G / WIFI
	Interface	RS232 × 4 (COM2 support RS232/422/485), HDMI out, VGA out, Audio out, DC 12V in, USB2.0×2, LAN×2, SIM slot, Antenna × 2
POWER	Input Voltage	DC 12V, optional: DC 6-32V wide voltage
	Current	1.8A
	Power Consumption	≤22W
	Speaker	1W
ENVIRONMENT	Working Temperature	0~50℃
	Storage Temperature	-10~65℃
DIMENSION	Dimension (LWD)	280 × 210 × 58.8 mm
	Weight	2190g

1. DC adapter	1 piece
2. Fixed bracket	1 piece
3. CD drive	1 piece
4. Manual	1 copy
5. Wide voltage box 6-32V (optional)	1 piece



GK-7000-Linux-Touch Screen PC

Descriptions

GK-7000 is a high performance enbedded industrial computer with a capacitive touch screen user interface. The CPU is the Samsung S3C2440 which is based on an Arm9 core,It's Linux 2.6.32 operating system.This computer offers a full list of technical specs at low power consumption and high reliability.



Hightlights

High resolutions
Ethernet supports
Speaker with Audio output
Keyboard or Mouse supports
SD card supports

PWM Input to Voltage Output Transducer

Descriptions



The PWM-1 is a signal converter which takes a pulsed binary input signal and outputs a voltage signal proportional to the duration of the pulse. The device allows controllers with only relay outputs to connect to field devices such as modulating dampers, valves and variable speed drives. The output signal can be modulated with precision of one-tenth of a volt. The device has an RS485 port for integrating over Modbus RTU and Bacnet MSTP, all settings and the current state of the inputs and outputs are visible as Modbus registers or Bacnet objects. Each output has a manual hand-off-auto switch which allows the installer and building operator to override the software settings for field testing and overrides. The voltage which is output in manual mode can be adjusted when in manual mode so you can effectively command the output to any state from fully open to fully closed using the hand-off-auto switch and potentiometer.

The device can be firmware updated in the field over the RS485 port and source code is available on github if you care to add your own firmware features.

The inputs are in fact universal inputs which can be software configured to operate over a number of ranges, including on-off and other binary modes as well as 10k thermistor mode, type 2 and 3 for monitoring temperatures.

The outputs similarly can be configured to a number of custom ranges besides the usual 0-10V modulating output they can be set to operate as binary on-off outputs. The current drive of the analog outputs is 100ma @10 volts which is enough to drive many typical 12VDC relays. Effectively this unit can be used as generic Modbus and bacnet i/o for integration with systems such from Siemens, Honeywell, Tridium, Kreuter and Delta to name a few.

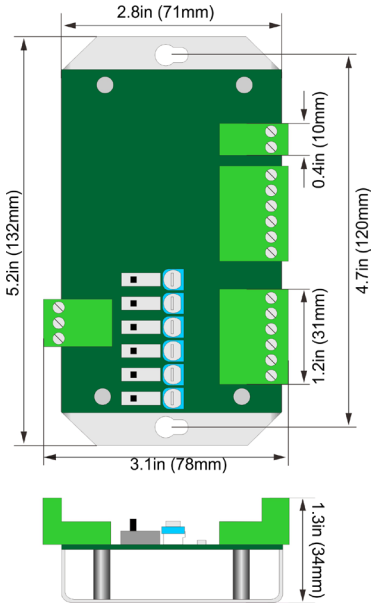
Features

Highlights:

- 6 Universal Inputs
- 6 Analog outputs
- Converts relay outputs to analog outputs.
- Use with PLC's to manage modulating dampers, valves and VFD's.
- RS-485 port supports both Modbus RTU and Bacnet MSTP protocols
- Use as generic Modbus/bacnet i/o for integration with popular DDC systems.

Applications:

- Pulse to Analog Transducer
- Interface to Electric Actuator
- Drive Variable Speed Pump Control
- Drive Variable Frequency Fan Control
- Dial potentiometer for manual override of output

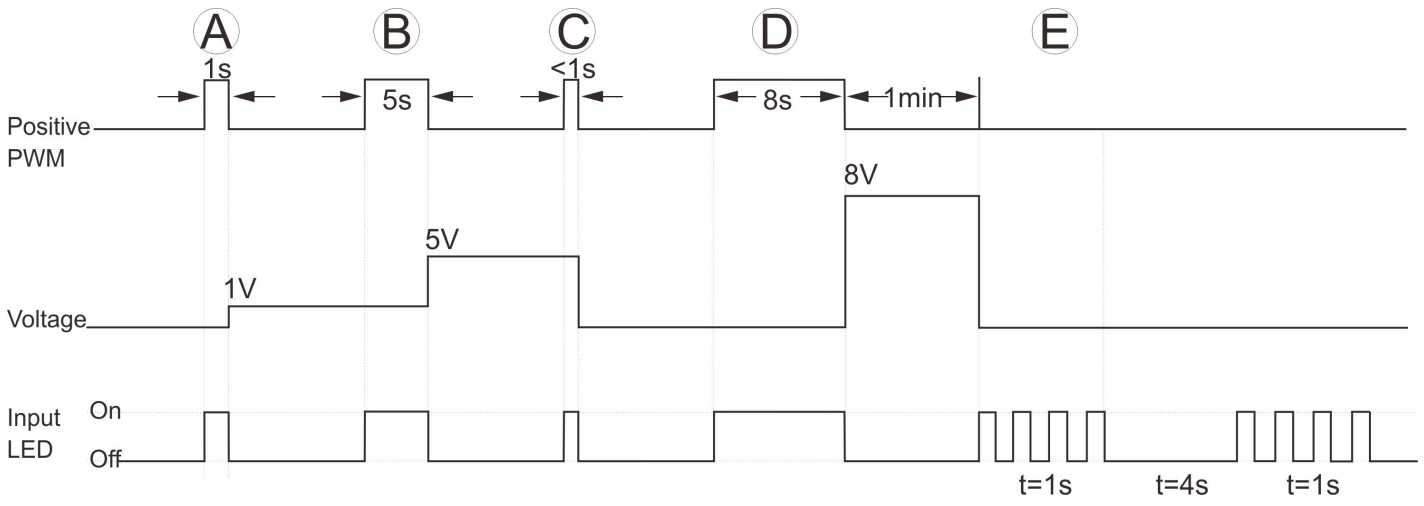


PWM Input to Voltage Output Transducer

Specifications

Power (Voltage) / Max Power	15-24V AC/DC / 2W
Operating Temperature	32 to 120°F (0 to 49°C)
Storage Temperature	-20 to 150°F (-29 to 65°C)
Operating Humidity	0% to 95% non-condensing
Accuracy	±0.1V
Status Indicators	Red LED - variable intensity to indicate output voltage, dim light indicates 1V and bright light indicates10V. Input LED provides direct status of PWM signal.
Input Specifications	Maximum input voltage is 24V AC/DC. Unit accepts positive or negative AC or DC signal, with a 50-60Hz frequency range. PWM integrator slow rate is at 1V/sec i.e. 10 seconds for 10V. Refresh must be once per 60 seconds otherwise output will failsafe to 0V and input LED for the channel will flash 4 times per second as a fault indicator. If PWM signal is less than 1 second, output is set to 0V.

Note:
Input Specifications



A) A 1 second input pulse produces a 1 volt output voltage at the end of the input pulse. The input LED is on for the duration of the input pulse (1 second).

B) A 5 second input pulse results in a 5 volt output voltage with the input LED on during the 5 second input pulse.

C) An input pulse less than 1 second produces an output voltage of 0 volts. The input LED correlates to the input signal.

D) Output voltage changes to 8 volts at the end of an 8 second input pulse. The input LED remains on for the 8 second pulse.

E) After a period of 60 seconds with no input pulse the output voltage faults to 0 volts and the input LED begins a fault cycle of 4 pulses per second followed by 4 second off period. This 5 second fault cycle will repeat until an input signal occurs.

PWM Input to Voltage Output Transducer

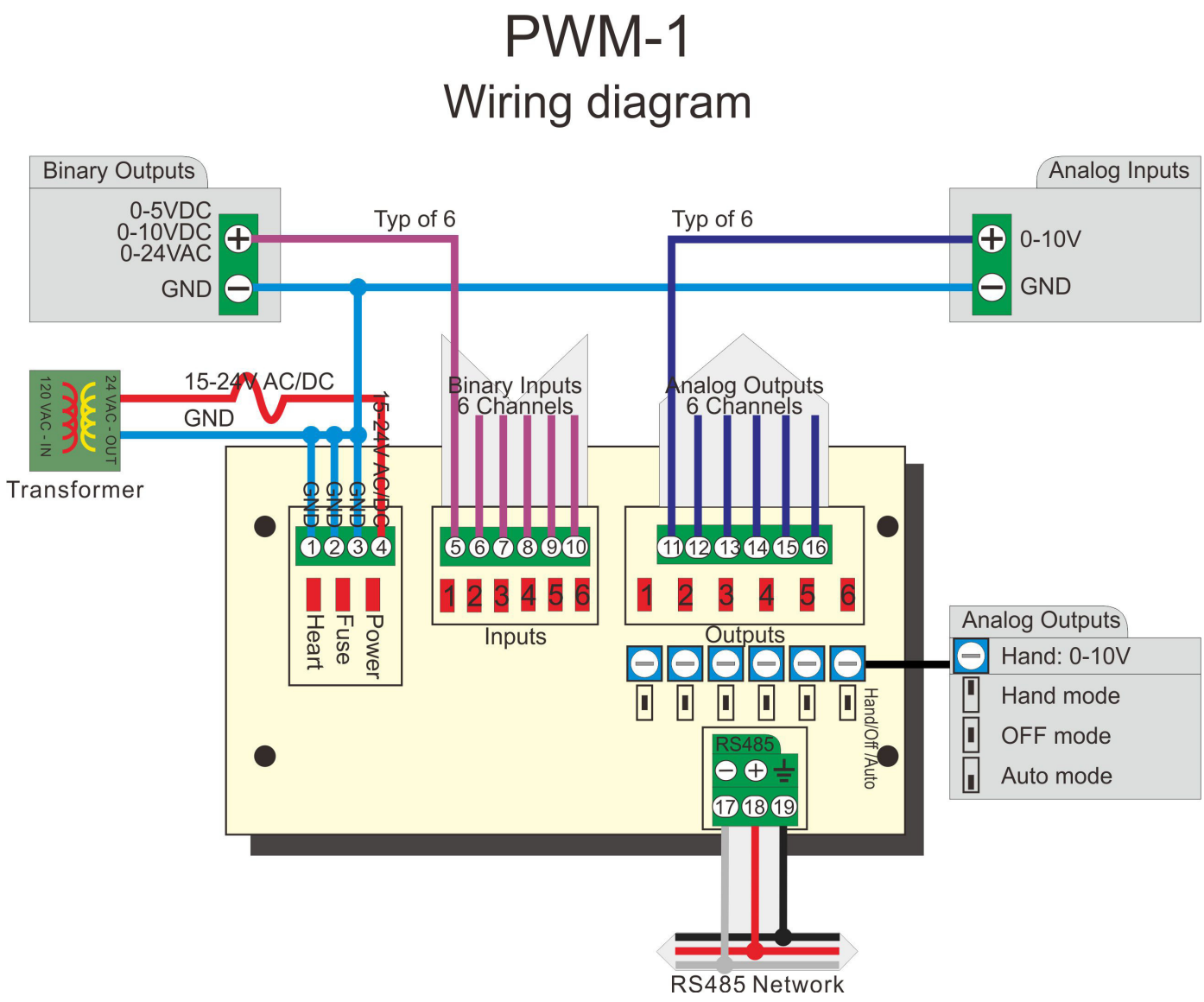
Wiring Diagram

Follow the PWM-1 wiring diagram below.

There are six output channels which can be selected by the switch : hand/ off/ auto. When the switch is at hand, the corresponding output can be adjusted by potentiometer, and the output range is 0-10V. When the switch is at off, the corresponding output is 0V. When the switch is at auto, the output is decided by the corresponding input from the PWM duty cycle.

There are six binary input channels, and the input voltage types are 5VDC, 10VDC, and 24VAC. No jumper is required, the unit will auto detect the signal type.

Analog Output/ Switch	Hand	Adjusted by potentiometer, and the output range is 0-10V
	Off	The corresponding output is 0V
	Auto	The output is decided by the corresponding input from the PWM duty cycle
Binary Input	Voltage supports 0-5VDC, 0-10VDC, and 0-24VAC	

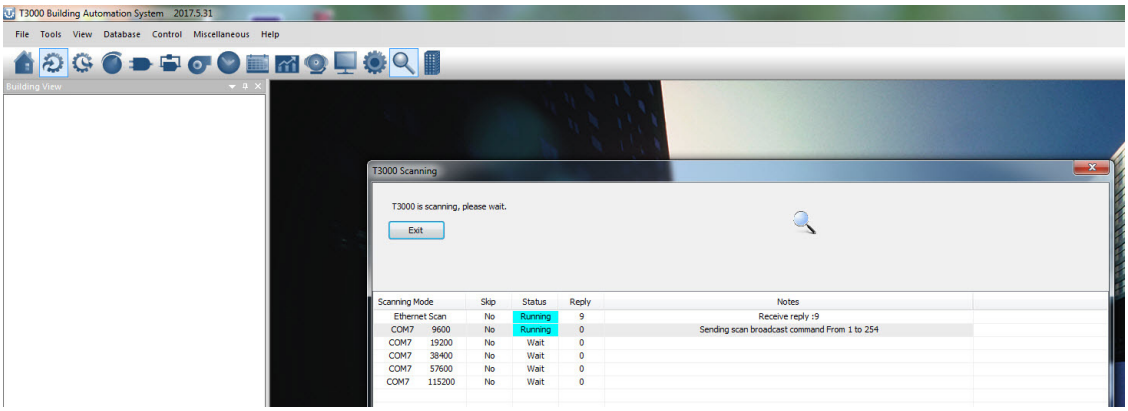


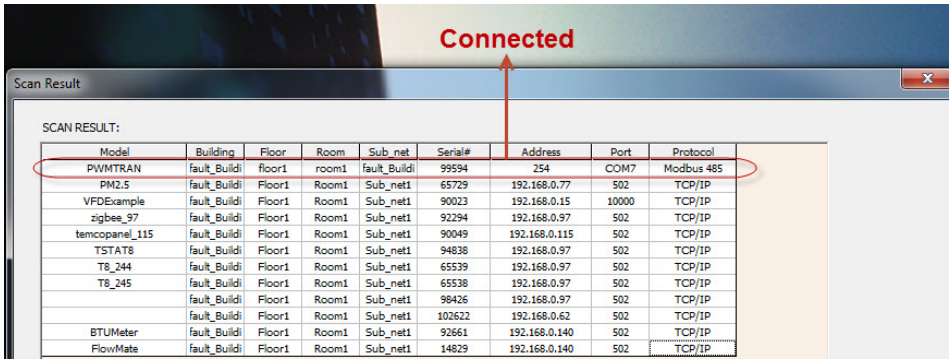
T3000 Operation

Step1.Plug the PWM Transducer in power,Connect it to PC via RS485.

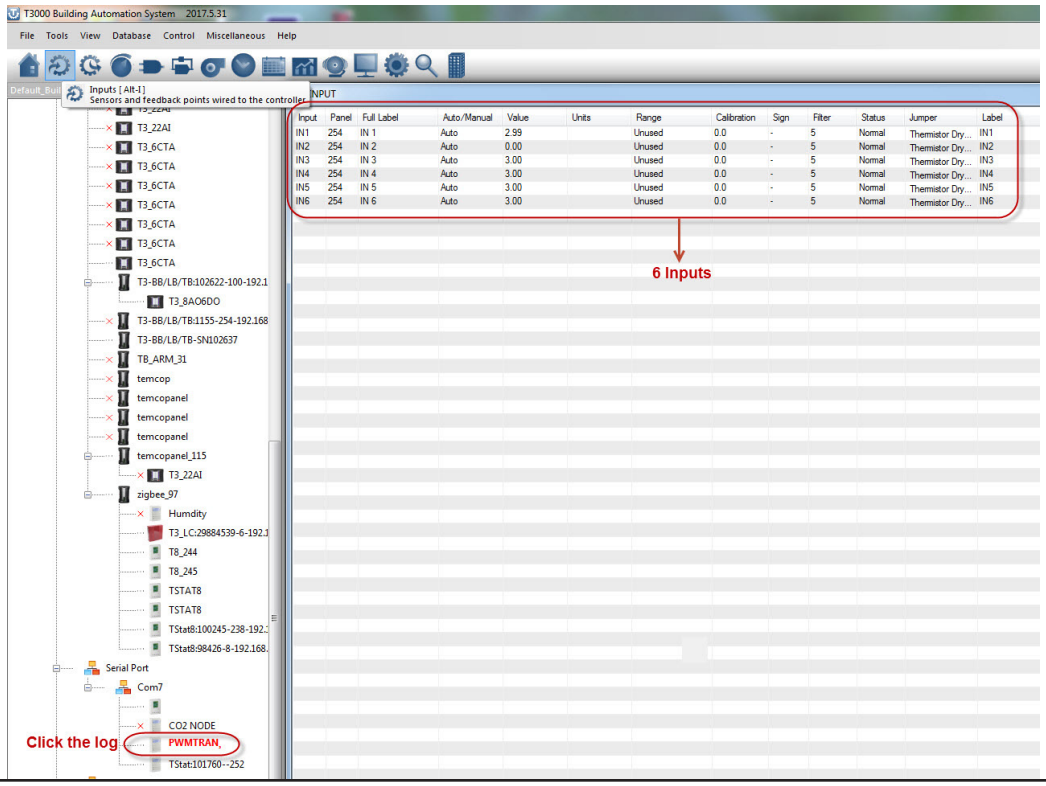
Step2.Visit https://temcocontrols.com/ftp/software/T3000.zip,download T3000 software.

Step2.Start T3000 program, Click  to scan,then you can find the device connected.

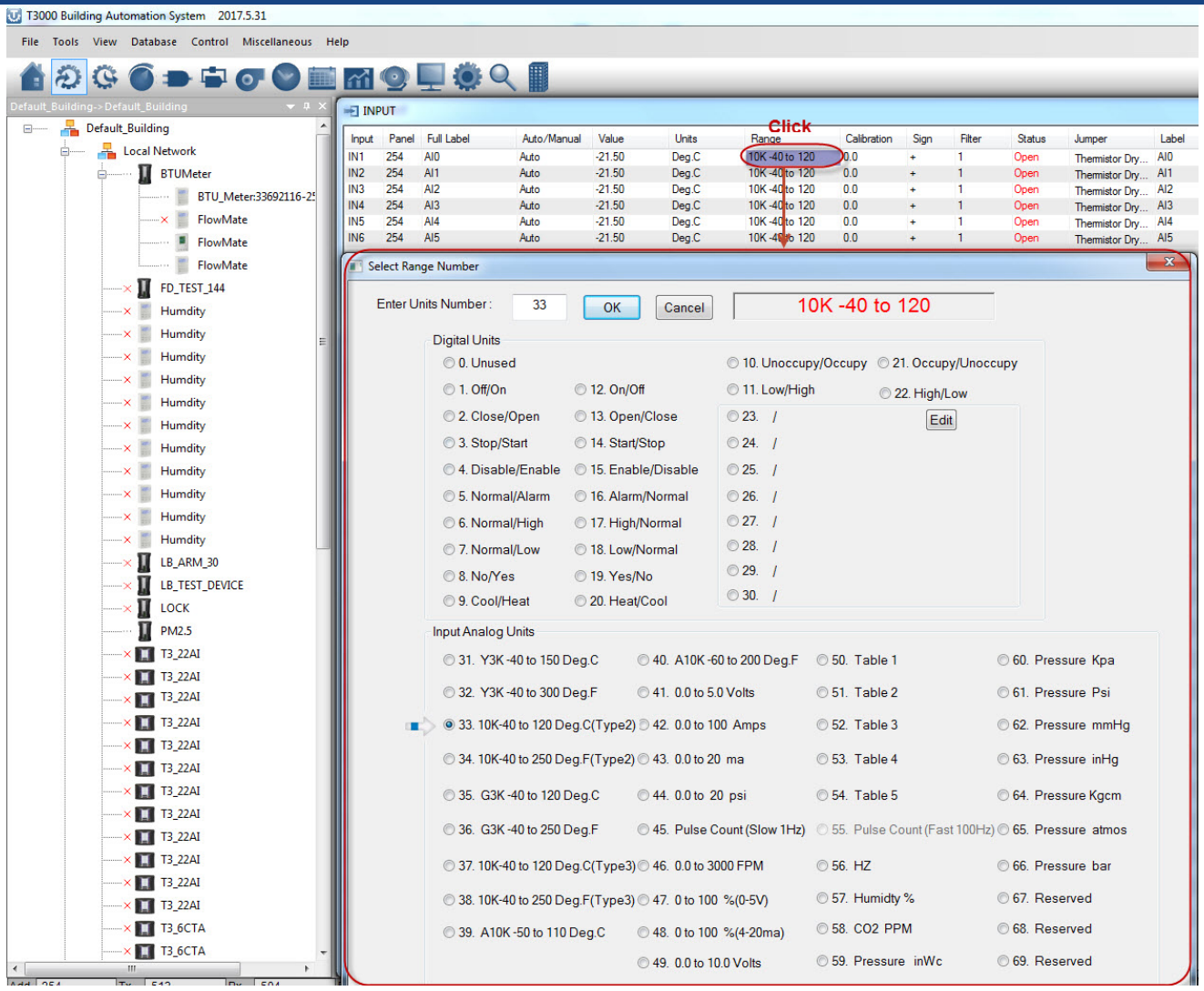




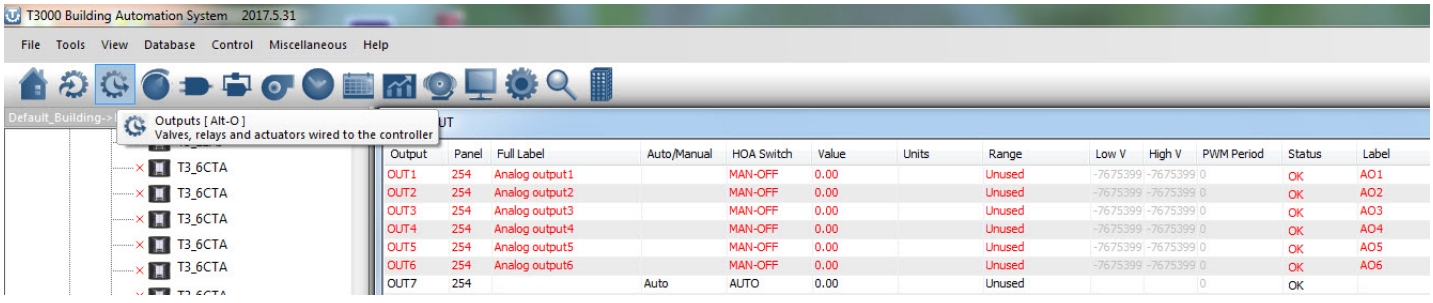
Step4.Click PWM Transducer log,click  to see 6 inputs.Click Range value to Select Range Number.



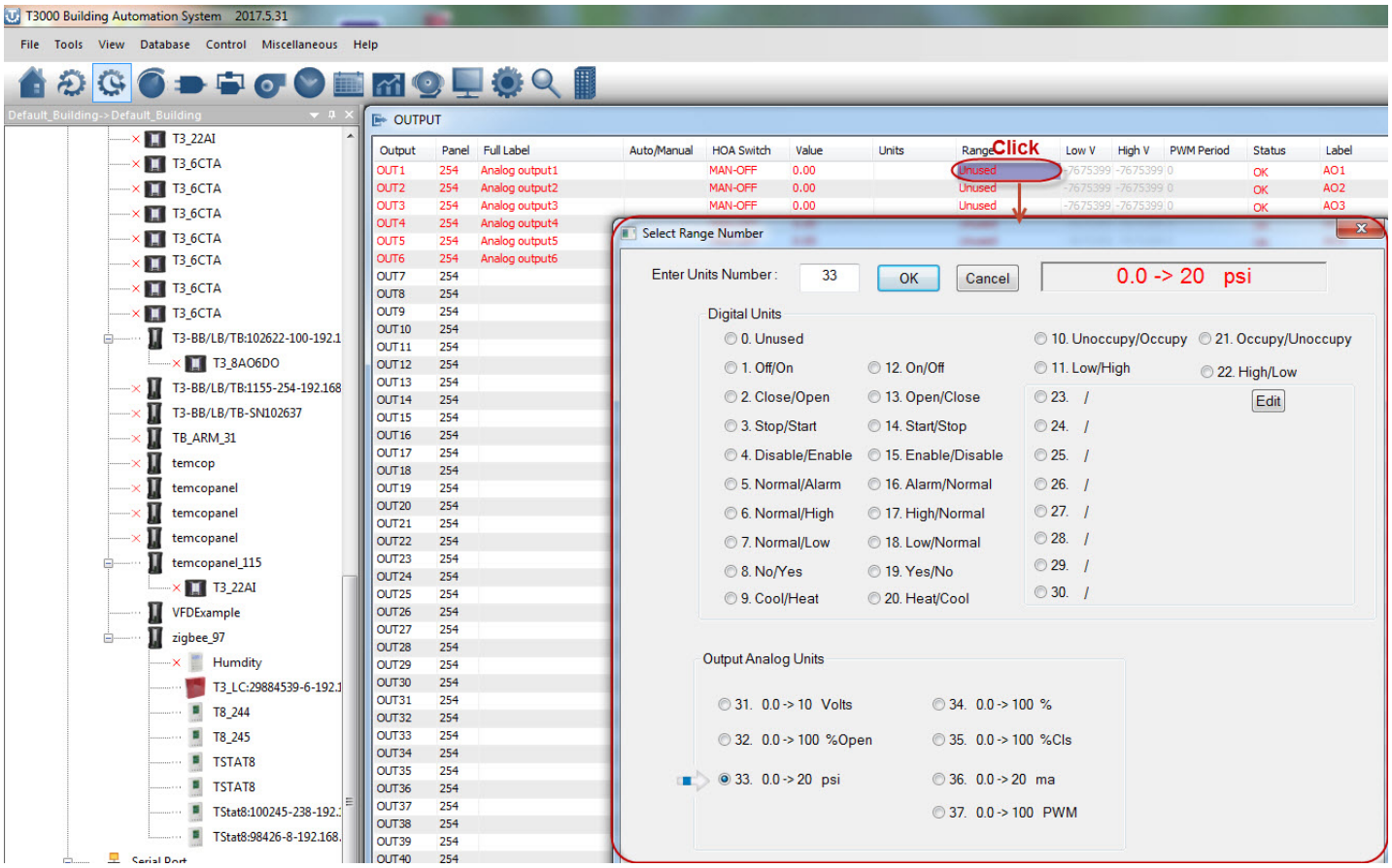
PWM Input to Voltage Output Transducer



Step5.Click  to see 6 outputs.Click Range value to Select Range Number.



PWM Input to Voltage Output Transducer



Electromagnetic Flow Meter

Descriptions

The EFM Series is the most economical flanged electromagnetic flowmeter on the market. It is used in 3 to 12” pipe in HVAC, municipal or industrial water, wastewater, pump stations and packaged plant applications.
The EFM has no moving parts and the electrodes are designed to discourage fouling. This magmeter requires no maintenance in applications where debris would impede mechanical meters. There are no moving parts so there’s nothing to ever wear out. Minimal straight pipe requirements allow the EFM Series meters to be used where there’s little space available. EFM Series meters come rated at IP65 for use in typical chiller and boiler room applications, IP68 is available on request. Rate and total indication are standard. All setup is done with our free & open source graphical T3000 software.



Integrated type



Highlights:

- No moving parts, nothing to wear out.
- Minimal straight pipe requirements,upstream ≥10DN, downstream ≥5DN.
- Suitable for all common fluids including boiler and chilled water systems.
- Unaffected by temperature,viscosity,pressure and density
- All parts inside & out are well protected from corrosion.
- Reversible flow readings.
- High definition LCD display with backlight, easy keypad setup.
- All parameters saved to EEPROM for backup during power outage.
- Wide working volts range
- Self diagnostics



Display

Specifications

Power supply voltage	20~24V DC
Power Consumption	<25W
Output Signal	4~20mA, pulse
Pipe Size	1.25 inches to 4 inches
Pressure rating	1.6MPa / 232 psi
Instrument range	8.48-282m³/h / 2240 gallons/hour
Flow Coefficient	Cv=1.3160
Accurancy	0.5%
Electrode material	SS316L
Ambient temperature	-25~+45C / -13 ~+140F
Ambient humidity	5%~95%rh(non-condensation)
Fluid conductivity	>5μS/cm
Fluid Temperature	-20~+65C / -4~+149F
Enclosure	IP65, IP68 on request
Communication Protocol	Modbus

Electromagnetic Flow Meter

Part Number Scheme

EMF-100 -M

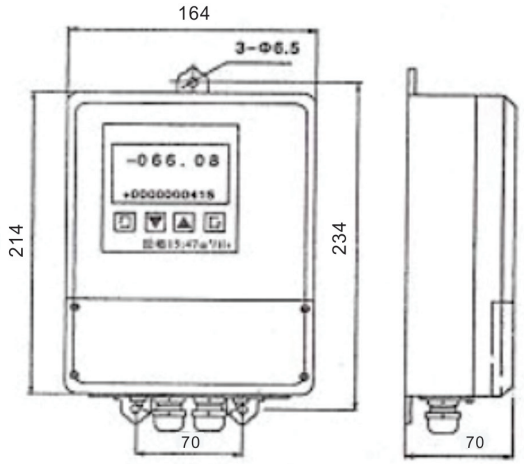
Code	Description
EFM	Electromagnetic flow meter

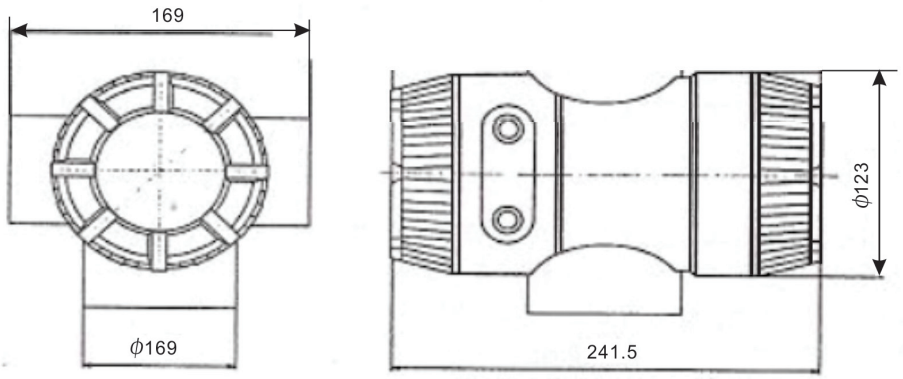
Code	Description
M	Modbus

Code	Pipe Diameter
100	100mm
20,25,32,40,50,65,80,100	

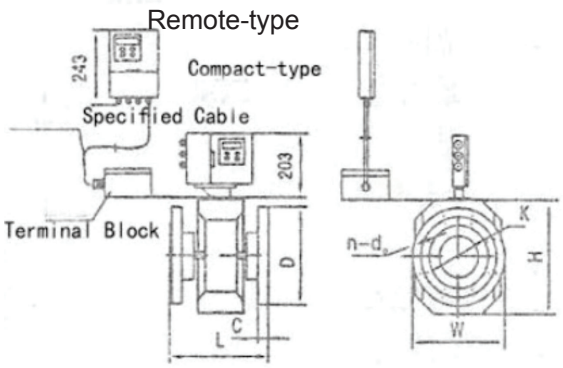
Dimension

Unit:mm



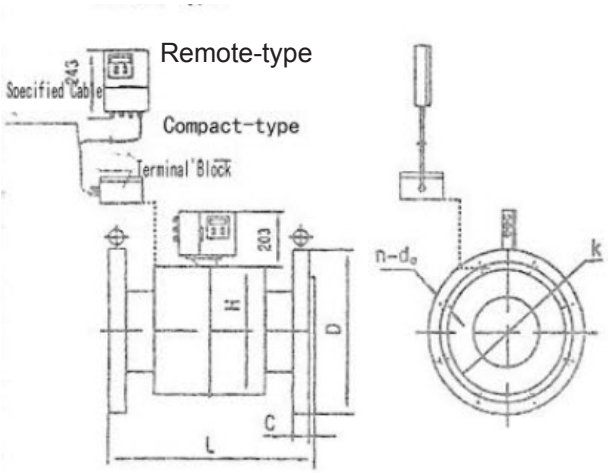


Sensor



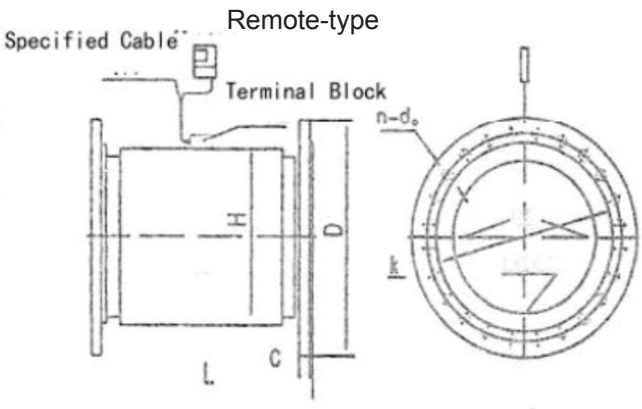
DN40~150

Nominal Diameter	L [2]	W	H	Approximate Weight		Flange Size [1] (GB/T9119 4.0MPa)				
				Compact-type	Sensor	D	K	d_o	n	C
40	200	150	210	16	13	150	110	14	4	20
50	200	165	210	17	14	165	125	18	4	20
65	200	185	250	25	22	185	145	18	8	22
80	200	200	250	29	26	200	160	18	8	22
100	250	235	272	31	28	235	190	22	8	26
150	300	300	304	41	38	300	250	26	8	28



DN200~DN600

Nominal Diameter	L [2]	H	Approximate Weight kg	Flange Size [1] (GB/T9119 1.6MPa)				
		Φ -		D	K	d_o	n	C
200	300	310	45	340	295	22	12	26
250	450	358	50	405	355	26	12	28
300	450	410	60	460	410	26	12	32
350	500	465	145	520	470	26	16	35
400	500	515	180	580	525	30	16	38
450	550	564	215	640	585	30	20	42
500	550	614	245	715	650	33	20	46
600	600	722	335	840	770	36	20	52



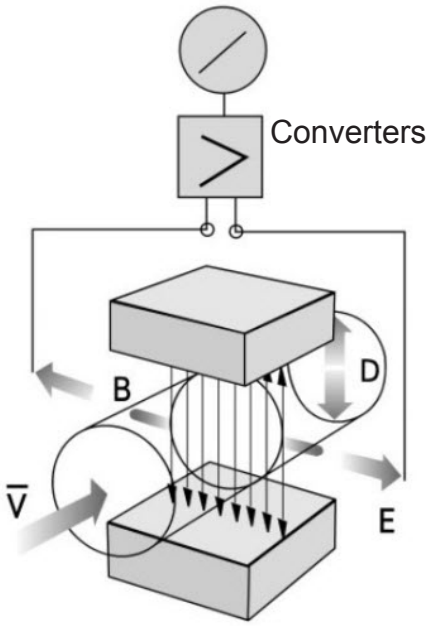
DN700~DN2000

Nominal Diameter	L [2]	H	Approximate Weight kg	Flange Size [1] (GB/T9119)					
		Φ -		pressure MPa	D	K	d_o	n	C
700	700	836	435	1.6	910	840	36	24	38
800	800	936	545		1025	950	39	24	38
900	900	1036	655		1125	1050	39	28	40
1000	1000	1136	810		1255	1170	42	28	42
1200	1200	1336	875	1.0	1455	1380	39	32	38
1400	1400	1536	1235		1675	1590	42	36	42
1600	1600	1736	1555		1915	1820	48	40	46
1800	1800	1960	2085	0.6	2045	1970	39	44	38
2000	2000	2160	2610		2265	2180	42	48	38

Working Principles

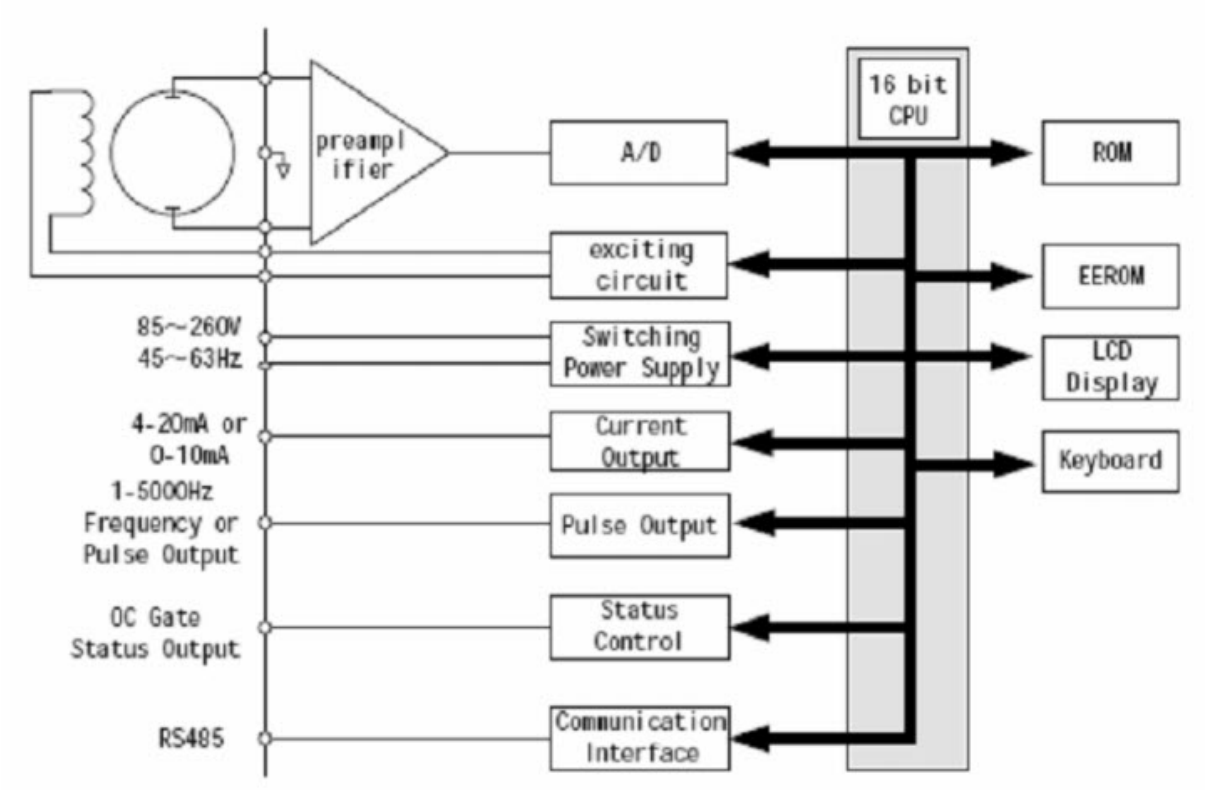
Measuring Principles

The measuring principle of electromagnetic flowmeter is based on the electromagnetic induction law of Farady. The sensor is mainly composed of measuring tube with isolate lining, a pair of electrodes installed by penetration of the measuring tube wall, a pair of coils and iron core to produce working magnetic field. When the conductive fluid flows through the measuring tube of the sensor, the voltage signal in direct proportion to the average flow velocity of the fluid will be inducted on the electrodes. The signal is amplified and treated by the transmitter to realize various display functions.



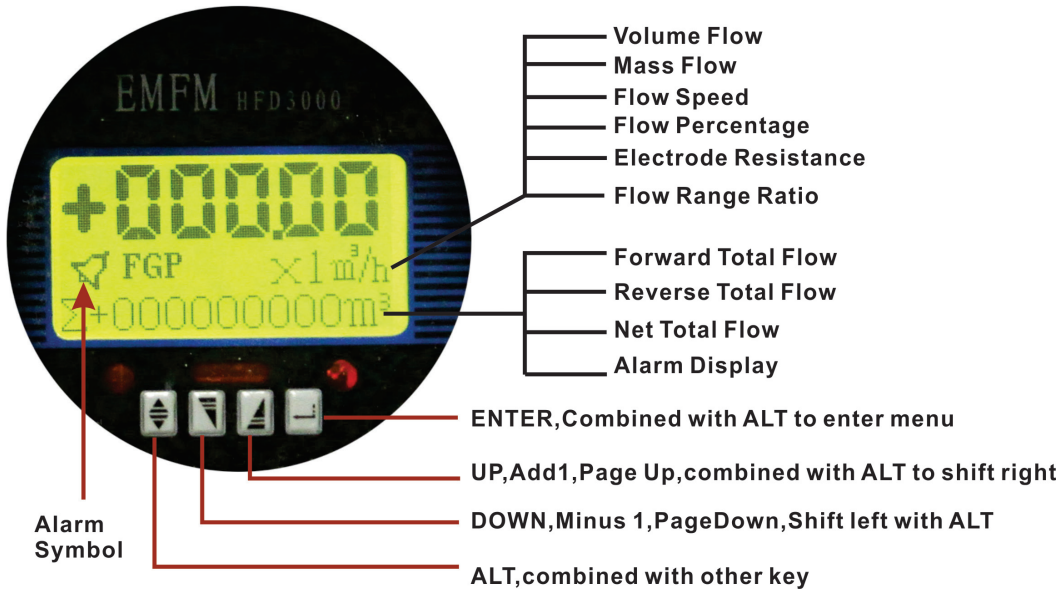
Converter Circuit Schematic

The converters supplies a stable exciting current to the coil in the sensor of electronetic flowmeters to get B constant and amplifies the electromotive force and convert it into standard signals of current or frequency so that the signals can be used for displaying, controlling and processing. The schematic of converter circuit is shown is below:



Converter Operation Menu And Parameter Setting

Keypad and Display



Keypad Function

1. Automatic Measurement Mode

DOWN: Scroll bottom line display;

UP: Scroll top line display;

ALT + ENTER: Enter into setting mode;

ENTER: Return to measurement mode.

(3) When adjusting flow zero, UP or DOWN key can be used to change the sign (+/-).

(4) When setting flow range, UP or DOWN key can be used to change flow unit.

2. Parameter Setting Mode

DOWN: Subtract one form the digit at the cursor;

UP: Add one on the digit at the cursor

ALT + DOWN: Cursor shifts left

ALT + UP: Cursor shifts right

ENTER: Enter/exit submenu;

ENTER: Return to measurement mode if held for 2 seconds at any location

Remarks:

(1) When using ALT key, hold ALT first and then press UP or DOWN.

(2) Under setting mode, the meter returns to measurement mode automatically if no key is pressed for 3 minutes.

Parameter Configuration and Operation

The setting parameters determine the operation status, calculation method and output mode of the flow meter. Properly setting meter parameter can make the meter work in best condition and higher accuracy of display and output can be obtained.

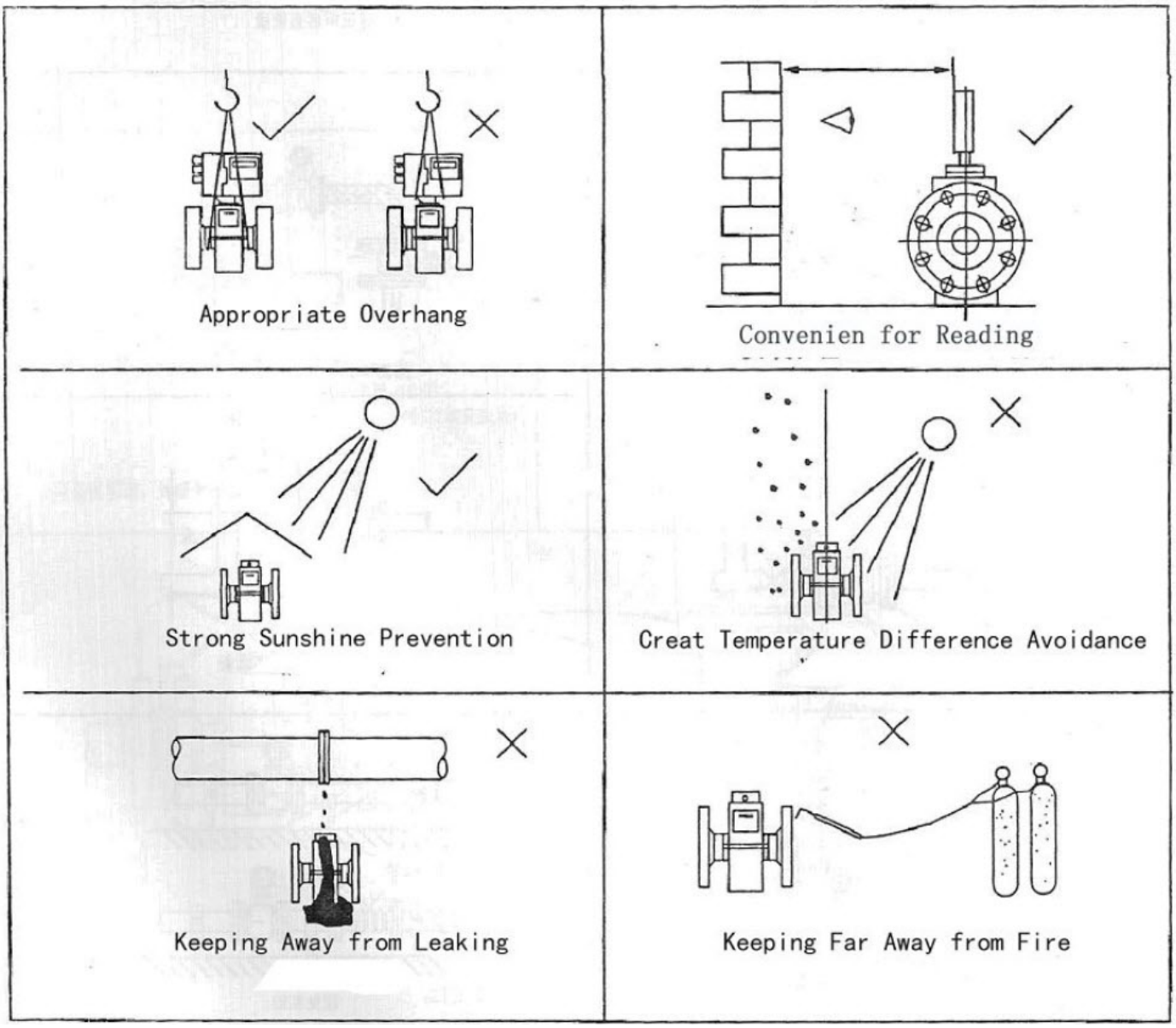
There are five levels of password, where level 0 - 3 are open for user and level 4 reserved for manufacturer. Level 1 to 2 passwords are changeable by higher level password-holder, e.g.Level-3 password.

Meter setting can be browsed by entering any level of password. However, higher level password is needed to change settings.

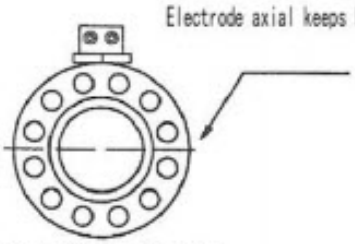
--Password Level-0 (default value 0521): fixed and browsing only;
--Password Level-1 (default value 7206): changeable and authorized to modify menu item 1 to 25;
--Password Level-2 (default value 3110): changeable and authorized to modify menu item 1 to 29;
--Password Level-3 (default value 2901): fixed and authorized to modify menu item 1 to 38;
--Password Level-4 (reserved): fixed and authorized to modify any menu item including resetting system.
--Totalizer Reset Password (default value 36666): changeable in menu item 'Clr Tot.Key 'and authorized to clear the three internal counter.
It is suggested that Level-3 password be held by manager or supervisor while Level-0 to 2 passwords be kept by operator. The Level-3 password can also be used to change the password for totalizer resetting

Installation

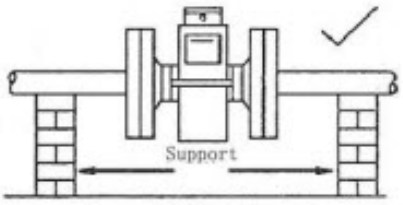
The installation of flowmeter is shown as below:



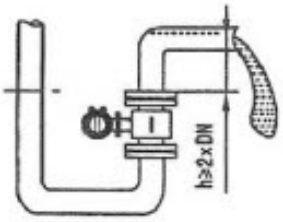
Electromagnetic Flow Meter



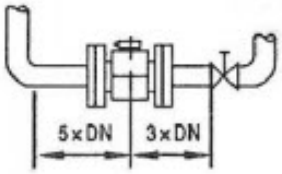
Level Installation



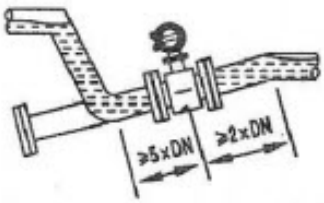
Reasonable Support



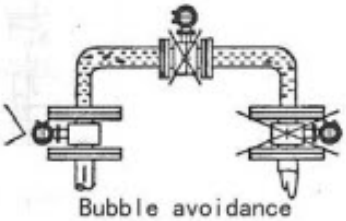
Full of Pipe



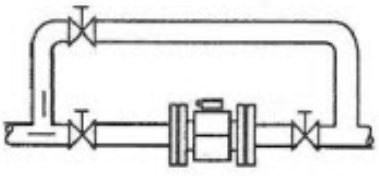
Ensure the Requir. of the Straight Pipe section



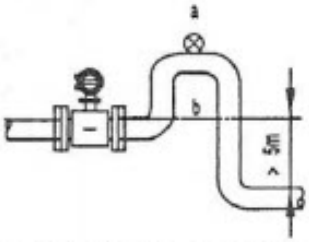
Measurement for the Precipitable



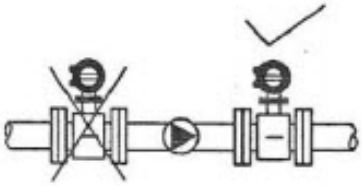
Bubble avoidance



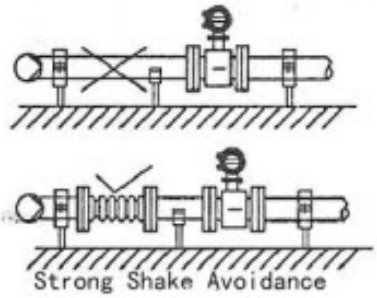
Easy to Maintenance and Clean-up



Negative Pressure and Non-filled pipe Avoidance

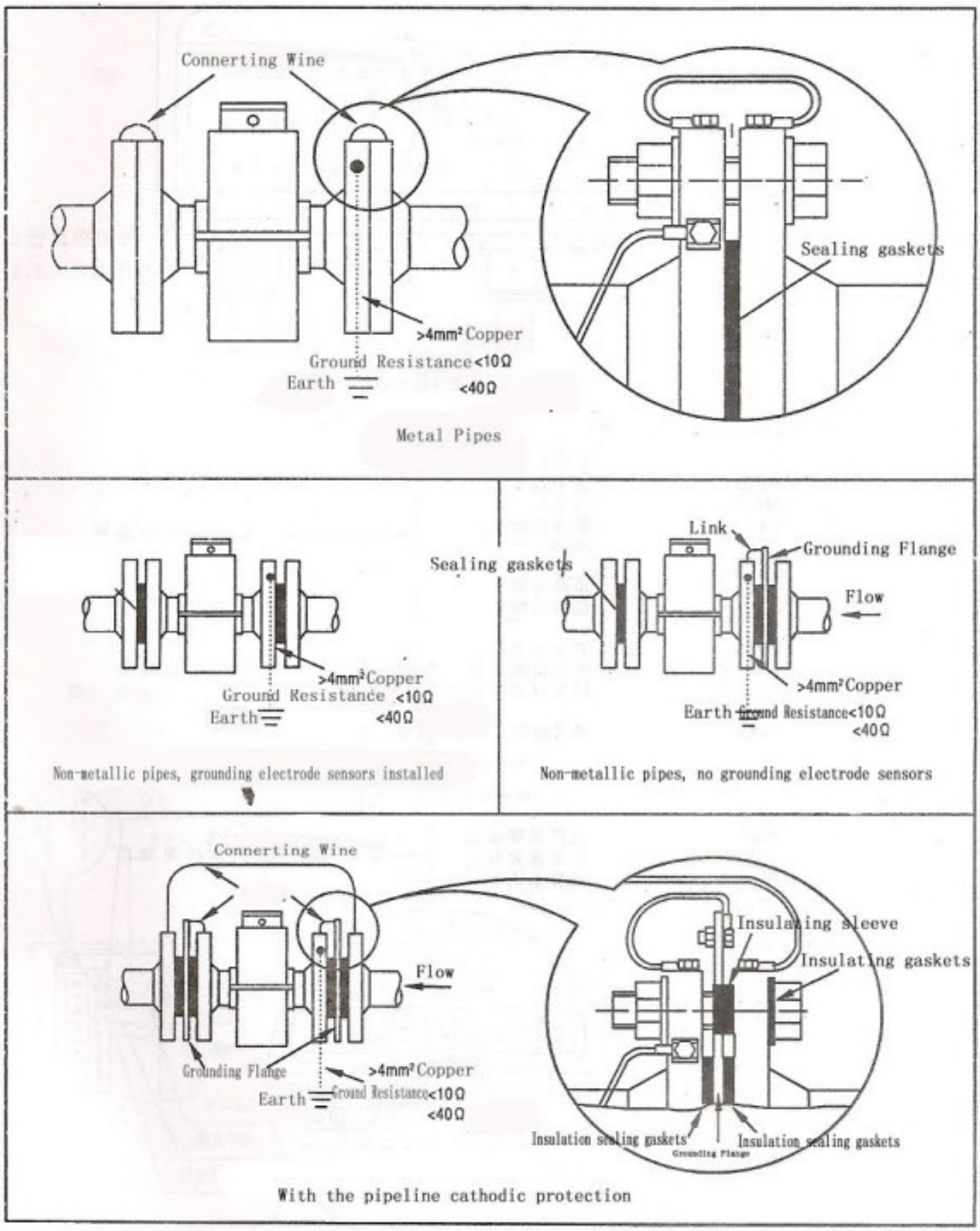


Not Installed in Front of the Inlet of Pump



Strong Shake Avoidance

Wiring


Connerting Wine
Sealing gaskets
>4mm² Copper
Ground Resistance<10Ω
Earth
<40Ω
Metal Pipes
>4mm² Copper
Ground Resistance <10Ω
Earth
<40Ω
Non-metallic pipes, grounding electrode sensors installed
Link
Grounding Flange
Sealing gaskets
Flow
>4mm² Copper
Earth
Ground Resistance<10Ω
<40Ω
Non-metallic pipes, no grounding electrode sensors
Connerting Wine
Flow
Grounding Flange
>4mm² Copper
Earth
Ground Resistance<10Ω
<40Ω
Insulating sleeve
Insulating gaskets
Insulation sealing gaskets
Insulation sealing gaskets
Grounding Flange
With the pipeline cathodic protection

Self-diagnostic

The converter is made by surface mount technology and is not repairable for user. Do not open the converter case.

The self-diagnosis function of the converter is capable of displaying alarm information except power supply or hardware failures. A '! ' symbol is displayed on the right corner of LCD top-line and malfunction information can be read from the bottom -line by pressing DOWN key.User may check the flowmeter according to the alarm information. Some examples of alarms are given below:

Coil Alm
Elctrd Alm
EpPipe Alm
Low Alarm
High Alarm

Operation

Before operation, the following inspection should be done to check if:

a. There is any damage caused by transportation or installation;

b. The power used is same as the label on the flowmeter;

c. The wiring is correct.

After inspection, turn the valve on to fill the pipe up and make sure there is no leakage and the gas inside the pipe is eliminated. Switch on the power supply and the flowmeter is ready to use after 10 minutes warm -up.

If there is any problem, please refer to the Section 9 for troubleshooting. If still not working properly, contact the manufacturer immediately.

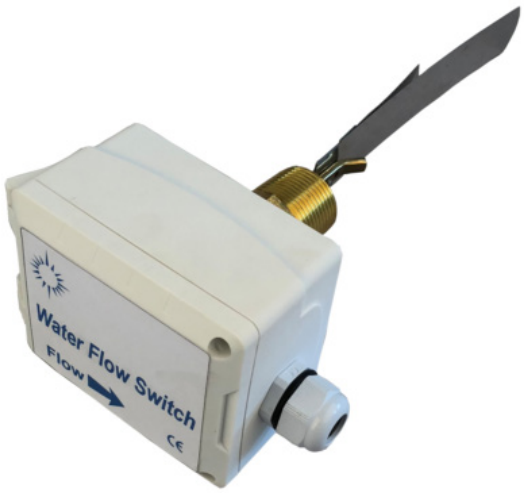
MODBUS register address definition

Protocol Addresses（Decimal）	Protocol Addresses（HEX）	Date format	Register definition
4112	0x1010	Float Inverse	Instantaneous flow floating point representation
4114	0x1012	Float Inverse	Instantaneous velocity floating point representation
4116	0x1014	Float Inverse	Flow percentage floating point representation（Battery supply meter reserved）
4118	0x1016	Float Inverse	Fti floating point representation
4120	0x1018	Long Inverse	Positive cumulative numerical integer part
4122	0x101A	Float Inverse	Forward cumulative Numeric Decimal part
4124	0x101C	Long Inverse	Reverse cumulative numerical integer part
4126	0x101E	Float Inverse	Reverse cumulative value fractional part
4128	0x1020	Unsigned short	Instantaneous flow unit 0:L/S 1:L/M 2:L/H 3:M3/S 4:M3/M 5:M3/H 6:T/S H 6:T/S 7:T/M 8:T/H 9:GPS 10:GPM 11:GPH
4129	0x1021	Unsigned short	Cumulative total unit 0:L 1:M3 2:T 3:USG
4130	0x1022	Unsigned short	Upper limit alarm
4131	0x1023	Unsigned short	Lower limit alarm
4132	0x1024	Unsigned short	Atc alarm
4133	0x1025	Unsigned short	System alarm

Water Flow Switch

Description

This unit is waterproof liquid flow switches which can be used in control and monitor liquid flow of boilers, pumps, etc..., of heating, cooling, and air conditioning equipment.



Features:
Flow control of water and normal media
Renovated SPDT micro switch ensures the reliable switch function
15(8A) 250VAC switch rating
IP65 enclosure
Flammability rating UL 94V0 file E194560
Setpoint adjustable
Stainless steel paddle
Brass material Pipe Connection: 1” NPT
Max. liquid temp 120C
Max working pressure 13.5 Bar

Specifications

Type of operation	On/Off, single-stage, micro switch
Output	SPDT 15(8)A, 24/250VAC
Flow rates	See flow rate table
Flow rate setting adjustment	Internal screw
Sensing element	Paddle
Liquid applications	Hot, chilled, well, pool and sea water, brine or ethylene glycol
Parts material in contact with fluid	Brass
Pipe Connection	1” NPT
Paddle material	Stainless steel
Liquid temperature	-20C~120C
Permissible ambient temperature	-40C~85C
Permissible ambient humidity	10~90% RH, non-condensing
Housing	Resistance ABS
Protection	IP65

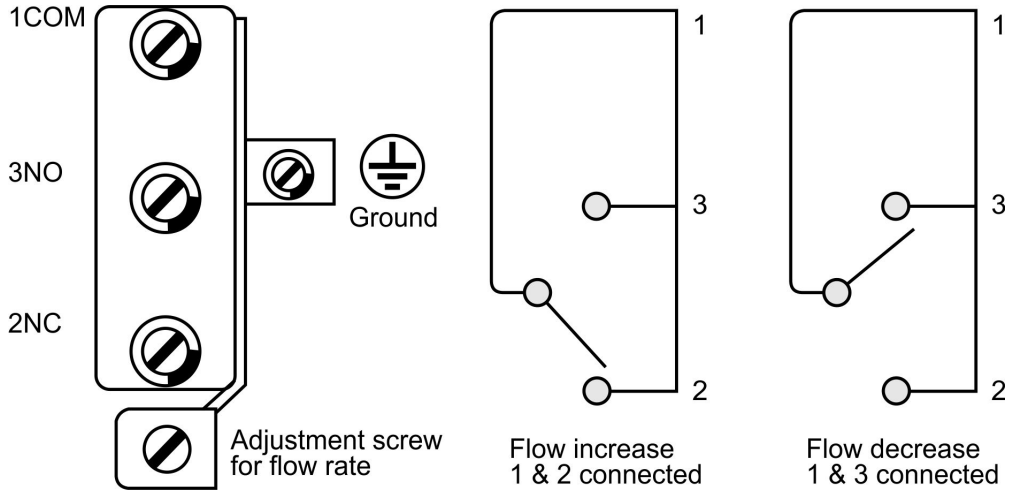
Water Flow Switch

Water Flow Rate Table

Line Pipe Size(in.)		1	1 1/4	1 1/2	2	2 1/2	3	4	4Z	5	5Z	6	6Z	8	8Z
Min. flow	Flow Increase 1&2 Connected	4.2 (1.0)	5.8 (1.3)	7.5 (1.7)	13.7 (3.1)	17.6 (4.0)	27.5 (6.2)	64.7 (14.7)	35.2 (8.0)	12.5 (28.4)	57.01 (12.9)	90.0 (43.1)	74.0 (16.8)	374.7 (85.1)	204.7 (46.5)
	Flow Decrease 1&3 Connected	2.5 (0.6)	3.7 (0.8)	5.0 (1.1)	13.7 (2.2)	11.9 (2.7)	19 (4.3)	50.1 (11.4)	26.9 (6.1)	101.1 (22.9)	41.0 (9.3)	158.0 (35.9)	54.0 (12.3)	319.7 (72.6)	170.0 (38.6)
Max. flow	Flow Increase 1&2 Connected	9.2 (2.1)	13.3 (3.0)	17.6 (4.0)	26.9 (6.1)	30.8 (7.0)	50.2 (11.4)	127.6 (29.0)	81.0 (18.4)	245.0 (55.6)	118.0 (18.4)	374.7 (85.1)	144.0 (32.7)	759.5 (172.5)	415.0 (94.2)
	Flow Decrease 1&3 Connected	8.1 (1.9)	12.5 (2.8)	16.3 (3.7)	25.1 (5.7)	28.6 (6.5)	471 (10.7)	122.0 (27.7)	76.2 (17.3)	234.7 (53.3)	111.0 (25.2)	359.7 (81.7)	134.7 (30.6)	729.6 (165.7)	400.6 90.8)

Notes:
For flow rates with suffix “Z”, the 6 inch paddle must be installed.

Wiring Diagram

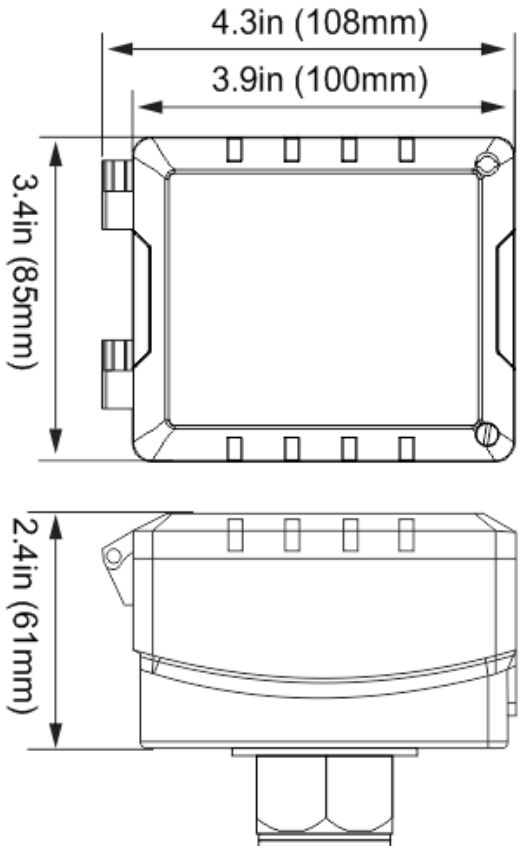


Installation

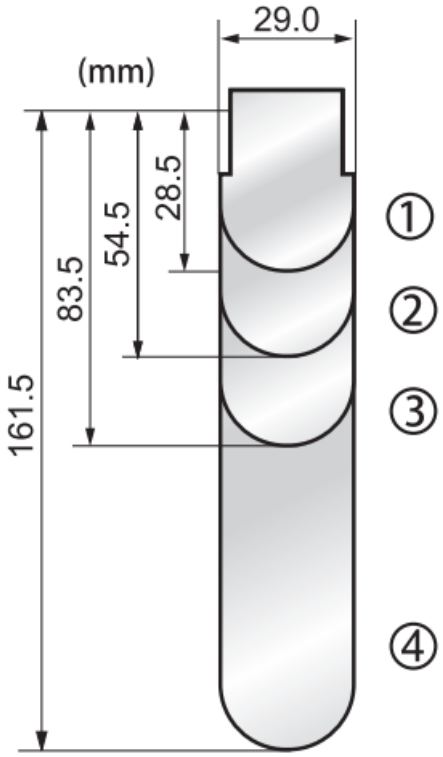
The flow switch can be installed in every position far from elbows or throttlings, with arrow on flow direction. If pipe is vertical, recalibrate range to balance paddle weight. If the device is downwards mounted, take care to slags and apply it in a straight pipe that is far from fiters, valves, etc., with length at least 5 times the diameter of pipe upstream and downsteam the unit.
Notes:
The flowswitch is factory calibrated at its minumum sensitivity.To increase the set valve,turn the adjustment screw clockwise.The cut-out valve must be ≥the minimum flow necessary to guarantee the protection of the plant.

Water Flow Switch

Dimension



Paddles



Install Paddle	
Pipe	No.
1”	1
1 1 /4”	1
1 1 /2”	1
2”	1,2
2 1 /2”	1,2
3”	1,2,3
4”	1,2,3
4”Z	1,2,3,4
5”	1,2,3
5”Z	1,2,3,4
6”	1,2,3
6”Z	1,2,3,4
8”	1,2,3
8”Z	1,2,3,4

Air Flow Switch

Description



The duct air flow switches is a kind of heating,cooling and air conditioning equipment,which is used to control and monitor air,non aggressive gases flow in ducts, chambers, etc. The duct air flow switch provides feedback of air flow in HVAC duct work.It can be connected directly to the control system as a feedback point or can be directly interlocked to prevent operation of heating and cooling equipment when there is no air flow. Stainless steel paddle resists corrosion. Adjustable spring tension screw allows setting the air flow trip point. The paddle can be trimmed down for higher flow applications. The cable enters through the water tight gland, or the gland can be removed and replaced with an EMT or flex connector for wiring with EMT or metal flex.

Features:

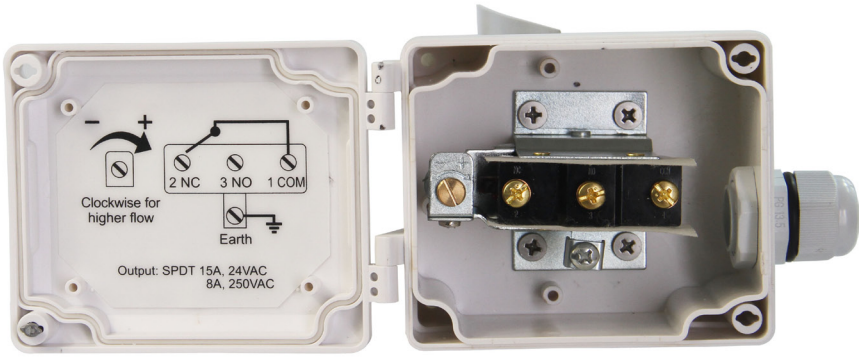
•Renovated SPDT micro switch ensures the reliable switch function
•Stainless steel paddle
•Cut-in and cut-out
•Brass level
•IP65 housing
•15(8A) 250VAC switch rating
•Max.liquid temp 120°C
•Max working pressure 13.5Bar

Specifications

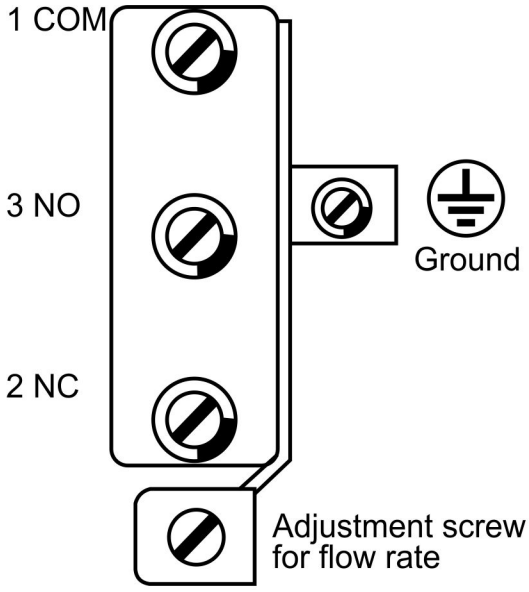
Type of operation		On/Off, single-stage, micro switch
Output		SPDT 15(8A) 24/250VAC
Flow rates switching		
	-Cut-out	Min. 1.0 m/sec, Max. 8.0 m/sec
	-Cut-in	Min. 2.5 m/sec, Max. 9.2 m/sec
Flow rate setting adjustment		Internal screw
Sensing element		Paddle
Paddle size		3.2 x 6.9 in. (80 x 175 mm)
Liquid applications		Air and non aggressive gases
Paddle material		Stainless steel
Permissible ambient temperature		
	- Housing	-40°F to 185°F (-40°C to 85°C)
	-Paddle	14°F to 185°F (-10°C to 85°C)
Operating temperature		14°F to 185°F (-10°C to 85°C)
Permissible ambient humidity		10~90% RH, non-condensing
Cable entry		M18 fitting
Housing	-Material	Fire Resistance ABS,UL NO.E56070
	-Protection	IP65
	-Color	White
Installation		Duct mounted

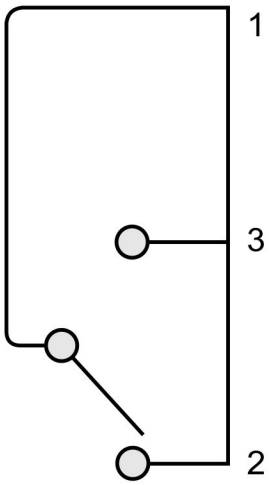
Air Flow Switch



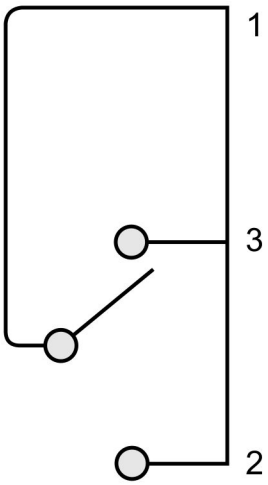


Wiring Diagram





Flow increase and attained to cut-in setting
1 & 2 connected



Flow decrease and attained to cut-out setting
1 & 3 connected

Installation

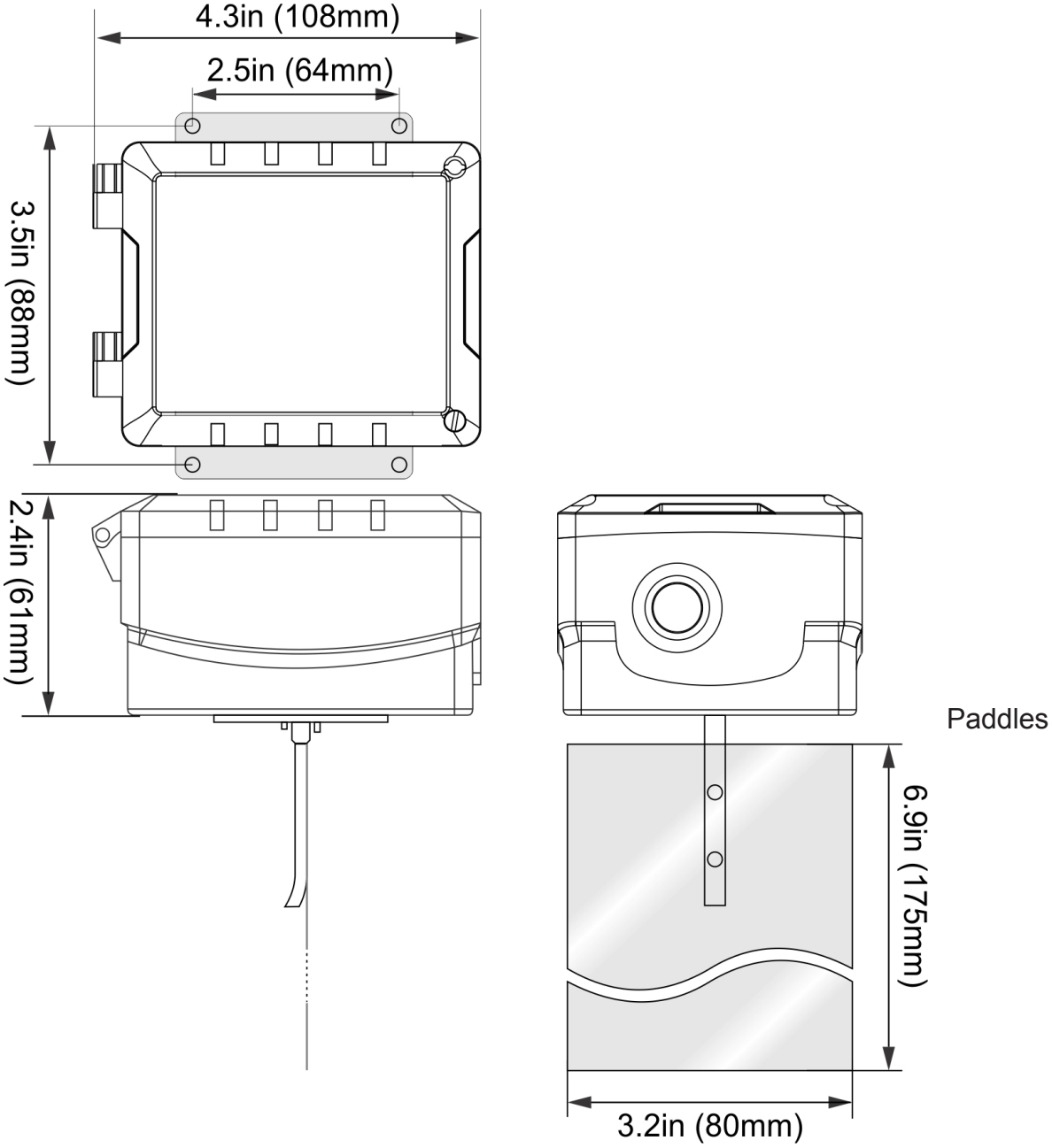
The flow switch should be mounted into a duct or chamber where the air paddle can freely point horizontally downwards. To avoid air swirl and paddle instability, straight zones should be provided for a length of 5 times the diameter of duct upstream and downstream from the installation location.

Notes:

The units are factory calibrated to the minimum switch-off value. To increase the set value, adjust the range screw clockwise. Due to the risk of fracture at air speeds of higher than 5.0 m/sec,the paddle must be cut off on the marked side. When the paddle is cut off, the minimum cut-out value increases from 1.0 m/sec to 2.5 m/sec.

Air Flow Switch

Dimension



Pitot Tube

Description

The Pitot Tube is a differential pressure producer suitabl for air flow measurement. It includes multiple sensing points to measure total and static pressures. It is easy to install and cost effective. It offers simple, low cost installation into pipes and ducts, and high energy savings due to its low unrecovered pressure loss. There are no moving parts or sharp edges to wear, so long term accuracy can be maintained.It contains a rubber cap,Plastic base and two 1 meters length air tube.





Features:
-Air Flow Measurement
-Low Installation Costs
-Long Term Accuracy
-Minimal Unrecovered Pressure Loss
-Mass Flow Measurement



Pitot Extrusion



Air tube



Plastic Base



Rubber cap

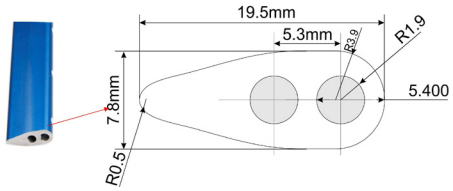


Screw

Specifications

Probe	Material	Aluminium alloy
	Dimensions	7.8 x 19.5mm (0.3”x 0.8”)
	Tubing inner diameter	Φ3.8mm
Rubber cap	Material	Rubber
	Connections	To suit 4mm (0.16”) i/d PVC air tubing
Duct flange	Material	ABS
	Dimensions	30 x 75mm (1.2”X 3”)
Air tube	Material	PU
	Dimensions	inside and out side diameter Φ 4 x Φ6mm length 1m





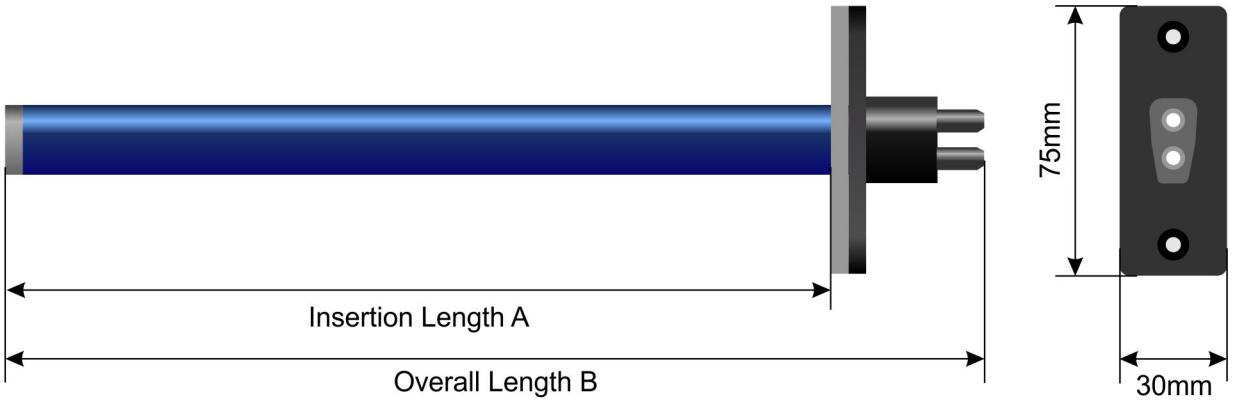
Pitot Tube

Part Number Scheme

PITO-250

Code	Description
PITO	Pitot Tube

Code	Pitot Length
100	4"
150	6"
200	8"
250	10"
300	12"
1000	39"
*	Other custom lengths are available, no minimum order



Insertion Length A (mm)	Overall Length B (mm)
150	193
200	243
250	293
300	343
1000	1043
Other custom lengths are available, no minimum order	

Pitot Tube

K Factor

Velocity (KM/H)	Pitot length(mm) Fan speed(Hz)	150	200	250	300	350	Average (mBar)	Comments / Remarks
25.2	60	0.420	0.421	0.427	0.424	0.451	0.429	
23.7	55	0.360	0.365	0.377	0.368	0.393	0.373	
21.7	50	0.306	0.307	0.314	0.308	0.332	0.313	
19.8	45	0.245	0.250	0.258	0.251	0.269	0.255	
17.7	40	0.197	0.195	0.198	0.195	0.208	0.199	
15.1	35	0.146	0.148	0.149	0.147	0.156	0.149	
12.6	30	0.103	0.101	0.102	0.100	0.107	0.103	
9.6	25	0.060	0.060	0.059	0.056	0.059	0.059	
7.4	20	0.032	0.033	0.034	0.034	0.036	0.034	

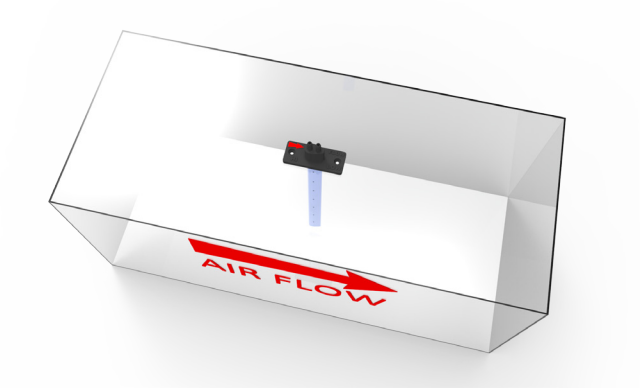
Fan Speed (Hz)	Left Side (KM/H)	Center (KM/H)	Right Side (KM/H)	Averge Speed (KM/H)
60	25.1	24.8	25.6	25.2
55	23.6	23.3	24.1	23.7
50	21.7	21.2	22.2	21.7
45	19.6	19.4	20.3	19.8
40	17.7	17.4	17.9	17.7
35	15.1	14.8	15.4	15.1
30	12.8	12.4	12.6	12.6
25	9.6	9.4	9.7	9.6
20	7.7	7.2	7.4	7.4

Velocity(KM/H) column data in up table is same as Average speed(KM/H) column data in below table.
Average speed(KM/H)=(left side(KM/H) + center(KM/H) + right side(KM/H)) /3
Average(mBar)=(150column + 200column + 250column + 300column+ 350column) /5

Pitot Tube

Instructions for installation

1 Duct orientation and sensor mounting

circular duct installation	square or rectangular duct installation
	

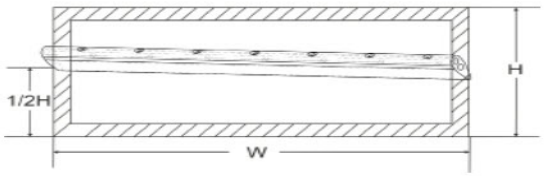
2 Instructions for installation

Step1:The primary station can be installed in any position on vertial or horizontal lines.However consideration to easy accesss of insrument connections should be given.

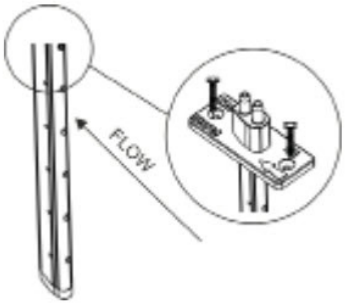
Step2:See location instrctions for best reselts.

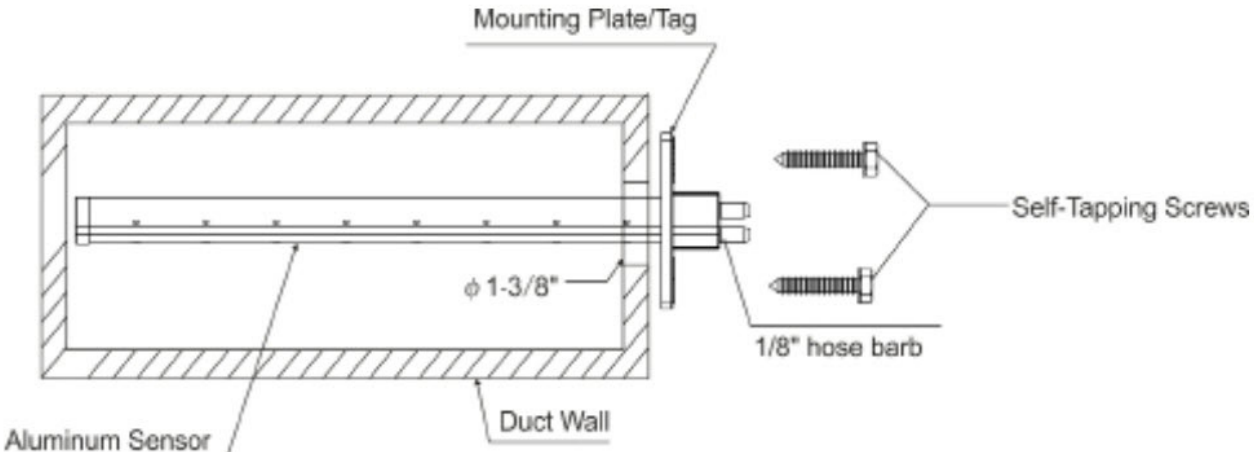
Step3:Drill a 1-7/8” hole in the center of the duct or pipe where the sensor is to be installed.Drill a 1/2” hole on the opposite side for the double support.

Step4:Attach opposite end-guide rod and pass through both holes.Ensure correct direction of flow.Secure mounting plate to duct or pipe with (2) self-tapping screws.



Prefererred Mounting





TF50-P Flow Switch

Water Meter

Description

FM15-25 Series Rotatory Wing Dry Transmitting Water Flow Meters are used for measuring the volume of cold/ hot potable water passing through the pipeline and remotely transmitting the signal of the water volume to remote monitoring equipment



Highlights

Rotary-Vane Dry-Dial Type
Iron Body
Magnetic Drive
Local Dials Provide Confirmation of Remote Indicators
Maintenance Free
Pulse Signal for Monitoring by Centralized System
Available in 10L and 100L per pulse

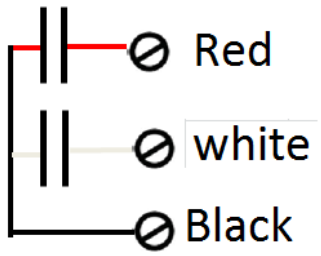
Technical Data

Part Number	Meter Size Dia. DN (mm)	Class	Qs Overload Flow	Qp Normal Flow	Qt Transitional Flow	Qmin Minimum Flow
			M_3 / h			
FM-DN15	15	A	3	1.5	0.15	0.06
FM-NPT0.5	(1/2 inch)	B			0.12	0.03
FM-DN20	20	A	5	2.5	0.25	0.10
FM-NPT0.75	(3/4 inch)	B			0.20	0.05
FM-DN25	25	A	7	3.5	0.35	0.14
FM-NPT1.0	(1 inch)	B			0.28	0.07

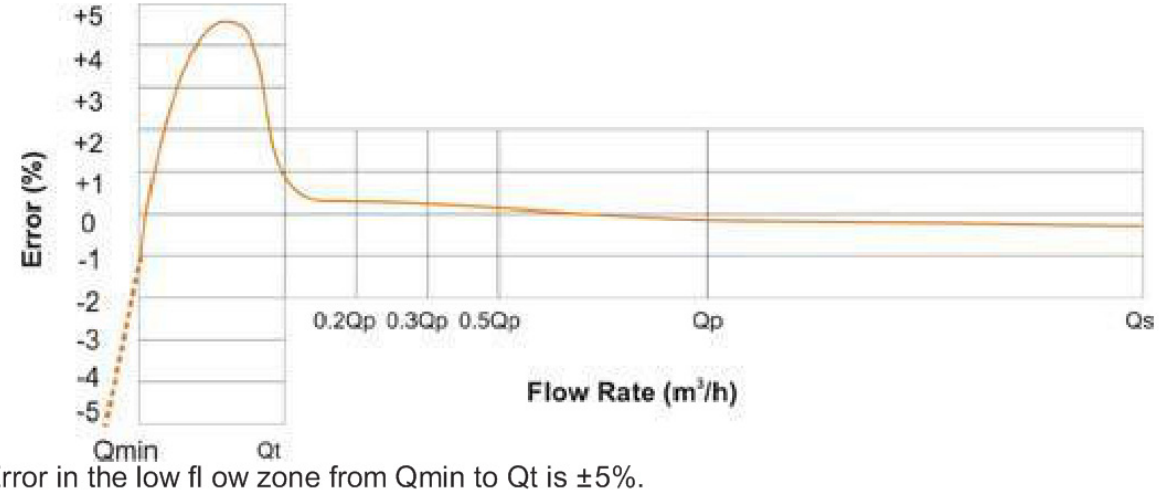
A.	Qs	Overload flow allowed without damaging the meter for approx 1 minute
B.	Qp	Normal rated maximum operating condition.
C.	Qt	The flow when the error range changes from 5% down to 2%
D.	Qmin	The minimum flow with error less than 5%

Water Meter

Wiring Diagram

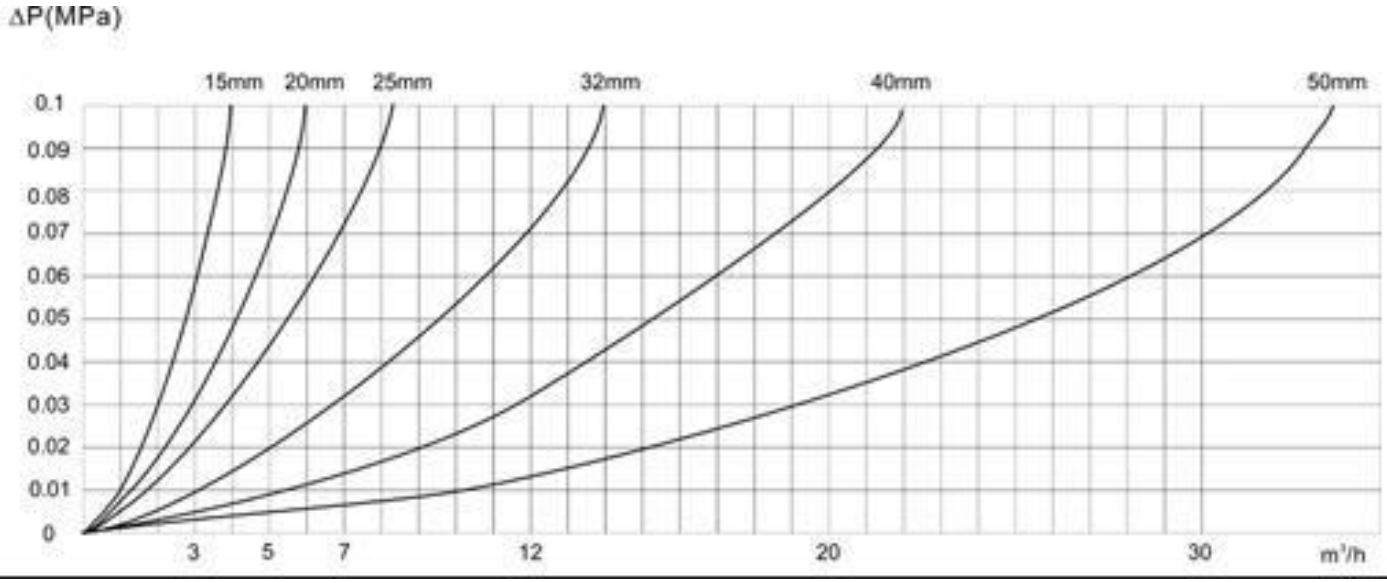
Type	Wiring	Wire Color		
Three-Wire Reed Switch		Red	white	Black
		Signal	Signal	GND

Flow Error Curve



Error in the low fl ow zone from Qmin to Qt is ±5%.
Error in the upper zone from Qt to Qs is ± 2%.

Head Loss Curve



Water Meter

Signal Type

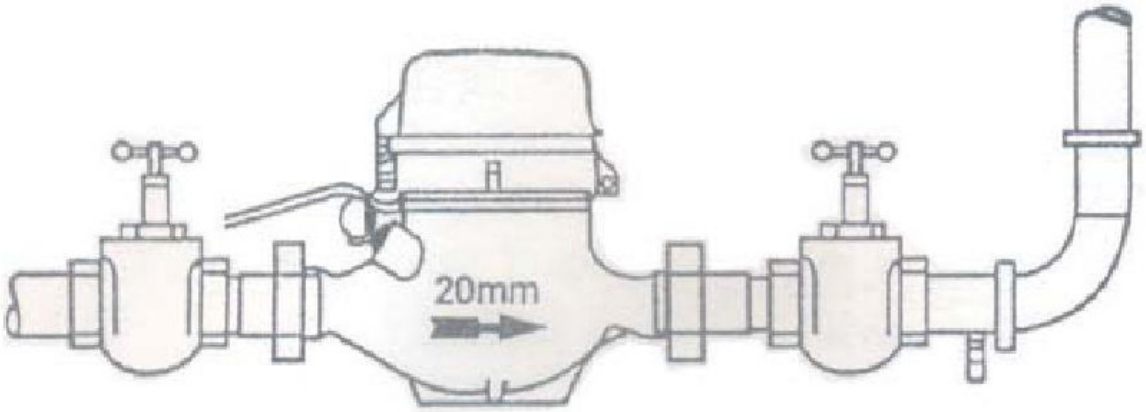
Signals are transmitted by reed switch,10ma typical or hall effect transmitter rated at approx 5mA

Working Condition

Water Temperature:10-90°C
Working Pressure:≤1Mpa
Meter should be in a dry envinment ,not outdoor rated

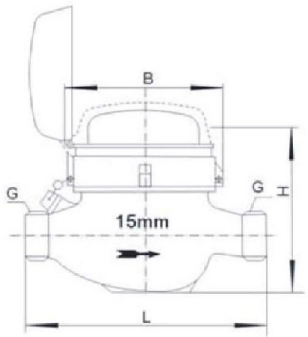
Installation Requirement

Clear debris from the pipe before installation
Must be installed in horizontal pipe section with the head upwards and arrow pointing in the flow direction
Must be installed in a dry,feeze protected location and easy for removal and maintenance
Suggest installing in a special metering box
Isolation valves shall be installed before & after the water meter



Demensions & Weight

Part Number	Meter Size Dia. DN (mm)	Length (L) (mm)	Width (B) (mm)	Height (H) (mm)	Connecting Thread (G)	Weight (kg)
FM-DN15	15	165	99	124	G3 / 4B	1.5
FM-DN20	20	190 / 195	99	124	G1B	1.7
FM-DN25	25	225	103	132	G11 / 4B	2.4



Dual Float Switch

Descriptions

The float switch is a device used to sense the level of water within a tank,it can actuate a pump, an indicator,an alarm,or other device.

Use them with hydroponics,saltwater tank, freshwater tank, gardening, aquariums for power head control,pet bowls,fish tanks,filtration, heating,or whatever your project may be.



Features:

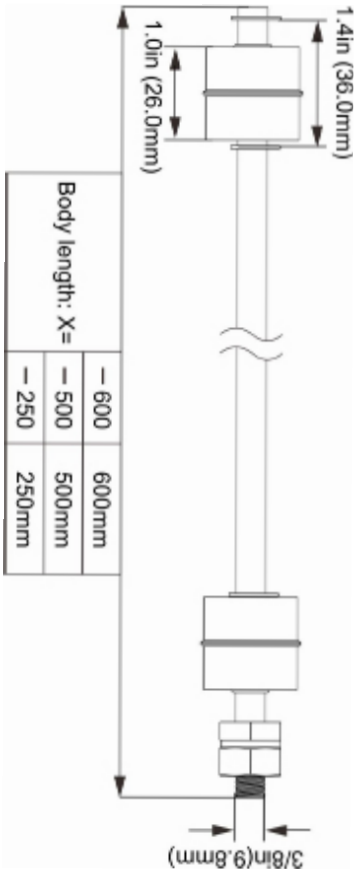
Good price & high quality

Contains no mercury

The switches can be removed and flipped over,to reverse the polarity,one or both can be flipped.

Specifications

Product Name	Float Switch
Operating Temperature	-10~+120 Degree
Contacts:Float switches are normally closed, as water rises to the float level the switch opens, Custom versions are available on special order.	
Max Contact Rating	10W
Max Switch Voltage	100V DC
Max Switch Current	0.5A
Max Breakdown Voltage	220V DC
Max Carry Current	1.0A
Max Contact Resistance	100m Ohm
Temperature Rating	-10 ~ +120 Degree
Float Ball Material	SSU304 Stainless Steel
Float Body Material	SSU304 Stainless Steel
Float Ball Size	26 x 26mm / 1” x 1” (D*H)
Screw Thread Diameter	9.8mm/ 3/8”
Cable Length	35cm / 4.7”
Color	Black, Red, Silver Tone
Net Weight	147g
Package Content	1 x Water Level Sensor



Dual Float Switch

Part Number Scheme

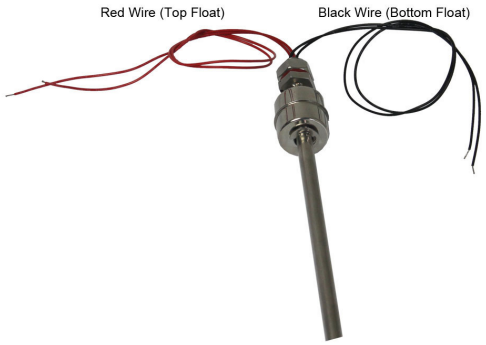
Float – 600

Code	Description
Float	Float Switch

Code	Body Length
250	250mm
500	500mm
600	600mm
	Other length available

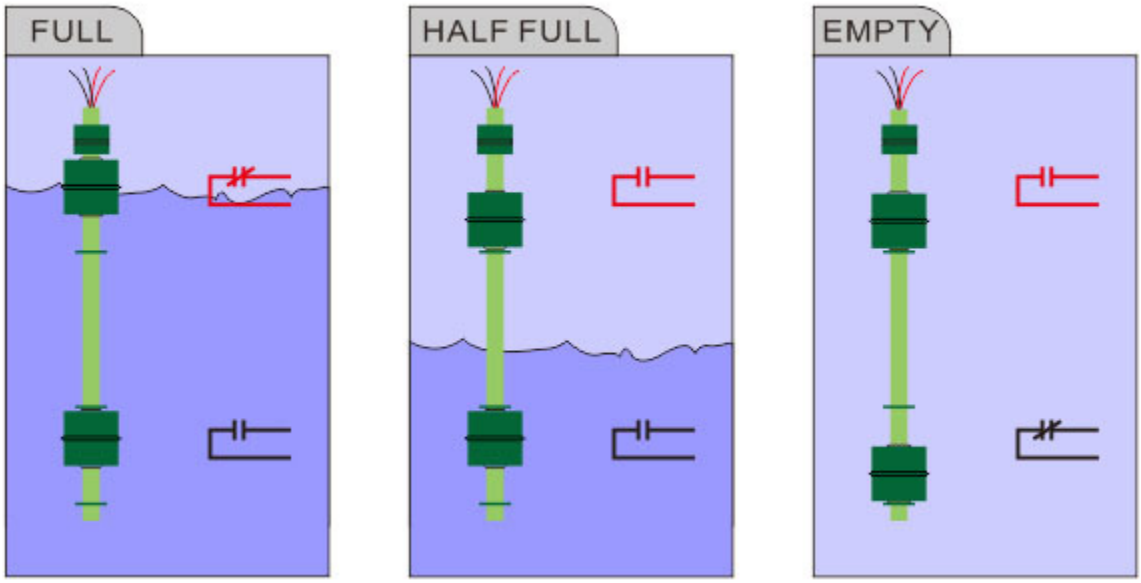
Equipment Highlights

There are four wires in the float switch including two red and two black. The red wires control the top float while the black wires control the bottom float.



Wiring Diagram

The wiring diagram below shows how float switches work with different water levels: full, half-full and empty. Float switches are normally closed, as water rises to the float level the switch opens. The switches can be removed and flipped over, one or both of them to reverse the polarity.



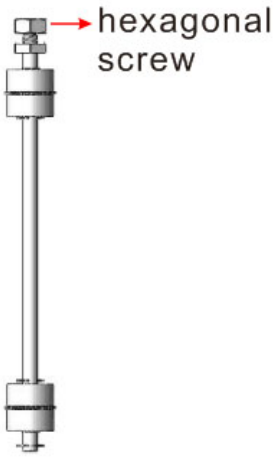
Dual Float Switch

Mounting

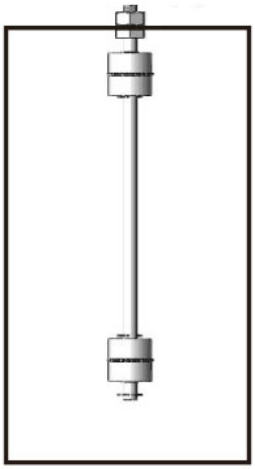
1) Float switch



2) Unfasten the hexagonal screw



2) Fasten the hexagonal screw. Mount the float switch vertically to the pole or fixtures.



Occupancy Sensor

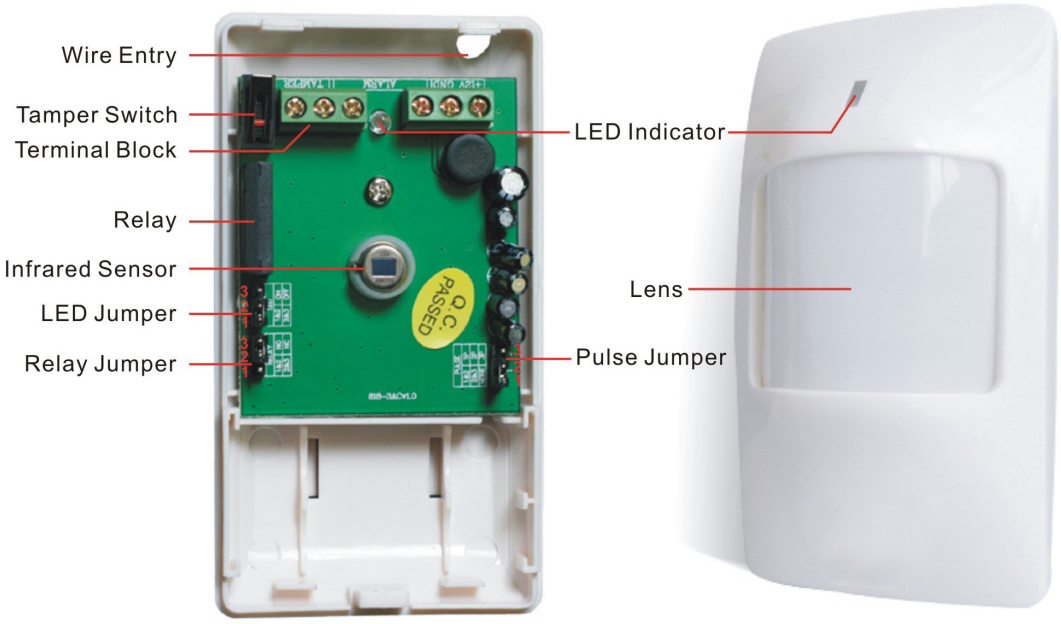
Descriptions

Temco's Passive Infrared Occupancy Sensor is a low cost comercial and residential surface mount occupancy sensor. Advanced filtering reduces false triggering due to air movement and lighting changes. The sensor switches a dry contact which is wired to a separate controller. There is a tamper switch terminal as well, when the enclosure is opened up the central controller will be able to signal an alert.



Main Features:
- Intelligent logic control, anti false alarm efficiently
- Auto temperature compensation
- Pulse count adjustment
- Anti white light interference
- Anti RF interference (20V/m-1GHz)
- Fresnel lens
- Wall installation
- SMT design adopted
- Alarm output N.C./N.O. Optional

Product Profile



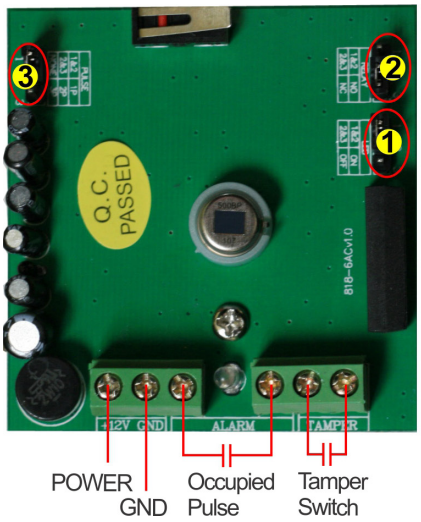
Technical Specifications

Operating voltage:
LS-818-3-24VAC: 24VAC, 1VA;
LS-818-3-12VDC: 9 to 12VDC,100 mA
Current consumption: 12VDC,≤18mA ;
24VAC,≤18mA
Detection distance: 12m
Detecting angle:110°
Self-testing time: about 60S
Operating temperature: -10~+50 °C
Alarm indicator: red LED
Alarm output: Jumper selectable as N.C.or N.O., DC28V, 100mA

Anti tamper switch output: Dry contact DC 28V max, 100mA max
Occupancy Sensor output: solid state, jumper selectable NO or NC, DC28 V,100mA max.
Coverage range: 11 meters,110°
Sensor: dual element infrared sensor
Environment humidity: 95%RH (non condensing)
Anti RF interference: 10MHz ~ 1GHz 20V/m
Mounting: Wall mount
Installation height: 1.7~2.5m
Outline Size: 59(L) * 39.5(W)* 107(H) mm

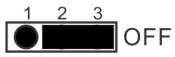
Occupancy Sensor

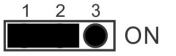
Terminal Block & Jumper Settings



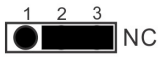
Jumper Settings:

1 LED Jumper



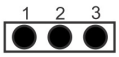


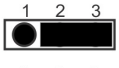
2 Relay Jumper

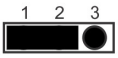




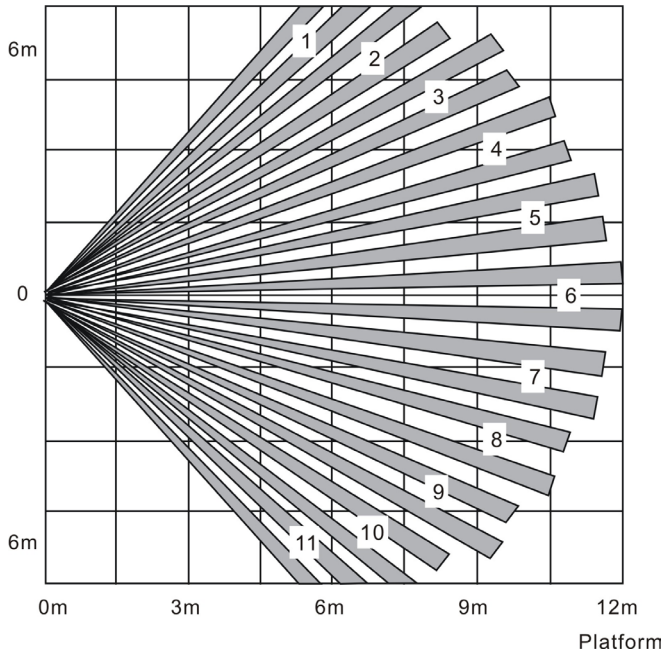
3 Pulse Jumper (Sensitivity Detection Seclection)

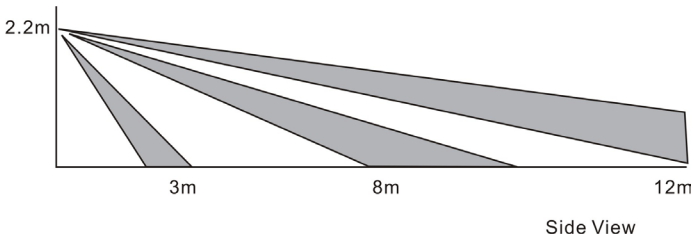






Detecting Area View





Installation Notes

- Avoid install at the out door, places with pets, air-conditioning nearby,derect sunshine,heat source and under rotating objects .
- Surface of installation should be firm with no vibration.
- Installing the detector in the place where intruder passes easily.

Installation Steps

1. Screw the detector bottom off, then open the detector.
2. Screw the PCB off and remove the PCB.
3.Drill a wire hole in the rear housing.
4. Install the rear housing on the suitable position.
5. Connect the terminal block.

Occupancy Sensor

Operating Instructions

Function Setting:

1. Relay Jumper: Choose N.C. or N.O. to set the state of alarm output.
according to the alarm panel or controller requirements, NC being the default.
Short 1&2: N.O.
Short 2&3: N.C.

2. Sensitivity Jumper: Three settings for low medium and high sensitivity. Note however that setting high sensitivity also increases the possibility of interference from RF. If you are getting false triggering, try setting the sensitivity down one level. The default setting is high.
Short 1&2: High sensitivity.
Short 2&3: Medium sensitivity.
Shut off: Low sensitivity.

3. LED Jumper: This jumper simply enables/diables the on board LED and does not affect the operation of the sensor itself. If the application calls for it you can conceal the detection indication by disabling the LED.
Short 1&2: LED will trigger when motion is detected.
Short 2&3: LED will be off always.

Product Setup:

Turning on power and LED indicator will be enabled regardless of the LED jumper settting so as to enable sensing activity confirmation during commissioning and maintenance. This lasts about 60s after which the LED will be enabled or disabled depending on the LED jumper position.

Notice

1. Please install and use the detector according to this manual, don't touch the surface of sensor □□ avoid affecting the sensitivity of the detector. Please shut off power and then clean the sensor by soft cloth with little alcohol if cleaning needed.

2. The product can reduce accident but may not perform as expected. The user is advised to take all necessary precautions for his/her safety and the protection of his/her property.

3. In order to ensure it can work normally, the power should be kept to supply and get on walking test periodically, once a week is better.

Occupancy Sensor

Descriptions

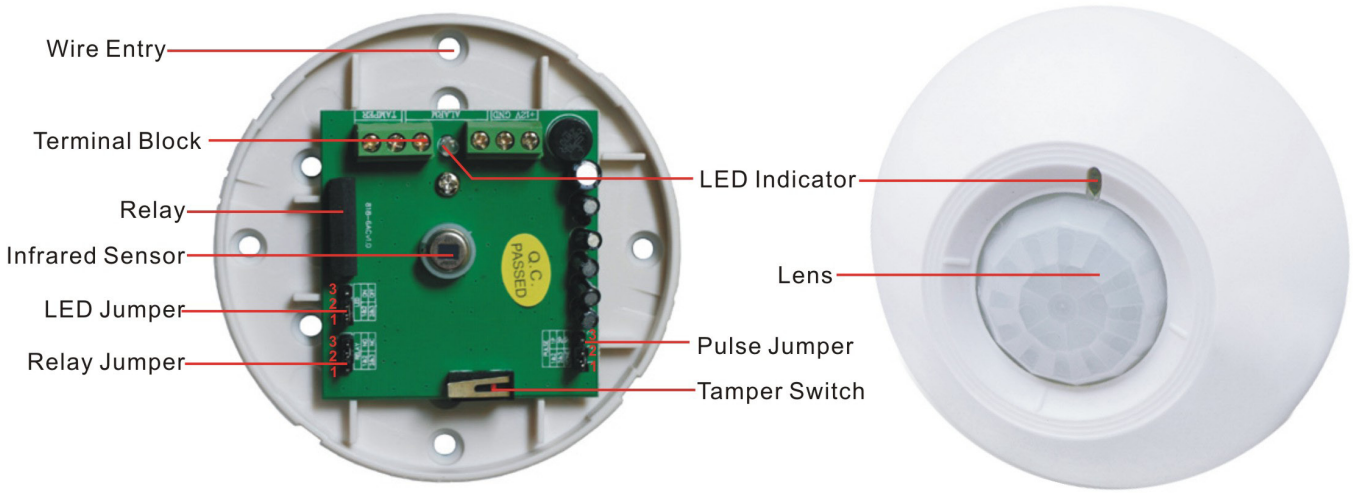
Temco's Passive Infrared Occupancy Sensor is a low cost comercial and residential surface mount occupancy sensor. Advanced filtering reduces false triggering due to air movement and lighting changes. The sensor switches a dry contact which is wired to a seprate controller. There is a tamper switch terminal as well, when the enclosure is opened up the central controller will be able to signal an alert.



Main Features:

- Intelligent logic control, anti false alarm efficiently
- Auto temperature compensation
- Pulse count adjustment
- Anti white light interference
- Anti RF interference (20V/m-1GHz)
- Fresnel lens
- ceiling installation
- SMT design adopted
- Alarm output N.C./N.O., Anti RF Interface

Product Profile

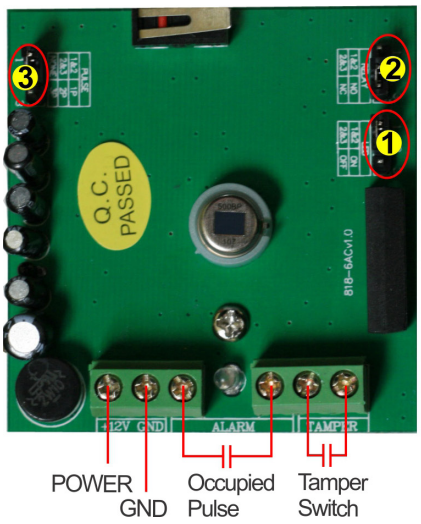


Operating voltage:
LS-818-6-24VAC: 24VAC, 1VA;
LS-818-6-12VDC: 9 to 12VDC,100 mA
Current consumption: 12VDC,≤18mA ;
24VAC,≤18mA
Detectiion distance: Diameter 8m when mounted @ 3.6m
Detecting angle:360°
Self-testing time: about 60S
Operating temperature: -10~+50 °C
Alarm indicator: red LED
Alarm output: Jumper selectable as N.C.or N.O., DC28V, 100mA

Anti tamper switch output: Dry contact DC 28V max, 100mA max
Occupancy Sensor output: solid state, jumper selectable NO or NC, DC28 V,100mA max.
Coverage range: 11 meters,360°
Sensor: dual element infrared sensor
Environment humidity: 95%RH (non condensing)
Anti RF interference: 10MHz ~ 1GHz 20V/m
Mounting: Wall mount
Installation height: 2.5 ~ 6m
Outline Size: 106(Dia.) * 36(Thickness) mm

Occupancy Sensor

Terminal Block & Jumper Settings



Jumper Settings:

1 LED Jumper

1 2 3 OFF

1 2 3 ON

2 Relay Jumper

1 2 3 NC

1 2 3 NO

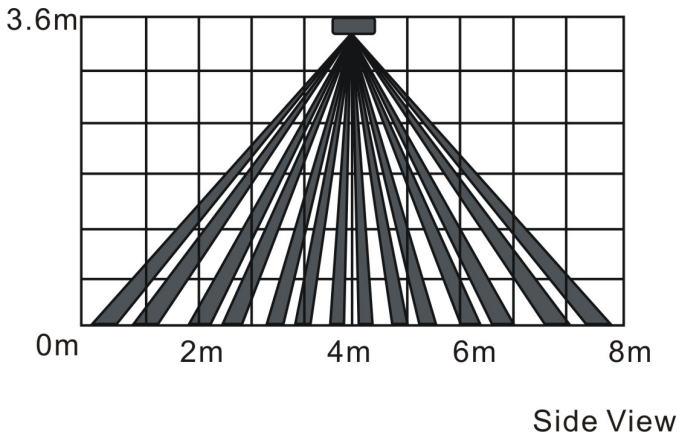
3 Pulse Jumper (Sensitivity Detection Seclection)

1 2 3 3 Pulses

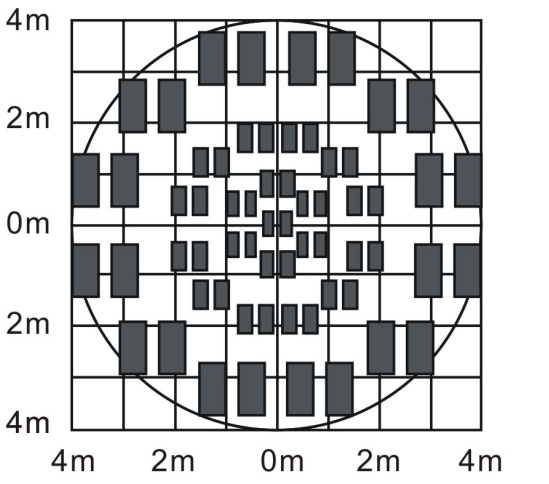
1 2 3 2 Pulses(Low sensitivity detection mode)

1 2 3 1 Pulse(High sensitivity detection mode)

Detecting Area View



Side View



Platform

Installation Notes

- Avoid install at the out door, places with pets, air-conditioning nearby,derect sunshine,heat source and under rotating objects .
- Surface of installation should be firm with no vibration.
- Installing the detector in the place where intruder passes easily.

Installation Steps

1. Turn the detector counterclockwise, remove the front cover.
2. Screw the PCB off and remove the PCB.
3. Drill a wire hole in the rear housing.
4. Install the rear housing on the suitable position.
5. Connect the terminal block.
6. Put back the front cover.

Current Sensor with 0-5VDC Output Signal

Descriptions

The CS Current Sensor is a solid state transducer for measuring the current in fans, pumps and other HVAC equipment.Select one of three ranges by moving a jumper onthe device to operate over 10A, 20A and 50A. This sensor outputs 0-5V directly and requires no power supply.

Clamping / Split Core Current Transformer is designed to provide a low cost method to monitoring electrical current. A unique hinge and locking snap allows attachment without interrupting the current-carrying wire. High secondary turn will develop signals up to 10Vac across a burden resistor.

Clamping Style

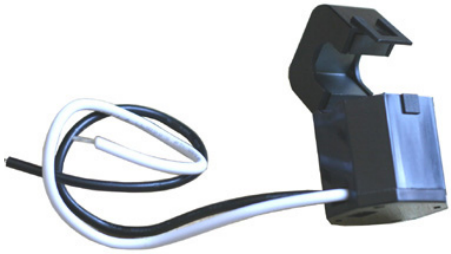
5V DC output



Features

1.Self powered, no external power supplyrequired
2.1-5VDC output, connects directly toautomation systems
3.One sensor for three ranges, jumper selected
4. Low cost, replaces digital status relays
5.Panel mounting

Raw 16.67mA AC current transformer output



Specifications

Power Supply: Not required
Operating Temperature: -20 ~ 60 OC
Operating Humidity: 0 ~ 95% RH
CT Material: ABS (UL94)
CT Ranges: 10, 20, 50Amp, jumper selected
Output Signal: 1~5VDC; porportional to average current
Accuracy: 2%
Plastic housing: Flammability rating UL94HB

Non Clamping Style

Key Specifications

Window Size	0.4” (10 mm)
Current Range*	0.25 - 40A AC
Output	300 mV @ 20A AC
Ratio Error**	<0.5% from 0.25 to 40A AC (typical)
Phase Error**	<1.5° from 1 to 40A C <2° from 0.25 to 1A AC

DC output

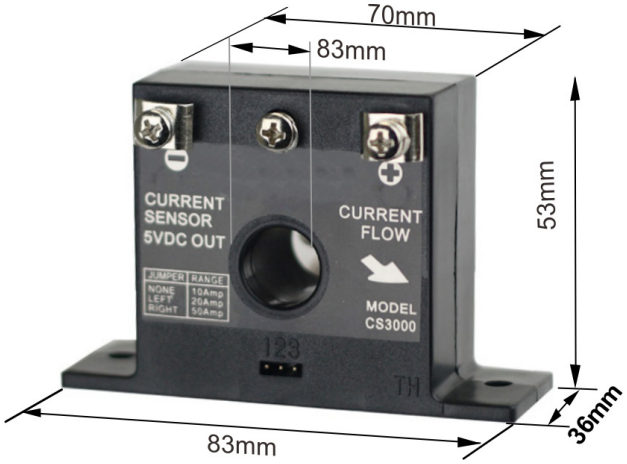


Current Sensor with 0-5VDC Output Signal

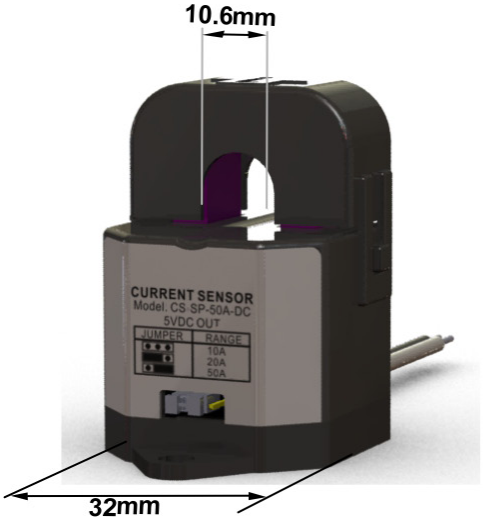
Electrical

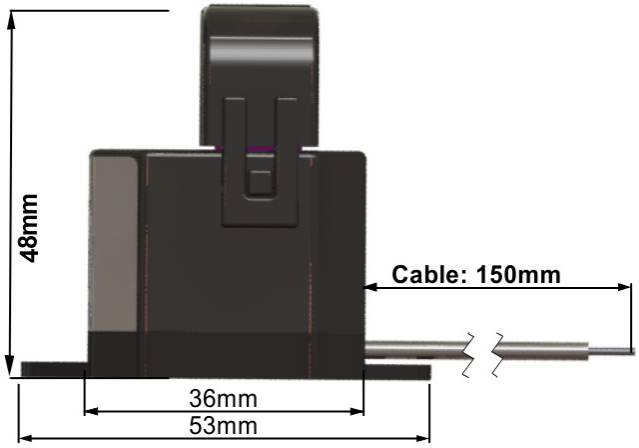
Output	300 mV @ 20 A
Wire Polarity	Red = Hi, positive(+) Black= Low, negative(-)
Phasing Orientation	Arrow On Case Points Toward Load
Frequency Range	50 to 400 Hz

Mechanical



Case Material	Back Nylon
Leads 2.4 M (8’).	600 V. 20 gage
Working Temperature	15 to 60 °C (59 to 140 °F)

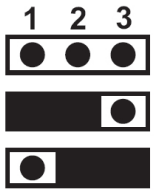




Unit: mm

Current Sensor with 0-5VDC Output Signal

Specifications

JUMPER	RANGE
	10A 20A 50A

Part Number Scheme

CS - SP - 50A - DC

Code	Description
CS	Current Sensor

Code	Style
SP	Split Core
DO	Donut, not split type

Code	Full Scale Output
50A	10A, 20A, 50A jumper select

Code	Output Signal
DC	DC average current signal, 5V full scale

Ordering Information

Part Number	Description
CS-DO-50A-DC	Non clamping current sensor, AC input, range 10A, 20A, 50A jumper select, 0-5VDC out.
CS-SP-50A-DC	Clamping current sensor, AC input, range 10A, 20A, 50A jumper select, 0-5VDC out.

Split Core Current Sensor 330mV output

Description

The series of split core current sensors are designed for fast and easy installation. Split-core transformers are ideal for installation on existing electrical wiring by snapping around the conductor. This method permits a safer, easy and portable current measurement.



Features:

- Small size, low cost
- High secondary turns
- Secure locking hinge

Specifications

Rated Current	5A to1000A
Rated Output	0.333Vac/5A/1A
Current Ratio	3000:1 or as per customer data
Insulation Voltage	600Vac
Maximum Primary Voltage	5000Vac(Insulated Conductor)
Operating Temperature	-15C to 60C
Frequency Range	50-400Hz
Leads	4Foot(105cm),UL 1015,Twisted Pair, 0.34 mm2(22AWG)
CE recognized	
Output and leads can be customized	
RoHS Compliant	

Quotation

Model	Rated current(A)	Accuracy
XH-SCT-T10	10/20/50/75	0.5~1
XH-SCT-T16	50/75 /100	0.5~1
XH-SCT-T24	100/150/200/250	0.5~1
XH-SCT-T36	200/250/300/400/500/600	0.5~1
XH-SCT-T10	800/1000	0.5~1

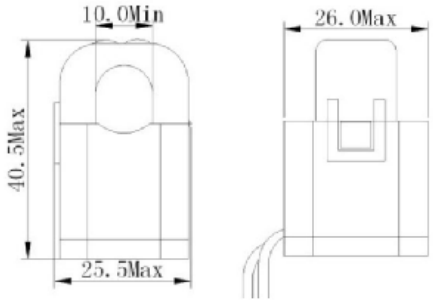
XH-SCT-T10

→ split core current transformer 10mm hole diamter

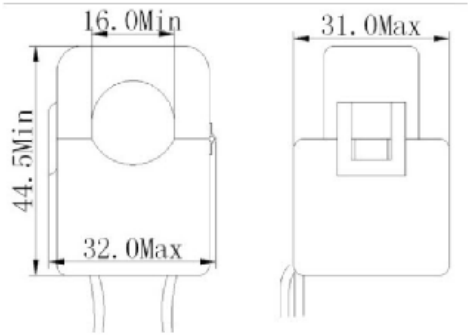
Split Core Current Sensor 330mV output

Dimensions

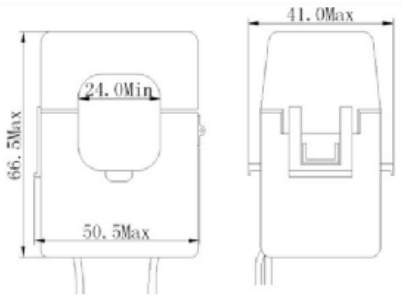
XH-SCT-T10



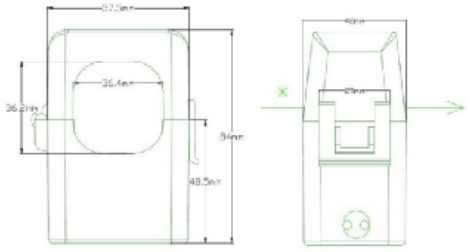
XH-SCT-T16



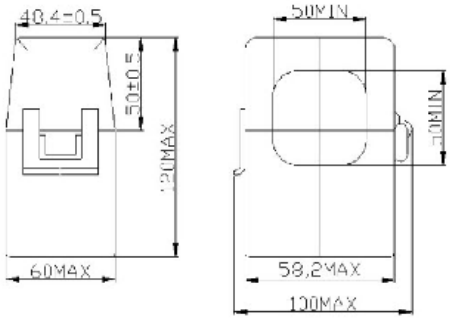
XH-SCT-T24



XH-SCT-T36



XH-SCT-T50



Part Number Scheme

CT - SP - 400A - 330mV

Code	Description
CT	Current Transformer

Code	Style
SP	Split Core

Code	Output Signal
330mV	330mV AC output

Code	Primary Current
10A	100A AC
20A	200A AC
50A	300A AC
75A	400A AC
100A	500A AC
150A	600A AC
200A	750A AC
250A	800A AC
300A	900A AC
400A	1000A AC
500A	1100A AC
600A	1200A AC
800A	1200A AC
1000A	1200A AC

Split Core Current Sensor 5V output

Description

Products:	Split core current transformer
Type :	CT-SP-100A-5A
Carried standard:	GB1208-2006

Split Core Current Transformer is designed to provide a low cost method to monitoring electrical current. A unique hinge and locking snap allows attachment without interrupting the current-carrying wire. High secondary turn will develop signals up to 10Vac across a burden resistor.

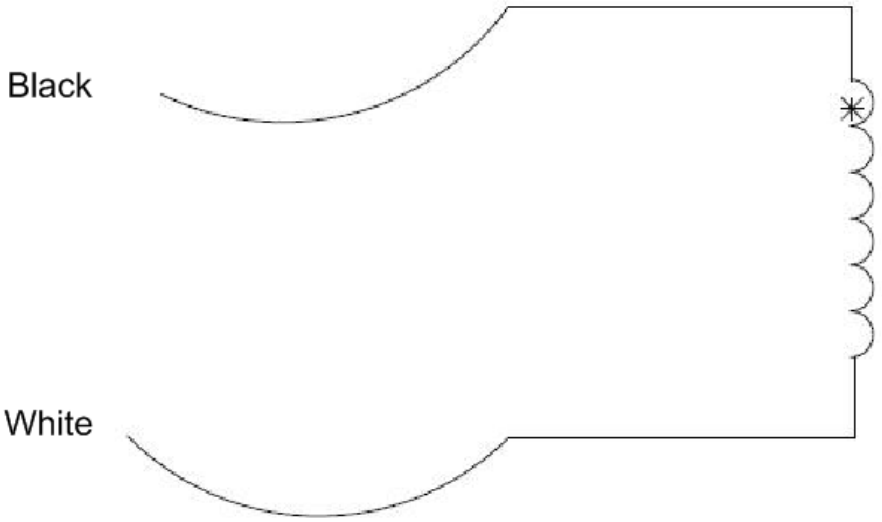


Specifications

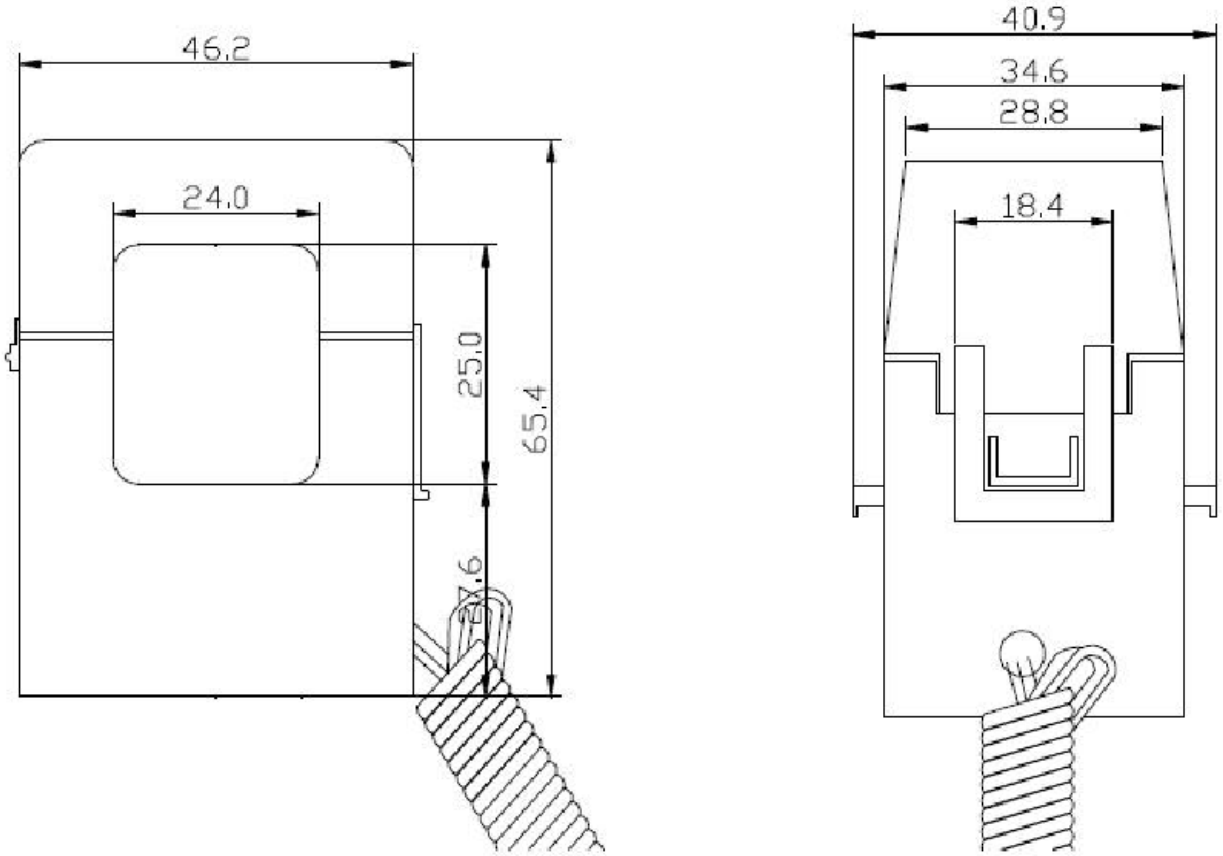
Maximum continuous primary current:	100 A AC
Output:	1A or 5A at rated current
Accuracy:	1% 2VA
Insulation voltage:	600V AC
Maximum primary voltage:	5000V AC (insulated conductor)
Phase angle:	less than 2 degrees at 50% of rated current
Frequency range:	50 to 400Hz
Operating temperature:	-15 to 60c
Leads:	1.0m cable
Indoor or outdoor use, and outdoor type with rubber cover	
CE standard RoHS Directi e-compliant	
Output and leads can be customized	

Split Core Current Sensor 5V output

Product Structure Drawing



Mechanical Dimensions(unit:mm)



Note： Wire lead length150mm

Split Core Current Sensor 5V output

Typical Product Parameter List

1). 5A Output

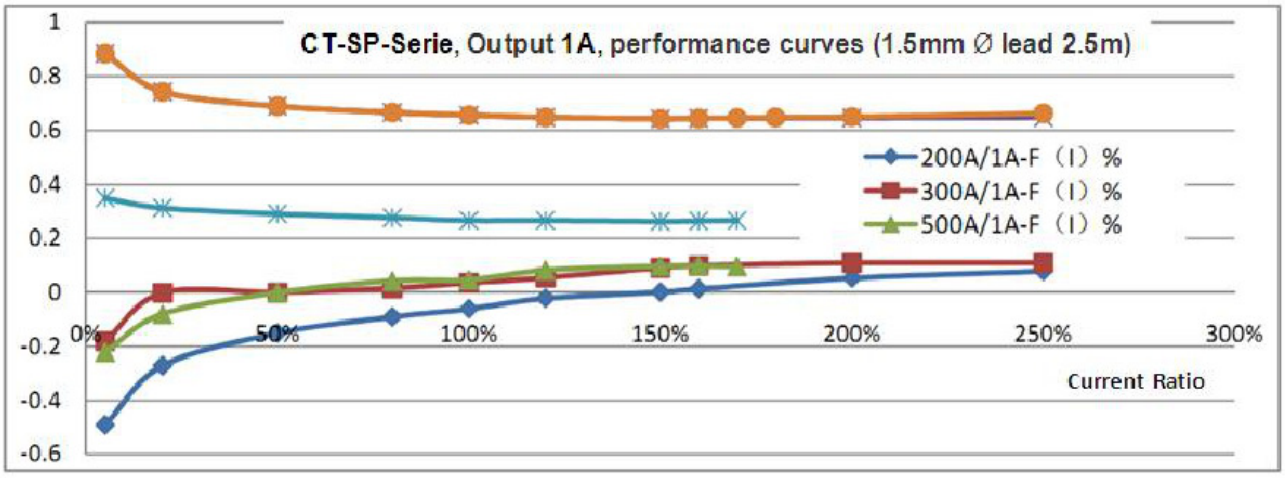
product standard	Input current (A)	Output current (A)	Overload current (A)	Wire size	Non linearity error (5% 120%)	
					F(I)%	δ(I)°
CT-SP-100A-5A	100	5	170	2.5 mm Ø/ 1 m	≤1%	≤1°
CT-SP-250A-5A	250	5	420	2.5 mm Ø/ 1 m	≤0.5%	≤0.7°
CT-SP-300A-5A	300	5	540	2.5 mm Ø/ 1 m	≤0.5%	≤0.2°
CT-SP-400A-5A	400	5	720	2.5 mm Ø/ 1 m	≤0.5%	≤0.2°
CT-SP-600A-5A	600	5	960	2.5 mm Ø/ 1 m	≤0.5%	≤0.1°

2). 1A Output

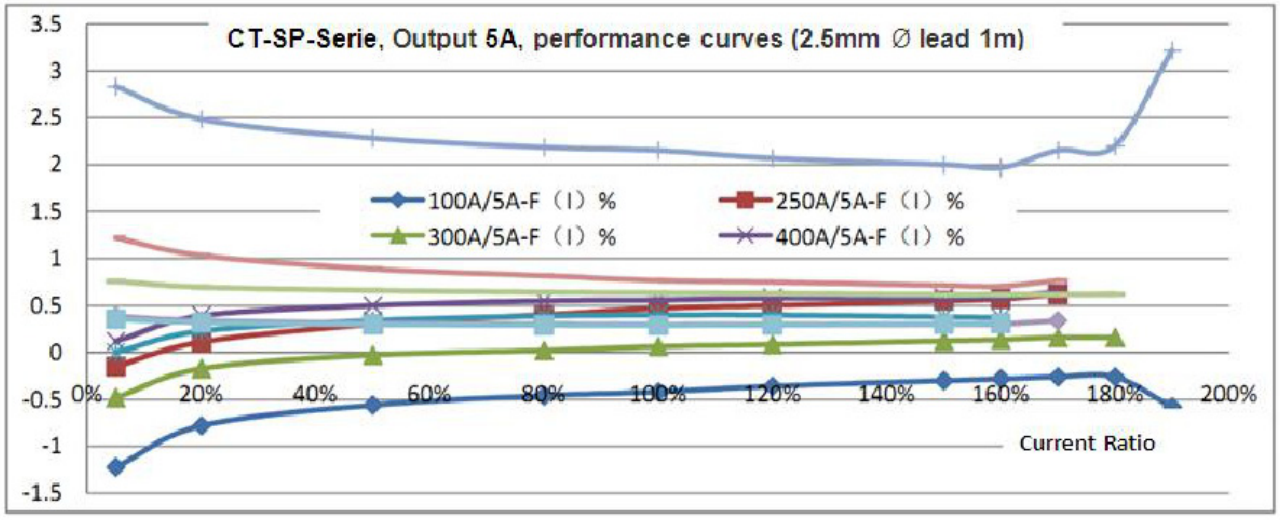
product standard	Input current (A)	Output current (A)	Overload current (A)	Wire size	Non linearity error (5% 120%)	
					F(I)%	δ(I)°
CT-SP-200A-1A	200	1	600	1.5 mm Ø / 2.5m	≤0.5%	≤0.3°
CT-SP-300A-1A	300	1	700	1.5 mm Ø / 2.5m	≤0.5%	≤0.2°
CT-SP-500A-1A	500	1	800	1.5 mm Ø / 2.5m	≤0.5%	≤0.1°

Typical Performance Curves

Split core current transformer



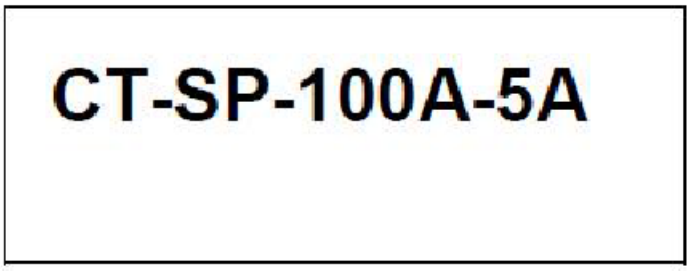
Split Core Current Sensor 5V output



Materials List

No.	Materials	Specifications
1	Silicone steel core	T24
2	Nylon Housing	SCT0024-01B
3	Skeleton	T24
4	Enameled wire	Φ0.85
5	Black wire lead	1.5 m^2
6	Red wire lead	

Label



Split Core Current Sensor 5V output

Test Report

1). Performance Test

a Test condition

input 100A, output 5A, ratio error 0.5 class

No.	Input	20%	50%	100%	120%	Instrument
1	Phase error(minute)	443	421	487	515	
2	Ratio error (%)	-0.96	0.001	0.13	0.001	
	Phase error(minute)	300	200	265	280	
3	Ratio error (%)	-0.98	-0.25	-0.11	-0.28	
	Phase error(minute)	287	259	283	294	

Test result: Qualified

2). Hi-pot test

Test Index	Instrument
Wire-housing: 2000V/0.5mA/3S	YD2665 hi-pot tester

Test Results: Qualified

Pressure Transmitter

Description

Pressure Transmitter is a kind of standard and most popular transmitter applied in air and liquid pressure measuring,since a high sensitivity silicon pressure chip is employed in the sensor.The pressure transmitter is designed for industry application with perfect long term stability,which is the most important specification for industry application.

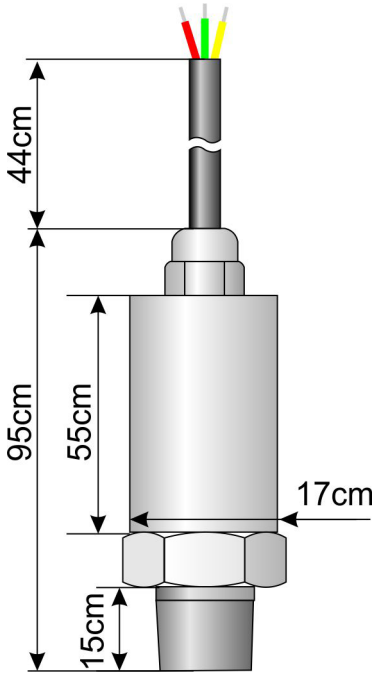


Feature:

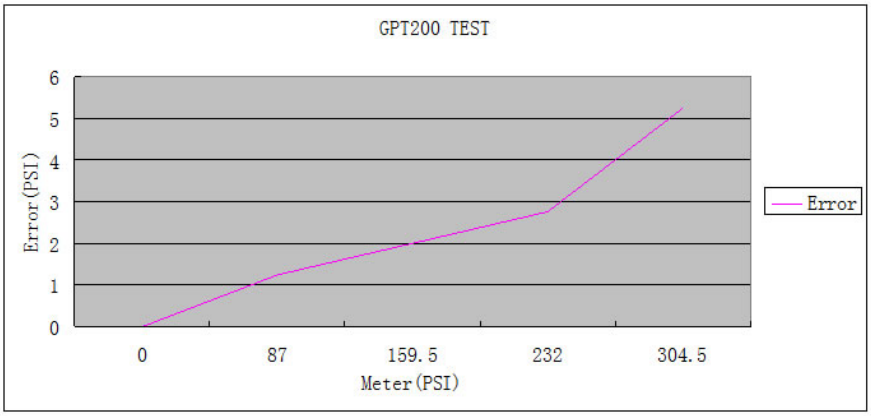
- piezoresistive pressure sensor
- pressure range: 0~700psi, 0-400psi
- gas or dilute liquid compatible with 316LSS
- high reliability and stability

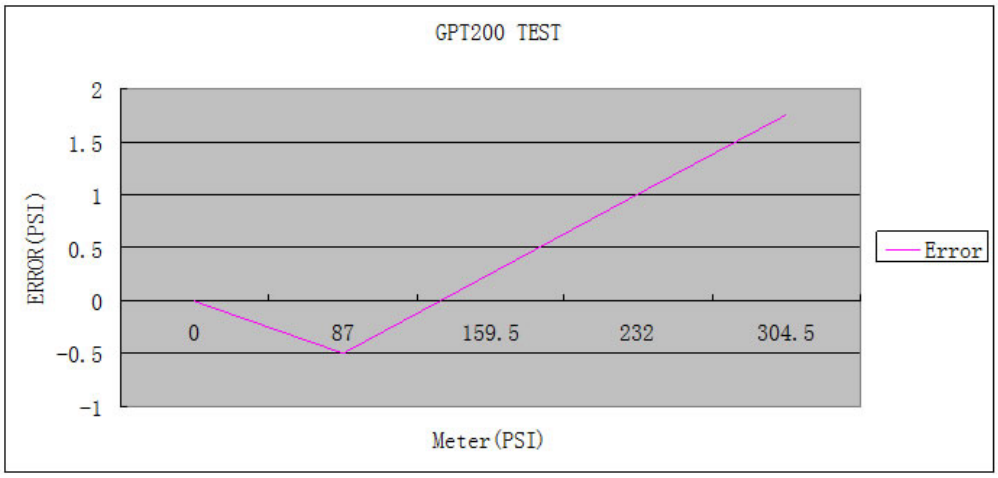
Specifications

Pressure range	0~700psi, 0-400psi
Supply power	24VAC
Output signal	1~5V
Accuracy	0. 5%F.S.
Pressure interface	1/4NPT
Operating temperature range	-20C~+85C
Storage temperature range	-40C~+125C
Protection	IP65
Explosion-proof	ExiallCT6
Housing material	Stainless steel
Material of pressure membrane	316L stainless steel



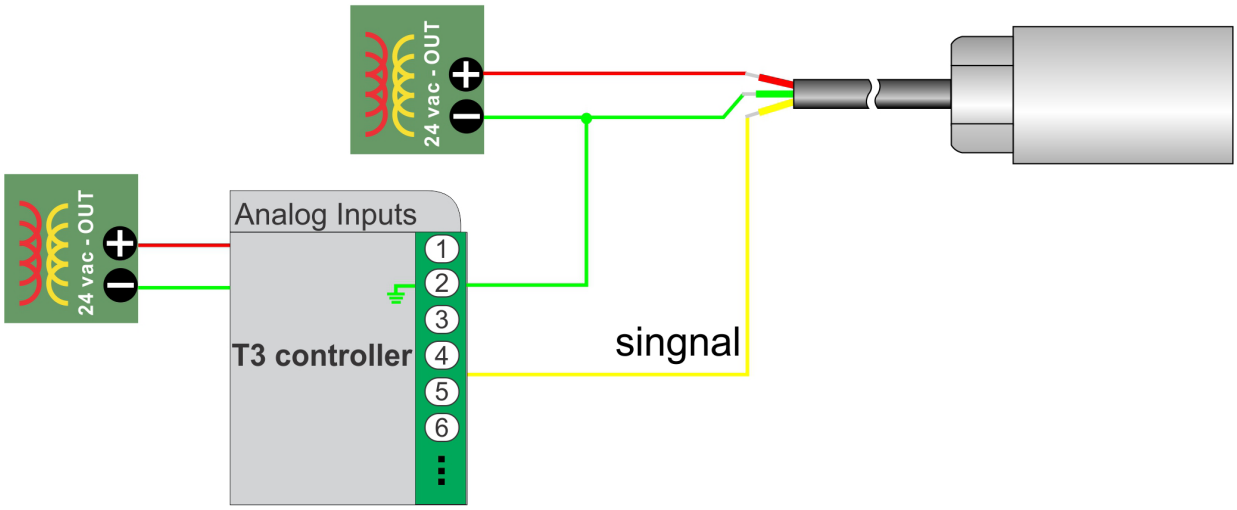
Pressure Test



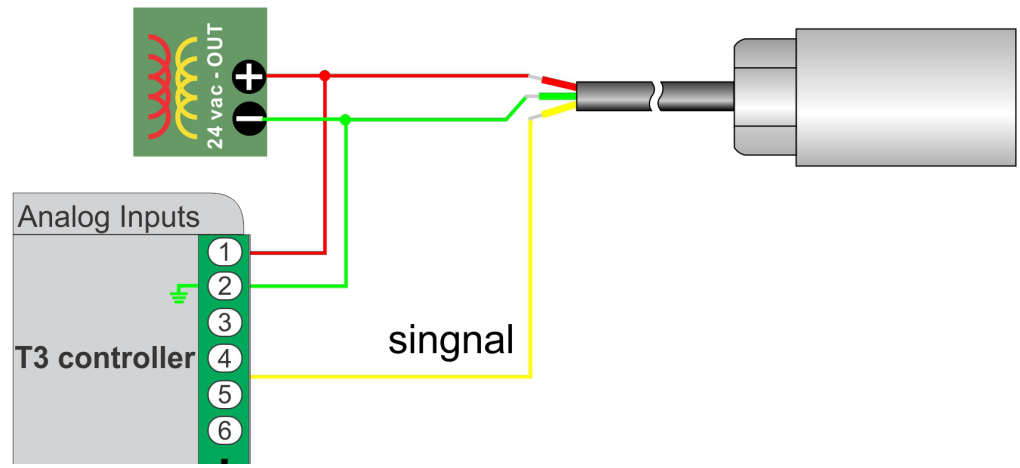


Wiring Diagram

Separate power supply



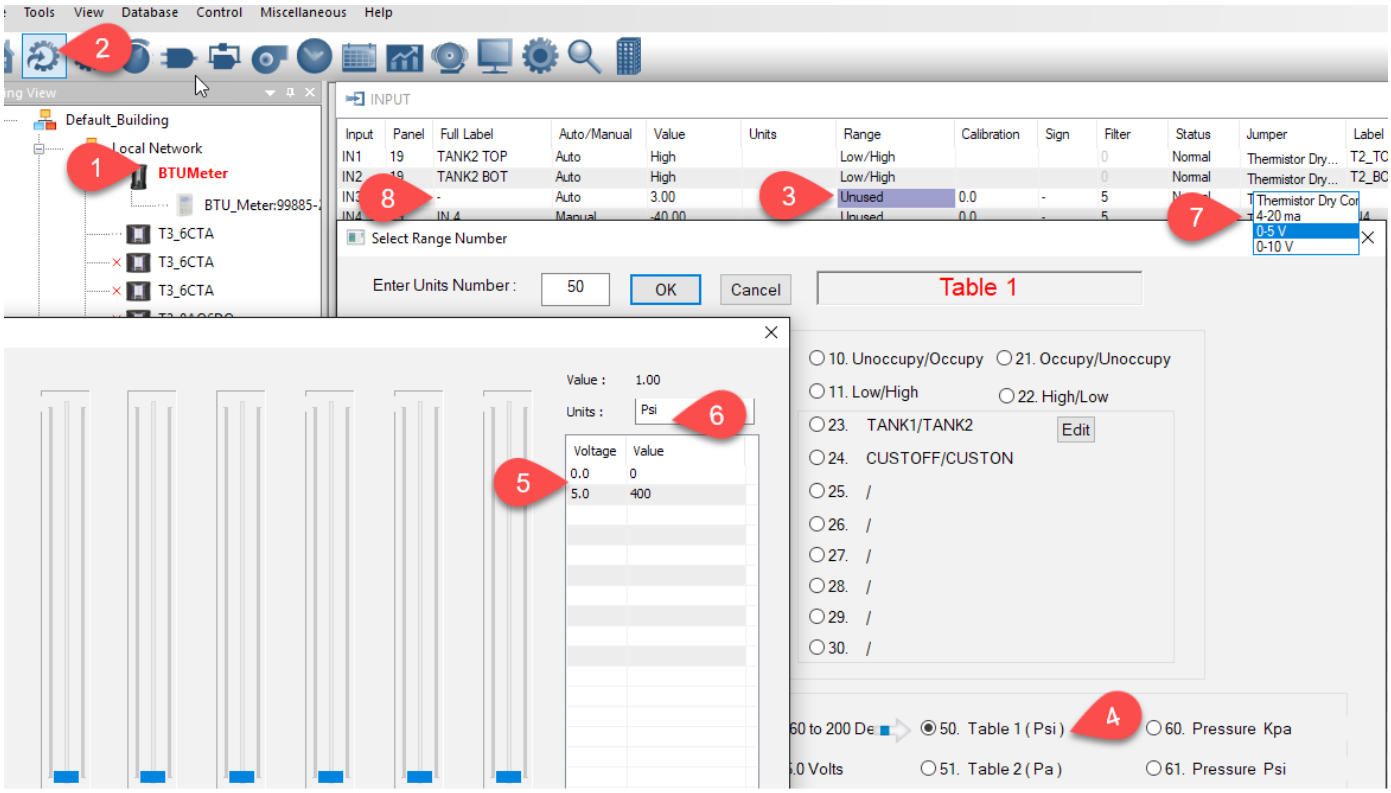
Shared power supply



Pressure Transmitter

Configuration

To configure one of the T3 controllers or expansion modules to use the pressure sensors, we can use the custom tables to scale the 0-5V signal to a certain pressure range. In the example below we're showing a 0-400psi sensor which outputs a 0-5V signal.



1. Connect to the T3 controller or expansion module and select it in the left hand tree view.
2. Select the inputs grid.
3. Click on the range column which brings up the available options for various types of sensor signal.
4. Select range type 50 which brings up a table and some sliders representing the voltage and value of the sensor signal.
5. Enter the minimum and maximum voltage of the sensor as well as the value for the signal. 0 volts at 0psi and 5V at 400 psi in this example.
6. Enter the engineering units for the sensor, in this case Psi but you can type anything here such as Pa or kPa.
7. Finally, select the 'jumper setting', these are software jumpers which allow you to match the controller hardware with the signal type from the various options shown.
8. Finally, give the particular input a user name in the "Full Label" and shorter 'Label' columns.

Pressure Transmitter

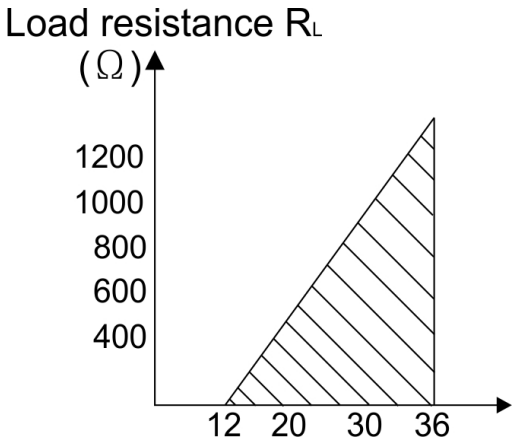
Description

The pressure transmitter use advanced technologies such as diffused silicon, laser correction, temperature compensation and analog signal processing. It has the characteristics of high accuracy, good reliability, fast response and stable performance. The utility model has the advantages of simple structure, convenient installation, use and maintenance, strong anti-interference ability, and is suitable for long-distance signal transmission.



Specifications

Supple Voltage	12~36 VDC(General 2V)
Output signal	4~20mA, two wire; 0~5V/0~10V/1~5V,three wire
Load Resistance	0~750 Ω (General 250 Ω)
Accurancy	±0.2 %FS, ±0.1 %FS Optional
Operating Temperature	-25~ +80 °C
Protection level	IP65
Connection terminal	Hirschmann/ Direct outlet/ Aviation plugs
Influence of environmental temperature	0.15%FS/10K
Measured medium	Liquid,Gas, Neat
Measuring range	Non-isolated 0~500Pa to 0~3kPa; Isolated 0~3kPa to 0~60MPa(Special 100MPa)
Over pressure limit	2 times the value of the calibration pressure
External Magnetic field strength	Less than or equal to 400A/m

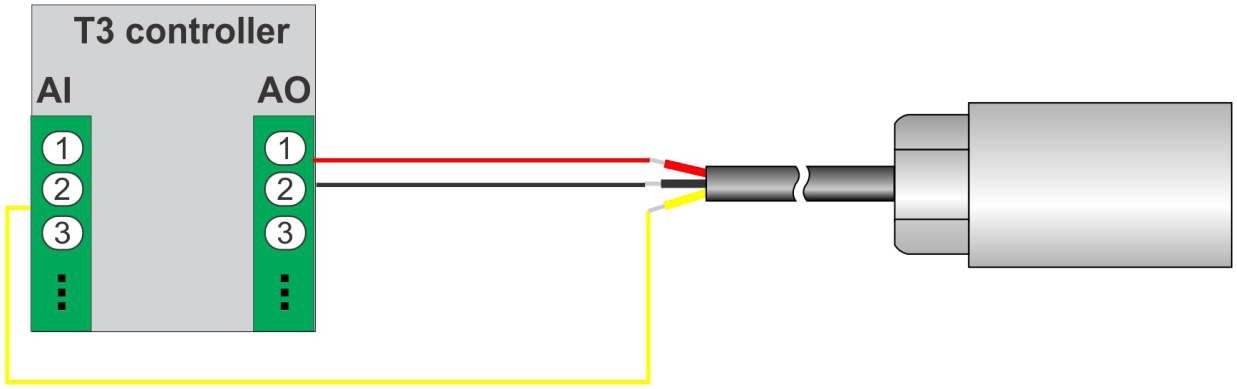


Connection and commissioning

The pressure transmitter has been debugged before leaving the factory and needs no adjustment. After a long period of use, if you need to re calibrate, you can adjust the “potentiometer Z” and “range potentiometer S” respectively”. The lower limit of the pressure range corresponds to the output 4mA, and the upper limit corresponds to 20mA

Pressure Transmitter

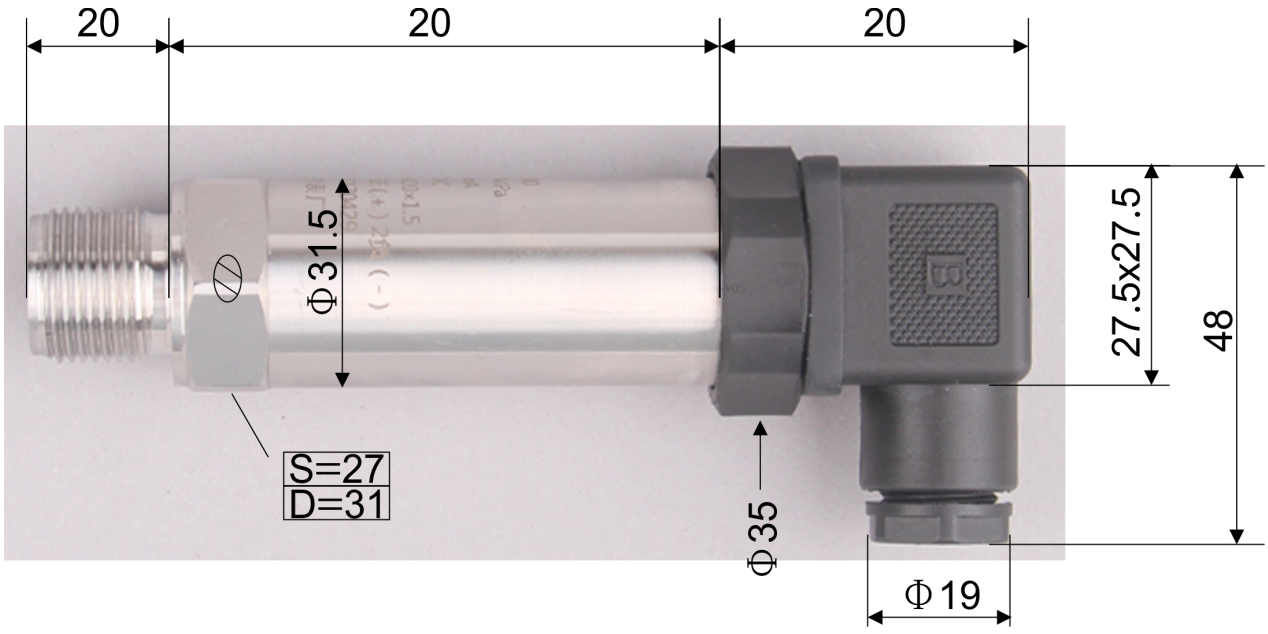
Use a spare AO as power supply,4~20mA



Dimension and Installation

*wetted material:316L Stainless steel;
Pressure interface:G1/2,M20x1.5,G1/4,NPT1/2,M12X1,external thread

The pressure transmitter shall be installed as far as possible in the temperature gradient and temperature fluctuations, while avoiding vibration and impact. To ensure the joint seal of the transmitter, roll up the sealing tape on the joint and then screw the transmitter. The transmitter shall be installed directly at the measuring point, but a strong corrosive or overheated media shall not be in contact with the transmitter, and ask for corrosion protection and high temperature transmitters.



Pressure Transmitter

Description

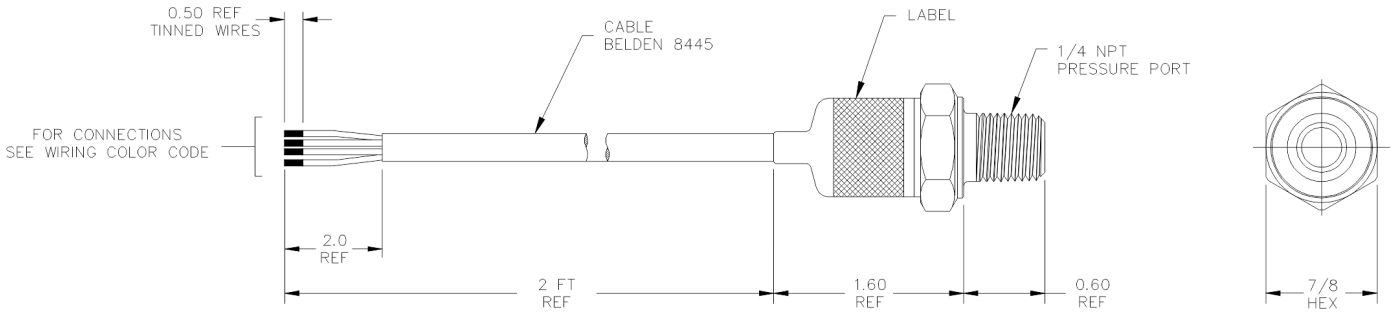
The MSP300 pressure transducer from the Microfused line of TE is suitable for measurement of liquid or gas pressure, even for difficult media such as contaminated water, steam, and mildly corrosive fluids.
The transducer pressure cavity is machined from a solid piece of 17-4PH or 316L stainless steel. The standard version includes a 1/4 NPT pipe thread allowing a leak-proof, all metal sealed system.With excellent durability, there are no o-rings, welds or organics exposed to the pressure media.
TE's proprietary Microfused technology, derived from demanding aerospace applications, employs micromachined silicon piezoresistive strain gages fused with high temperature glass to a stainless steel diaphragm. This approach achieves media compatibility simply and elegantly while providing an exceptionally stable sensor without the PN junctions of conventional micromachined sensors.



Features:
- One Piece Stainless Steel Construction
- Ranges up to 10k psi or 700 Bar
- mV or Amplified Outputs
- Excellent Accuracy
-Wide Operating Temperature Range

Range	psig	Range	Barg
0 to 100	•	0 to 7	•
0 to 250	•	0 to 17	•
0 to 500	•	0 to 35	•
0 to 1000	•	0 to 70	•
0 to 2500	•	0 to 175	•
0 to 5000	•	0 to 350	•
0 to 10k	•	0 to 700	•

Dimension



Pressure Transmitter

Specifications

Supply Voltage: 5.0V, Ambient Temperature: 25°C (unless otherwise specified)

PARAMETERS	MIN	TYP	MAX	UNITS	NOTES
Span Setting	-2		2	%Span	1
Zero Pressure Output (0 – 100mV)	-3		3	%Span	1
Zero Pressure Output (Amplified)	-2		2	%Span	1
Accuracy (combined non linearity, hysteresis, and repeatability)	-1		1	%Span	2
Temperature Error – Zero	-2		2	%Span	
Temperature Error – Span	-2		2	%Span	
Supply Current (0 – 100mV, 0.5 – 4.5V)			10	mA	
Supply Current (1 – 5V)			15	mA	
Long Term Stability (1 year)	-0.25		0.25	%Span	3
Pressure Overload	2X			Rated	
Pressure Cycles (Zero to Full Scale)	10			Million	
Output Load			1	MΩ	
Compensated Temperature	0		55	°C	
Operating Temperature	-20		+85	°C	4
Storage Temperature	-40		+125	°C	4
Burst Pressure	5X			Rated	
Vibration	±20			g	5
Shock (11ms)	50			g	6
Output Noise			2	mVRMS	
Bandwidth (-3dB)	1			kHz	
Weight		82.55		grams	
Media Compatibility	All Materials Compatible with 17-4 Stainless Steel				

Notes
1. Ratiometric to supply.
2. Best fit straight line.
3. Long term stability over a one year period.
4. Maximum temperature range for product with standard cable is -20°C to +105°C.
5. Per MIL-STD-810C, Procedure 514.2, Figure 514.2-2, Curve L.
6. 1/2 sine per MIL-STD 202F Method 213B condition A.

Output Options

		Supply (V)		
Code	**Output**	**MIN**	**TYP**	**MAX**
2	0 – 100 mV (ratiometric)	2.5	5	12
3	0.5 – 4.5 V (ratiometric)	4.75	5	5.25
4	1 – 5 V	8		30
5	4 – 20 mA	9		30

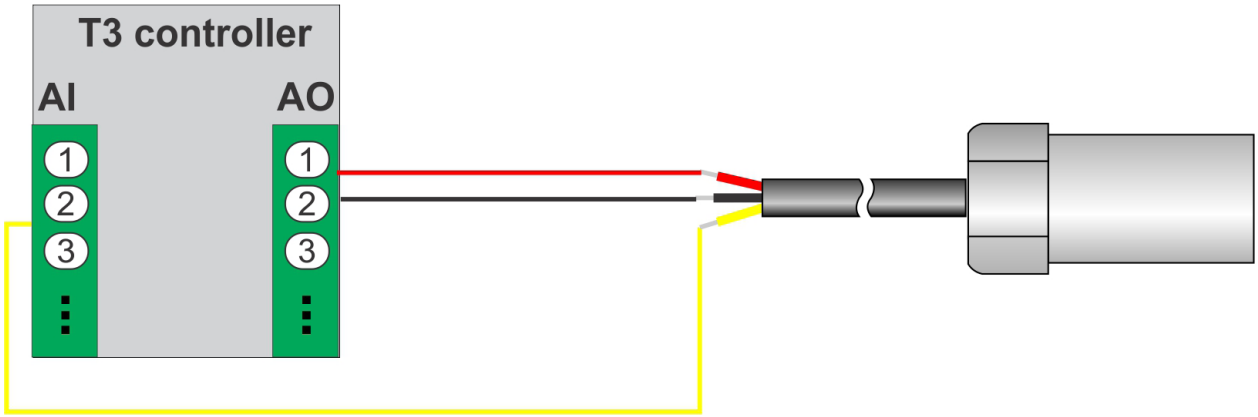
Wiring Color Code

Code	Output	+Supply	-Supply	+Out	-Out
2	0 – 100 mV (ratiometric)	Red	Black	Green	White
3	0.5 – 4.5 V (ratiometric)	Red	Black	White	N/A
4	1 – 5 V	Red	Black	White	N/A
5	4 – 20 mA	Red	Black	N/A	N/A

Pressure Transmitter

Wiring Diagram

Use a spare AO as power supply,10~15mA



Differential Air Pressure Switch

Descriptions

- On/off output
- Electrical rating 250 VAC
- Switching pressure easily adjusted with a scaled adjustment knob
- Static, over, underpressure and vacuum



Ordering

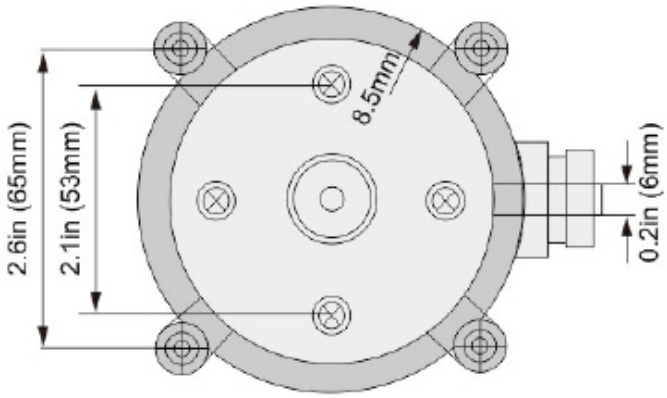
Type no.	Adjustment range	Switching differential
PSN 20-200A	20-200Pa	10Pa
PSN 30-300A	30-300Pa	10Pa
PSN 40-400A	40-400Pa	20Pa

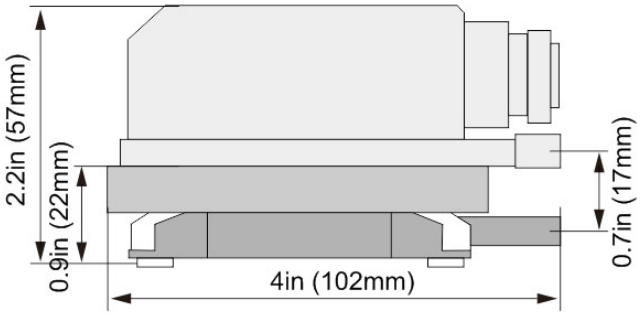
Specifications

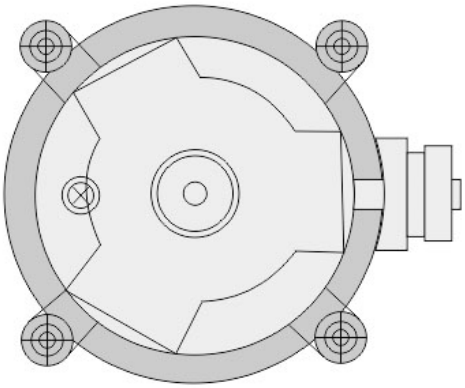
Output	on/off
Max. operating pressure	5 kPa
Medium	Air, non-combustible and non-aggressive gases
Operating temp. range	- 40°C to +85°C
Pressure connections	2 plastic pipe connection pieces (P1 and P2) external diameter 6.0 mm: P1 for connection to higher pressure (marked +) P2 for connection to lower pressure (marked –)
Mounting position	Diaphragm in any vertical plane
Contact arrangement	SPDT
Tolerances	15%
Weight	152g for the switch only; 260g for switch with duct fixing kit packed into a carton
Electrical rating	Resistance: initial < 400 milliohms Current: 1.5 A (0.4 A) / 250 V
Protection	IP 54
Approvals	CE approved

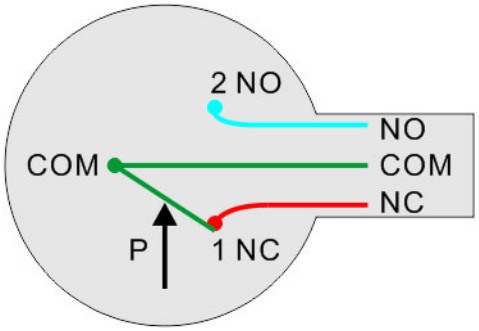
Differential Air Pressure Switch

Dimensions & Wiring Diagram









Packaging & Duct Mounting Kit



All components are packaged in a nice plain white box for private labelling.



The duct mounting kit includes everythign you need: 2 static pressure takeoff tubes made from sturdy flame retardent ABS, 2 meters of clear pvc tubing and 4 screws.

Pressure Sensor

Descriptions



The Pressure Monitor is used to measure differential pressure in the range of +/-1 full Scale, +/-8inWC, 100PSI, 250PSI. It combines precision high sensitivity silicon sensing capabilities and the latest ASI C technology to substantially reduce offset errors due to changes in temperature, stability to warm up, long term instability and position sensitivity.
It features an LCD to display the pressure value and field-selectable output signal types for the most flexible application. The device has an on-board auto-zero function. I t also features two optional output : PID control type and transducer type.

Features:

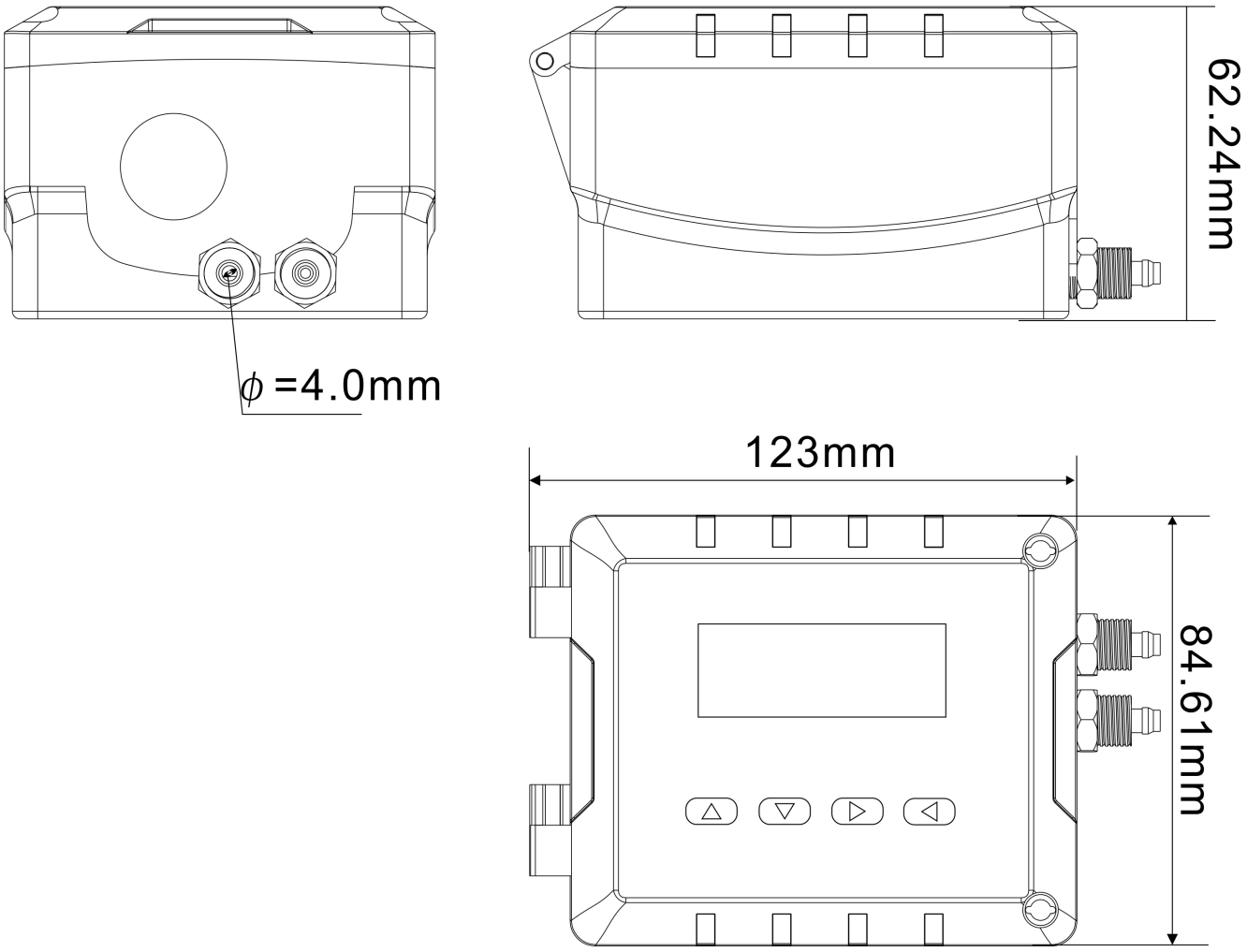
-LCD indication
-Jumper selectable outputs
-Precision silicon sensor
-Functional and attractive enclosure
-Installer friendly wiring access
-2.5% Typical Error over +10C to +60C with Auto Zero
-6.25% Maximum Error over +10C to +60C without Auto Zero
-Temperature Compensated over +10C to +60C
-Differential Input
-8 units available: inWC, inHg, mmHg, PSI , atm, Bar, Pa, & kg/cm

Specifications

Supply Voltage	15~24VAC/DC ± 10%		
Power Consumption	50mA @ 12VDC		
Relay Contacts Rating	0.5A / 125VAC, 1A / 24VDC		
Analog Output	Analog outputs setting 0-5V, 0-10V, 4-20mA		
	Operating Temperature	Accurac	Operating Range
PS-1-0	0 ~ 70°C	+/-1.5% full scale	1inWC / 250 Pa
PS-8-0	10 ~ 60°C	+/-2.5% full scale	8inWC / 2 kPa
PS-100-1	-40 ~ +85°C	+/-0.5% full scale	100psi / 689kPa
PS-250-1	-40 ~ +85°C	+/-0.5% full scale	250psi / 1.7MPa
PS-100-1, PS-250-1 Wetted Parts: Silicon, should only be in contact with media such as water			
Enclosure	Flammability rating UL 94HB		

Pressure Sensor

Dimension



Part Number Scheme

PS - 8 - 0 - 0

Code	Description
PS	Pressure Sensor

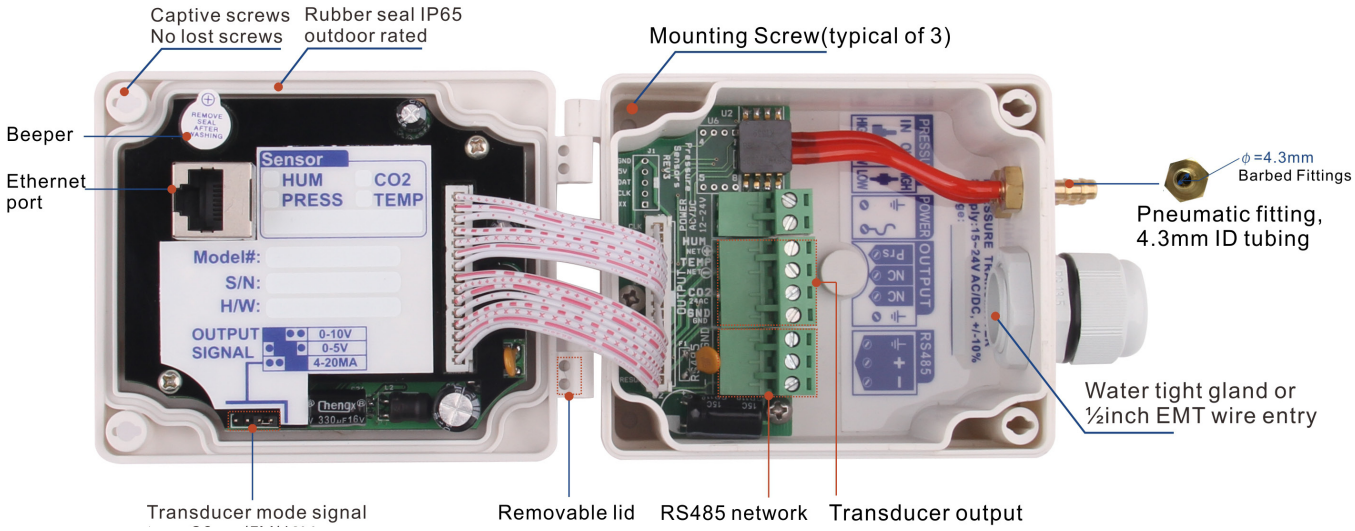
Code	Operating Range
1	1inWC / 250 Pa
8	8inWC / 2 kPa
100	100psi / 689kPa
250	250psi / 1.7MPa

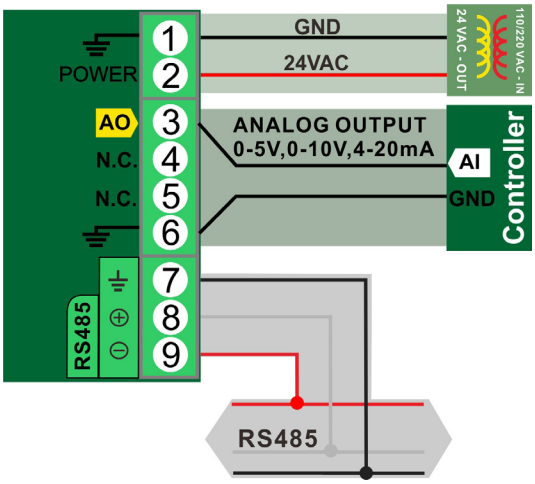
Code	Fittings
0	1/4in Barbed
1	1/8NPT

Code	Medium
0	Dry Air
1	Air or water

Pressure Sensor

Wiring&Highlights





Register List

Modbus

Pressure Sensor uses MODBUS protocol to communicate with others.Below is the register list.

Address	Bytes	Register and Description
6	1	ADDRESS. Modbus device address.
21	1	Protocol switch. 3 = MODBUS,0=Bacnet MSTP
185	1	Bau - Baudrate, 0=9.6kbaud, 1=19.2kbaud, 2=38.4kbaud 3=57.6kbaud, 4=115.2kbaud
711	2	Pressure value reading.
...	...	.....

Bacnet

Pressure Sensor also uses Bacnet protocol to communicate with others.Below is the register list.

Pressure Sensor

Variable	Variable and Description
4	ID Adrress
8	Uart BaudRate.0=9.6kbaud, 1=19.2kbaud 2=38.4kbaud 3=57.6kbaud 4=115.2kbaud
10	Protocol
...	.....

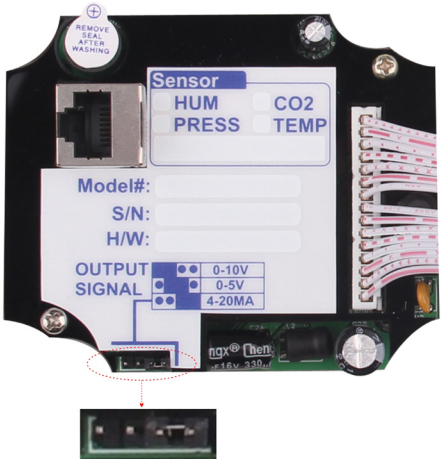
Input	Input and Description
4	Pressure

Output	Output and Description
1	Pressure analog output

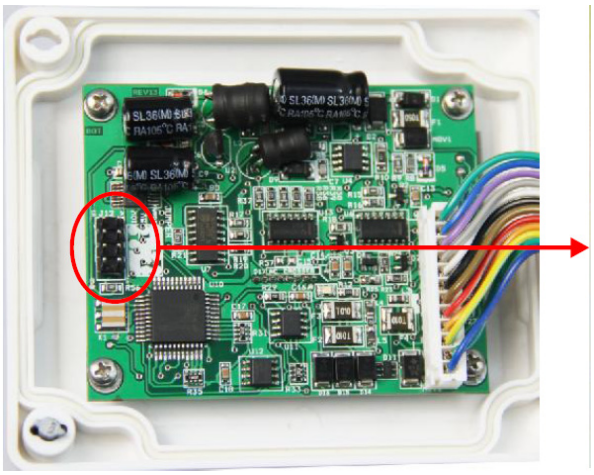
*For more register list details,please downloaded an excel spreadsheet (ModbusBacnetRegisterList.xls) as the following link: https://tinyurl.com/ybaj9d3u.

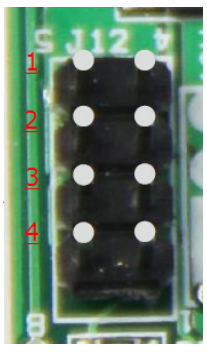
Output Jumper Settings

In this mode the device acts as a traditional transducer where it sends out three analog signals, all you need to do is to set this one single jumper to the appropriate signal type: 4-20mA, 0-10V, or 0-5V.

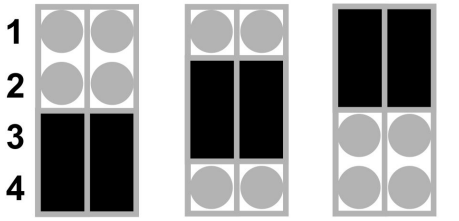


PS/rev13 jumper settings





Jumpers:



Pressure Sensor

Instructions

1) How is it programmed to change the command value etc?
Mostly you'll want to use the T3000 front end to configure PI D. For simple transducer mode setups you can get by with just the keypad. The PI D setup will be too complex for the keypad I think, use T3000. You'd need an RS485 converter, there are a few on the web site. Current sensor name, do not need to be changed by user

2) There are four icons, two setpoints and two menus. Under the menu column, it provide you 7 choices.

 Increase setpoint

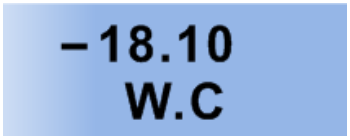
 Decrease setpoint

 Previous item select

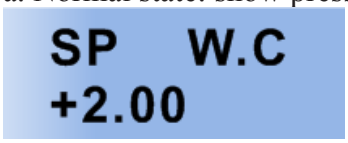
 Next item select

PSensor Type	26PCDFA, MPXV7002
Prs_unit	W.C, bar, atm, kg/cm^2, inHg, KP, Psi, mmHg
Min/ Max	
Prs_c al	
Prs_mode	Diff, Gauge
Prs_def	Yes, No

3). Here are the instructions about how to use the key and together with some screen shot for the system.



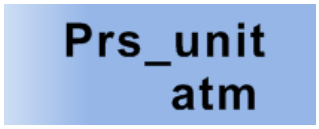
a. Normal state: show pressure value and unit.



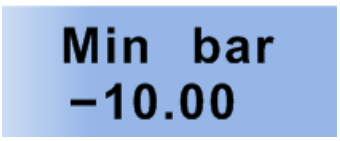
b. When click  or  , it will increase or decrease setpoint.

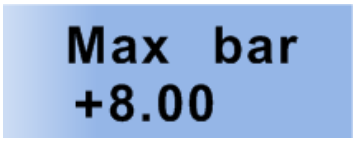


c. Click  or  , it will go into item adjust item as the photo shows. Click  or  , you can select MPXV7002 or 26PCDDFA. Click  or  , go to the previous or next menu item.

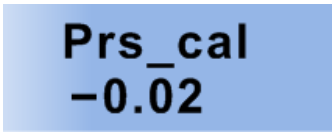


d. Click or to select the pressure unit.
   a. W.C(inches of water)
   b. KP
   c. PSI
   d. mmHg
   e. inHg
   f. kg/cm2
   g. atm
   h. bar



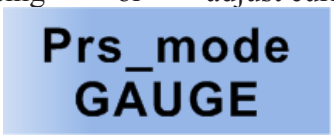
and


e. Pressure range set: this relative with the output type.
For example: if set output type to transducer mode(default mode):
the output will be : output_type * current_pressure / (max_pressure – min_pressure)
output_type: 0-10V or 0-5V or 4-20mA.

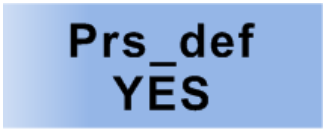


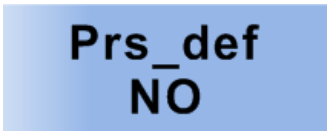
f. Pressure zero calibration: using or adjust current pressure to zero to do the zero calibration



and


g. Pressure sensor type selection: DIFFERENTIAL or GAUGE type

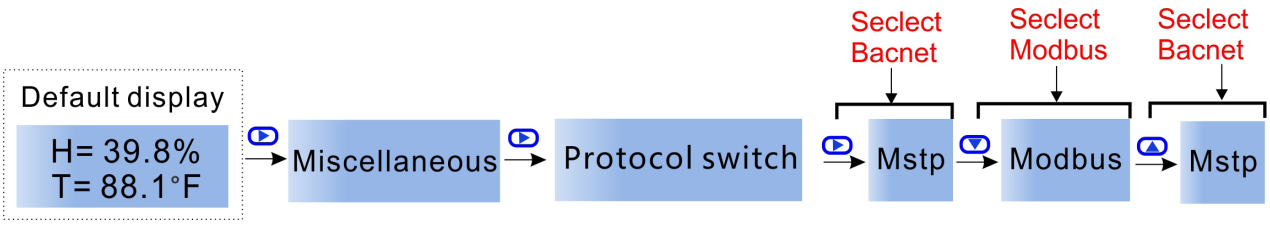


and


h. Back to factory default: select “YES” will make all the parameters of unit back to factory value.

Modbus/Bacnet switch

To select the protocol as Modbus or Bacnet,Press to choose Miscellaneous,then press to choose Protocol switch,press ,it reads Mstp,which means you have seclected Bacnet ;if you want to switch to Modbus,press ,or back to Bacnet.



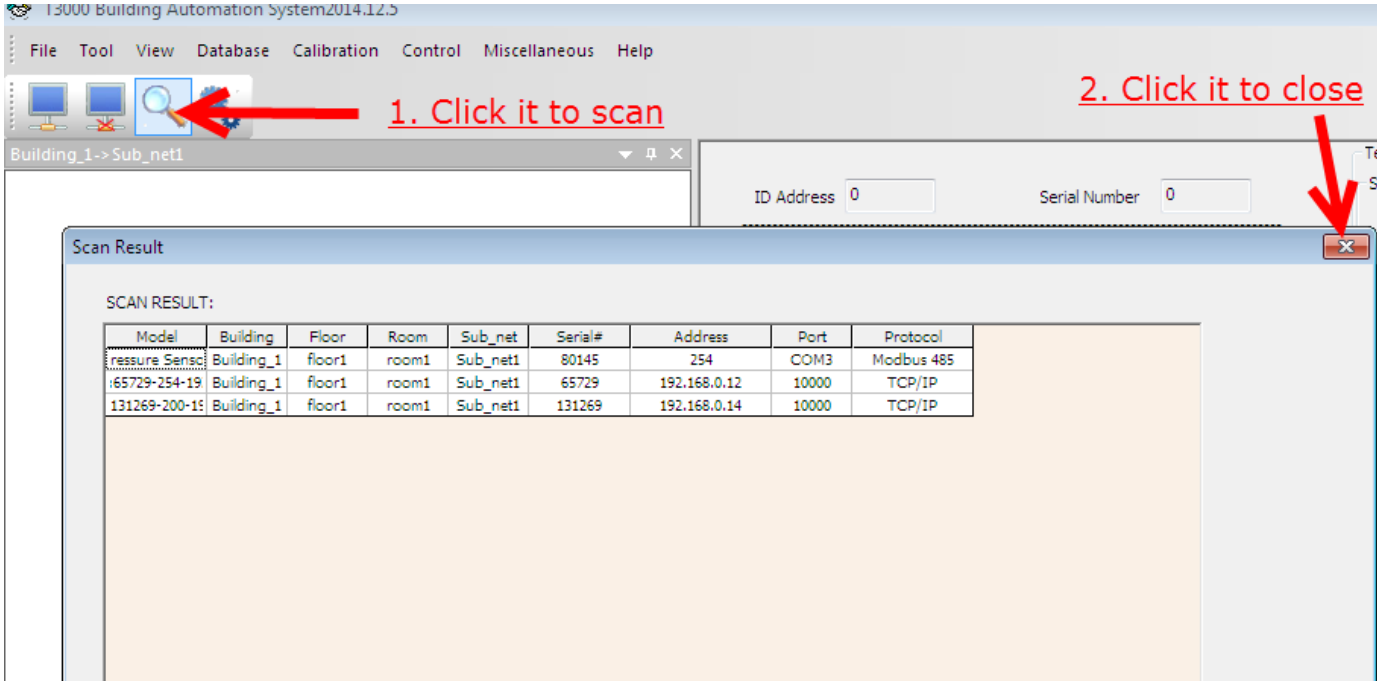
Or you can check the Bacnet Resgister List,No.9: Protocol switch. 0 = MODBUS,1=MSTP.

Pressure Sensor

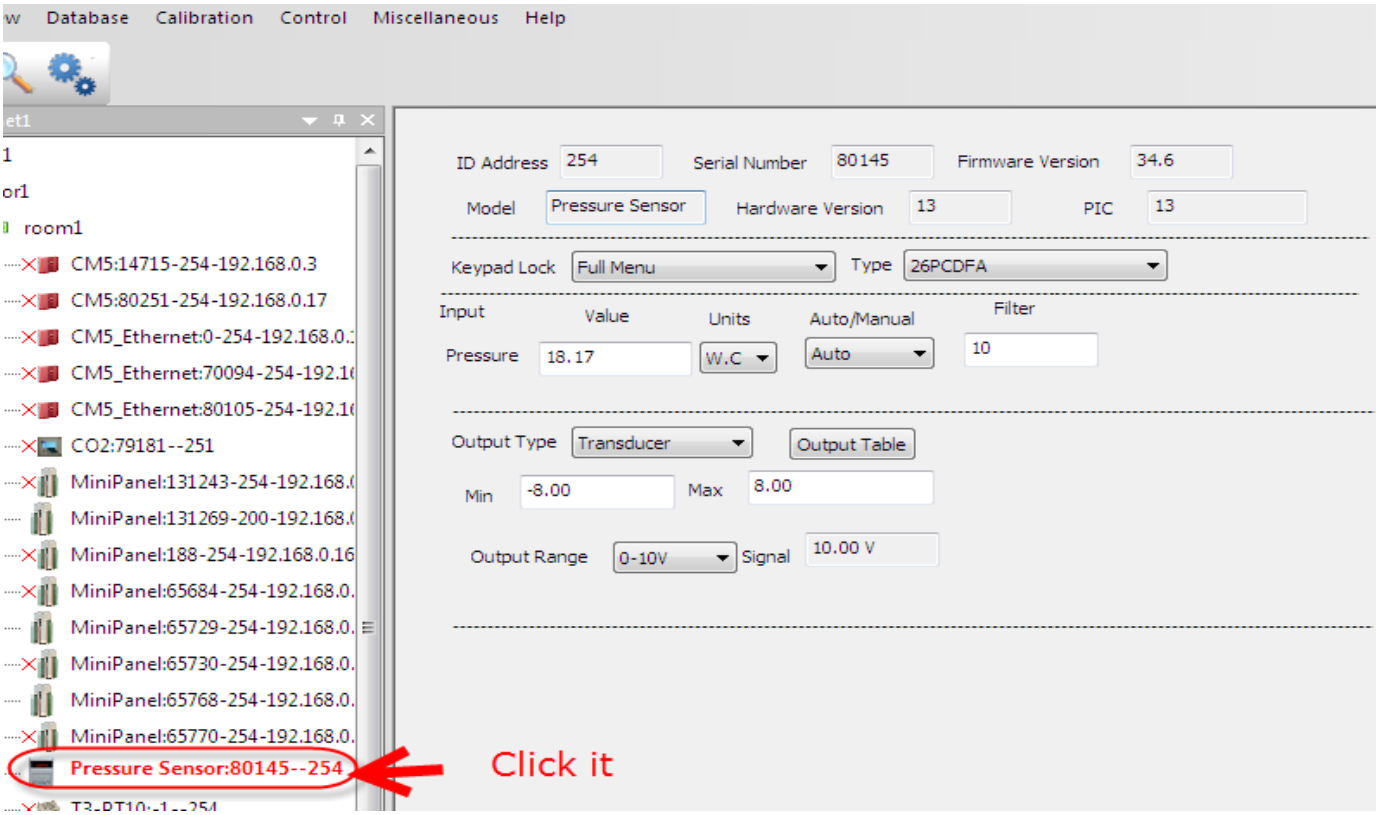
Calibrations

1). Connect pressure sensor to PC by RS485.

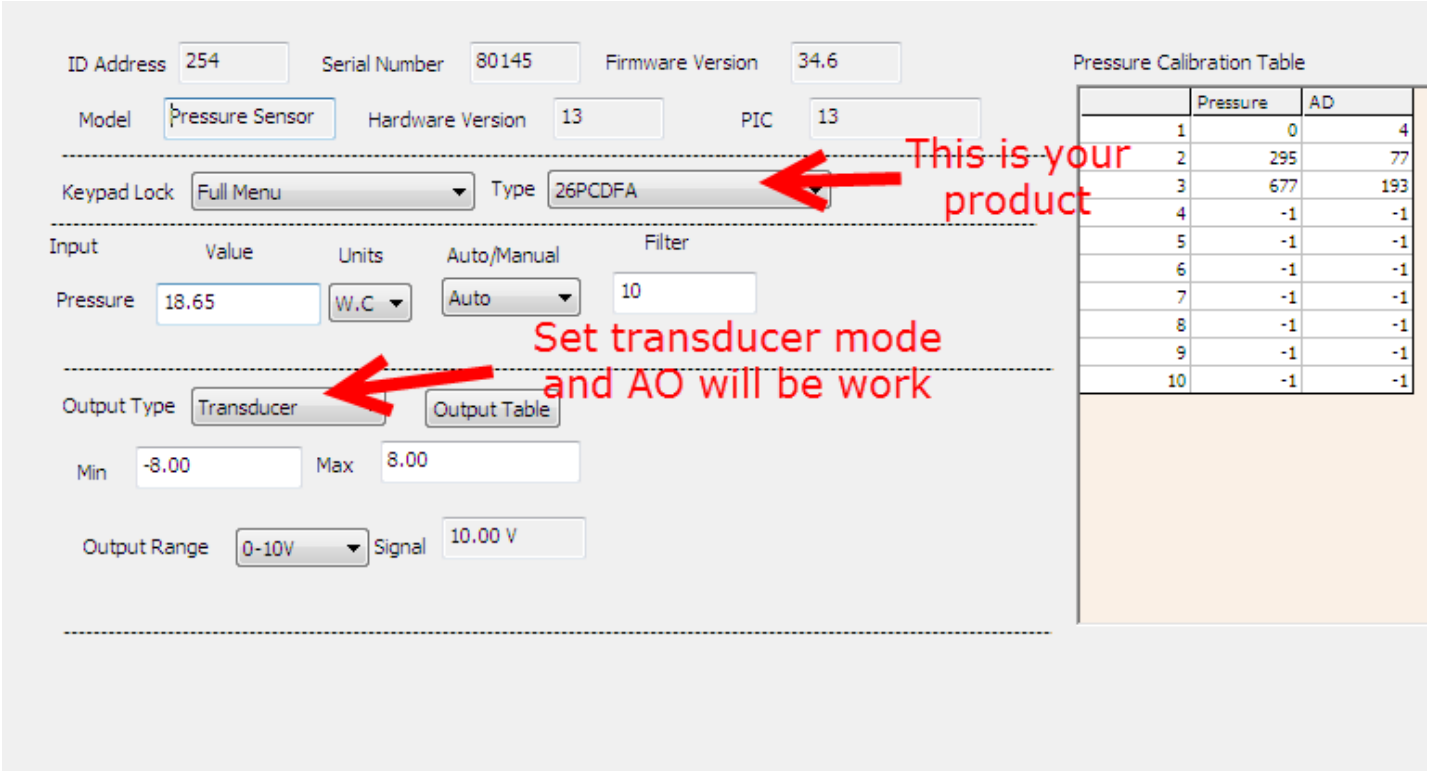
2). Open T3000 and click the button to scan. The following view will appear then close it as the picture shows.

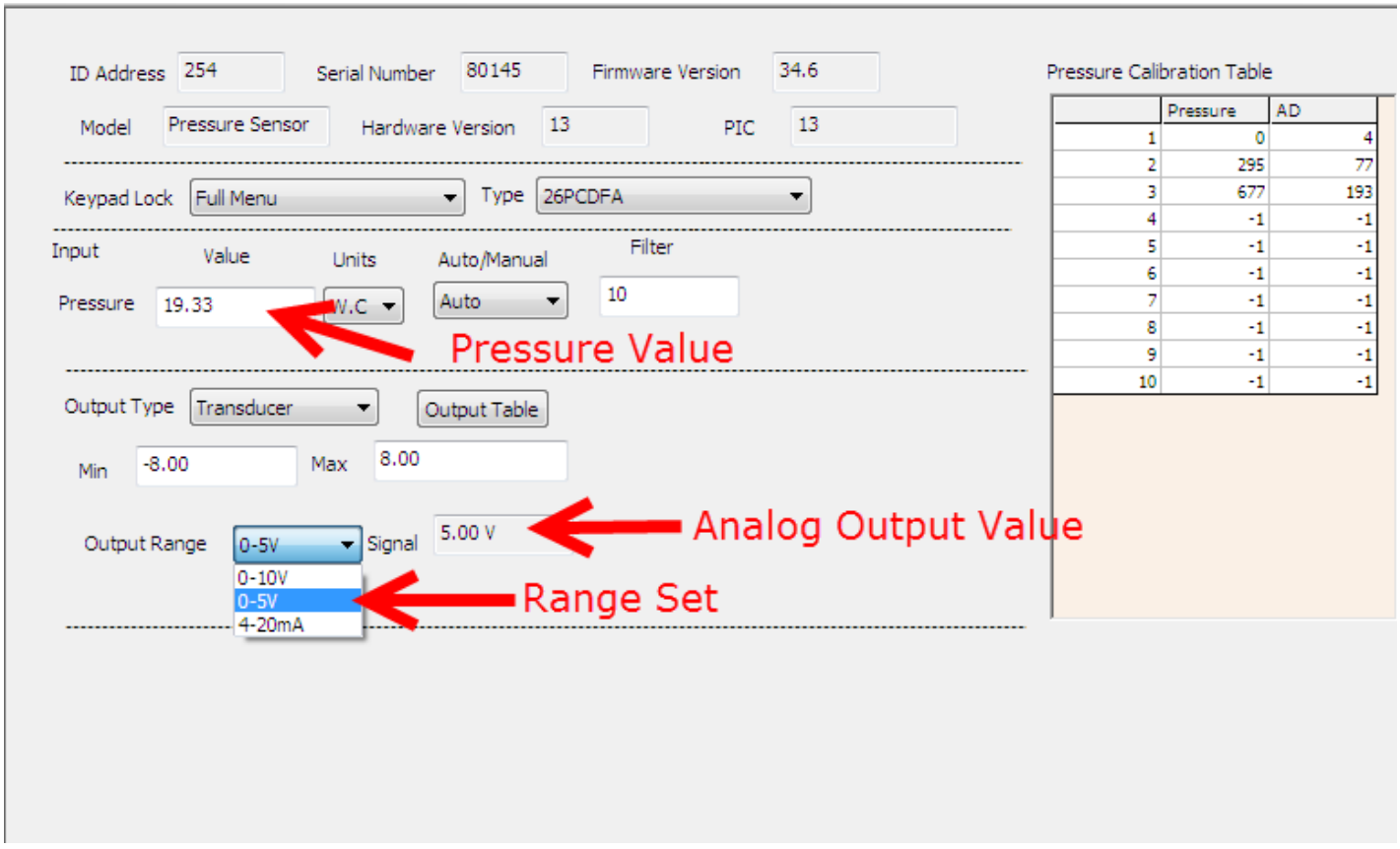


3). Click pressure sensor log and the T3000 will show all the information of pressure sensor.



4). Make sure your sets are same to the below.



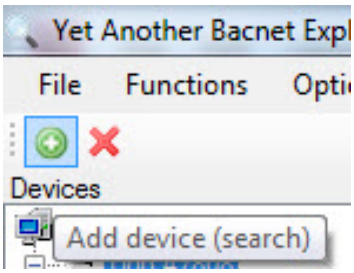


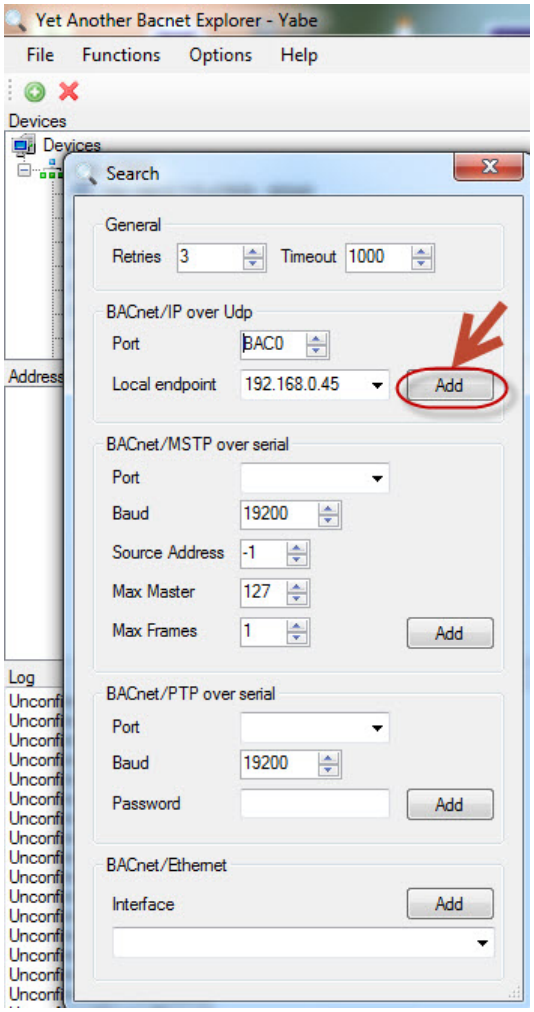
Connecting to the device using Bacnet

The device can be connected using Bacnet.Below are the steps:

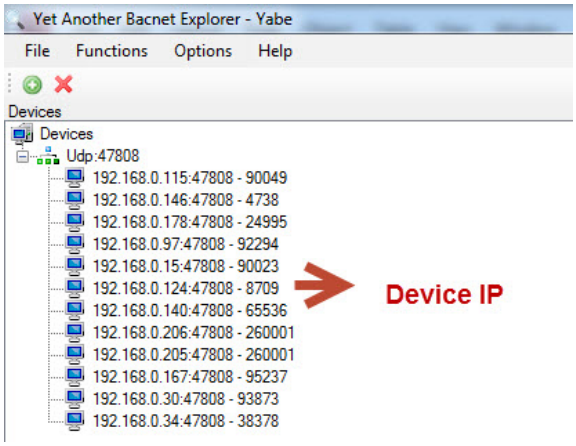
Step1.Download Yabe software as the link:*https://www.temcocontrols.com/ftp/software/08Yabe.zip* and install it.

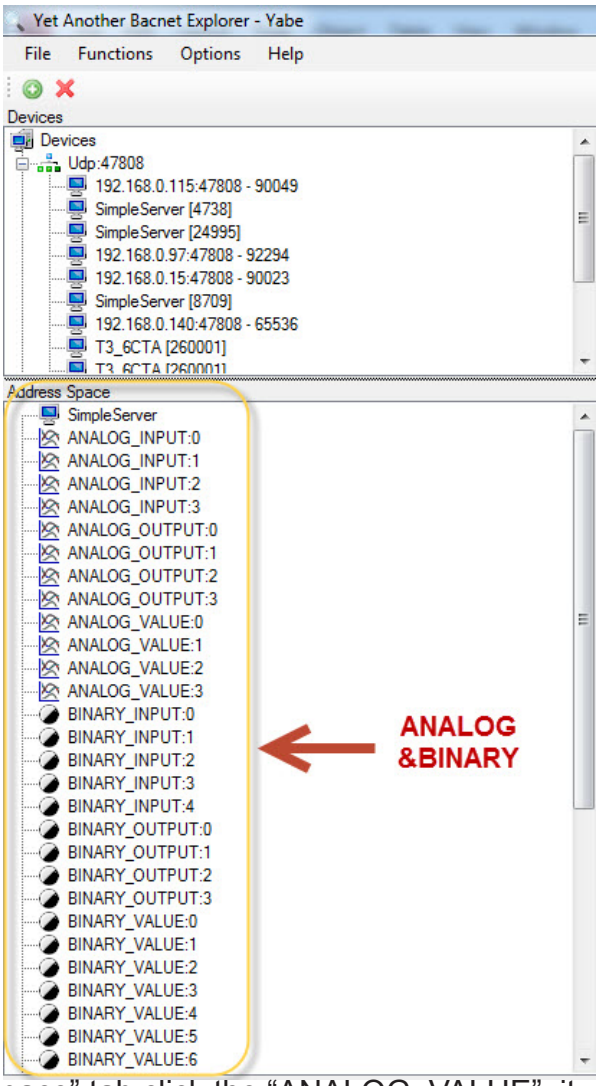
Step2.Connect the device to the computer,select Bacnet protocol.Start the Yabe software,add the



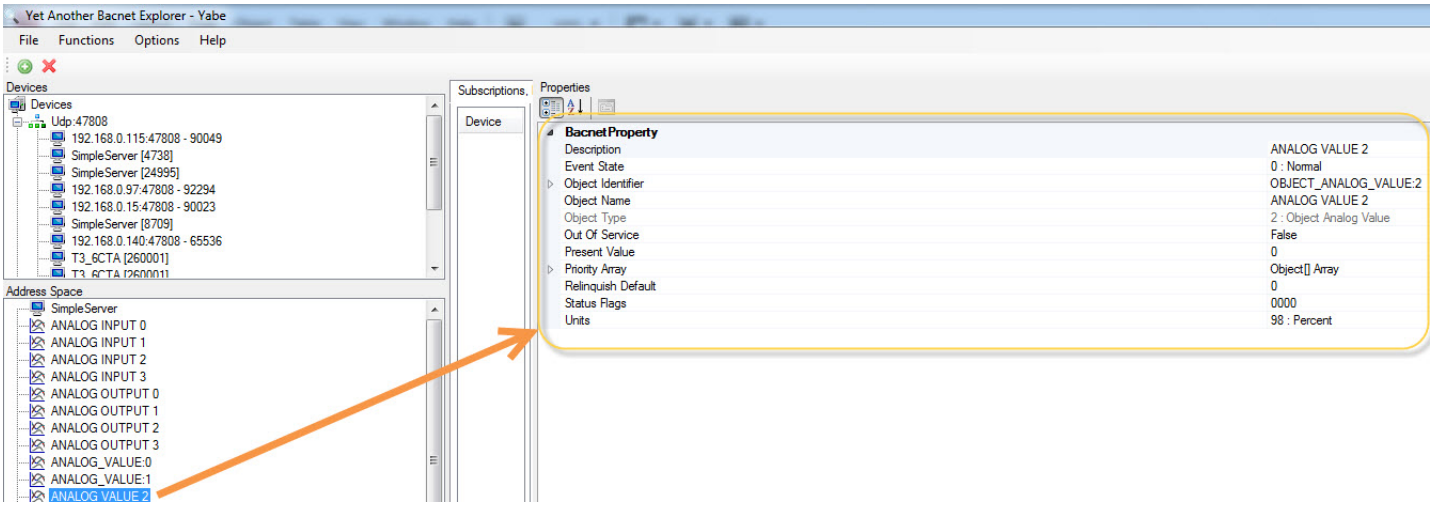


Step3.You can find your device IP as below.Double click the left mouse button,you can find your device and the bacnet information in the “Adress Space” tab.





Step4.In the “Address Space” tab,click the “ANALOG_VALUE” ,it will show the information of “log ANALOG_VALUE”in the BacnetProperty tab. And it ‘s the same with “ANALOG_OUTPUT” and other items.



Register List

Address	Bytes	Register and Description
0 to 3	4	Serial Number - 4 byte value. Read-only
4 to 5	2	Software Version – 2 byte value. Read-only
6	1	ADDRESS. Modbus device address
7	1	Product Model. This is a read-only register that is used by the microcontroller to determine the product
8	1	"Hardware Revision. This is a read-only register that is used by the microcontroller to determine the hardware rev"
9	1	PIC firmware version
10	1	"PLUG_N_PLAY_ADDRESS, 'plug n play' address, used by the network master to resolve address conflicts. See VC code for algorithms"
15	1	Base address selection.0 = Protocol address,1 = PLC address.
16	1	Firmware Update Register, used to show the status of firmware updates
11 to 100		Blank, for future use
101	2	Pressure value and calibrate.
102	2	COOLING_VALVE, a number from 0-1000 representing 0% (closed) to 100% (open)
103	2	HEATING_VALVE, a number from 0-1000 representing 0% (closed) to 100% (open)
104	2	PID, current PI calculation for cooling term
105		NOT USED FOR REV 25
106	1	COOL_HEAT_MODE, heating or cooling mode. 0=none, 1=cooling, 2=heating.
107	1	MODE_OPERATION, heating or cooling state: 0-7 = coasting, cooling 1,2,3, heating 1,2,3
108	1	DIGITAL_OUTPUT_STATE, bit 0 thru 4 = relay 1 thru 5.
112	1	DAC_OFFSET , Calibration data for the 0-10VDC signal, internal variable maintained by tstat(default 100)
113	1	NOT USED FOR REV 25
114	1	PTERM , proportional term for PI calculation
115	1	ITERM , integral term for PI calculation
118	1	SEQUENCE , control sequence i.e. fancoil, heatpump etc. (default 1)
119	1	COOLING_DEADBAND , offset from setpoint for cooling to begin. Units of 0.1 deg.
120	1	HEATING_DEADBAND , offset from setpoint for heating to begin. Units of 0.1 deg.
122	1	FAN , number of fan speeds. Single speed = 1 up to three speed fan = 3
123	1	NIGHT_HEATING_DEADBAND , heating deadband in the night time or OFF mode. Units of 1 deg.
124	1	NIGHT_COOLING_DEADBAND , cooling deadband for the night (OFF) mode. Units of 1 deg.
125	1	APPLICATION , application: 0 = office, 1 = Hotel or Residential(default 1)
126	1	POWERUP_SETPOINT , setpoint on power up
127	1	"POWERUP_MODE, mode of operation on power up. 0 = power off, 1 = power up in on mode, 2 = last value (default), 3 = auto mode."
129	1	"AUTO_ONLY , enables or disables manual mode. 0 = Manual Fan Modes 1-x Allowed (depending on R122 value, 1 = Auto Mode Only, 2 = DDC mode,the user can not change setpoint and fan speed from keypad."
131	1	MAX_SETPOINT, Setpoint high, the highest setpoint a user will be able to set from the keypad.

Pressure Sensor

Address	Bytes	Register and Description
132	1	MIN_SETPOINT, Setpoint Low, the lowest setpoint a user will be able to set from the keypad.
133	1	"SPECIAL_MENU_LOCK, Special menu lockout via keypad, serial port only, 0=Full Menu, 1=Menu Disabled, 2=User Menu, 3 = The user need adjust setpoint in menu mode,4=disable display"
135	1	current setpoint
137	1	FAN_SPEED, current operating fan speed
		Relay Output Tables (bit0 = relay1, bit1 = relay2, bit2 = relay3, bit3 = relay4, bit4 = relay5) "Fan0 table is for the off state. Fan1, Fan2, and Fan3 are for the manual states. Fan4 is for the Auto state. These states are controlled by the user." The mode of operation (coasting, cooling, heating) is determined by the PID parameter.
138	1	FAN0_OPERATION_TABLE_COAST
139	1	FAN0_OPERATION_TABLE_COOL1
140	1	FAN0_OPERATION_TABLE_COOL2
141	1	FAN0_OPERATION_TABLE_COOL3
142	1	FAN0_OPERATION_TABLE_HEAT1
143	1	FAN0_OPERATION_TABLE_HEAT2
144	1	FAN0_OPERATION_TABLE_HEAT3
145	1	FAN1_OPERATION_TABLE_COAST
146	1	FAN1_OPERATION_TABLE_COOL1
147	1	FAN1_OPERATION_TABLE_COOL2
148	1	FAN1_OPERATION_TABLE_COOL3
149	1	FAN1_OPERATION_TABLE_HEAT1
150	1	FAN1_OPERATION_TABLE_HEAT2
151	1	FAN1_OPERATION_TABLE_HEAT3
152	1	FAN2_OPERATION_TABLE_COAST
153	1	FAN2_OPERATION_TABLE_COOL1
154	1	FAN2_OPERATION_TABLE_COOL2
155	1	FAN2_OPERATION_TABLE_COOL3
156	1	FAN2_OPERATION_TABLE_HEAT1
157	1	FAN2_OPERATION_TABLE_HEAT2
158	1	FAN2_OPERATION_TABLE_HEAT3
159	1	FAN3_OPERATION_TABLE_COAST
160	1	FAN3_OPERATION_TABLE_COOL1
161	1	FAN3_OPERATION_TABLE_COOL2
162	1	FAN3_OPERATION_TABLE_COOL3
163	1	FAN3_OPERATION_TABLE_HEAT1
164	1	FAN3_OPERATION_TABLE_HEAT2
165	1	FAN3_OPERATION_TABLE_HEAT3

Pressure Sensor

Address	Bytes	Register and Description
166	1	FANAUT_OPERATION_TABLE_COAST
167	1	FANAUT_OPERATION_TABLE_COOL1
168	1	FANAUT_OPERATION_TABLE_COOL2
169	1	FANAUT_OPERATION_TABLE_COOL3
170	1	FANAUT_OPERATION_TABLE_HEAT1
171	1	FANAUT_OPERATION_TABLE_HEAT2
172	1	FANAUT_OPERATION_TABLE_HEAT3
173	1	VALVE_OPER_TABLE_COAST, Analog output state for each of the 7 modes of operation
174	1	VALVE_OPER_TABLE_COOLING1
175	1	VALVE_OPER_TABLE_COOLING2
176	1	VALVE_OPER_TABLE_COOLING3
177	1	VALVE_OPER_TABLE_HEATING1
178	1	VALVE_OPER_TABLE_HEATING2
179	1	VALVE_OPER_TABLE_HEATING3
182	1	Night heating setpoint
183	1	Night cooling setpoint
184	1	Info Byte, this register contains info about the state of the tstat.
		"Bit 0 is read/write and shows the occupancy mode. Bit 0 = 0 means unoccupied. Bit 0 = 1 means occupied. " "Bit 1 is read only and shows the reset state. Bit 1 = 0 means hardware restart. Bit 1 = 1 means software restart. " "Bit 2 is read/write and is the reset prevention bit. Bit 2 = 0 means the tstat will automatically reset after certain registers are changed. Bit 2 = 1 prevents this reset. Changing this bit from 1 to 0 will trigger a reset." Bit 3 is the state of the digital input. Bit 3 = 1 means logic high. Bit 3 = 0 means logic low. Bit 4,5: Reserved, used for some non standard occupancy sensor logic Bit6 0=no delay on modbus reply, 1= 10ms delay before send for slower PLC's to switch from TX to RX "Bit7, RS485/wireless communications mode: The normal communications method is a bus topology using RS485 which uses a 'transmit enable' or TX_EN line on the RS485 hardware whenever transmission from the thermostat to the bus takes place. For wireless devices this is typically taken care of by the radio module itself so it is not needed. Default = 0, When bit7 is 0, the RS485 chip, TX_EN line is used for normal RS485 bus communications. When bit7 is 1, the TX_EN line is not used, allowing the radio module to communicate one-to-one with the Tstat"
185	1	Bau - Baudrate, 0=9.6kbaud, 1=19.2kbaud, 2=38.4kbaud 3=57.6kbaud, 4=115.2kbaud
186	1	Ou1 - Output1 Scale - 1=0-10V, 2=0-5V, 5= 4-20mA(for pressure)
213	1	Pressure sensor filter, FIL.
214		Heating cooling mode configuration, HC, 0=PID, 1=Keypad, 2=Digital_in1, 3=Digital_in1, 4=Analog_in1, 5=Analog_in2
215		Internal Temperature Sensor IC - Shows the filtered, calibrated value of the internal temperature sensor IC
216		Internal Thermistor Sensor - Shows the filtered, calibrated value of the internal thermistor sensor

Pressure Sensor

Address	Bytes	Register and Description
217	2	Calibration Internal Thermistor - Calibration value used on the internal thermistor
218	2	Calibration Analog Input2 - Calibration value used on the analog input 2
219	2	Lookup Table 1 - 0.0V value Sensor value that corresponds to 0.0V
220	2	Lookup Table 1 - 0.5V value Sensor value that corresponds to 0.5V
221	2	Lookup Table 1 - 1.0V value Sensor value that corresponds to 1.0V
222	2	Lookup Table 1 - 1.5V value Sensor value that corresponds to 1.5V
223	2	Lookup Table 1 - 2.0V value Sensor value that corresponds to 2.0V
224	2	Lookup Table 1 - 2.5V value Sensor value that corresponds to 2.5V
225	2	Lookup Table 1 - 3.0V value Sensor value that corresponds to 3.0V
226	2	Lookup Table 1 - 3.5V value Sensor value that corresponds to 3.5V
227	2	Lookup Table 1 - 4.0V value Sensor value that corresponds to 4.0V
228	2	Lookup Table 1 - 4.5V value Sensor value that corresponds to 4.5V
229	2	Lookup Table 1 - 5.0V value Sensor value that corresponds to 5.0V
230	2	Lookup Table 2 - 0.0V value Sensor value that corresponds to 0.0V
231	2	Lookup Table 2 - 0.5V value Sensor value that corresponds to 0.5V
232	2	Lookup Table 2 - 1.0V value Sensor value that corresponds to 1.0V
233	2	Lookup Table 2 - 1.5V value Sensor value that corresponds to 1.5V
234	2	Lookup Table 2 - 2.0V value Sensor value that corresponds to 2.0V
235	2	Lookup Table 2 - 2.5V value Sensor value that corresponds to 2.5V
236	2	Lookup Table 2 - 3.0V value Sensor value that corresponds to 3.0V
237	2	Lookup Table 2 - 3.5V value Sensor value that corresponds to 3.5V
238	2	Lookup Table 2 - 4.0V value Sensor value that corresponds to 4.0V
239	2	Lookup Table 2 - 4.5V value Sensor value that corresponds to 4.5V
240	2	Lookup Table 2 - 5.0V value Sensor value that corresponds to 5.0V

Pressure Sensor

Address	Bytes	Register and Description
241	2	Universal PID input select, 0=none, 1=analog_in1, 2=analog_in2
242	2	Universal PID upper deadband
243	2	Universal PID lower deadband
244	2	Universal PID pterm
245	2	Universal PID iterm
246	2	Universal PID setpoint
252	1	Output 6 PID Control
254	1	Universal PID Output - Coasting
255	1	Universal PID Output - Cooling1
256	1	Universal PID Output - Cooling2
257	1	Universal PID Output - Cooling3
258	1	Universal PID Output - Heating1
259	1	Universal PID Output - Heating2
260	1	Universal PID Output - Heating3
		Analog Output Tables (bit0,1=analog out1, bit2,3=analog out2, 00=0%, 01=0-100%, 11=100%)
261	1	Universal PID Valve Output - Coasting
262	1	Universal PID Valve Output - Cooling1
263	1	Universal PID Valve Output - Cooling2
264	1	Universal PID Valve Output - Cooling3
265	1	Universal PID Valve Output - Heating1
266	1	Universal PID Valve Output - Heating2
267	1	Universal PID Valve Output - Heating3
268	1	Number of Heating Stages in Universal Table-(Maximum # of total heating and cooling states is 6)
269	1	Number of Cooling Stages in Universal Table-(Maximum # of total heating and cooling states is 6)
270	1	Universal PID
275	2	Universal Night Setpoint
276	1	Number of Heating Stages in Original Table - (Maximum # of total heating and cooling states is 6)
277	1	Number of Cooling Stages in Original Table - (Maximum # of total heating and cooling states is 6)
278	1	PID2 heating or cooling state.0=coasting, 1=cooling1, 2=cooling2, 3=cooling3, 4=heating1, 5=heating2, 6=heating3, 14=cooling4, 15=cooling5, 16=cooling6, 17=heating4, 18=heating5, 19=heating6.
279	1	Valve travel time. The time of the valve travel from one end to another end. The units is second.
285	1	Valve percent. Show the valve opened how much percent. READ ONLY
309	1	Input auto/ manual enable
310	1	"Output auto/manual enable. Bit 0 to 4 correspond to output1 to output5, bit 5 correspond to output6(register 102), bit 6 correspond to output7(register 103). 0, auto mode; 1, manual mode."

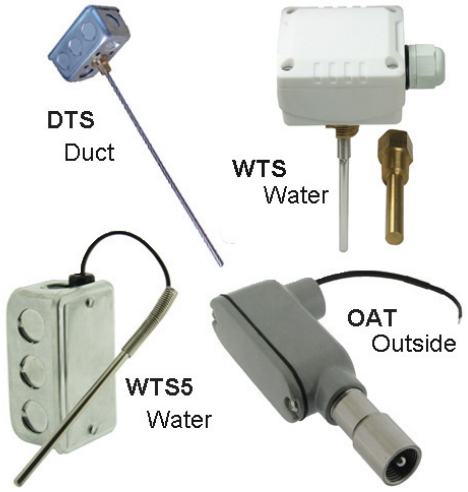
Pressure Sensor

Address	Bytes	Register and Description
311	1	Digital manual input. Write the manual value for digital input when digital input in manual mode.
319	1	The minimum device address can be set
320	1	The maximum device address can be set. The device address should between min and max address
326	1	Show the size of E2 chip. 0 = 24c02, 1 = 24c08/24c16.
338	1	Default occupied setpoint. Works in concert with the "occupied setpoint control register", register 339
		Analog Output Tables (bit0,1 =analog out1, bit2,3=analog out2, 00=0%, 01=0-100%, 11=100%)
351	1	Analog output OFF table, coasting mode
352	1	Analog output OFF table, cooling1 mode
353	1	Analog output OFF table, cooling2 mode
354	1	Analog output OFF table, cooling3 mode
355	1	Analog output OFF table, heating1 mode
356	1	Analog output OFF table, heating2 mode
357	1	Analog output OFF table, heating3 mode
407	1	the pressure sensor anolog value
408	1	the raw data of pressure
411	1	pressure sensor type.1=MPXV7002,2=26PCDFA
412	1	Pressure unit select. 1:W.C 2:KPa 3:Psi 4:mmHg 5:inches of Hg 6:Kg/cm2 7:atmosphere 8:bar
413	1	minimal pressure(0 to -1000), for example if current pressure unit is inch of water, -800 = -8inch if water
414	2	maxium pressure(0 to +1000) for example if current pressure unit is inch of water, +800 = 8inch if water
419		Pressure analog output select 0: output control by PID, for example if PID is 0 to 1000, output will be 0 to 10V 1:transduce mode, output voltage = (current pressure/(max pressure - min pressure)) x 10V
422	1	clear the pressure's offset
423	1	0-10V output calibration parameter,typical 15
424	1	4-20mA output calibration differentce,typical 95
425	1	4-20mA output calibration offset,typical 8
426	2	1st calibration pressure value
427	2	1st calibration voltage value
428	2	2nd calibration pressure value
429	2	2nd calibration voltage value
430	2	3rd calibration pressure value
431	2	3rd calibration voltage value
432-445	12	4th-10th calibration value
446-455	40	0-10V output output calibration value
456-465	40	4-20mA output output calibration value

Temperature Sensors

Description

Temperature sensors are used to measuring the temperature for the air conditioning industry.
This document shows the enclosures and temperature vs. resistance curves for the standard sensors.



General

The sensors employ precision interchangeable thermistors and RTD which are compatible with all the major building automation systems.

- Designed for temperature sensing in an HVAC and light industrial control applications.
- Precision interchangeability eliminates the necessity for individual circuit calibration.

There are several sensor element ranges to choose from, which guarantee compatibility with all popular DDC systems. The sensor elements are precision thermistors or platinum RTDs. Field calibration is not generally required. The probe is epoxy sealed to prevent moisture from migrating into the probe. Custom probe lengths, wire types and sensor elements are available for large OEM projects. Ask about our plastics & metal manufacturing capabilities for custom housings as well.

Part # Suffix	Sensor	Typical User
2	100 ohm Platinum 3-wire	Honeywell
5	1,801 ohm Thermistor	t.a.c. / CSI
6	3,000 ohm Thermistor	Alerton
7	10,000 ohm Thermistor ‘Type2’	Trane, Automated Logic, Temco, t.a.c., CSI, Solidyne, Alerton
9	100,000 ohm Thermistor	Siemens(Landis & Staefa)
11	LM334 IC sensor	t.a.c. / CSI
12	1000 ohm Platinum	Invensys(siebe), Honeywell, Johnson Controls, Siemens (Landis & Staefa)
13	1000 ohm Nickel	Johnson Controls
20	20,000 ohm Thermistor	Honeywell
21	LM335 IC Sensor	Solidyne, IECC
24	10,000 ohm Thermistor, ‘Type 3’	Andover, AAM, Teletrol, Invensys(Siebe), Multinet, Delta, Carrier, KMC, Temco

Specification

Sensor Type	Accuracy	Operating Temperature Range
10,000 ohm Thermistor ‘Type2’	+/- 0.2°C	-40°C to 125°C
10,000 ohm Thermistor, ‘Type 3’	+/- 0.2°C	-50°C to 105°C
100,000 ohm Thermistor	+/- 0.3°C	-40°C to 125°C
1000 ohm Platinum	+/- 0.4°C	-200°C to 400°C
100 ohm Platinum	+/- 0.4°C	-200°C to 300°C
Probe Material	Stainless Steel 304, 1mm thick wall	
Cable Property	FT4, 105°C, 300V standard or 200°C, 300V high temperature on request.	
Cable Material	PVC standard or High temperature silicon available on request.	
Exposure Rating	IP65, for outdoor use	

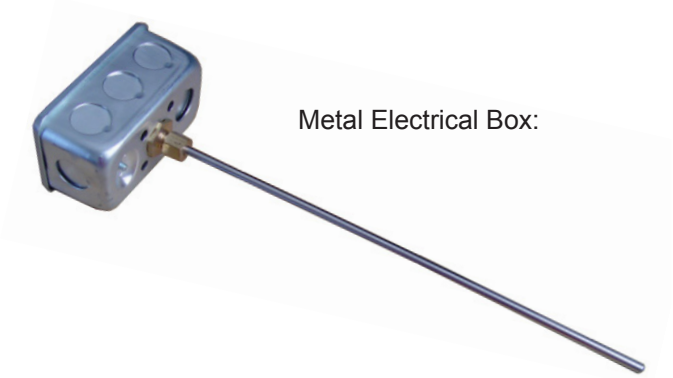
Temperature Sensors

Temperature Curves:

Thermister Type, Ohms / Part Number Suffix						
Part # -> DegC	**3K 6**	**10K Type2 7**	**10K Type3 24**	**20K 20**	**100K 9**	**1K RTD 12**
-40	100,701	335,671	239,700	814,000	4,067,212	843
-35	72,658	242,195	187,500	578,600	2,890,843	863
-30	53,005	176,683	135,300	415,600	2,077,394	882
-25	39,073	130,243	107,105	301,000	1,508,530	902
-20	29,092	96,974	78,910	220,600	1,106,485	922
-15	21,868	72,895	63,225	163,600	819,378	941
-10	16,589	55,298	47,540	122,380	612,366	961
-5	12,694	42,314	38,515	92,300	461,683	980
0	9,795	32,650	29,490	70,200	351,017	1,000
5	7,618	25,395	23,460	53,800	269,041	1,020
10	5,971	19,903	18,790	41,560	207,807	1,039
15	4,714	15,714	15,130	32,340	161,702	1,059
20	3,748	12,493	12,260	25,340	126,729	1,078
25	3,000	10,000	10,000	20,000	100,000	1,105
30	2,416	8,056	8,194	15,884	79,428	1,117
35	1,959	6,530	6,752	12,696	63,489	1,136
40	1,597	5,324	5,592	10,210	51,058	1,155
45	1,310	4,366	4,655	8,258	41,301	1,175
50	1,080	3,601	3,893	6,718	33,598	1,194
55	896	2,985	3,327	5,494	27,479	1,205
60	746	2,487	2,760	4,518	22,593	1,232
65	625	2,082	2,375	3,734	18,669	1,244
70	526	1,751	1,990	3,100	15,502	1270.7
75	444	1,480	1,724	2,586	12,932	1,290
80	377	1,256	1,458	2,186	10,837	1308.9
85	321	1,070	1,271	1,824	9,121	1,328
90	275	916	1,084	1,542	7,709	1,347
95	236	787	950	1,308	6,542	1,366
100	204	679	817	1,114	5,574	1385
105	176	587	720	953	4,767	1,404
110	153	510	624	818	4,093	1422.9
115	133	445	553	705	3,525	1,442
120	117	389	481	609	3,046	1,460

Temperature Sensors

Duct Temperature Sensor

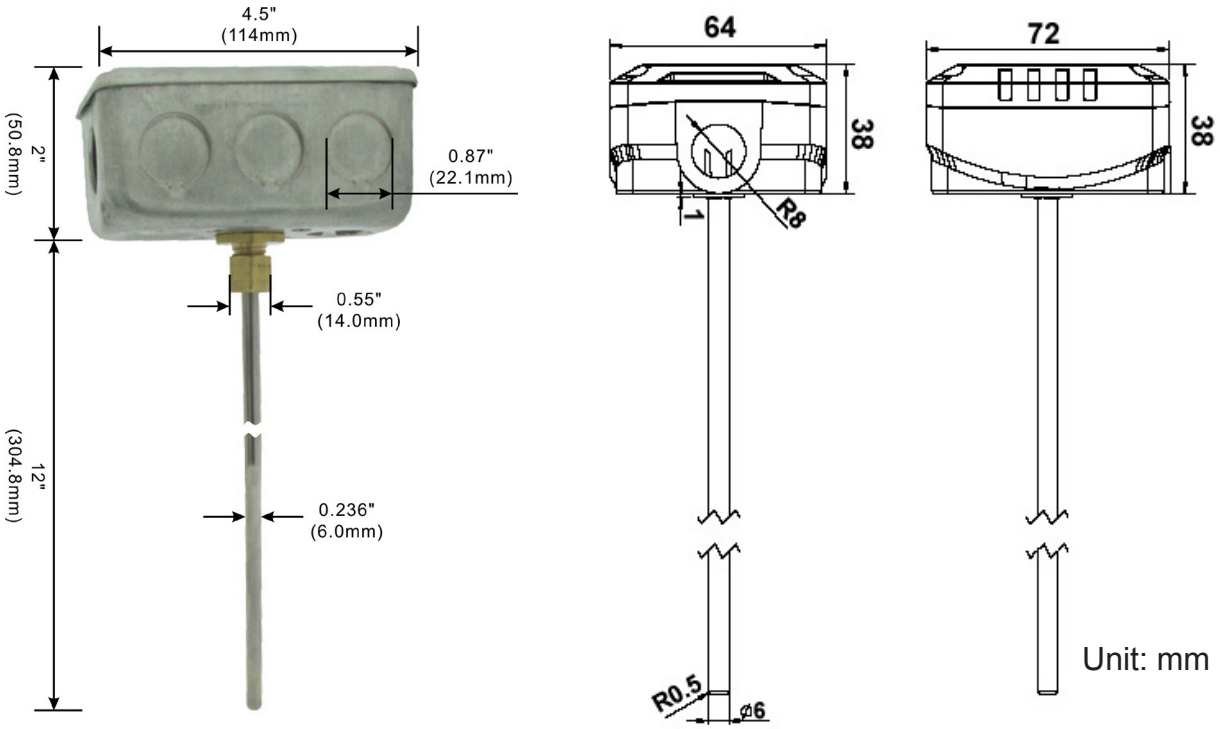


Metal Electrical Box:

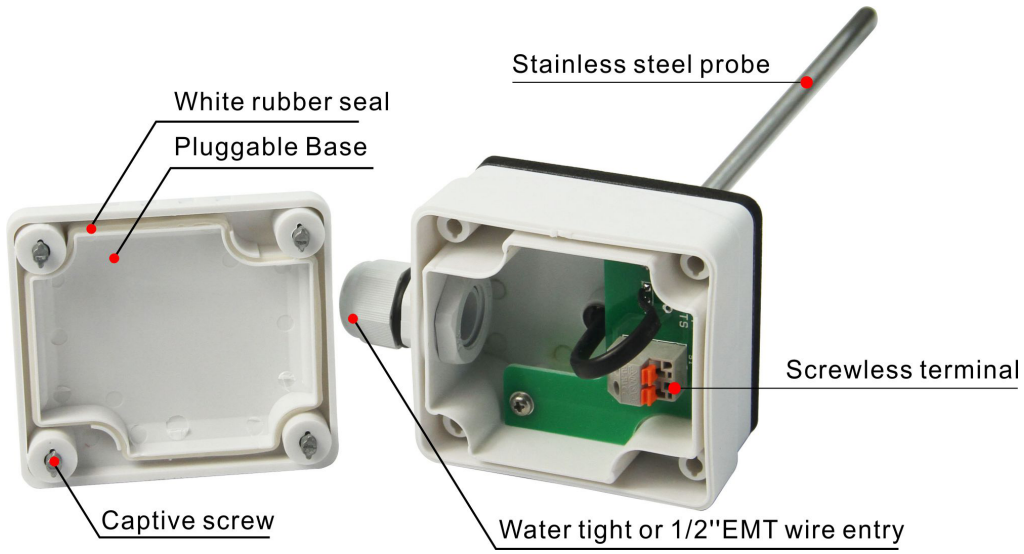
Plastic Water Resistant Box:



Dimension:



Temperature Sensors



Part Number Scheme:

DTS - WP - 12 - 7

Code	Description
DTS	Duct Temperature Sensor

Code	Enclosure
WP	Watertight Plastic Box
E	Metal Box

Code	Temperature Curve
2	100PT
7	10K type 2
12	1K PT

Code	Probe Length
4	4inch
6	6inch
8	8inch
12	12inch

*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

Temperature Sensors

DTS-FL: Flange Mount Duct Temperature Sensor

Description:

This sensor is used to measure the supply and return temperature in HVAC system. The flange mount design makes it easy to install the sensor in tight quarters. There are several sensor elements to choose from which guarantee compatibility with all popular DDC systems. The probe in the photo is out standard model which is always in stock, it has a 8 inch probe and 6 inch long cable, and employs either a precision thermistor or platinum film sensor field calibration is not generally required. The 10ft(3m) cable is plenum rated.



Contruction:

The sensor is a high quality unit manufactured to high standards, using materials and assembly techniques. The probe material is stainless steel with a welded and ground tip.The DTS probe is baked and then epoxy sealed to eliminate long term moisture problems. The flange accepts two #6 screws, and is made from glavanized steel.

DTS - FL - 12 - 12 - 7

Code	Description
DTS	Duct Temperature Sensor

Code	Description
FL	Flange mount

Code	Probe Length
4	4inch
8	8inch
9	9inch
12	12inch

Code	Temperature Curve
6	3K
7	10K type 2
12	1K PT
24	10K type 3

Code	Wire Length
6	6inch
12	12inch(1ft)
120	120inch(10ft)

*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

Temperature Sensors

DTS-PF: Plastic Flange Duct Temperature Sensor

This sensor is used to measure the supply and return temperature in HVAC system. The plastic flange mount design makes it easy to install the sensor in tight quarters. There are several sensor elements to choose from which guarantee compatibility with all popular DDC systems. The probe in the photo is out standard model which is always in stock, it has a 8 inch probe and 8 inch long cable, plenum rated cable, 10K type 2 thermistors.





Part Number Scheme:

DTS - PF - 8 - 8 - 7

Code	Description
DTS	Duct Temperature Sensor

Code	Description
PF	Plastic Flange

Code	Probe Length
4	4inch
6	6inch
8	8inch
12	12inch

Code	Temperature Curve
7	10K type 2
12	1K PT
24	10K type 3

Code	Wire Length
6	6inch
8	8inch
12	12inch(1ft)
120	120inch(10ft)

*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

Temperature Sensors

OAT: Outside Air Temperature Sensor



This sensor is used to measure the outside air temperature to allow the DDC system to coordinate the mechanical systems with actual building load conditions, enabling such strategies as free cooling, optimum start / stop, and supply temperature reset.

The housing is made from PVC electrical fittings which shield the probe from direct sunlight. The probe is manufactured to industrial standards. There are three thermistor based models, and one RTD version to provide compatibility with the majority of DDC systems. The sensors are accurate enough that calibration is not usually required.

Contruction:



The sensor probe is made from stainless steel which is welded, ground down, and finally pressure tested before assembling. The probe is then baked and epoxy sealed to provide long term protection from moisture.

The sensor housing is a PVC electrical enclosure which is UL approved for outdoor use. The housing extends over the probe to protect from sunlight radiation.

The sensor lead extends 12” from the enclosure, making it long enough to reach a junction box and terminate inside the building.

Installation:

The sensor probe is made from stainless steel which is welded, ground down, and finally pressure tested before assembling. The probe is then baked and epoxy sealed to provide long term protection from moisture.

The sensor housing is a PVC electrical enclosure which is UL approved for outdoor use. The housing extends over the probe to protect from sunlight radiation.

The sensor lead extends 12” from the enclosure, making it long enough to reach a junction box and terminate inside the building.

Temperature Sensors

OAT: Outdoor Air Temperature Sensor

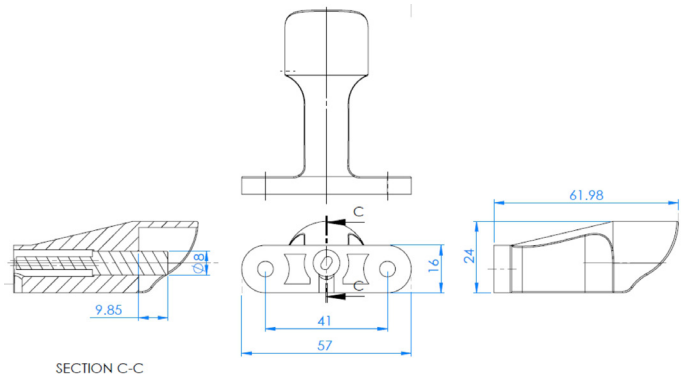


Description:

The temperature sensor is designed to measure outdoor air temperature. The sensor isdesigned for mounting in a standard ½" knock out.The temperature sensor uses a 10K Ω thermistor. The thermistor is enclosed in a plastic housing.The sensor has a short 20AWG black leads. It is designed for use in residential and commercial building automation controls. It features a fast response, precision thermistor sensing element that is totally sealed against the outdoor elements. The PVC sun-shield prevents false readings from direct sunlight. An optional weatherproof electrical box allows for simple installation and provides an extra rugged and reliable sensor for energy management and HVAC applications.

Features:

- General purpose outdoor air temperature sensor
- Available in threaded PVC version with rugged weatherproof electrical box
- Easy installation - just threads into mounting hole or standard handy box installation
- Fully potted metal housing protects sensing element and provides fast, accurate temperature sensing
- Cost efficient design
- Sturdy construction - all plastic housing with PVC solar shield with optional weatherproof electrical box



Part Number Scheme:

OAT - M - 7

Code	Description
OAT	Outdoor Air Temperature Sensor

Code	Enclosure
M	Metal Enclosure
P	Plastic Enclosure

Code	Temperature Curve
6	3K
7	10K type 2
9	100K
12	1K PT
24	10K type 3

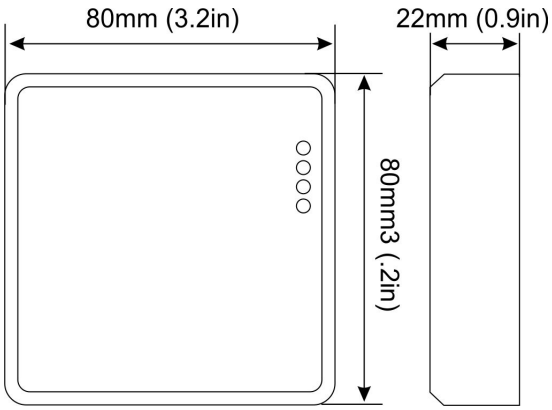
*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

Temperature Sensors

Room Temperature Sensor

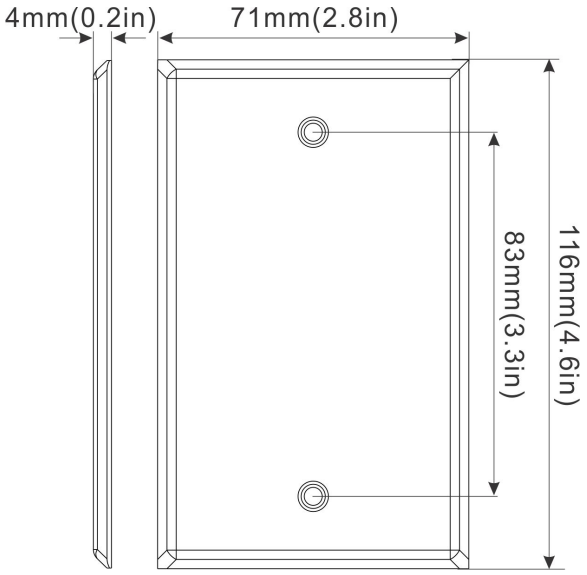
RTS: Room temperature sensor, 10K type 2





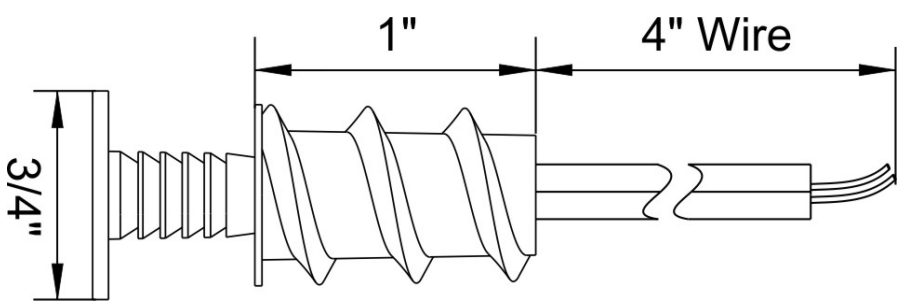
RTS1: Tamper proof room temperature sensor, 10K type 2





RTS3: Flush mounting sensor, 10K type 2

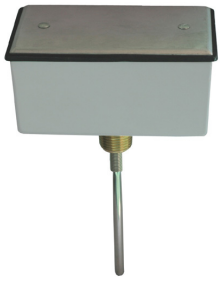




Temperature Sensors

WTS Series Water Temperature Sensor

WTS-MO:



Outdoor Rated

WTS-WP:



Watertight Plastic



Plastic Fitting
Provided by Default



Electrical Fitting
Not Included

WTS-M1:



Metal

WTS-P:



Probe Only

Installation:

Locate water temperature sensor at least a few pipe diameters downstream any heat or cooling source:

- A 1/2” NPT female pipe fitting is welded into the pipe. These fittings are usually supplied and installed by the piping trade under direction of the controls trade.
- Choose an orientation where any condensation will not collect, such as the top of a horizontal pipe section or at a 45° angle from horizon.
- Before threading the sensor into the well, deposit some thermal paste in the bottom of the well to improve heat conduction between the metal parts.
- The sensor is wired with two conductors, normally 18ga unshielded twisted pair.

Part Number Scheme:

WTS - WP - 4-12

Code	Description
WTS	Water Temperature Sensor

FC11UiE-v2.pdf

Code	Probe Size
M1	Metal 11-10 electrical box
MO	Metal outdoor electrical box
P	Probe
WP	Watertight plastic box

Code	Temperature Curve
2	100PT
7	10K Type2
12	1K PT
24	10K Type3

Code	Probe Length
2	2 inch
4	4 inch
6	6 inch

*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don’t see what you need online.

Temperature Sensors

WTS5 Series Strap on Water Temperature Sensor

WTS5-WP:





Plastic Fitting
Provided by Default



Electrical Fitting
Not Included

WTS5-M1:



Installation:

For measuring water temperature, the probe is strapped with plastic tie wraps or a metal strap onto the outside of the pipe and covered with insulation. The electrical box is mounted on a strut bar or on the wall near the pipe. Two conductors are required, 18ga, unshielded twisted pair is common.

Part Number Scheme:

WTS5 - WP - 7

Code	Description
WTS5	Strap-on Water Temp Sensor

Code	Probe Size
M1	Metal 11-10 electrical box
WP	Watertight plastic box

Code	Temperature Curve
7	10K Type2

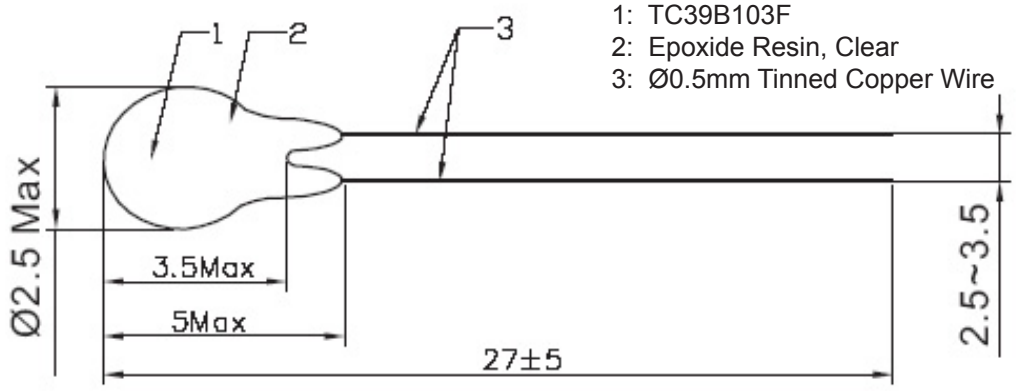
*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

Temperature Sensors

RTS-Raw 10K NTC Thermistor, Temco's standard thermistor element



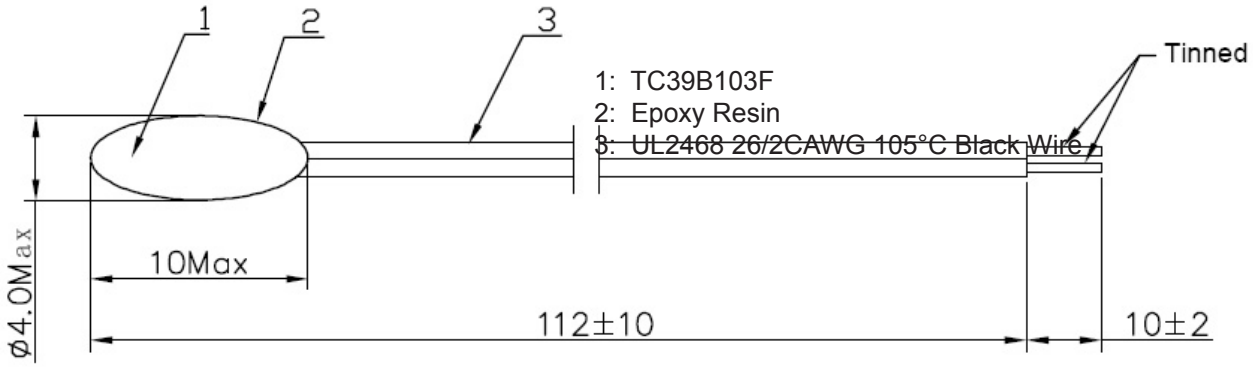
Dimensions (mm):



RTS-Bead-4: Thermistor bead, 4"(10cm) lead, 10mm wire trimmed and tinned, 0.2DegC accuracy



Dimensions (mm):



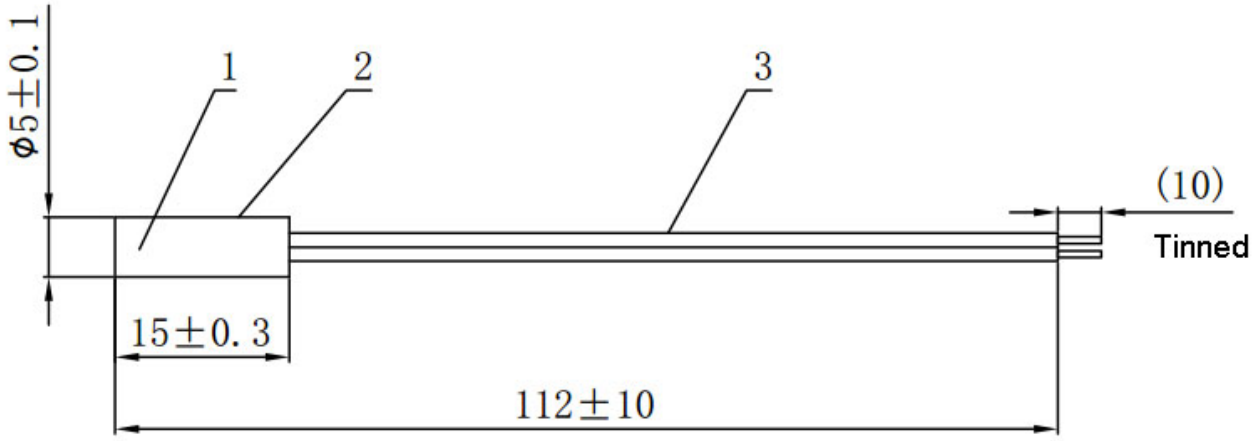
*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

Temperature Sensors

PRB-0.6-7 Temperature Sensor: 0.6” SS probe temp sensor, 10K thermistor, Type 2



Dimensions (mm):



Part Number Scheme:

PRB - 0.6 - 7

Code	Description
PRB	Temperature Probe

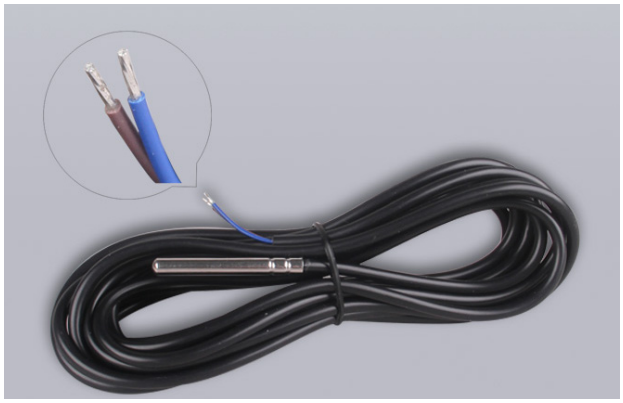
Code	Probe Size
0.6	0.6" stainless steel probe
*	Other lengths availabel, consult factory

Code	Temperature Curve
6	3K
7	10K Type2
9	100K
12	1K PT
24	10K Type3

*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don’t see what you need online.

Temperature Sensors

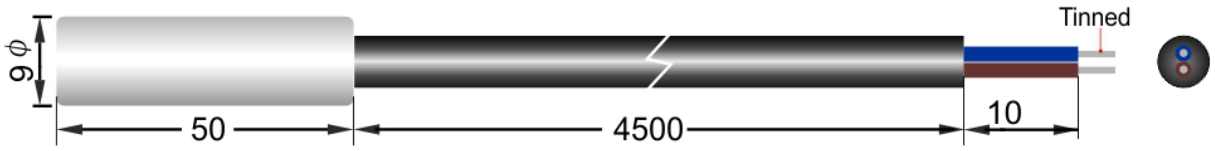
PRB-50-45-7 Temperature Sensor: ID6 X 50mmprobe temp sensor, 10K thermistor, Type 2



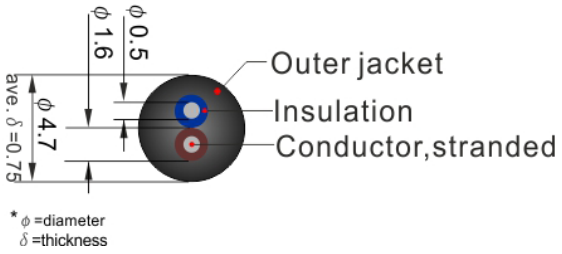
Dimensions:

unit:mm

1: Ø6x50 Stainless Steel
2: UL2464 20/2CAWG 105°C Black Wire



cross-section



Part Number Scheme:

PRB - 50 -45- 7

Code	Description
PRB	Temperature Probe

Code	Description
50	50mm stainless steel probe
*	Other lengths available, consult factory

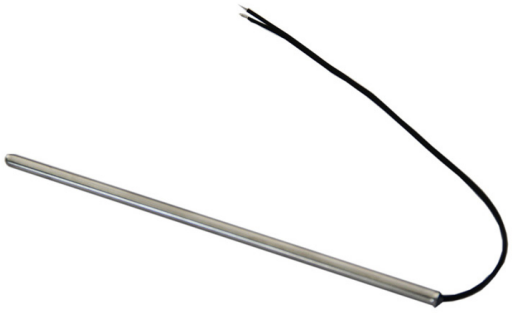
Code	Temperature Curve
7	10K Type 2
24	10K Type 3
12	1K PT
*	Other curve available, consult factory

Code	Cable length
45	4.5m
*	Other lengths available, consult factory

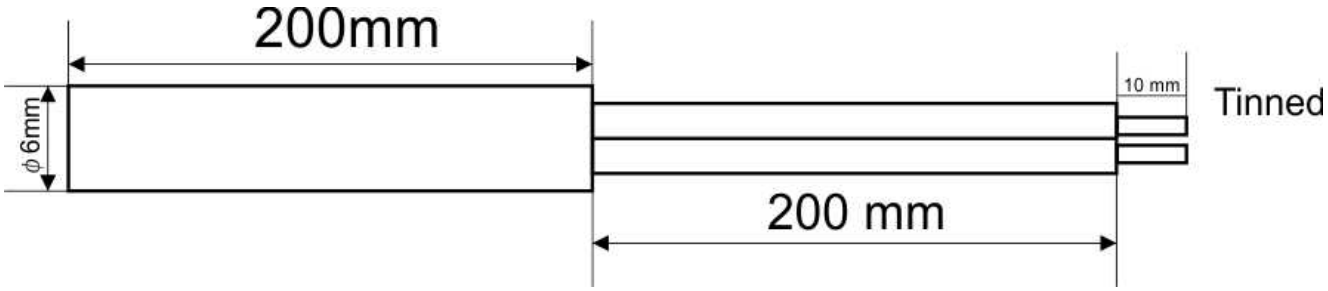
*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

Temperature Sensors

PRB-8-8-12 Temperature Sensor: ID6mm X 200mm probe temp sensor, 1K Platinum thermistor



Dimensions (mm):



Part Number Scheme:

PRB - 8 -8- 12

Code	Description
PRB	Temperature Probe

Code	Probe Length
8	8in

Code	Temperature Curve
2	100PT
6	3K
7	10K Type2
9	100K
12	1K PT
24	10K Type3

Code	Cable length
8	8in

*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

Accuracy Table:

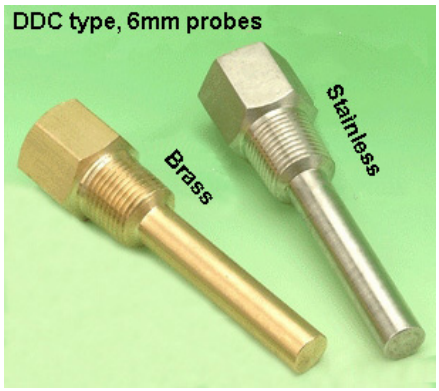
ACTUAL	RTD ACCURACY +/- °C PT100 Ω ALPHA 0.003850 to DIN 43760 IEC751 DIN EN 60 751			
	B GRADE	A GRADE	BAND 3 (1/3 DIN)	BAND 5 (1/10 DIN)
-200 °C	1.30 °C	0.55 °C	0.39 °C	0.38 °C
-150 °C	1.05 °C	0.45 °C	0.23 °C	0.21 °C
-100 °C	0.80 °C	0.35 °C	0.15 °C	0.12 °C
-90 °C	0.75 °C	0.33 °C	0.14 °C	0.10 °C
-80 °C	0.70 °C	0.31 °C	0.13 °C	0.09 °C
-70 °C	0.65 °C	0.29 °C	0.12 °C	0.08 °C
-60 °C	0.60 °C	0.27 °C	0.11 °C	0.07 °C
-50 °C	0.55 °C	0.25 °C	0.10 °C	0.06 °C
-40 °C	0.50 °C	0.23 °C	0.10 °C	0.06 °C
-30 °C	0.45 °C	0.21 °C	0.09 °C	0.05 °C
-20 °C	0.40 °C	0.19 °C	0.09 °C	0.04 °C
-10 °C	0.37 °C	0.17 °C	0.08 °C	0.03 °C
0 °C	0.30 °C	0.15 °C	0.08 °C	0.03 °C
10 °C	0.35 °C	0.17 °C	0.09 °C	0.04 °C
20 °C	0.40 °C	0.19 °C	0.10 °C	0.04 °C
30 °C	0.45 °C	0.21 °C	0.11 °C	0.05 °C
40 °C	0.50 °C	0.23 °C	0.12 °C	0.06 °C
50 °C	0.55 °C	0.25 °C	0.13 °C	0.07 °C
60 °C	0.60 °C	0.27 °C	0.14 °C	0.08 °C
70 °C	0.65 °C	0.29 °C	0.16 °C	0.09 °C
80 °C	0.70 °C	0.31 °C	0.17 °C	0.10 °C
90 °C	0.75 °C	0.33 °C	0.18 °C	0.11 °C
100 °C	0.80 °C	0.35 °C	0.19 °C	0.12 °C
110 °C	0.85 °C	0.37 °C	0.20 °C	0.13 °C
120 °C	0.90 °C	0.39 °C	0.21 °C	0.14 °C
130 °C	0.95 °C	0.41 °C	0.22 °C	0.15 °C
140 °C	1.00 °C	0.43 °C	0.24 °C	0.15 °C
150 °C	1.05 °C	0.45 °C	0.25 °C	0.16 °C
160 °C	1.10 °C	0.47 °C	0.26 °C	0.17 °C
170 °C	1.15 °C	0.49 °C	0.27 °C	0.18 °C
180 °C	1.20 °C	0.51 °C	0.29 °C	0.19 °C
190 °C	1.25 °C	0.53 °C	0.30 °C	0.21 °C
200 °C	1.30 °C	0.55 °C	0.31 °C	0.22 °C

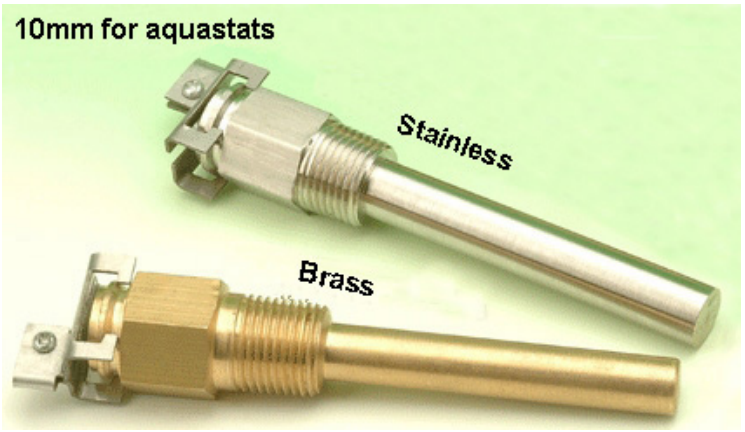
Temperature Sensors

Wells (Brass and Stainless Steel):

Description:

The stainless steel and brass thermowells which is machined from a single piece of bar stock, no welds, are designed for mounting temperature sensors in pipes and tanks. The thermowells are designed to reduce the stress encountered in a flowing fluid installation which produces a constantly oscillating force that can eventually crack a probe unless mounted within one of these wells. The wells are designed to handle the stress, while providing good thermal contact with fluid. They also provide isolation, if the sensor needs to be serviced the system can remain in operation without having to drain the lines.





Features & Options:

- Five Lengths: 2”, 3”,4” , 6”,and 8”
- Stainless Steel (304) or Brass
- Construction: machined from a single piece of bar stock, no welds.
- Other Lengths or Materials Available Upon Request
- Limited Lifetime Warranty
- NPT or BSP thread need to be specified when order

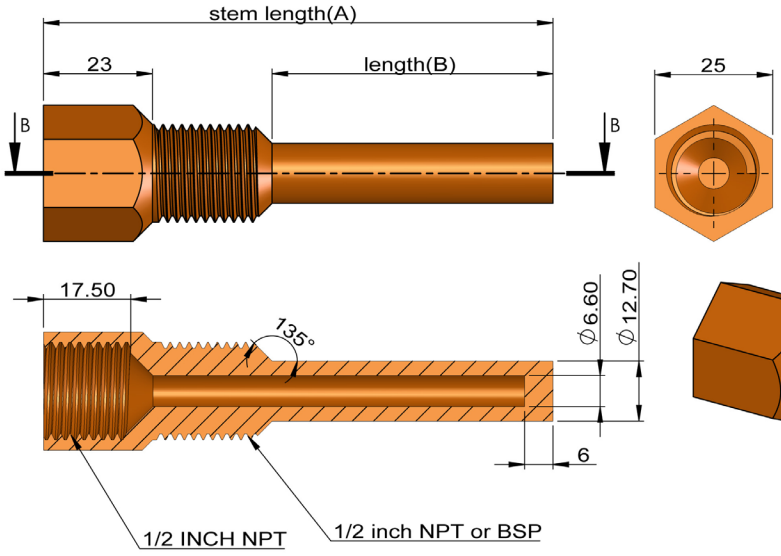
Specifications:

Maximum Fluid Velocity (Stainless steel 304)				
Thermowell lengths	2.5”	4”	6”	10”
Steam, air, gas& fluids with similar density	300 ft/sec	109 ft/sec	39.5 ft/sec	20.1 ft/sec
Water flow (safe values)	148 ft/sec	82.2 ft/sec	39.5 ft/sec	20.1 ft/sec

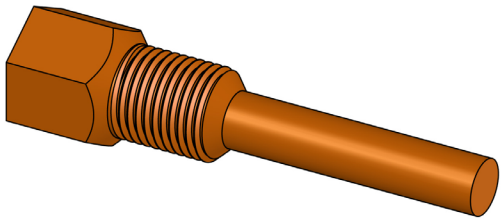
Maximum Fluid Velocity (Stainless steel 304)				
Temperature	70F	200F	400F	600F
Pressure	1600 psi	1600 psi	1600 psi	1600 psi

Temperature Sensors

Dimensions



standard		
inch	stem length(A)	length(B)
2"	60mm	11.5mm
3"	70mm	26.5mm
4"	108mm	59.5mm
6"	155mm	106.5mm
8"	200mm	151.5mm



note

internal thread is standard for NPT







Part Number Scheme:

WL-H-B-4-N

Code	Description
WL	Thermo well

Code	Inner Diameter
H	10mm for aquastats
-	DDC type, 6mm probes

Code	Material
B	Brass
S	Stainless steel 304

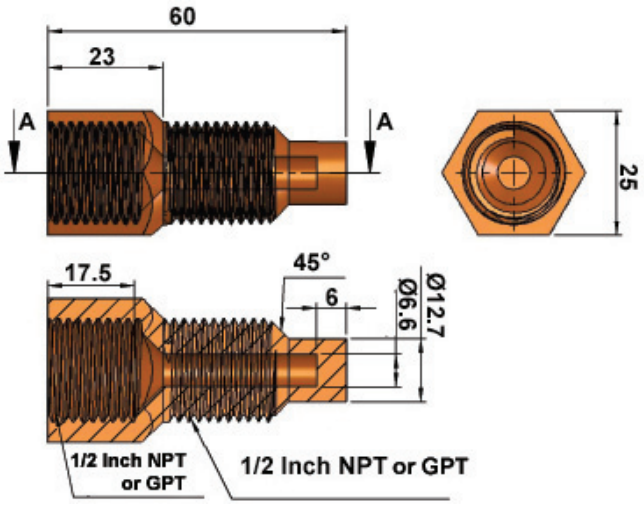
Code	Thread
N	NPT tapered thread
B	BSP British standard

Code	Probe Length
2	2 inch probe
3	3 inch probe
4	4 inch probe
6	6 inch probe
8	8 inch probe

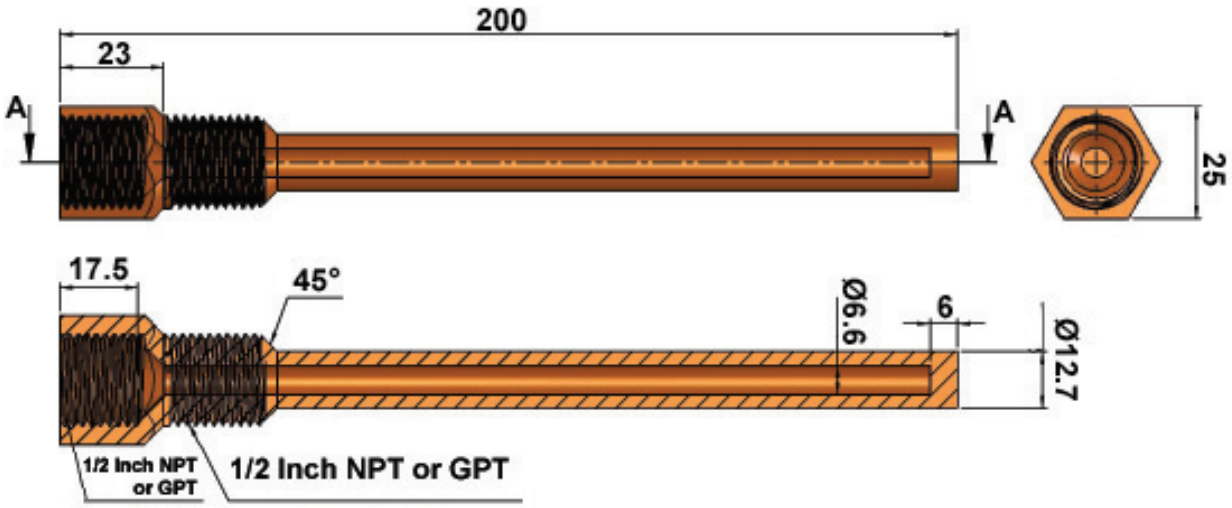
*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

DDC Type:

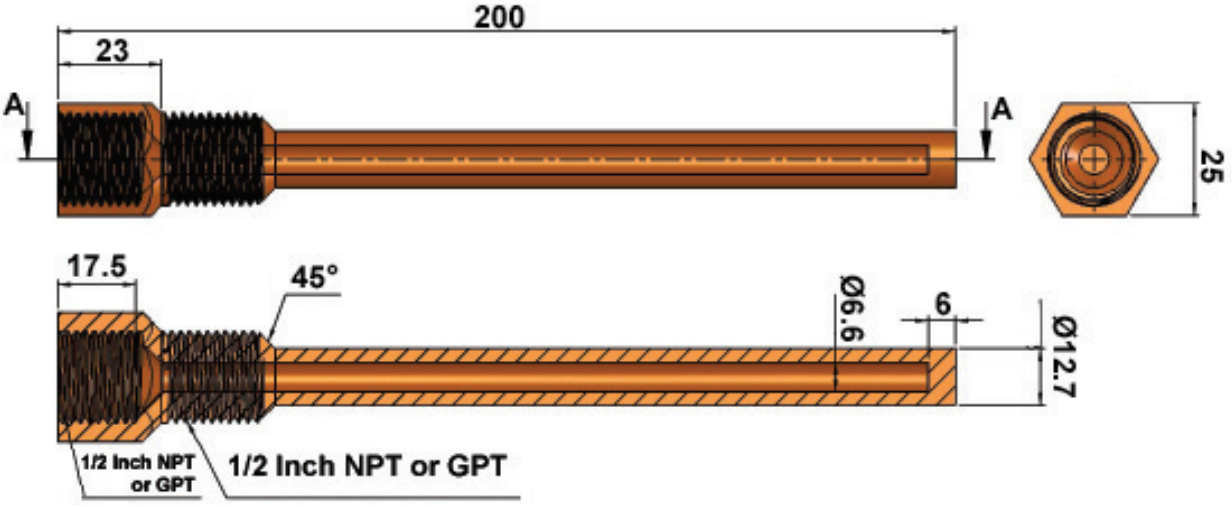
2 inch Dimensions (mm):



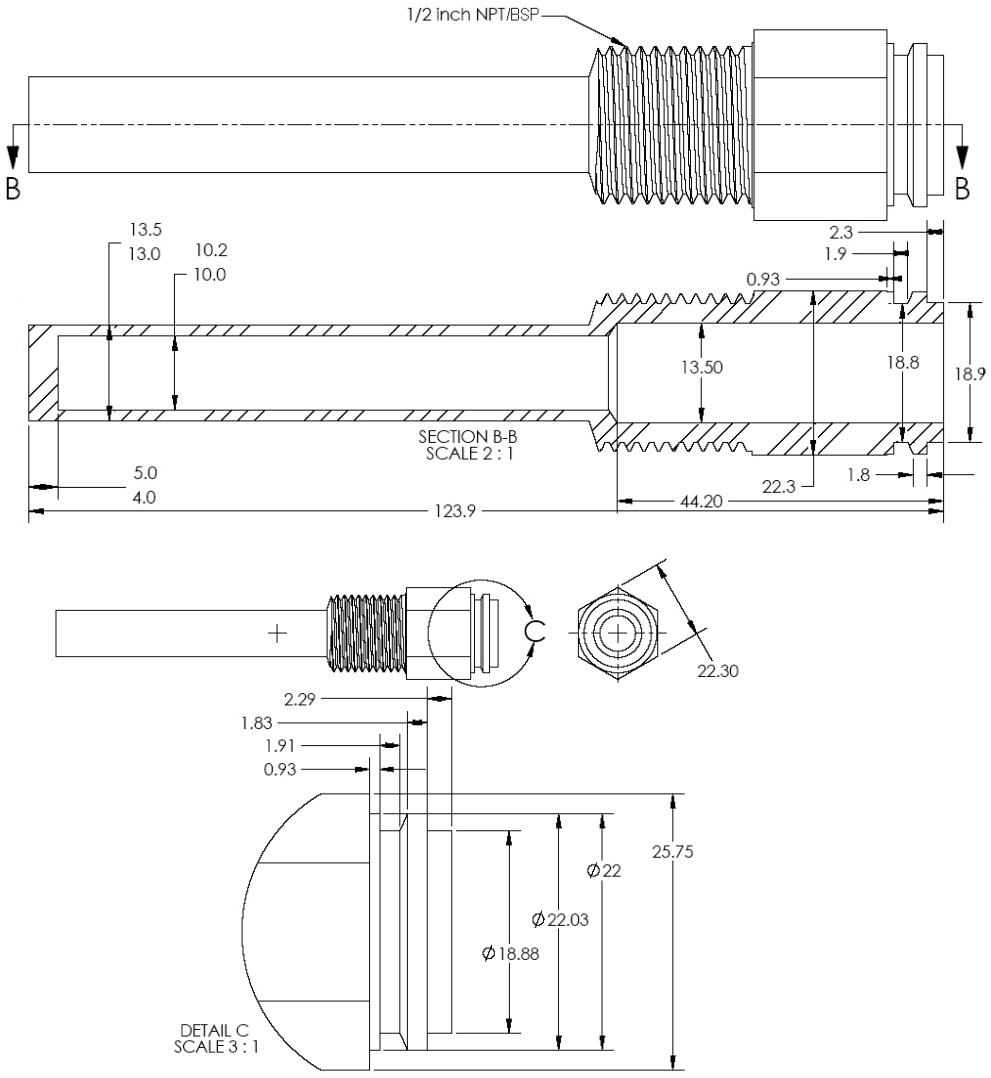
4 inch & 6 inch Dimensions (mm):



8 inch Dimensions (mm):

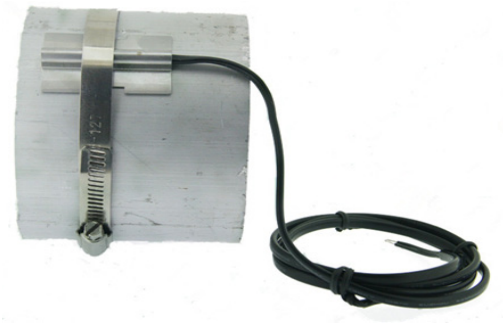


10mm for aquastats:



Temperature Sensors

Strap On Temperature Sensor



Features

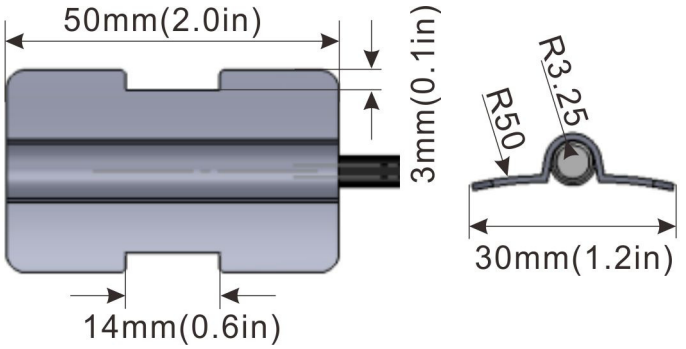
• Sensing elements
Thermistors and RTDs in all industry standard ranges.
• Included 300 mm adjustable strap-on band,for pipe diameter 13 to 92 mm (1/4“ to 3“)
• IP 54 protection
• Simple two wire connection
• Economical way to measure temperature
• Metal Wing: Stainless steel 304

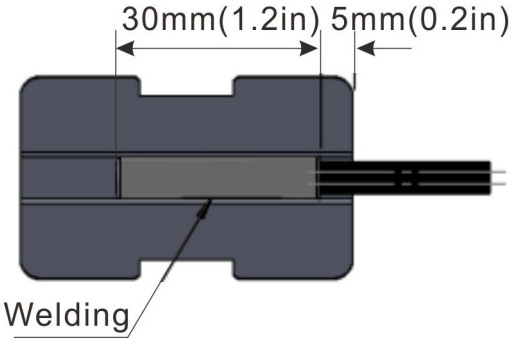


Application/Description

The strap-on temperature sensor is used for sensing the temperature of pipework in heating, ventilation and air conditioning systems.
The strap on sensor is available with RTD and PT type passive sensor elements.
Passive sensing elements is a low cost alternative to measure temperature with simple two wire connection.
The sensing element is housed in a 50 mm long metal wing.
The probe will be fixed to the pipe with an adjustable 300 mm, strap-on band, other strap-on lengths on request.

Dimension:





Part Number Scheme:

WTS6 - E - M - 7

Code	Description
WTS6	Water Temperature Sensor6

Code	Description
E	External
*	Other lengths available, consult factory

Code	Temperature Curve
6	3K
7	10K Type2
9	100K
12	1K PT
24	10K Type3

Code	Enclosure
M	Metal Wing

*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don’t see what you need online.

Temperature Sensors

Strap On Insert Temperature Sensor:





Strap-on Insert Sensor

The strap-on Insert sensor consists of a stainless steel sheath temperature sensor, thermal conducting compound, and an adjustable pipe bracket accessory. The stainless steel sheath temperature sensor is suitable for direct application to pipe surfaces for chilled or hot water measurement. It is also used for freezer cases, where moisture protection is important.

Strap-on Applications

Where it is not practical to install immersion wells, the stainless sheath sensor may be strapped to the pipe. A pipe strap accessory provides a bracket to hold a thermally conductive compound and clamps the sensor securely in place.

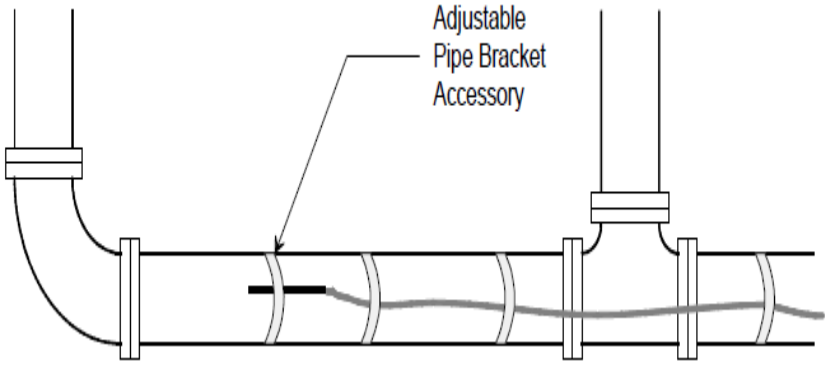
Make electrical connections to the sensor in accordance with the installation wiring diagram for the job and in accordance with national and local electrical codes. Use the one big-foot lead furnished with the sensor. ***Do not use wire nuts***.

Though the sensor itself does not require shielded cable, some controllers and microprocessors do; check with the controller supplier.

Accuracy ±36°F from 32°F to 158°F) ±2°C from 0°C to 70°C)
Stability 24°F (-4.4°C) over 5 years
Basic Model Basic model comes with one foot lead and a 0.24-inch stainless steel tube.

Typical Mounting

When used as a strap-on Insert sensor, best results are obtained when conductive compound is applied between the sensor and the pipe. In addition, the sensor should be inserted under insulation with at least 4mm of the sensor lead covered. A pipe clamp accessory is available for use with this sensor.



Temperature Sensors

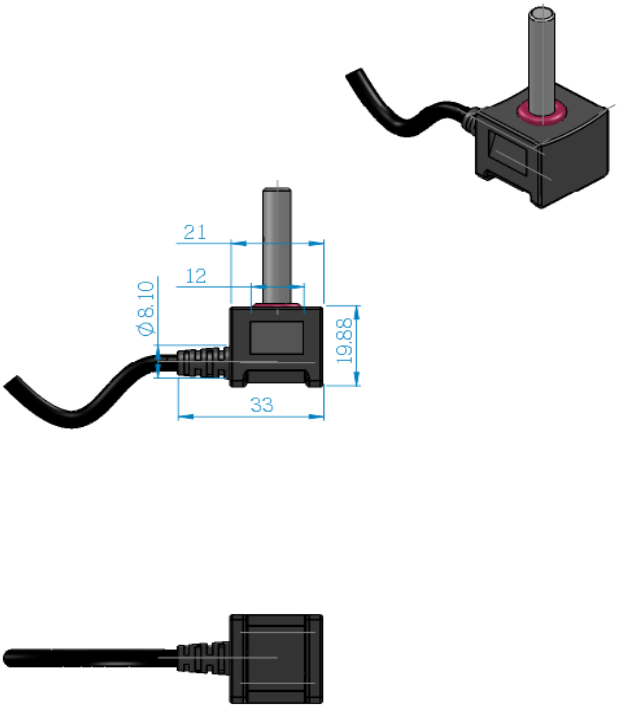
Strap On Insert Temperature Sensor:



Adjustable Pipe Bracket Accessory
The pipe bracket is designed for use with the stainless sheath sensor. The bracket can be used on pipe sizes from 2" (50.8mm) to 8" (203mm) outside diameter. Thermal conducting compound should be used with the bracket to improve heat transfer between the pipe and the temperature sensor.

130~152mm adjustable 304 stainless steel strap as a standard accessory with larger size available on request.

Dimensions



Part Number Scheme:

WTS6 - I - P - 7

Code	Description
WTS6	Water Temperature Sensor6

Code	Temperature Curve
6	3K
7	10K Type2
9	100K
12	1K PT
24	10K Type3

Code	Description
I	Insert Strap on
*	Other lengths available, consult factory

Code	Enclosure
P	Plastic Enclosure

*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

Temperature Sensors

Installation

1. Drill a hole which diameter is 8mm in the pipe



2. Put sensor into the hole



3. Attach with a stainless steel strap



Bacnet Room Setpoint& Temp Display

Descriptions



Bacnet Room Setpoint & Temp Display is designed for environment monitoring and controlling in industrial, commercial and other buildings. These transmitters can be used to monitor air temperature in various industrial and commercial settings. Modbus RS485/ Bacnet MS/TP for direct digital reading on all models.

Highlights:

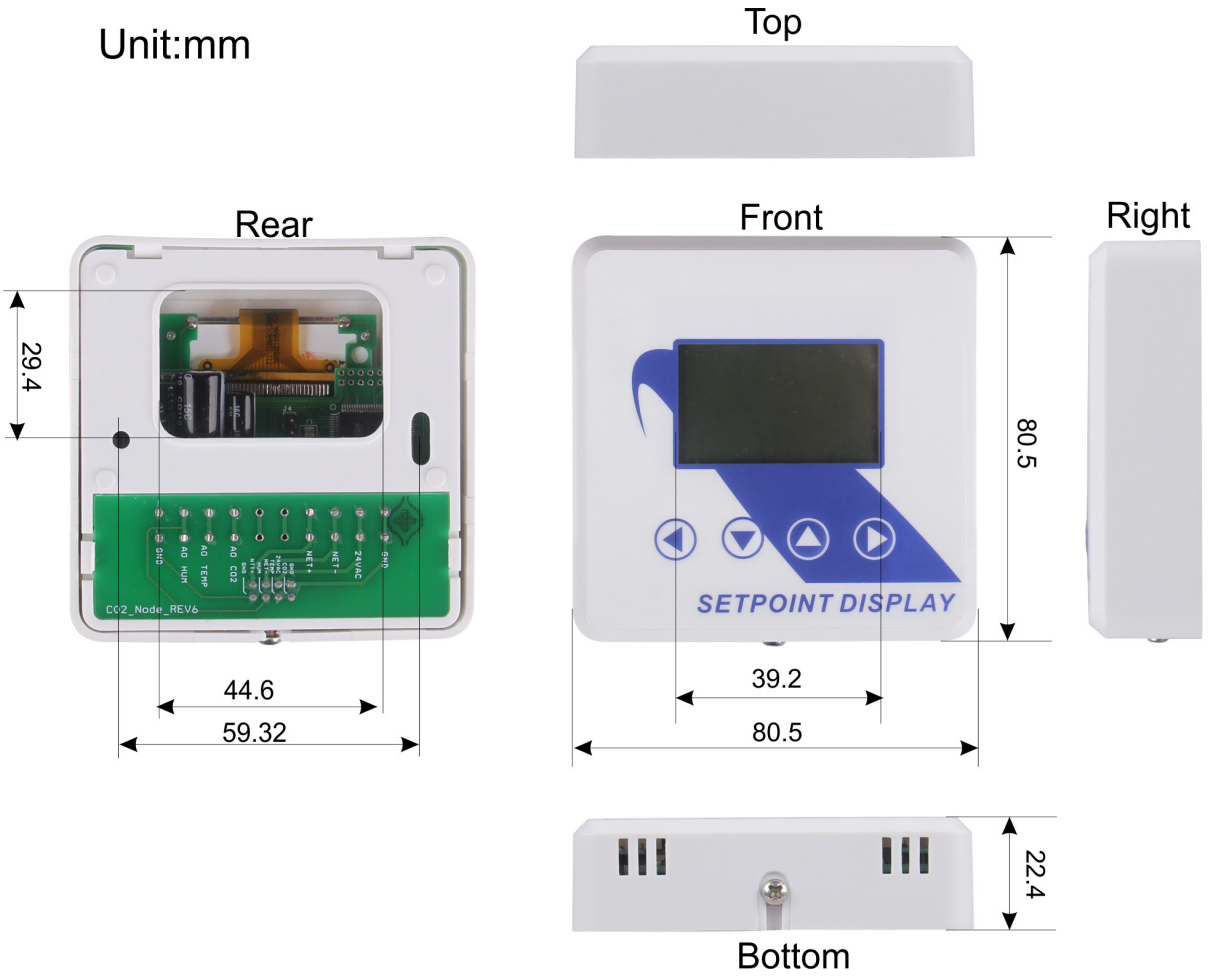
- The output signals and RS485 are hardened up for overvoltage and power supply crossed over.
- Display in degrees Fahrenheit or Celsius(connection to Bacnet).
- The LCD is a bitmap so we can show network connectivity.
- The user can configure what they want to show on the display: network activiy, baud rate, protocol, etc.
- You can show a user setpoint so you can use it as a room / setpoint display.
- RS485/Bacnet MS/TP for direct digital reading on all models

Specifications

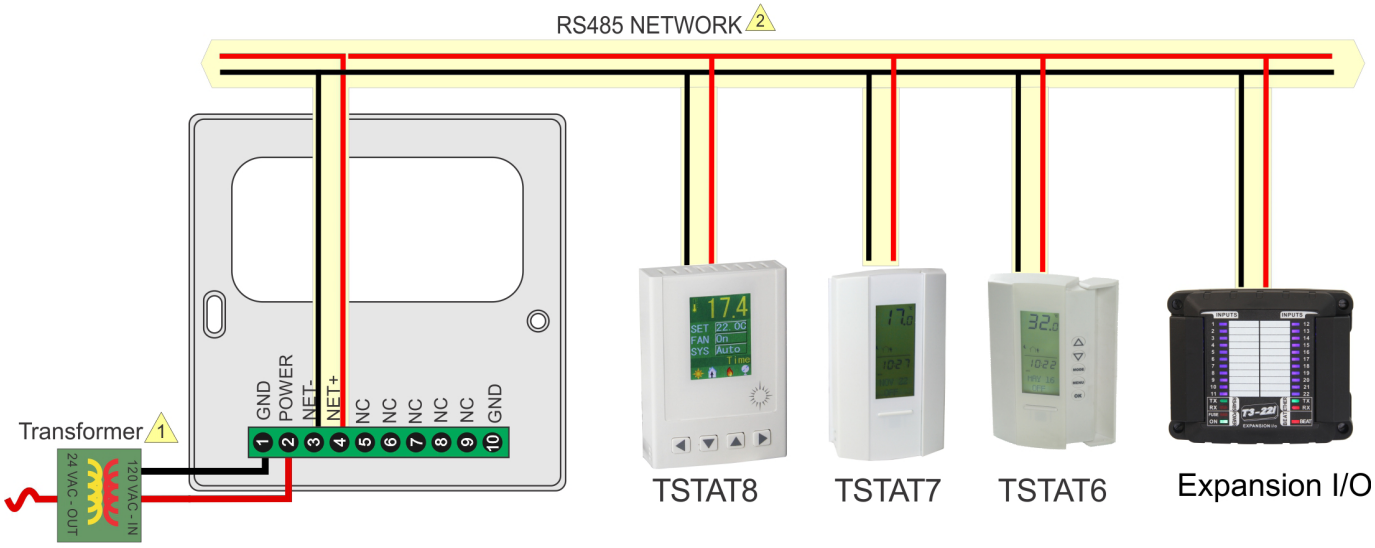
Typical Application	Wall mount indoors
Output Signal Type	Jumper select: 4-20mA,0-10V,0-5V
Output Signal Drive	> 500Ω for mA mode, 75mA max output drive for voltage mode
RS485 ports	1
Power	15-24V +/- 10%, AC or DC, 1 watt typical
Operating Temp	-30~+60°C, 0-95% non condensing
Plastic Housing	Flammability rating UL 94V0 file E194560
Display	LCD screen, Resolution 0.1°C, 0.1% RH
Control Features	N/A

Bacnet Room Setpoint& Temp Display

Dimension



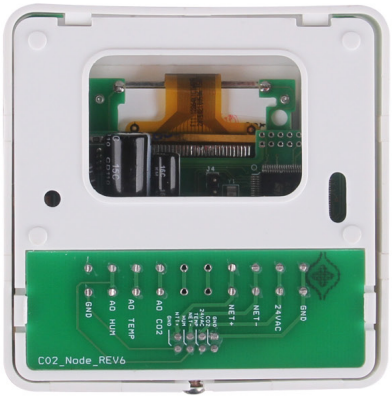
Backplate Features



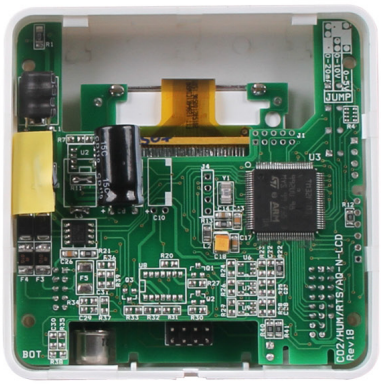
1 Power Supply, 15 to 24V, AC or DC

2 RS485 Net, 18ga twisted pair typical, optional ground & shield

Bacnet Room Setpoint& Temp Display



Rear



Rear of device



Front

Bacnet Room Setpoint& Temp Display

Modbus Register List

Address	Bytes	Register Description
0 to 3	4	Serial Number - 4 byte value. Read-only
4 to 5	2	Software Version – 2 byte value. Read-only
6	1	ADDRESS. Modbus device address
7	1	Product Model. This is a read-only register that is used by the microcontroller to determine the product
8	1	Hardware Revision. This is a read-only register that is used by the microcontroller to determine the hardware rev
9	1	PIC firmware version
10	1	PLUG_N_PLAY_ADDRESS, 'plug n play' address, used by the network master to resolve address conflicts. See VC code for algorithms
15	1	Baudrate Setting: 0 = 9600bps, 1 = 19200bps
16	1	Firmware Update Register, used to show the status of firmware updates
17 to 99		Blank, for future use
100	2	adc value of co2 voltage output, not used, read only
101	2	adc value of temperature voltage output, not used, read only
102	2	adc value of humidity voltage output, not used, read only
103	2	adc value of co2 current output, not used, read only
104	2	adc value of temperature current output, not used, read only
105	1	adc value of humidity current output, not used, read only
106	2	adc value of on board thermistor sensor, read only
107	2	adc value of on board light sensor, read only
108	2	co2 value (ppm). It will be calibrated if write to it.
109	2	co2 calibration offset. User can change it to calibrate the co2 ppm. It will be changed also if user write the data to register co2 ppm
110	1	Delta value for eliminating the pulse ppm value. The default value is 200.
111	2	Fitler times, make the ppm value go smooth. The default value is 5.
112	2	The fair alarm ppm setpoint of co2 sensor.
113	2	The poor alarm ppm setpoint of co2 sensor.
114	1	co2 alarm status:
		0b'xxxx 1xxx': co2 poor
		0b'xxxx 01xx': co2 fair
		0b'xxxx 001x': co2 good
115	1	the version number of humidity sensor
116	2	the relative humidity
117	2	the frequency value read from humidity sensor, read only
118	1	the number of calibration points of the humidity sensor
119	2	degree celsius temperature value of the humidity sensor
120	2	degree fahrenheit temperature value of the humidity sensor
121	2	celsius degree temperature value of the on board thermistor sensor
122	2	fahrenheit degree temperature value of the on board thermistor sensor

Modbus Register List

Address	Bytes	Register Description
123	2	the offset for calibrating the on board thermistor sensor
124	1	select the temperature direct to analog output: 0: on board thermistor sensor, default setting 1: humidity sensor
125	1	select the temperature unit direct to analog output:
		0: degree celsius
		1: degree fahrenheit, default setting
126	2	Lighting value, for feature
127	1	analog output mode, change it by setting the jumper (J20) on the board, read only
128	2	the minimum value of temperature directs to the analog output
129	2	the maximum value of temperature directs to the analog output
130	2	the minimum value of humidity directs to the analog output
131	2	the maximum value of humidity directs to the analog output
132	2	the minimum value of co2 directs to the analog output
133	2	the maximum value of co2 directs to the analog output
		e.g. co2 output: if the co2 ppm is 1000, the (minimum value, maximum value) = (0, 3000), then
		1. setting J20 to select 0V-10V output mode, so the co2 output is about ((1000ppm / (3000ppm - 0ppm)) * (10V - 0V)) + 0V = 3.3V
		2. setting J20 to select 0V-5V output mode, so the co2 output is about ((1000ppm / (3000ppm - 0ppm)) * (5V - 0V)) + 0V = 1.65V
		3. setting J20 to select 4mA-20mA output mode, so the co2 output is about ((1000ppm / (3000ppm - 0ppm)) * (20mA - 4mA)) + 4mA = 9.3mA
500	1	co2 automatic compensation background enalbe or disable.0 = Disable,1= Enable.
501	2	“Background C02”, default is 400ppm, minimum is 390, max is 500.
502	1	Maximum adjustment per day” default is 1ppm, max is 10 ppm, minimum is 1.
503	1	“Number of days to watch for minimum” , default is 7 days. Max is 30 days. Minimum is 2 days.
505	2	co2 background calibration offset.

Bacnet Room Setpoint& Temp Display

Bacnet Register List

Value	Value and Description
AV1	SerialNumber LowByte
AV2	SerialNumber HighByte
AV3	SoftWare Version
AV4	Modbus id
AV5	Product Model
AV6	Instance
AV7	Station Number
AV8	BaudRate
AV9	Update
AV10	Protocol switch. 0 = MODBUS,1=MSTP.
AV11	Auto/Manual,Analog output auto/manual control. Bit 1 directs to temperature output, 0=Auto, 1=Manual.
AV12	Dew Point
AV13	Passwords
AV14	Mixing Ratio, the mass of water over the mass of dry gas, [g/kg]
AV15	Enthalpy of the air, [kJ/kg]
AV16	Spare
AV17	Temperature Offset
AV18~AV19	Spare
AV20	Temperature Filter
AV21	Spare
AV22	Temperature Unit
AV23	Output Mode
AV24~ AV25	Spare
AV26	Minimal Range for temperature
AV27	Maxium Range for temperature
AV28~AV30	Spare
AV31	Temperature Setpoint
AV32	Spare

Analog Intput	Analog Input and Description
AI1	Spare
AI2	Temperature
AI3	Spare

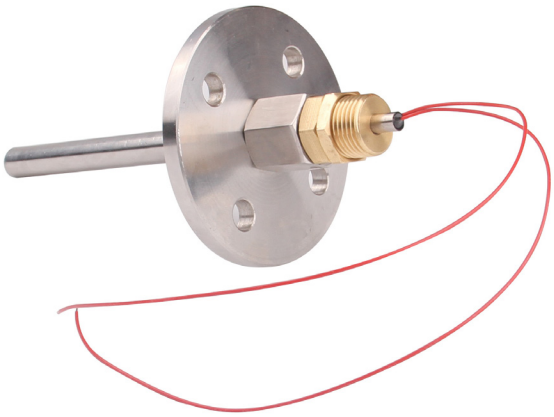
Bacnet Room Setpoint& Temp Display

Analog Output	Analog Output and Description
AO1	Spare
AO2	Temperature
AO3	Spare

Boiler Stack Temperature Sensor and Thermowell

Description

The Boiler stack temperature sensor and well is designed to monitor the temperature of boiler stacks,steam lines,and other applications where the temperature may rise above the operating range of standard sensors.The Platinum thermistor sensor embedded in a stainless steel housing allows for protection against water ingress that cause traditional temperature sensors to fail. When it's used with the RTD2 Transmitter,a 1~5V output is created to measure the temperature. To adjust the RTD2,set the DIP switches to match the desired range and use the zero to fine tune .Digital ohmmeter are required.



Highlights

- All stainless steel probe;
- High temperature span,-200 ℃ ~300 ℃;
- Brief response time;
- Low self-heating rate;
- Long-Term Stability;
- Resistant against vibration and temperature shocks.



RTD2

Specifications

Operating Temperature Range	-200 °C ~300 °C
Operating Pressure	3000 psig (20.7 mPa) max
Accuracy	Calibration accuracy ±0.05% of span
B Value:	1000Ω ±1%
Temperature Coefficient	TCR = 3850 ppm/K
Sensor Type	1K Platinum thermistor
Sensor Leads	Two-wire nickel coated stranded copper
Extension	Wire connections
Probe Material	Stainless Steel 304
Well Material	Stainless Steel 304

Supply Voltage	12~24VDC
Signal Output	1~5V
Maximum Output Impedance	675Ω@24VDC
Accuracy	0.1°F
Operating Humidity	0% to 95% non-condensing

Boiler Stack Temperature Sensor and Thermowell

Part Number Scheme

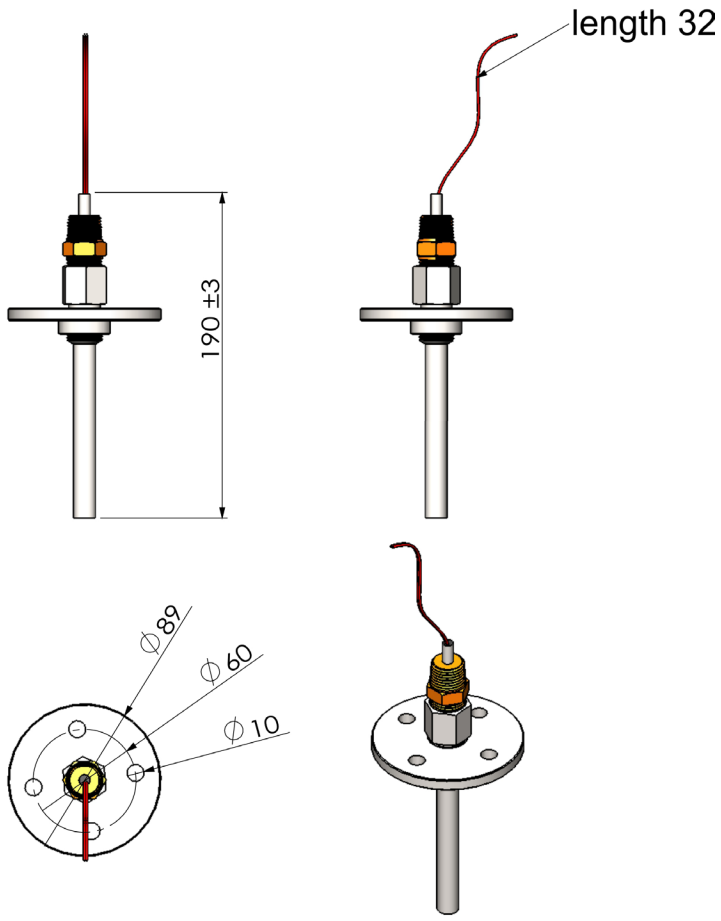
BTS-12

Code	Description
BTS	Boiler stack temperature sensor and well

Code	Temperature Curve
12	1K PT

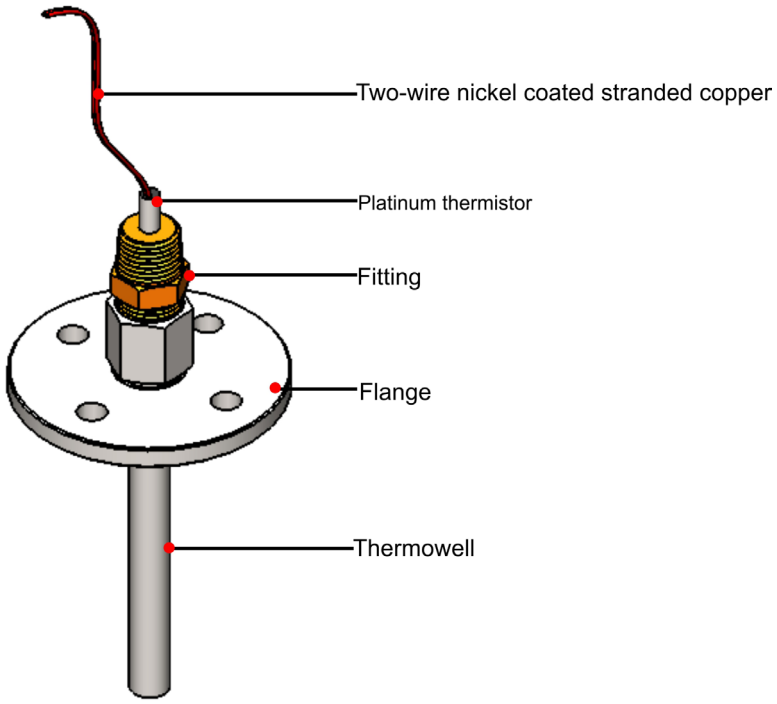
Dimension

Unit:mm



Boiler Stack Temperature Sensor and Thermowell

Structure Graphic



RTD2 Calibration to Zero-Point

The RTD2 transmitter can be field-calibrated by using the ZERO potentiometers.Use the step-by-step instructions below to the Zero-Point

Step 1 Assemble required equipment:temperature transmitter,24VDC Power supply ,RTD Volt-age vs Temperature Chart ,digital VOM.

Step 2 Use a High-Precision PT100 to get 1 Volt on the VOM.

Overmolded temp Sensor

Description

The Overmolded temp sensor is a 10K type2 thermistor sensor with -50~105 Deg C cable,4.5m in length,two black wires with soldered connected to the end

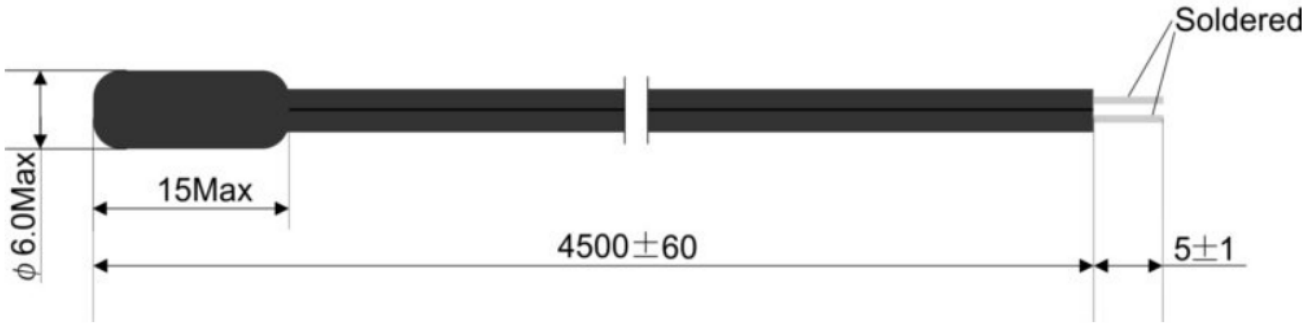


Highlights

- Temperature range:-50°C~+105°C
- Waterproof degree:IP68
- Available in a variety of connector types

Dimension

unit:mm



Temperature and Humidity Transducer with Bacnet & Modbus port

Description

Duct temperature and humidity sensor / transmitter is applicable to all kinds of building automation, environment monitoring, HVAC systems. Product appearance is simple, direct connection terminals, convenient installation.Products use high performance embedded microprocessor, and high-precision sensors to meet all kinds of high precision,high stability of the temperature and humidity measurement requirements , and variety needs of different environments.Duct temperature sensor / transmitter has current, voltage, 485 output signal to select, using 485 serial port out put and Modbus communication protocol. It is commonly used in HVAC, electrical plant,environment monitoring,dynamic environment monitoring, agricultural environmental monitoring, meteorological environmental monitoring,environmental monitoring of biological pharmacy, airport, subway stations, hotel,museum,



XDUCER-D-TH

Higslights

-High precision temperature and humidity sensor
-Applicable to all types of air environmental monitoring
- HVAC systems
-Advanced circuit design, high accuracy,stable performance
-Appearance is concise,easy to install, cost-effective



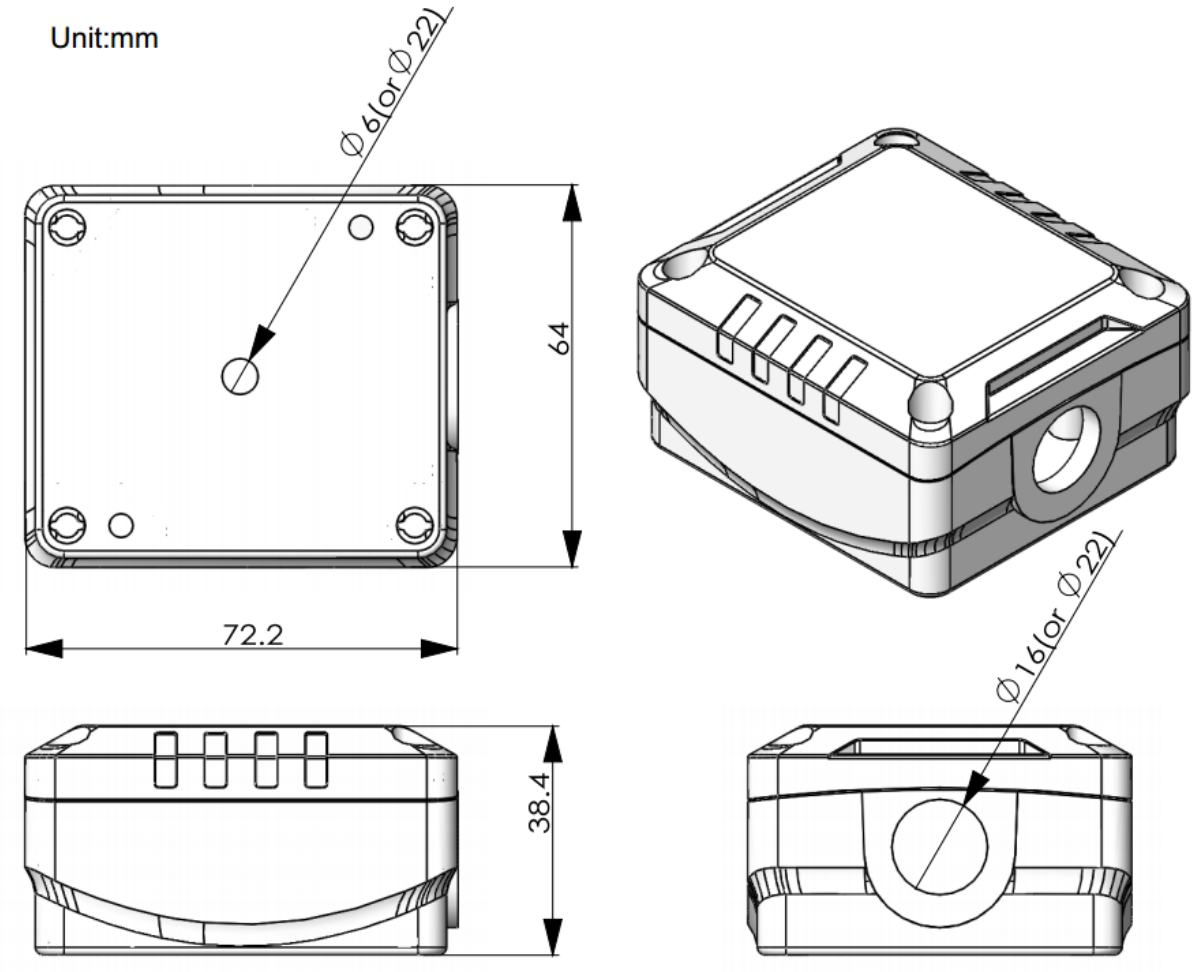
XDUCER-D-T

Specifications

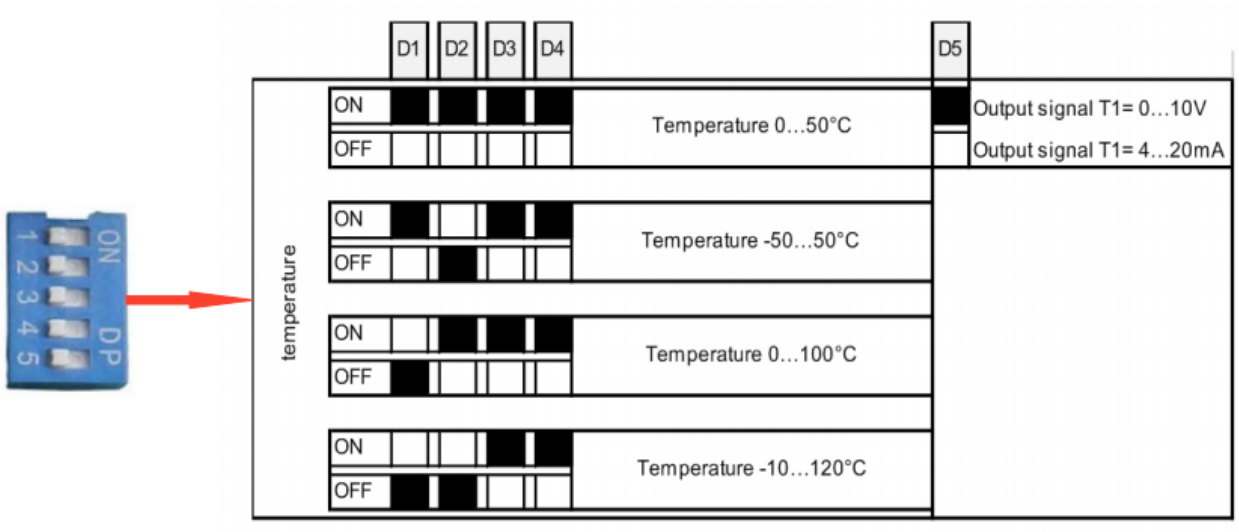
Typical Application	Duct mount indoors	
Output Signal Type	Jumper select:4-20mA,0-10V	
Output Signal Drive	>500Ω for mA mode,75mA max output drive for voltagemode	
Power	15-24V+/-10%, AC or DC,1watt typical	
Operating Temp	-30~+60°C,0-95%non condensing	
Plastic Housing	Flammability rating UL94V0 file E194560	
Control Features	N/A	
HUM	Sensor Type	Capacitive
	Range	0-100%Non-Condensing
	Accuracy	5%@25°C,20~80%
	Drift	<0.5%RH/year
TEMP	Sensor Type	10K thermistor
	Range	-40~150°C(-60~340°F)
	Accuracy	<±0.5°C@25°C
Size	72.2mmX64mmX38.4mm	

Temperature and Humidity Transducer with Bacnet & Modbus port

Dimension

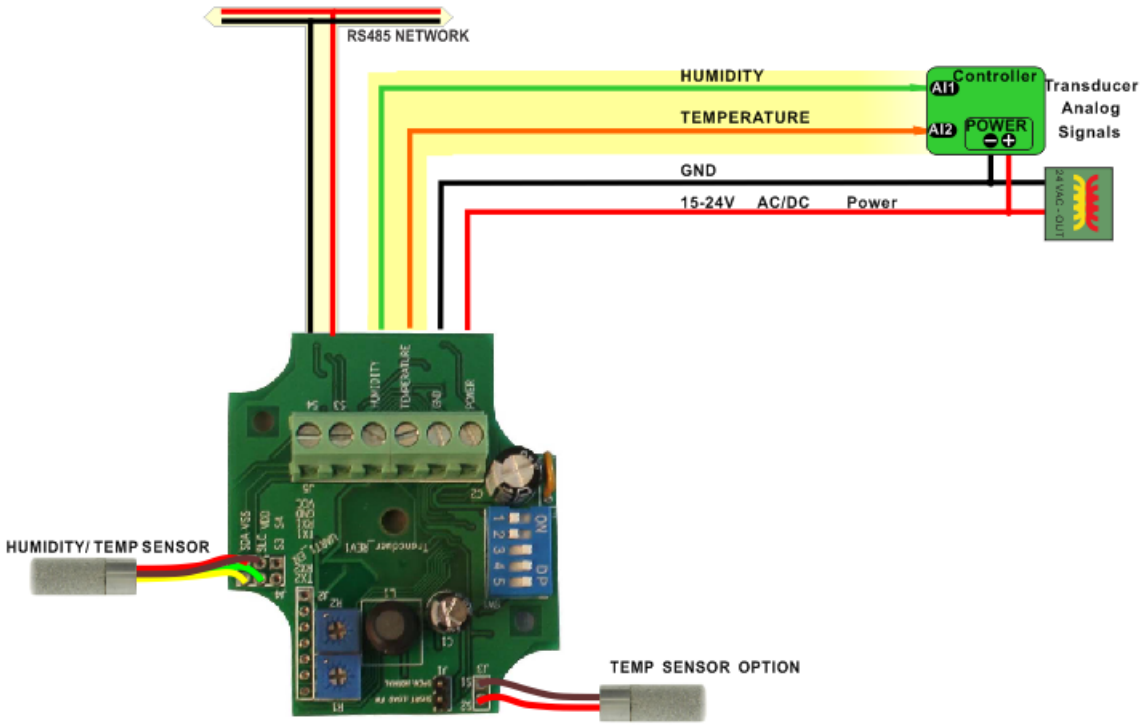


Jumper Settings



Temperature and Humidity Transducer with Bacnet & Modbus port

Wiring Diagram



Modbus Register List

ADDRESS	Register Description
0-3	Serial number
4	Software version
6	Modbus Address
8	Hardware version
17	Switch 5, 1=0…10V, 0=4…20mA
18	Switch 1-2, 0=0-100,1=-20…80,2=0…50,3=-50…50
19	Switch 3-4, 0=dewPoint, 1=enthalpy, 2=absolute humidity,3=real humidity
25	potentiometer R1 AD value
27	potentiometer R2 AD value
34	SHT 35 Temperature
35	SHT 35 Humidity
45	NTC temperature
36	potentiometer R1 offset value
37	potentiometer R2 offset value
38	Temperature with offset
39	Humidity with offset
41	Dew point value
42	Enthalpy value
44	Absolute humidity
51	Test switch, if on, input voltage to register 52,53
52	Input voltage for Temperature output, 500 mean 5.00 v
53	input voltage for humidity output, 500 mean 5.00 v
54	input current for temperature output, 4 mean 4mA
55	input current for humidity output, 4 mean 4mA
60-76	NTC sensor 17 calibration points
80	NTC sensor's AD value

Temperature and Humidity Transducer with Bacnet & Modbus port

Part Number Scheme

XDUCER — D — TH

Code	Description
XDUCER	Transducer Sensor

Code	Module
D	Duct Mount

Code	Option
T	Temp
TH	Temp & Hum

Mounting Installation

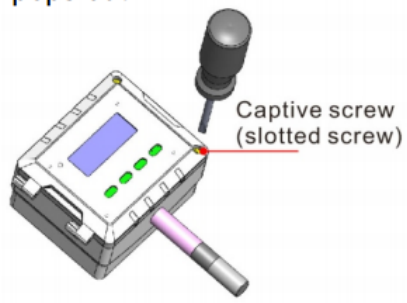
1)slotted screwdriver



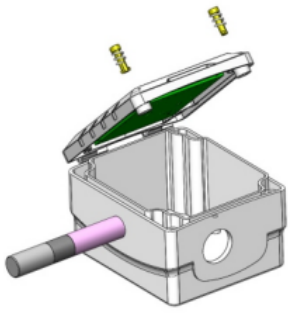
Captiver screw(slotted screw)



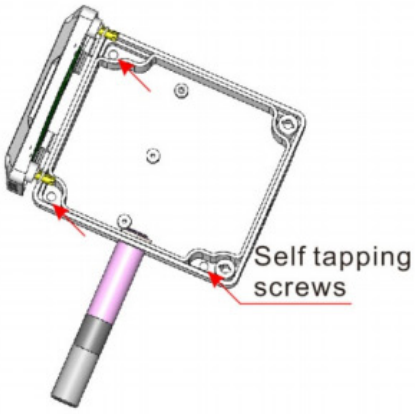
2)Unfasten screw at cover,turn the captive screw ½ turn till it pops out

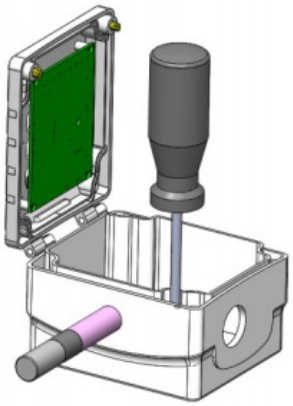


3)Open the cover

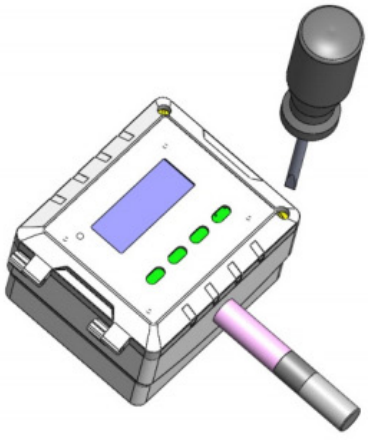


4)There are three small holes as red arrows showed below inside the box for fastening self tapping screws drilling the hole in the duct with a template





5)Re-fasten screw at cover



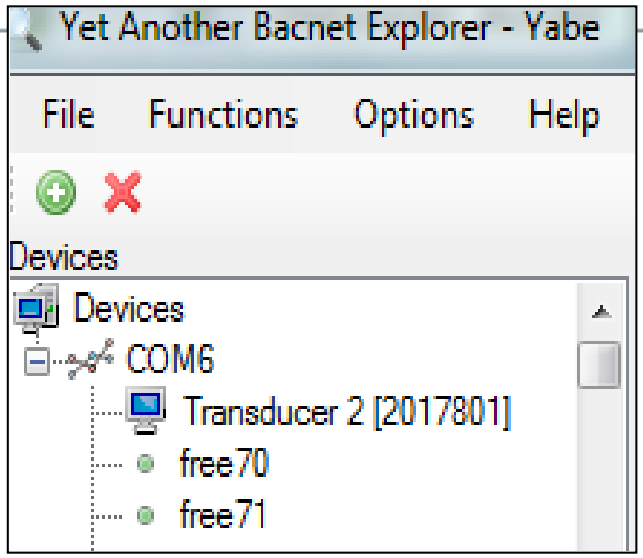
Temperature and Humidity Transducer with Bacnet & Modbus port

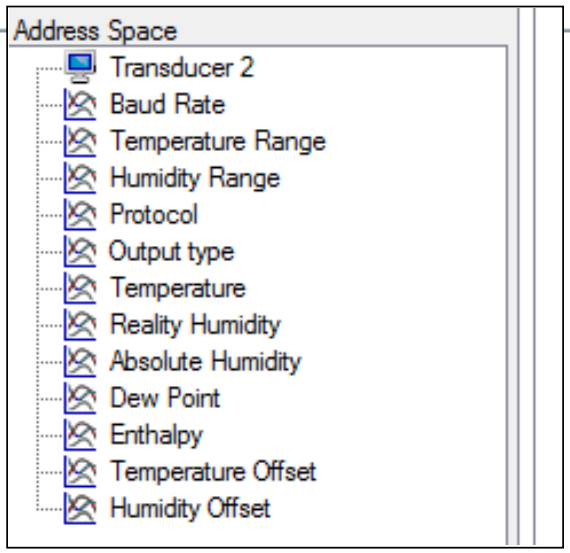
Bachnet Object List

Supported BACnet Object Types
analog-value, 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

MSTP Object

Analog-value	AV0:baudrate select	
	AV1:Temperature range	0=0-100℃; 1=-20...80℃ ;2=0...50℃; 3=-50...50℃
	AV2:Humidity range	0=dewPoint, 1=enthalpy, 2=absolute humidity,3=real humidity
	AV3:Protocol	0: Modbus; 1:Bacnet
	AV4:Output type	0: 4~20mA; 1: 0-10V
	AV5:Temperature	
	AV6:Reality Humidity	
	AV7:Absolute Humidity	
	AV8:Dew Point	
	AV9:Enthalpy	
	AV10:Temperature Offset	Range: -4.0 ~ 4.0
	AV11: Humidity Offset	Range: -4.0 ~ 4.0
Device	device-identifier,device-name	





Air Quality, Hunm&Temp

Descriptions

Air Quality Node is designed for environment monitoring and controlling in industrial, commercial and other buildings. These transmitters can be used to monitor air quality and temperature in various industrial and commercial settings. Modbus RS485/Bacnet MS/TP for direct digital reading on all models.



AQ-N-LCD



AQ-N

Highlights:

- The RS485 are hardened up for overvoltage and power supply crossed over.
- Display in degrees Fahrenheit or Celsius(connection to Bacnet).
- The LCD is a bitmap so we can show network connectivity.
- The user can configure what they want to show on the display: network activiy, baud rate, protocol, etc.
- You can show a user setpoint so you can use it as a room / setpoint display.
- RS485/Bacnet MS/TP for direct digital reading on all models

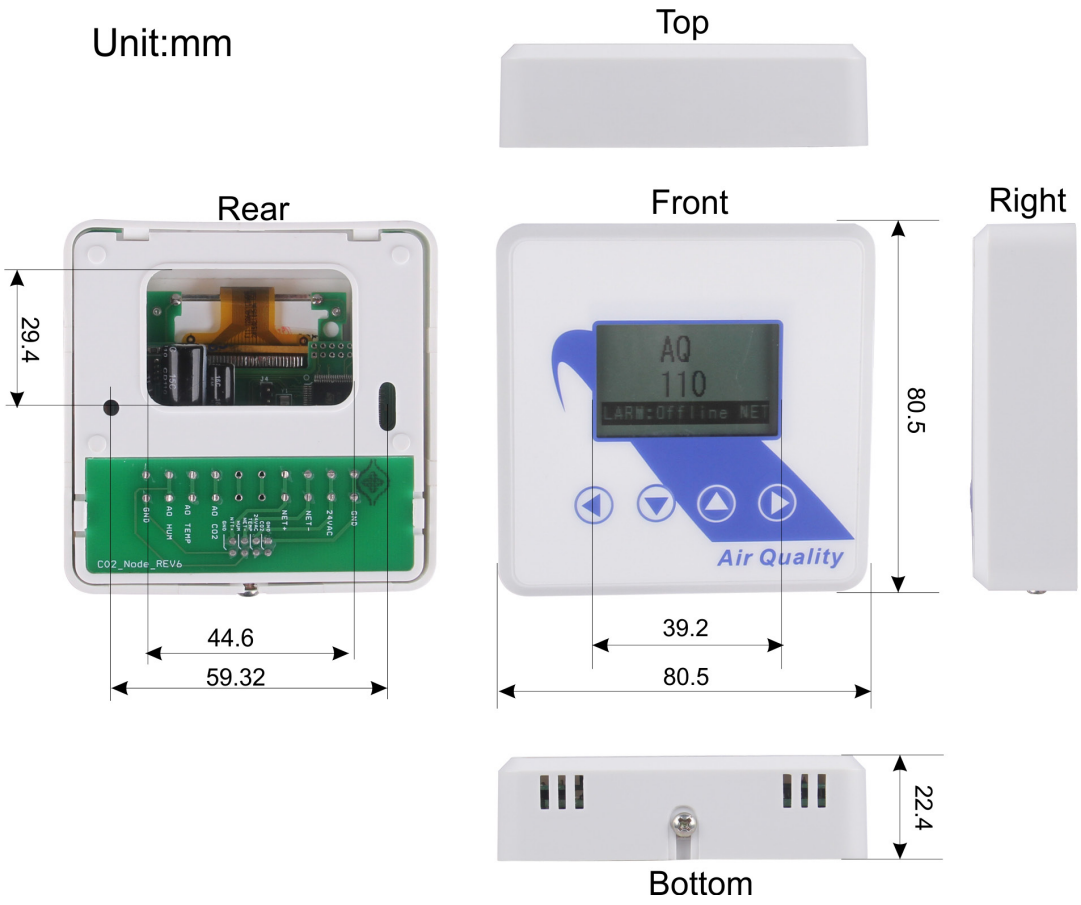
Specifications

Typical Application	Wall mount indoors	
RS485 ports	1	
Power	15-24V +/- 10%, AC or DC, 1 watt typical	
Operating Temp	-30~+60°C, 0-95% non condensing	
Plastic Housing	Flammability rating UL 94V0 file E194560	
Display	LCD screen, Resolution 0.1°C, 0.1% RH	
Control Features	N/A	
TEMP	Sensor Type	10K thermistor
	Range	-40~150°C(-60~340°F)
	Accuracy	< ±0.5°C @ 25°C
AQ	Sensor Type	TGS2600
Size	80.5 (L)x 80.5(W)x22.4(H)mm	

Dimension

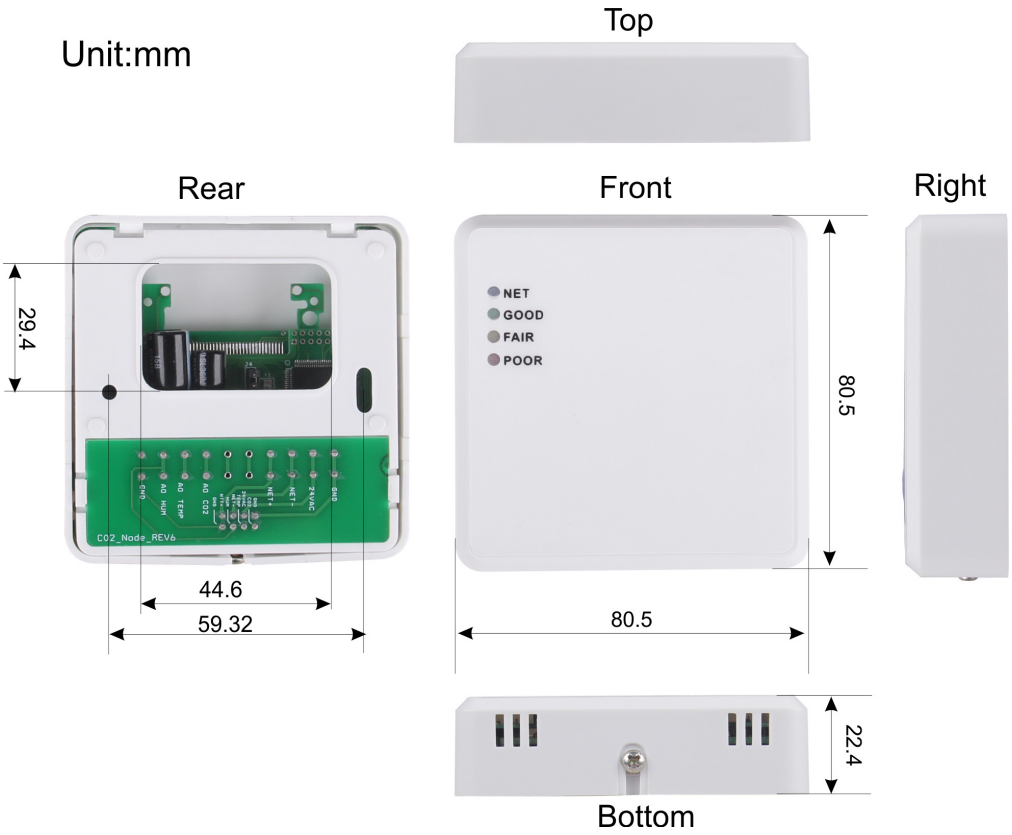
AQ-N-LCD

Unit:mm

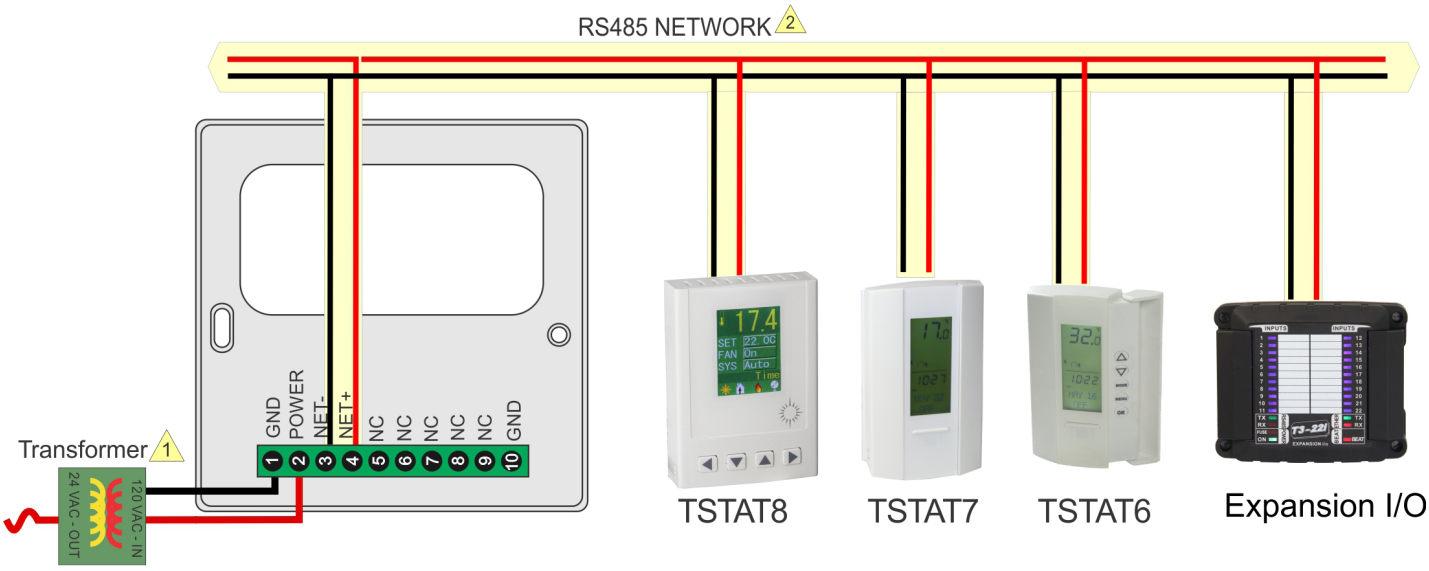


AQ-N

Unit:mm



Backplate Features

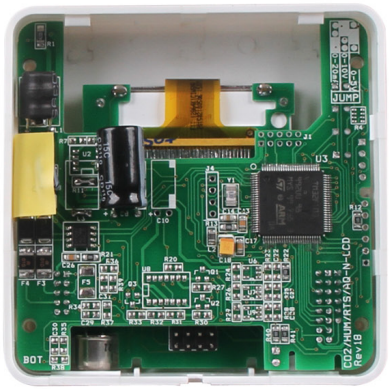


1 Power Supply, 15 to 24V, AC or DC

2 RS485 Net, 18ga twisted pair typical, optional ground & shield



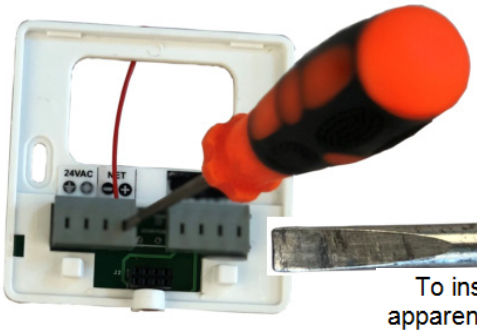
Rear



Rear of device



Front



Front

Installation instructions

Flat screwdriver tip

To insert wires into the unscrew terminals there is a small trick which may not be apparent to folks who have not used these terminals before. Strip the wire about half a centimeter and twist the strands together if its stranded conductor. Gently press the end of a small flat screwdriver into the slot as shown. This will push back a spring inside the terminal and open up the wire entry port, insert the wire into the hole while maintaining pressure with the screwdriver. Release the screwdriver and the connection is made. Tug on the wire to make sure there's good contact, the wire should not pull out.

Air Quality, Hunm&Temp

Modbus Register List

Address	Bytes	Register Description
0 to 3	4	Serial Number - 4 byte value. Read-only
4 to 5	2	Software Version – 2 byte value. Read-only
6	1	ADDRESS. Modbus device address
7	1	Product Model. This is a read-only register that is used by the microcontroller to determine the product
8	1	Hardware Revision. This is a read-only register that is used by the microcontroller to determine the hardware rev
9	1	PIC firmware version
10	1	PLUG_N_PLAY_ADDRESS, 'plug n play' address, used by the network master to resolve address conflicts. See VC code for algorithms
15	1	Baudrate Setting: 0 = 9600bps, 1 = 19200bps
16	1	Firmware Update Register, used to show the status of firmware updates
17 to 99		Blank, for future use
100	2	adc value of co2 voltage output, not used, read only
101	2	adc value of temperature voltage output, not used, read only
102	2	adc value of humidity voltage output, not used, read only
103	2	adc value of co2 current output, not used, read only
104	2	adc value of temperature current output, not used, read only
105	1	adc value of humidity current output, not used, read only
106	2	adc value of on board thermistor sensor, read only
107	2	adc value of on board light sensor, read only
108	2	co2 value (ppm). It will be calibrated if write to it.
109	2	co2 calibration offset. User can change it to calibrate the co2 ppm. It will be changed also if user write the data to register co2 ppm
110	1	Delta value for eliminating the pulse ppm value. The default value is 200.
111	2	Fitler times, make the ppm value go smooth. The default value is 5.
112	2	The fair alarm ppm setpoint of co2 sensor.
113	2	The poor alarm ppm setpoint of co2 sensor.
114	1	co2 alarm status:
		0b'xxxx 1xxx': co2 poor
		0b'xxxx 01xx': co2 fair
		0b'xxxx 001x': co2 good
115	1	the version number of humidity sensor
116	2	the relative humidity
117	2	the frequency value read from humidity sensor, read only
118	1	the number of calibration points of the humidity sensor
119	2	degree celsius temperature value of the humidity sensor
120	2	degree fahrenheit temperature value of the humidity sensor
121	2	celsius degree temperature value of the on board thermistor sensor
122	2	fahrenheit degree temperature value of the on board thermistor sensor

Air Quality, Hunm&Temp

Address	Bytes	Register Description
123	2	the offset for calibrating the on board thermistor sensor
124	1	select the temperature direct to analog output: 0: on board thermistor sensor, default setting 1: humidity sensor
125	1	select the temperature unit direct to analog output:
		0: degree celsius
		1: degree fahrenheit, default setting
126	2	Lighting value, for feature
127	1	analog output mode, change it by setting the jumper (J20) on the board, read only
128	2	the minimum value of temperature directs to the analog output
129	2	the maximum value of temperature directs to the analog output
130	2	the minimum value of humidity directs to the analog output
131	2	the maximum value of humidity directs to the analog output
132	2	the minimum value of co2 directs to the analog output
133	2	the maximum value of co2 directs to the analog output
		e.g. co2 output: if the co2 ppm is 1000, the (minimum value, maximum value) = (0, 3000), then
		1. setting J20 to select 0V-10V output mode, so the co2 output is about ((1000ppm / (3000ppm - 0ppm)) * (10V - 0V)) + 0V = 3.3V
		2. setting J20 to select 0V-5V output mode, so the co2 output is about ((1000ppm / (3000ppm - 0ppm)) * (5V - 0V)) + 0V = 1.65V
		3. setting J20 to select 4mA-20mA output mode, so the co2 output is about ((1000ppm / (3000ppm - 0ppm)) * (20mA - 4mA)) + 4mA = 9.3mA
184	2	AQ value
500	1	co2 automatic compensation background enalbe or disable.0 = Disable,1= Enable.
501	2	“Background C02”, default is 400ppm, minimum is 390, max is 500.
502	1	Maximum adjustment per day” default is 1ppm, max is 10 ppm, minimum is 1.
503	1	“Number of days to watch for minimum” , default is 7 days. Max is 30 days. Minimum is 2 days.
505	2	co2 background calibration offset.

Air Quality, Hunm&Temp

Bacnet Register List

Value	Value and Description
AV1	SerialNumber LowByte
AV2	SerialNumber HighByte
AV3	SoftWare Version
AV4	Modbus id
AV5	Product Model
AV6	Instance
AV7	Station Number
AV8	BaudRate
AV9	Update
AV10	Protocol switch. 0 = MODBUS,1=MSTP.
AV11	Auto/Manual,Analog output auto/manual control. Bit 1 directs to temperature output, 0=Auto, 1=Manual.
AV12	Dew Point
AV13	Passwords
AV14	Mixing Ratio, the mass of water over the mass of dry gas, [g/kg]
AV15	Enthalpy of the air, [kJ/kg]
AV16	Spare
AV17	Temperature Offset
AV18~AV19	Spare
AV20	Temperature Filter
AV21	Spare
AV22	Temperature Unit
AV23	Output Mode
AV24~ AV25	Spare
AV26	Minimal Range for temperature
AV27	Maxium Range for temperature
AV28~AV30	Spare
AV31	Temperature Setpoint
AV32	Spare

Analog Intput	Analog Input and Description
AI1	Spare
AI2	Temperature
AI3	Spare

Air Quality, Hunm&Temp

Analog Output	Analog Output and Description
AO1	Spare
AO2	Temperature
AO3	Spare

Humidity and Temp Transmitters

Descriptions

Humidity & Temperature transmitters are designed for environment monitoring and controlling in industrial, commercial and other buildings. These transmitters can be used for indoor air temperature and humidity monitoring in various industrial plant, clean room, lab, machine room, office and commercial building, airport, station, library and stadium. The modbus interface is documented and integrator friendly. They also have transducer outputs for connecting as analog inputs to all popular control systems. Various models are available:Duct Mount,Wall Mount,Room Mount and 2 meter cable.BACnet MS/TP and Modbus RTU protocols over RS485,with an ethernet port.



HUM-W



HUM-D

Highlights

- High performance digital sensors and circuits, ensure accurate measurement and temperature compensation
- Good long term stability and reliability
- 100% field changeable sensors, no re-calibration needed
- Fast response
- Multiple output signals selectable: 4-20mA, 0-5V or 0-10V
- Display in degrees Fahrenheit or Celsius (connection to Modbus)
- HUM-C is same as HUM-W but with extended cable to connect the sensor
- Featured as pluggable sensor pipe
- Dew point and enthalpy can be configured by register list
- BACnet MS/TP and Modbus RTU protocols over RS485,with an ethernet port.



HUM-C

Specifications

General		
Power	15 to 24V AC or DC, ±10%	
Current Output Load	< 500Ω	
Display	LCD screen for wall outdoor / room mount and duct mount	
Display Resolution	0.1°C, 0.1% RH	
Temperature Limit	-30~70°C, 0~95% RH(Non condensing)	
Plastic Housing	Flammability rating UL 94HB	
Connector	UL File E365137, Vol. 1	
Protection	IP65, outdoor rated for duct and wall mount models; IP30 for room mount	
	Relative Humidity	**Temperature**
Sensor	Capacitance polymer	10K internal
Range	0~100% non condensing	-30~70°C(-22~158°F)
Output	4-20mA, 0-5V or 0-10V, RS 485	4-20mA, 0-5V or 0-10V, RS 485
Accuracy	5% RH (25°C, 20~80% RH)	< ±0.5°C @ 25°C
Hysteresis	< ±1% RH	
Response time	< 10s (25°C, in slow air)	
Drift	< ±0.5% RH / year	

Humidity and Temp Transmitters

Note:

1. The default setting for the transducers is 0 to 10V, over the range 0 to 100 Degrees C. If you're using the 10V transducer output signal, the sensor needs to be powered with at least 15V AC or DC.
2.For application not using the 10V transducer output signal, using 4-20ma signal, 0-5V transducers, or Modbus/Ethernet only, in this case you can use 12V AC or DC.

Approvals

Plastic Enclosure	PA66 UL 94 V0 file E194560
Connectors	PA66 UL 94V0 file E3651 37
PCB	FR-4 Epoxy Glass Cloth UL E360179

Part Number Scheme

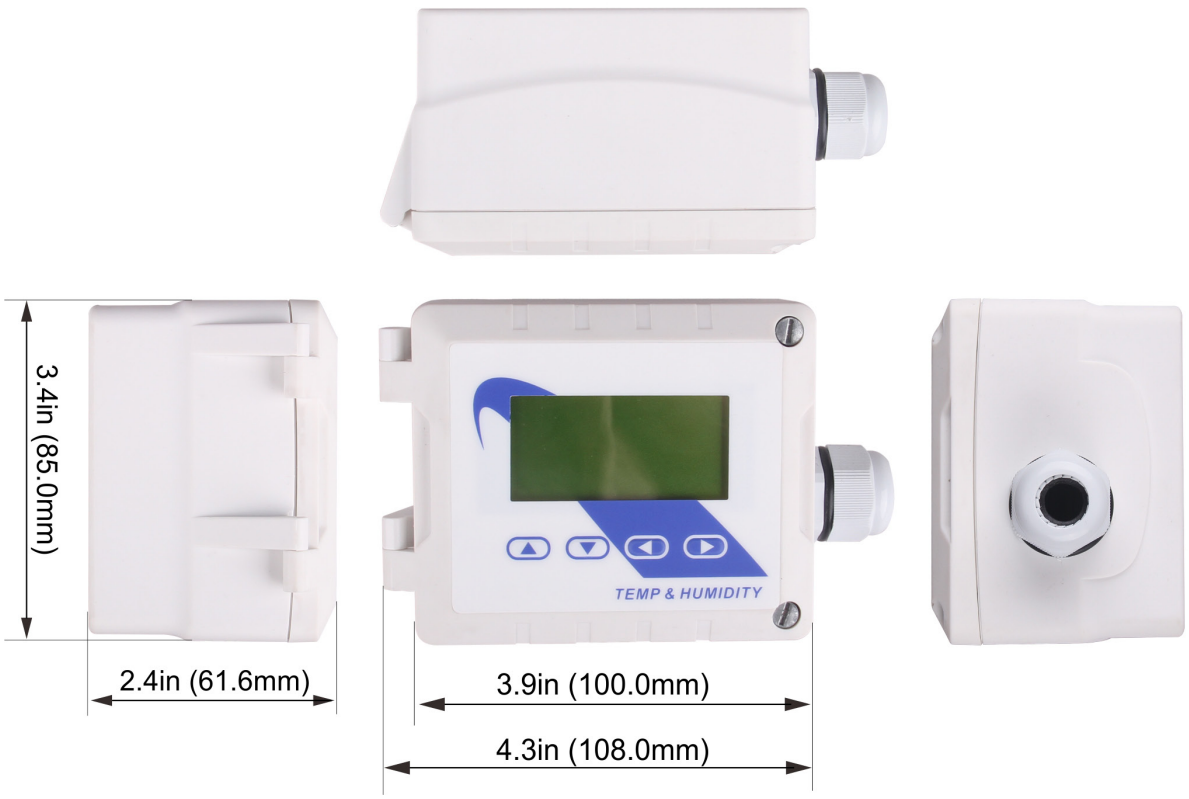
HUM - D

Code	Description
HUM	Hum/Temp Transmitter

Code	Module
D	Duct Mount
W	Wall Mount
C	2 Meter Cable

Dimensions

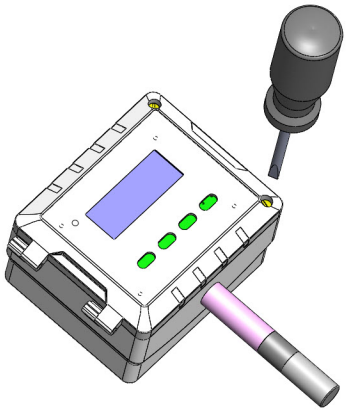
HUM-D/W



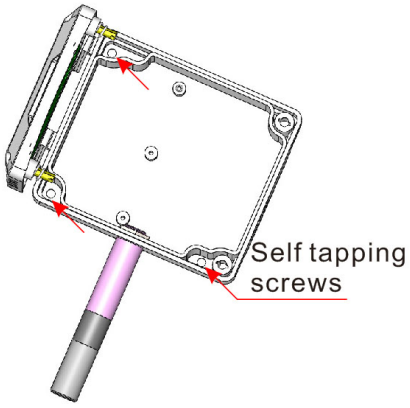
Installation Mounting

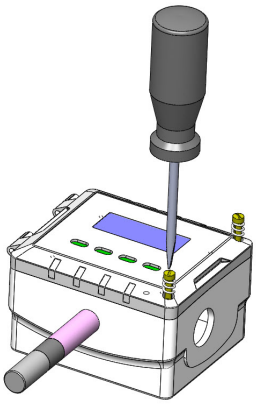
HUM-D & HUM-W

1) Unfasten the slotted screw on the enclosure. Turn the slotted screw ½ a turn till it pops out.



2) There are three small holes, indicated with the red arrows, inside the box. Use these holes to fasten the unit to the wall with self tapping screws.





Register List

Modbus

Humidity/Temp Transmitter w/Bacnet uses MODBUS protocol to communicate with others.Below is the register list.

Address	Register and Description
6	Address. Modbus device address
15	Baudrate. 0=9.6kbaud, 1=19.2kbaud 2=38.4kbaud 3=57.6kbaud 4=115.2kbaud
21	Protocol switch. 3 = MODBUS,0=Bacnet MSTP.
100	Room temperature reading in DegF. Can also write to this register for single point calibration.
373	Relative humidity reading in percentage,the same to register304
482	Dew point in unit C
490	Enthalpy of the air, [kJ/kg]
538	Light sensor value.The resolution is 0.1 lux;
...	.....

Bacnet

Humidity/Temp Transmitter w/Bacnet also uses Bacnet protocol to communicate with others.Below is the register list.

Variable	Variable and Description
3	Modbus ID
8	Uart BaudRate.0=9.6kbaud, 1=19.2kbaud 2=38.4kbaud 3=57.6kbaud 4=115.2kbaud
10	Protocol
12	Dew point
15	Enthalpy
...	.....

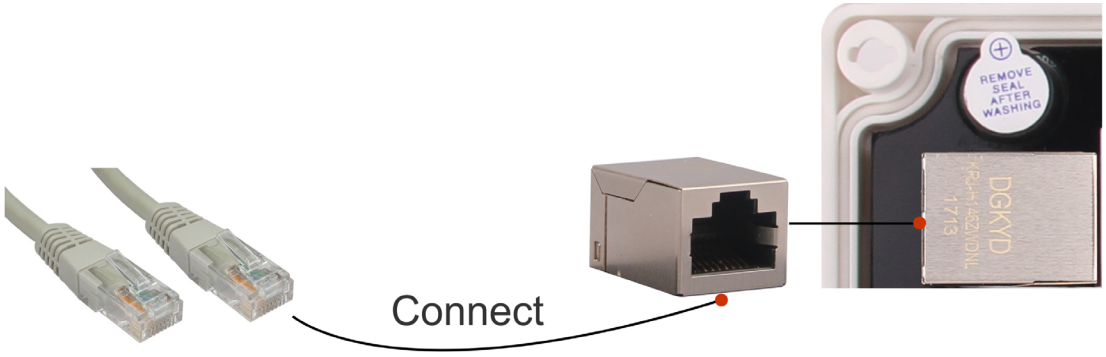
Input	Input and Description
1	Temperature
2	Humidity

Output	Output and Description
1	Analog output1
2	Analog output2

*For more register list details,please downloaded an excel spreadsheet (03ModbusBacnetRegisterList. xls) at the following link: *http://tinyurl.com/ybaj9d3u*

Stucture Graphic

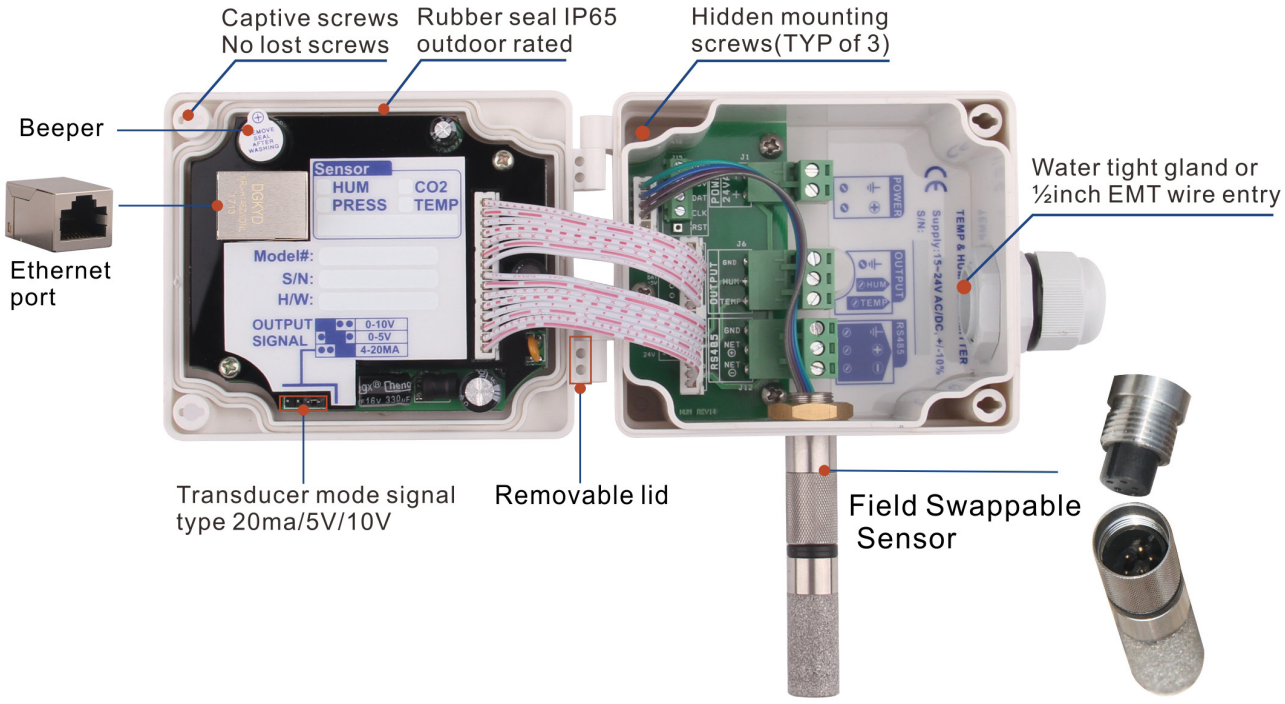
*Ethernet Port



Standard Ethernet Cable

Ethernet Implementation:
A family of computer networking technologies commonly used in local area networks (LANs) and metropolitan area networks .Ethernet has largely replaced competing wired LAN technologies such as token ring, FDDI and ARCNET.Features such as the 48-bit MAC address and Ethernet frame format have influenced other networking protocols. The primary alternative for some uses of contemporary LANs is Wi-Fi, a wireless protocol standardized as IEEE 802.11.

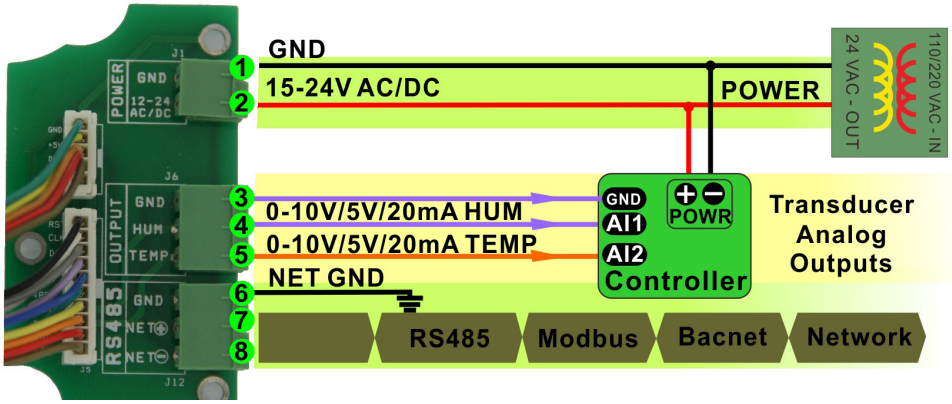
HUM-D & HUM-W



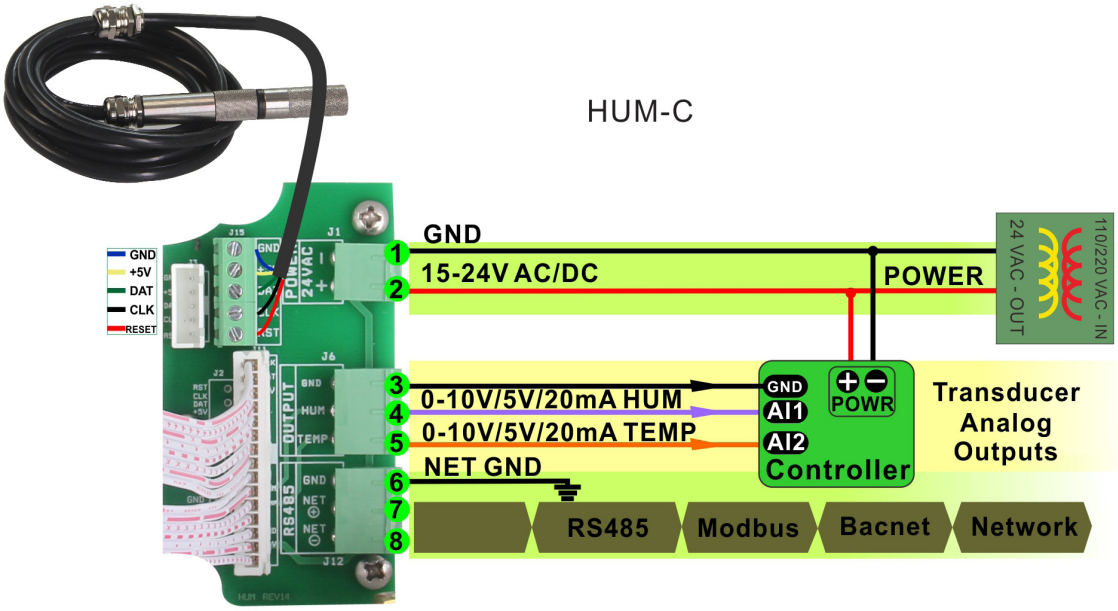
Wiring Diagram

The diagram below shows the wiring for the usual transducer mode of operation for the humidity / temperature transmitter. The transducer outputs connect to a master controller using the traditional analog output signals, 0-5V, 0-10V, 4-20mA.

HUM-D & HUM-W Rev 25

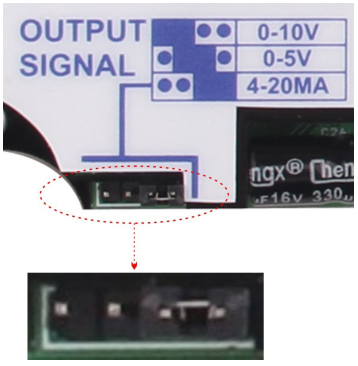


HUM-C



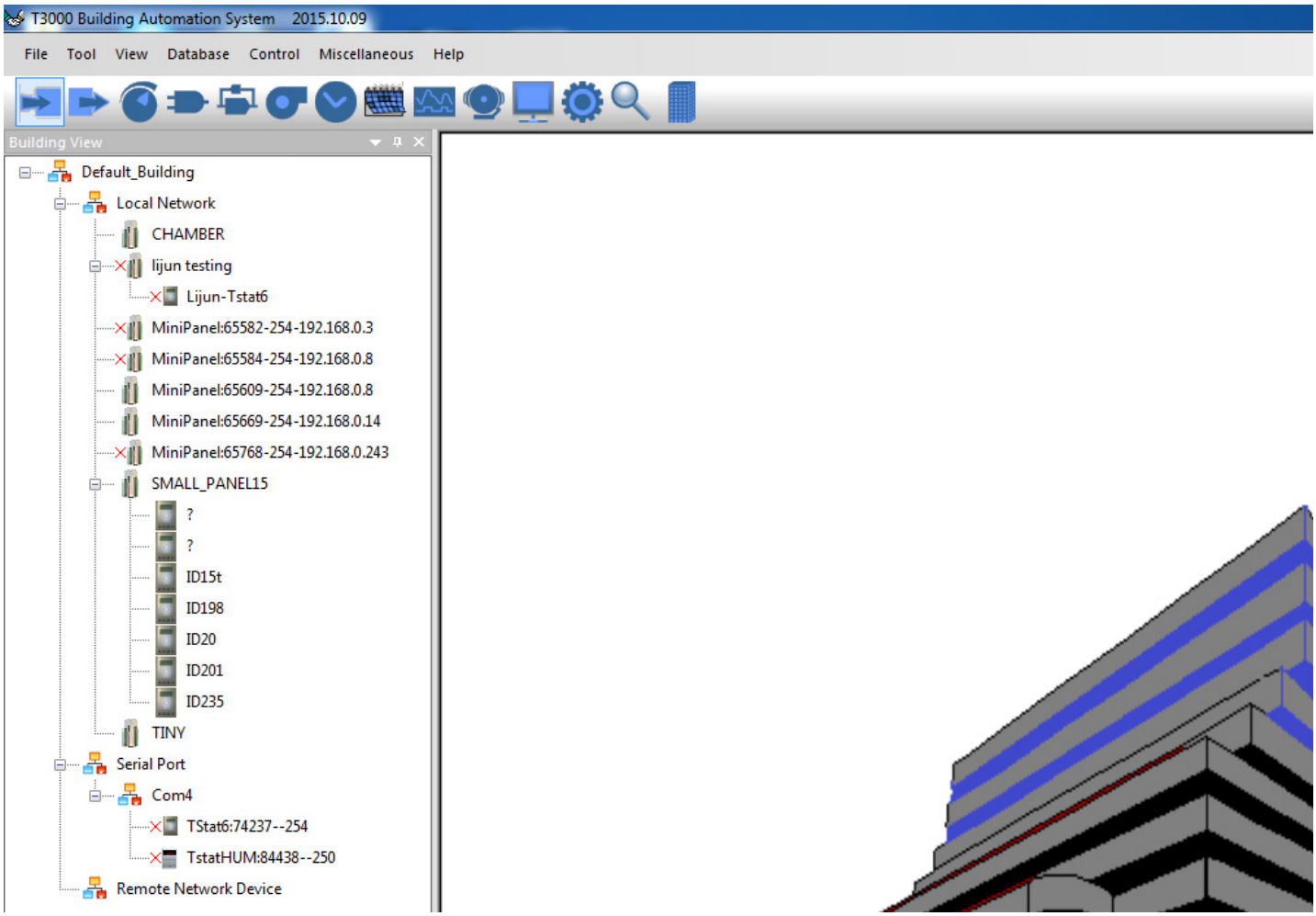
Output Jumper Settings

In this mode the device acts as a traditional transducer where it sends out three analog signals, all you need to do is to set this one single jumper to the appropriate signal type: 4-20mA, 0-10V, or 0-5V.

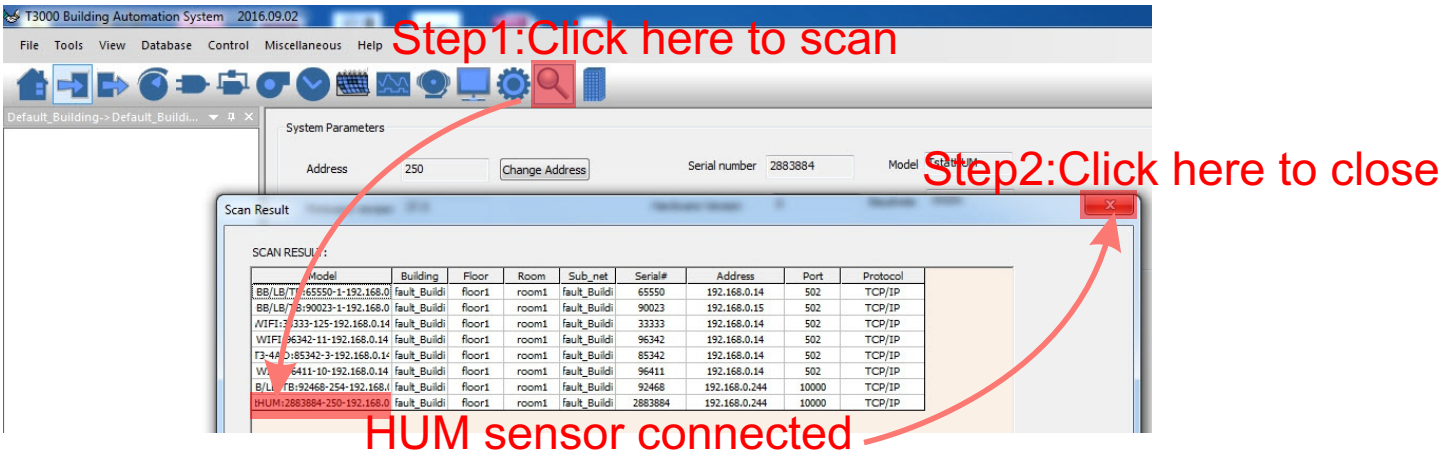


T3000 Operation

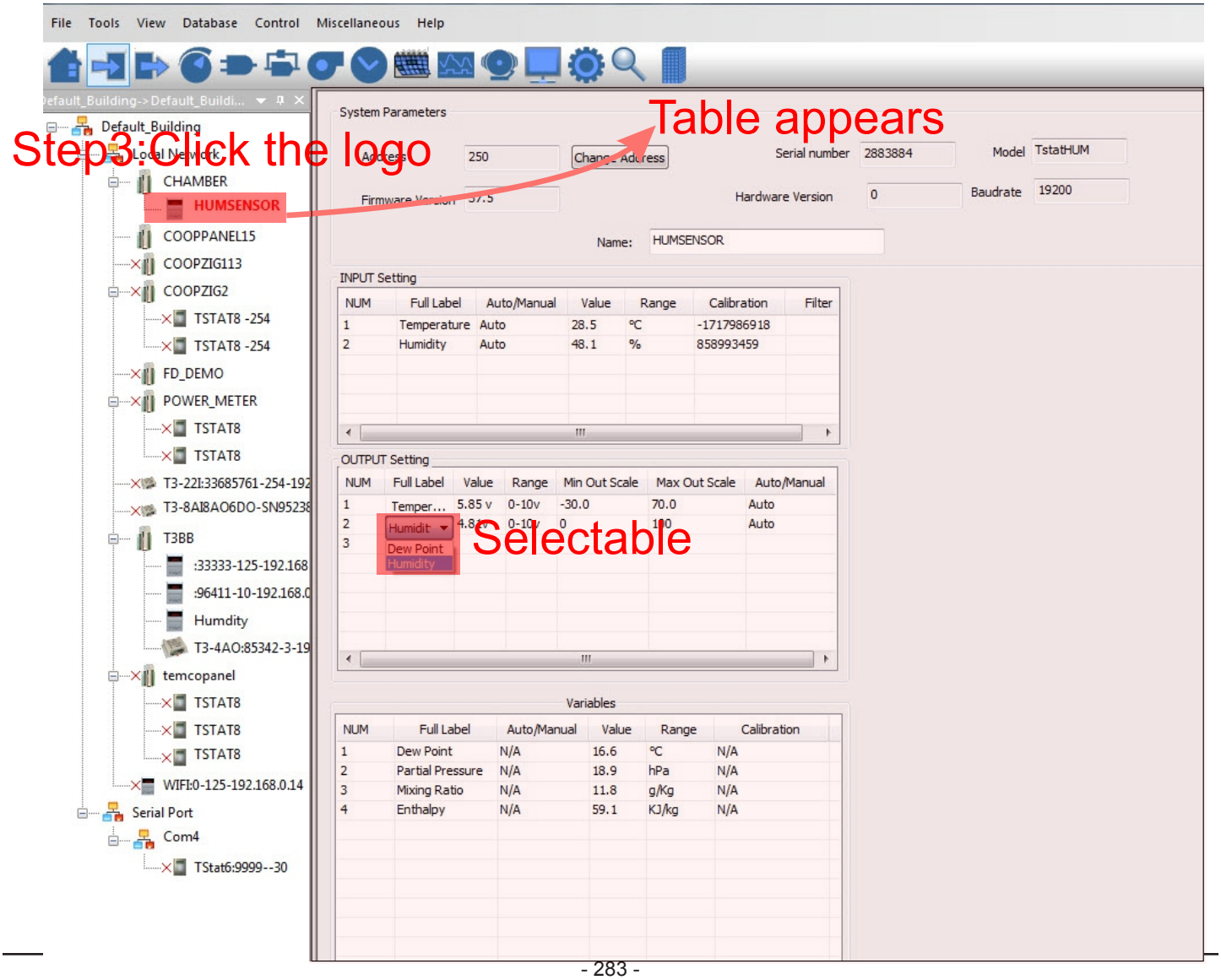
1. Connect HUM to PC by RS485.
2. Open T3000 and it show the following view.



3. Click the button to scan, the following view will appear and close it as the picture shows.



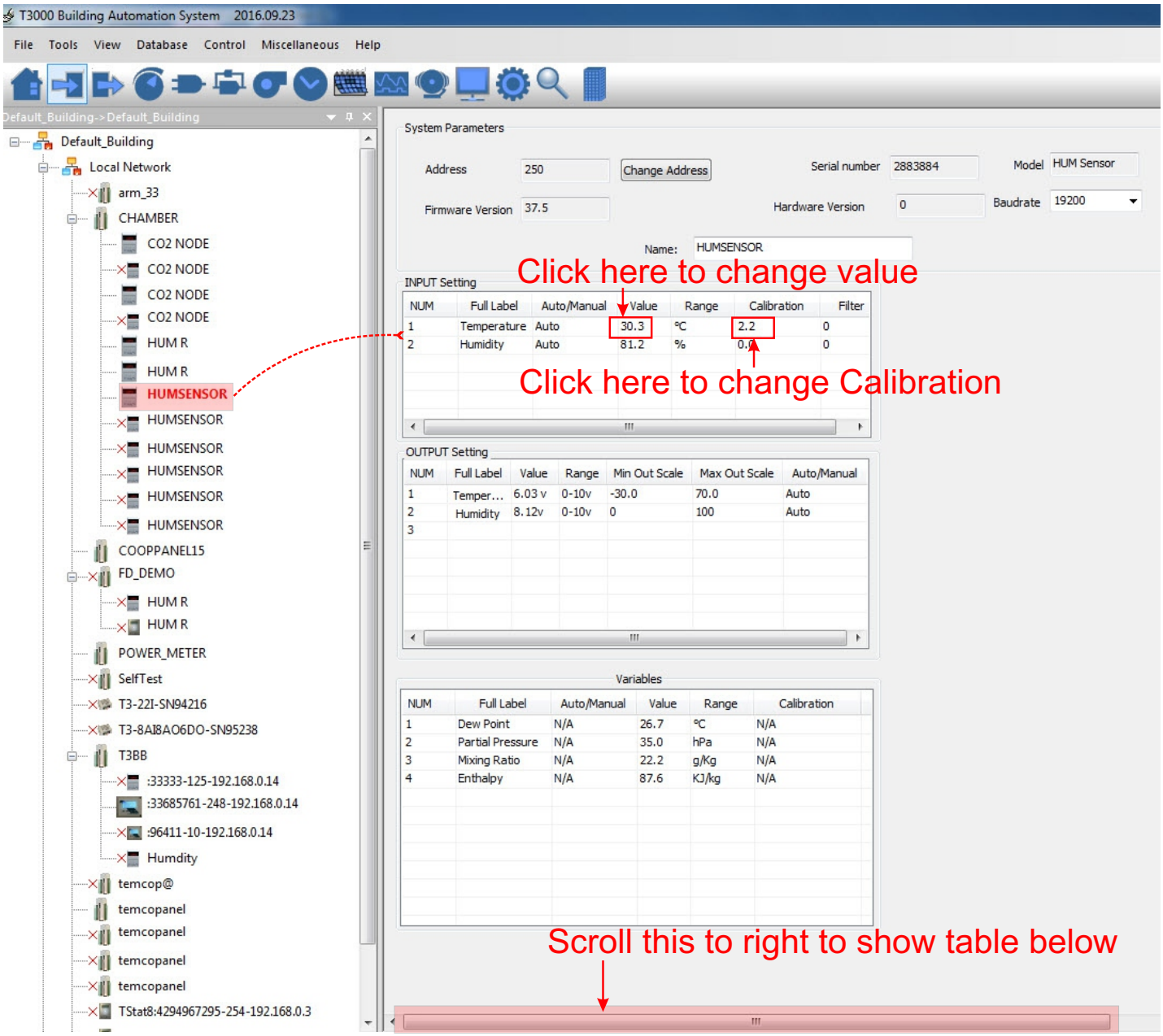
4.Click the HUM log and it will show all the information.
In input setting view, there are temperature, humidity and dew point.In output setting view, when you click the humidity, an arrow appears, you can choose humidity or dew point.



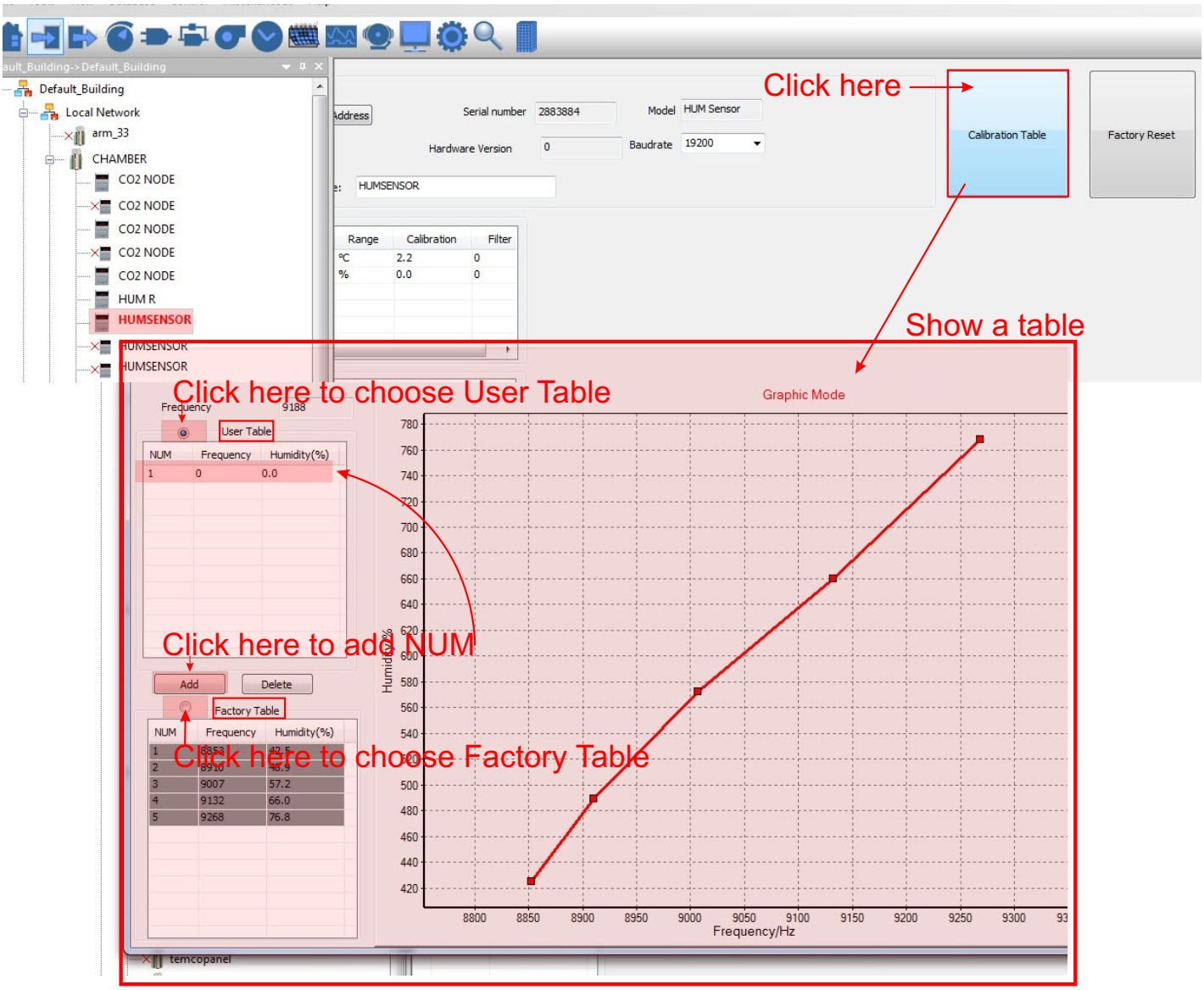
T3000 calibration

The picture shows T3000 calibration of HUM.Do as the follows:

You can click to change value or calibration,also to choose User Table or Factory Table:

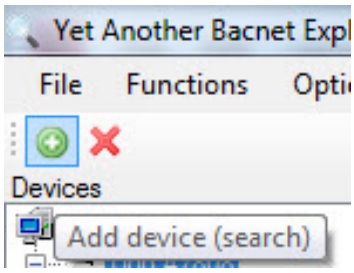


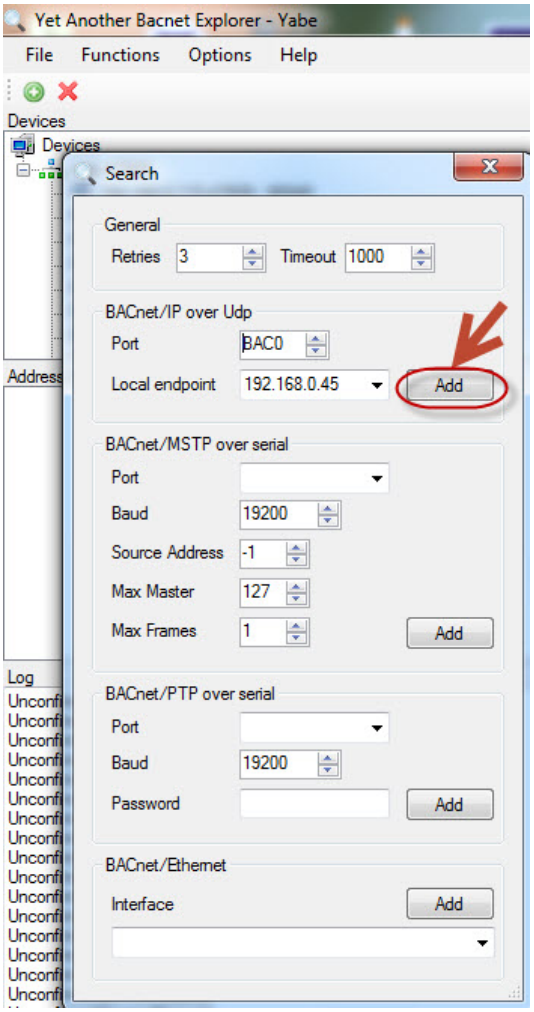
T3000 calibration



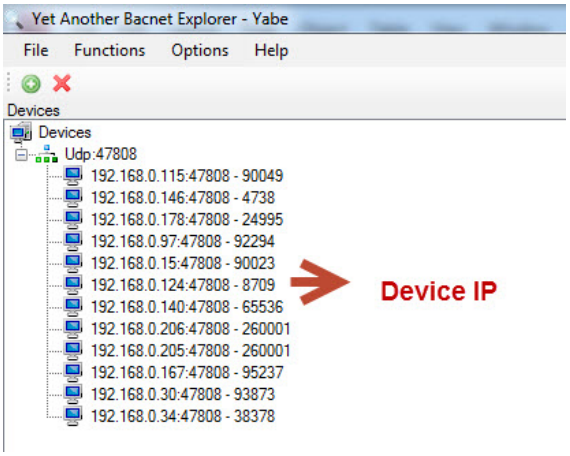
Connecting to the device using Bacnet

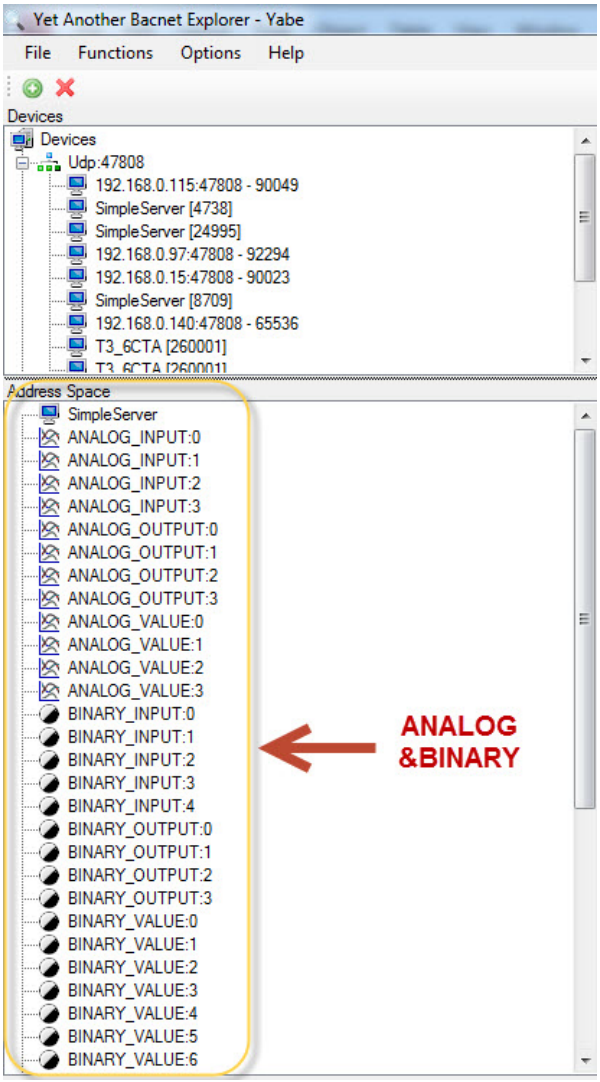
The device can be connected using Bacnet.Below are the steps:
Step1.Download Yabe software as the link:*https://tinyurl.com/ycrt9jep* and install it.
Step2.Connect the device to the computer,select Bacnet protocol.Start the Yabe software,add the device.



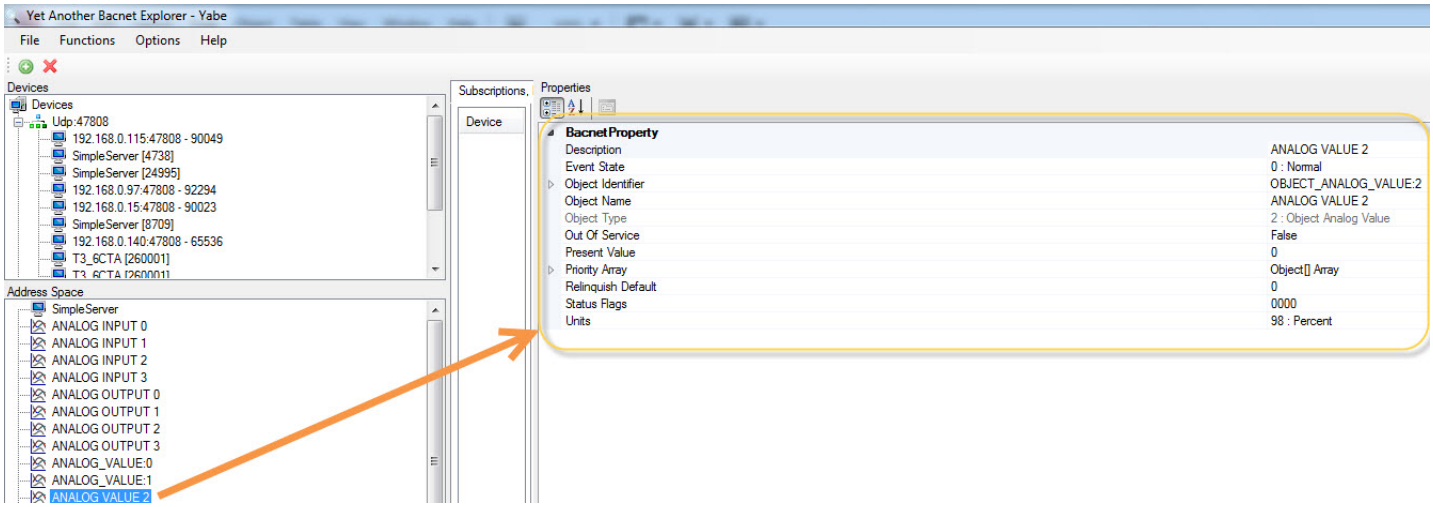


Step3.You can find your device IP as below.Double click the left mouse button,you can find your device and the bacnet information in the “Adress Space” tab.





Step4.In the “Address Space” tab,click the “ANALOG_VALUE” ,it will show the information of “log ANALOG_VALUE”in the BacnetProperty tab. And it ‘s the same with “ANALOG_OUTPUT” and other items.



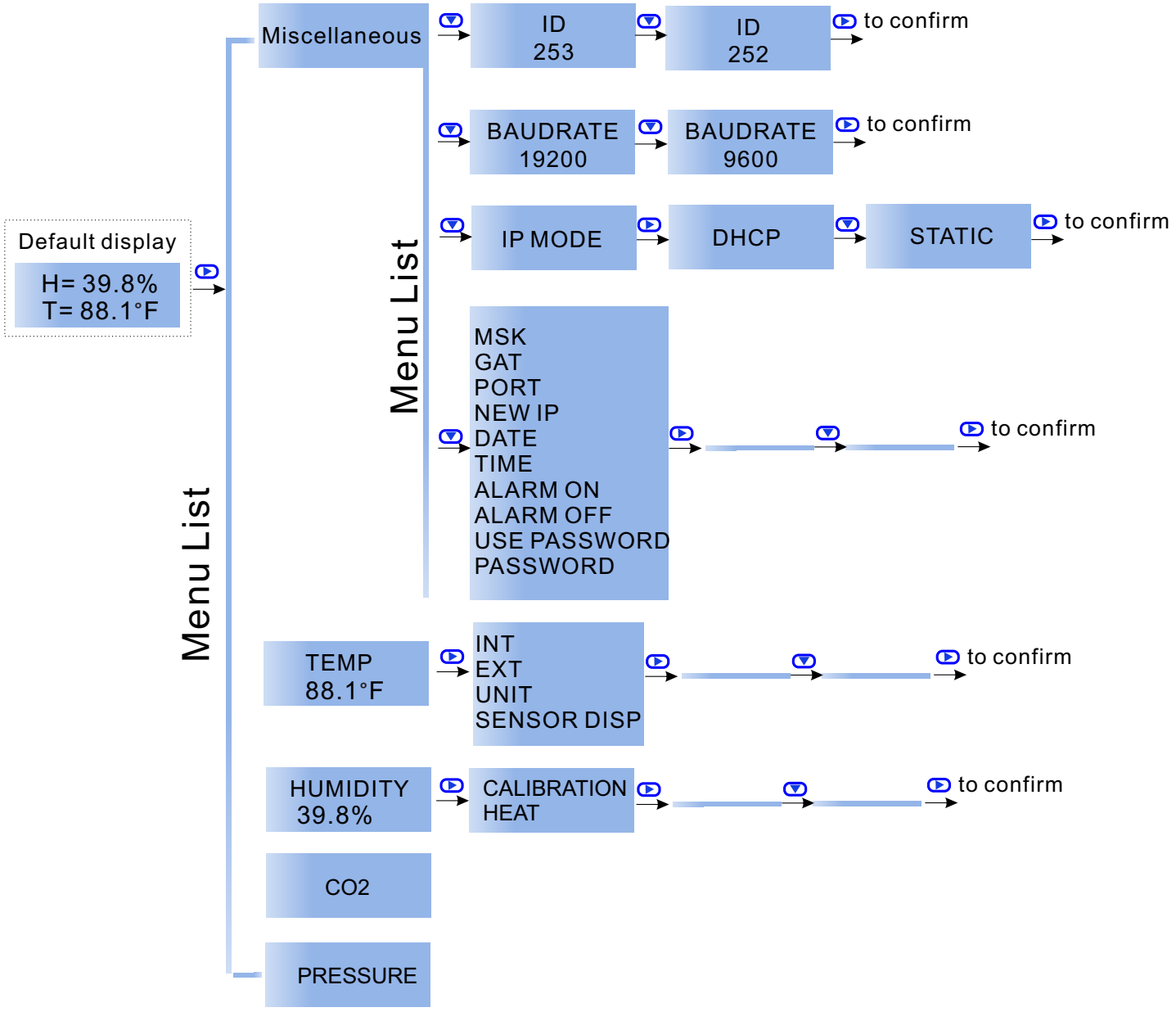
Humidity and Temp Transmitters

Voltage & Current Formula for HUM-D/W(Hardware=Rev9~12)	
0-10V output	Temperature (C) = (Voltage * 100 - offset) / 10
	Temperature (F) = (DegC) * 9 / 5 + 32
	Humidity = Voltage / 10
0-5V output	Temperature (C) = (Voltage * 100 - offset) / 20
	Temperature (F) = (DegC) * 9 / 5 + 32
	Humidity = Voltage / 20
4-20mA output	Temperature (C) = ((Current – 4)/0.16) – offset/10
	Temperature (F) = DegC * 9 / 5 + 32
	Humidity = (Current – 4)/0.16
	Temperature(F) : register 100
	Temperature© : register 101
Applied for all	Offset : register 443, offset from zero C to adjust temperature range
	For example 0 = 0-100C; 300 = -30 to +70C (Default setting)
	Where Voltage is the input voltage in Volts, and Current is in mA, ie 10 = 10mA

Voltage & Current Formula for HUM-D/W (Hardware=Rev22+)	
0-10V output	Voltage = Temperature (C) / Temperature_Range * 10
	Voltage = Humidity / Humidity_Range * 10
0-5V output	Voltage = Temperature (C) / Temperature_Range * 5
	Voltage = Humidity / Humidity_Range * 5
4-20mA output	Current = Temperature (C) / Temperature_Range * 16 + 4
	Current = Humidity / Humidity_Range * 16 + 4
Temperature (C): Register 101 Humidity: Register 304 Temperature_Range = (Register 286 - Register 285) / 10 Humidity_Range = (Register 288 - Register 287) / 1000 Voltage in V Current in mA	

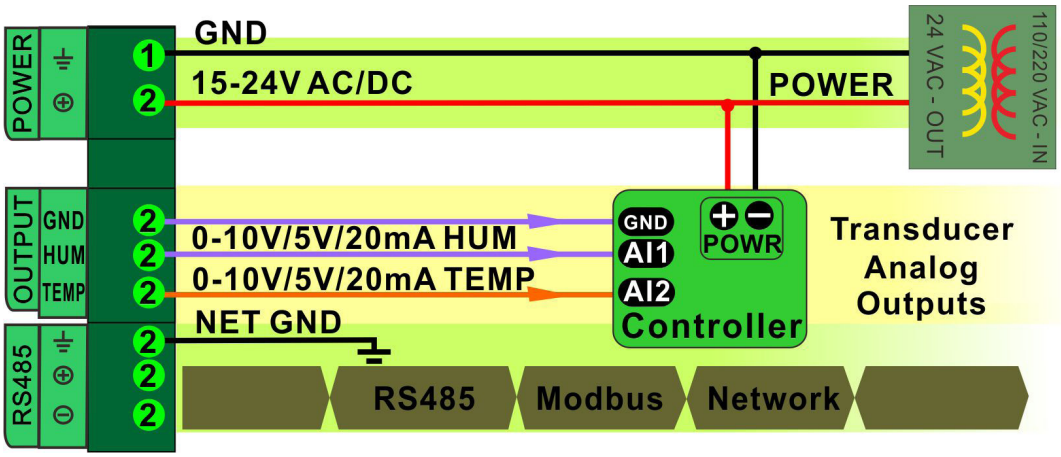
Voltage & Current Formula for HUM-R	
0-10V output	Voltage = Temperature (C) / Temperature_Range * 10
	Voltage = Humidity / Humidity_Range * 10
0-5V output	Voltage = Temperature (C) / Temperature_Range * 5
	Voltage = Humidity / Humidity_Range * 5
4-20mA output	Current = Temperature (C) / Temperature_Range * 16 + 4
	Current = Humidity / Humidity_Range * 16 + 4
Temperature (C): Register 101 Humidity: Register 102 Temperature_Range = (Register 333 - Register 332) / 10 Humidity_Range = (Register 335 - Register 334) / 1000 Voltage in V Current in mA	

Hardware=Rev22+

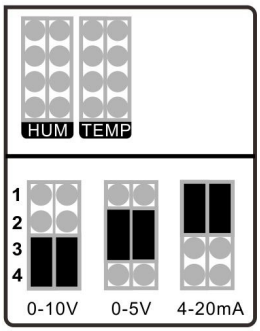


External Inputs

HUM-W Rev 12 Wiring Diagram

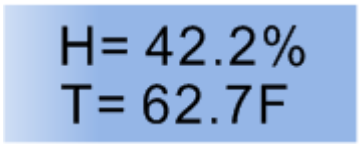


Jumper Settings



Advanced Menu Item Instructions

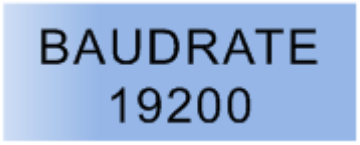
a. Normal state

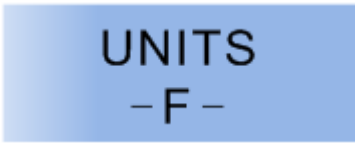


b. To set the unit's ID, click ◀ or ▶ to enter the menu mode. Continue clicking ◀ or ▶ until the screen displays "ID". Use the buttons; ▲ and ▼ to change the unit's ID. Leave the unit for several seconds upon reaching a desired value to store it.

c. To set the unit's baudrate, click ◀ or ▶ to enter the menu mode. Continue clicking ◀ or ▶ until the screen displays "BAUDRATE". Use the buttons; ▲ and ▼ to change the baudrate. Leave the unit for several seconds upon reaching a desired value to store it.







Modbus Register List of HUM-D/W/C

Humidity Sensor uses MODBUS protocol to communicate with others. Below table for HUM-D/HUM-W/HUM-C.

Address	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 microcontroller to determine the product
8	Hardware Revision. This is a read-only register that is used by the microcontroller to determine the hardware Rev
9	PIC firmware version
10	'Plug n Play' address, used by the network master to resolve address conflicts. See VC code for algorithms
15	Bau - Baudrate, 0=9.6kbaud, 1=19.2kbaud 2=38.4kbaud 3=57.6kbaud 4=115.2kbaud
16	Firmware Update Register, used to show the status of firmware updates
21	Protocol switch. 3 = MODBUS,0=MSTP.
17-39	Blank, for future use
40 to 45	reg40, MAC address, read only normally
46	reg46, IP mode. 0=static IP; 1= DHCP
47 to 48	reg47, upper two bytes of IP address
49 to 50	reg49, lower two bytes of IP address
51 to 52	reg51, right two bytes of SUBNET MASK address
53 to 54	reg53, left two bytes of SUBNET MASK address
55 to56	reg55, right two bytes of GATEWAY address
57 to 58	reg57, left two bytes of GATEWAY address
59	reg59, 0, TCP server, (NO USE)
60	reg60, listen port at TCP server mode
61~75	buffer mirror for changing to a new IP address, copy of reg 46 to 60
76	write 1 to set the ghost settings to the system and start new settings, then clear the ghost registers.
93	Enable for MAC setting. It should be set as 1 before write the new MAC to the MAC registers(100-105), and it will be cleared automatically after setting the MAC address.
100	ROOM TEMPERATURE reading in DegF. Can also write to this register for single point calibration.
101	ROOM TEMPERATURE reading in DegC. Can also write to this register for single point calibration.
113	Not used
121	LCD temperature will show C or F, 0 =C, 1=F

Modbus Register List of HUM-D/W/C

Address	Register and Description
185	Bau - Baudrate, 0=9600, 1=19.2k baud
186	The factory default is 1. Temperature Transducer output range, 1=0-10V, 2=0-5V, 3=4-20mA
187	The factory default is 1. Humidity Transducer output range, 1=0-10V, 2=0-5V, 3=4-20mA
285	The minimum degree of temperature range corresponding to the temperature output
286	the maximum degree of temperature range corresponding to the temperature output
287	the minimum percent of humidity range corresponding to the humidity output
288	the maximum percent of humidity range corresponding to the humidity output
304	Relative Humidity reading. Writing a humidity value to the register will do calibration, for details, refer to Humidity Calibration.
370	Auto/Manual output calibrate set. 0 : default value 1 : user manual. Bit 0 :temperture bit1 :humidity
371	Temperature manual output value input, releative with register 370
372	Humidity manual output value input, releative with register 370
373	Relative humidity in percentage,the same to register304
374	sensor frequency on time
375~380	spare for futher function

Modbus Register List of HUM-D/W/C

Address	Register and Description
400	Factory 10th Calibration point. Frequency
450	Temperature Calibration Offset for sensor
451	Humidity Calibration Offset for sensor
452	the filter of temperature
453	the filter of humidity
454	calibrate table select,default tabel =0 or customer table = 1
455	user calibrate points number
456 ~ 475	user calibrate points
476	K line
477	B line
478	humidity sensor serial number
479	spare for futher function
480	spare for futher function
481	spare for futher function
482	dew point in unit c
483	dew point in unit F
484	heat control
485	spare for futher function
486	dewpoint output min range
487	dewpoint output max range
488	Partial Pressure of water at saturation at given temperature, [hPa]
489	Mixing Ratio, the mass of water over the mass of dry gas, [g/kg]
490	Enthalpy of the air, [kJ/kg]
491	Modbus reply delay time (ms)
492	Modbus receive delay time(ms)
500	PID1 MODE: 0=COOL MODE,1=HEAT MODE
501	PID1 SetPoint
502	PID1 Pterm
503	PID1 Iterm
504	PID1 Value
510	PID2 MODE:0=COOL MODE,1=HEAT MODE
511	PID2 SetPoint
512	PID2 Pterm
513	PID2 Iterm
514	PID2 Value

Bacnet Register List of HUM-D/W/C

Humidity Sensor uses BACNET protocol to communicate with others. Below table is for HUM-D/HUM-W/HUM-C

Variable	Variable and Description
0	SerialNumber LowByte
1	Product Model
2	SerialNumber HighByte
4	SoftWare Version
5	HardWare Version
6	Humdity Version
7	Uart BaudRate 0=9.6kbaud, 1=19.2kbaud 2=38.4kbaud 3=57.6kbaud 4=115.2kbaud
8	Reset to factory set = 143
9	Protocol switch. 0 = MODBUS,1=MSTP.
10	Auto/Manual, Bit 0 :temperture bit1 :humidity
11	Humidity Value
12	Temperature Value
13	
14	Dew point
15	Partial Pressure of water at saturation at given temperature, [hPa]
16	Mixing Ratio, the mass of water over the mass of dry gas, [g/kg]
17	Enthalpy of the air, [kJ/kg]
18	OffSet Humdity
19	OffSet Tempeature
20	
21	Filter Humdity
22	Filter Temperature
23	
24	
25	Temperature Unit:0 =C, 1=F
26	
27	OutMode: 1=0-10V, 2=0-5V, 3=4-20mA
28	Humdity analog output
29	Temperature analog output
30	Co2 analog output
31	Humdity Min Range
32	Humdity Max Range
33	
34	

Bacnet Register List

Variable	Variable and Description
35	PID/Transmit select
36	PID1 MODE: 0=COOL MODE,1=HEAT MODE
37	PID1 SetPoint
38	PID1 Pterm
39	PID1 Iterm
40	PID1 Value
41	PID2 MODE:0=COOL MODE,1=HEAT MODE
42	PID2 SetPoint
43	PID2 Pterm
44	PID2 Iterm
45	PID2 Value

Humidity and Temp Transmitters

Descriptions

Humidity & Temperature transmitters node with display is designed for environment monitoring and controlling in industrial, commercial and other buildings. These transmitters can be used to monitor air temperature and humidity in various industrial and commercial settings. Use in the traditional mode for analog output to other controllers or use Modbus RS485/Bacnet MS/TP to integrate over the network.

HUM-N-LCD



Highlights:

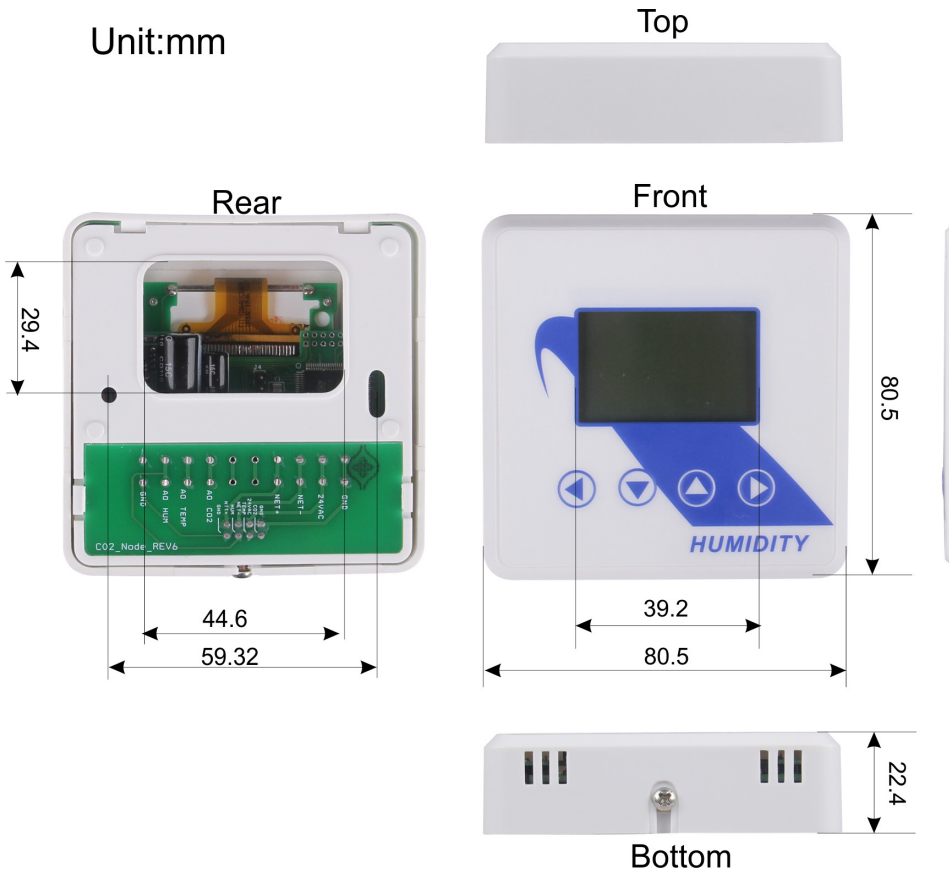
- High performance digital sensors and circuits, ensure accurate measurement and temperature compensation
- Good long term stability and reliability.
- Display in degrees Fahrenheit or Celsius(connection to Modbus).
- RS485/Bacnet MS/TP for direct digital reading on all models.
- To set jumper to select the transducer signal type: 4-20mA, 0-5V or 0-10V

Specifications

Typical Application	Wall mount indoors	
Output Signal Type	Jumper select: 4-20mA,0-10V,0-5V	
Output Signal Drive	> 500Ω for mA mode, 75mA max output drive for voltage mode	
RS485 ports	1	
Power	15-24V +/- 10%, AC or DC, 1 watt typical	
Operating Temp	-30~+60°C, 0-95% non condensing	
Plastic Housing	Flammability rating UL 94V0 file E194560	
Display	LCD screen, Resolution 0.1°C, 0.1% RH	
Control Features	N/A	
HUM	Sensor Type	Capacitive
	Range	0-100% Non-Condensing
	Accuracy	5%@25°C, 20~80%
	Drift	< 0.5% RH / year
TEMP	Sensor Type	10K thermistor
	Range	-40~150°C(-60~340°F)
	Accuracy	< ±0.5°C @ 25°C
Size	80.45 x 80.45mm (3.167 x 3.167in)	

Dimension

Unit:mm





Part Number Scheme

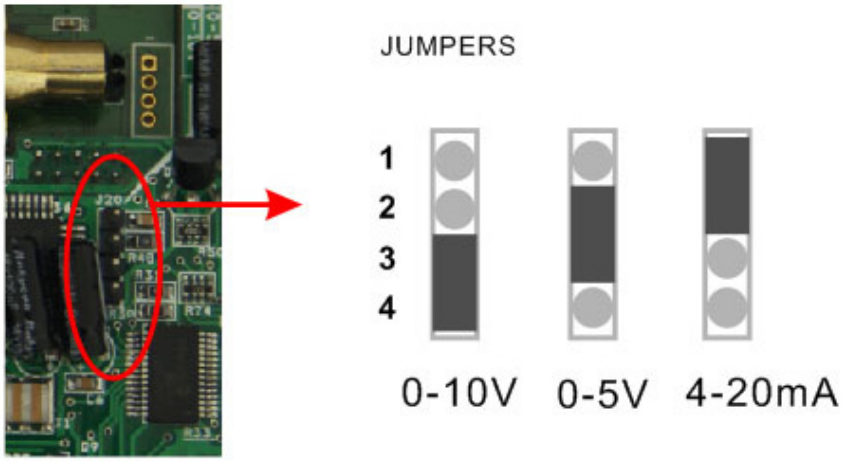
HUM - D - LCD

Code	Description
HUM	Hum/Temp Transmitter

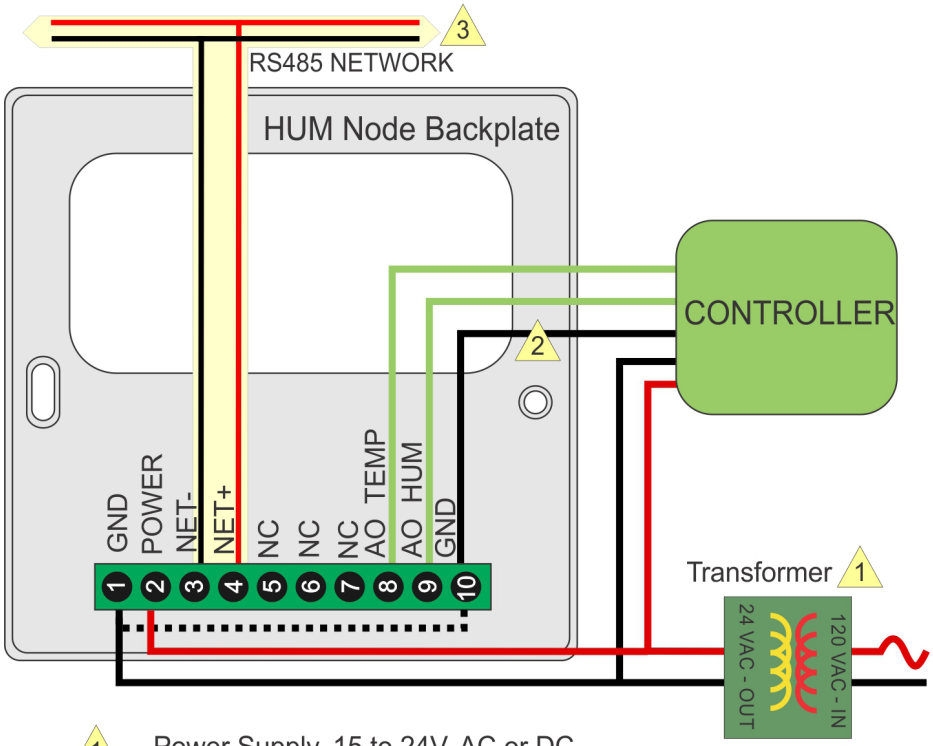
Code	Module
N	Node

Code	Module
LCD	LCD Screen
—	NO LCD Screen

Jumper Settings



Backplate Features



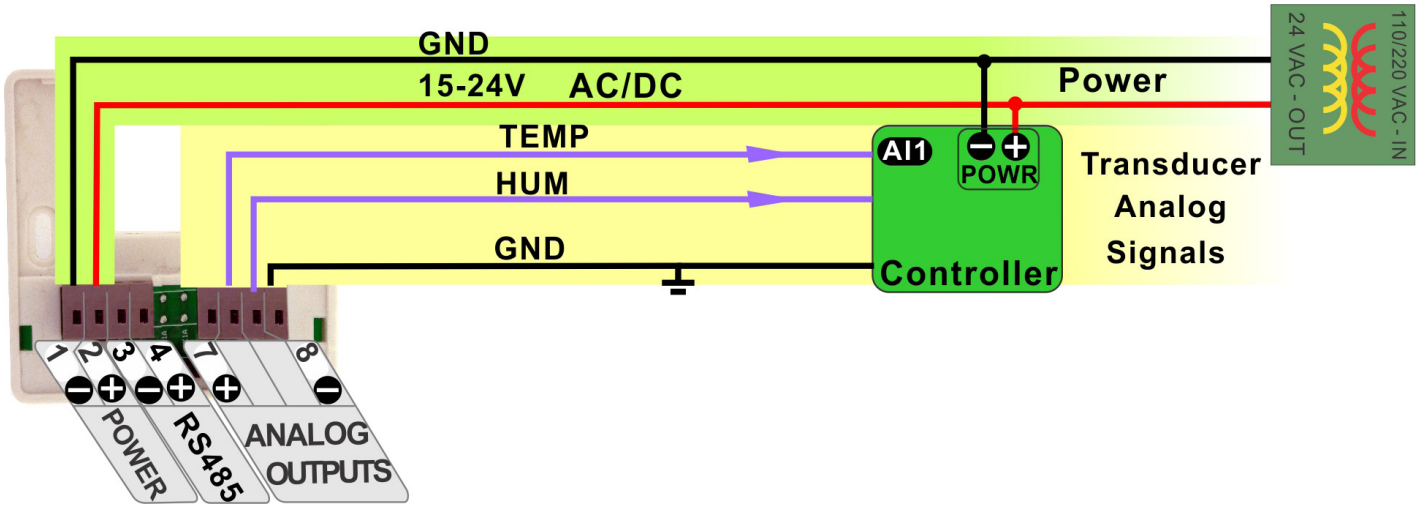
1 Power Supply, 15 to 24V, AC or DC

2 Suggested GND from sensor to controller for signal return path

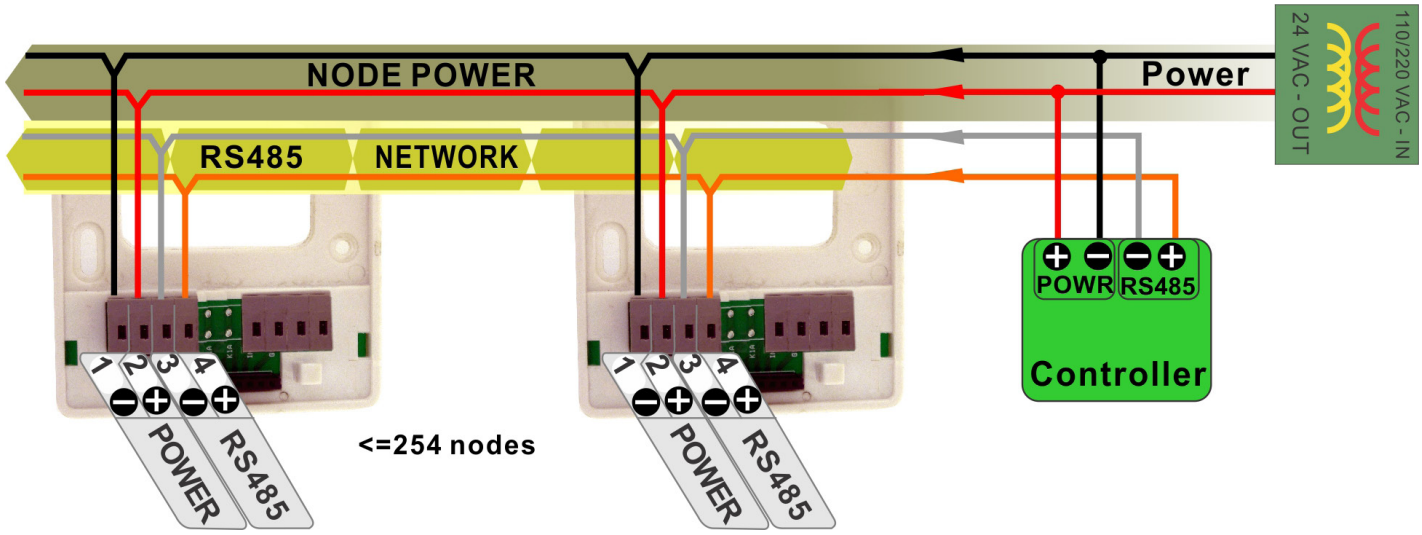
3 RS485 Net, 18ga twisted pair typical, optional ground & shield

Wiring Diagram

The diagram below shows the wiring for the usual transducer mode of operation for the HUM Node. The transducer outputs connect to a master controller using the traditional analog output signals.

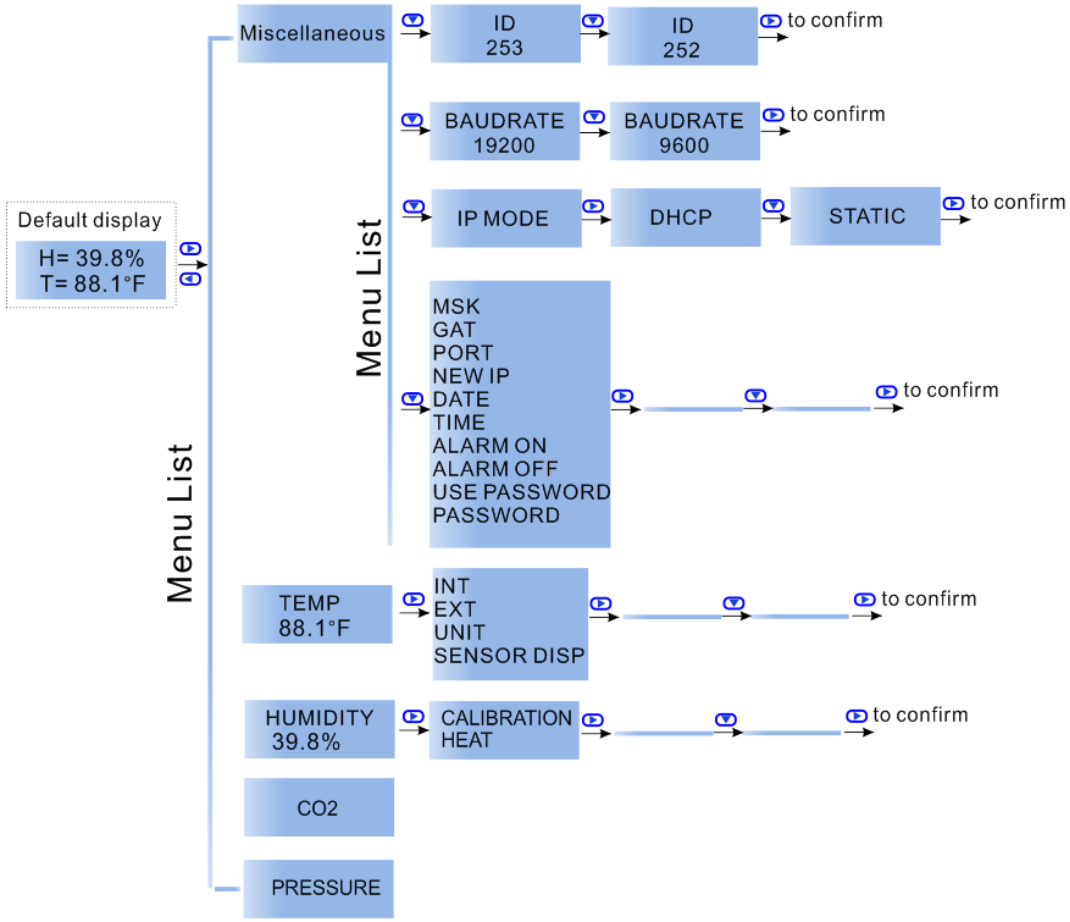


The next diagram shows the HUM Node working in the RS485 network, the node quantity can be 255. A group of sensors distributed through the building can cooperate friendly through net. The RS485 network is available for transmitting the same values digitally to other controllers.



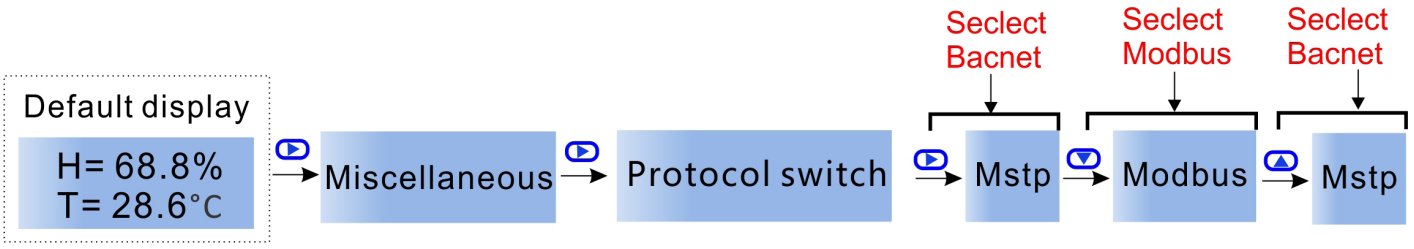
In this mode the device acts as a traditional transducer where it sends out three analog signals which is humidity, temperature readings. All you need to do is to set this one single jumper to the appropriate signal type: 4-20mA, 0-10V, or 0-5V.

Instruction,Hareware=Rev22+



Modbus/Bacnet switch

To select the protocol as Modbus or Bacnet,Press ▶ to choose Miscellaneous,then press ▶ to choose Protocol switch,press ▼ ,it reads Mstp,which means you have seclected Bacnet ;if you want to switch to Modbus,press ▼ , or ▲ back to Bacnet.

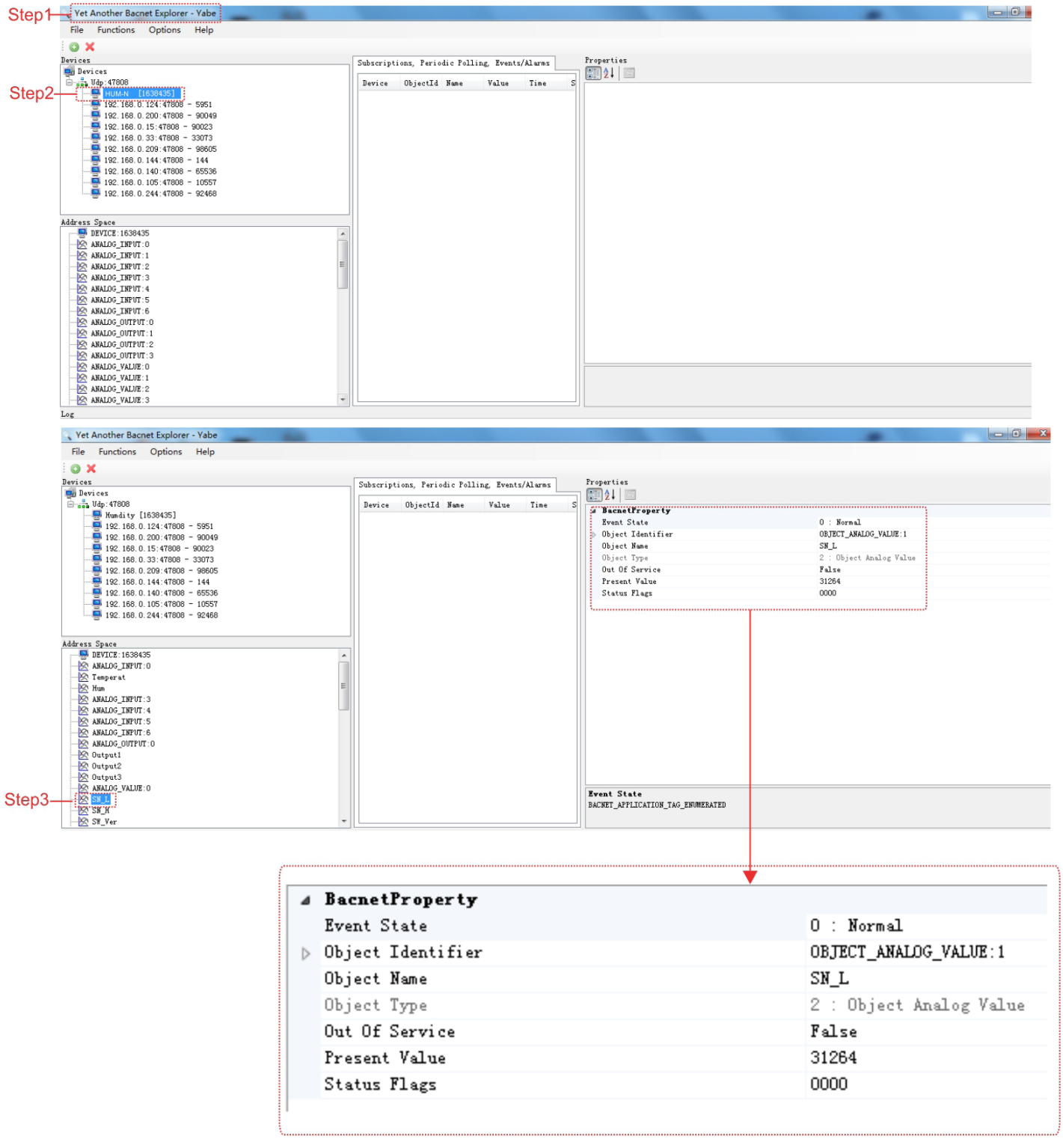


Besides,you can check the Modbus Register List below,No.21:Protocol switch. 3 = MODBUS,0=MSTP.Or Bacnet Resgister List,No.9: Protocol switch. 0 = MODBUS,1=MSTP.

Analog Value

To check the analog value,you can use a software”Yet Another Bacnet Explorer-Yabe”.Below are the steps to get the analog value.

*Step1:*Download the software”Yet Another Bacnet Explorer-Yabe” and install it.
*Step2:*Plug HUM-N in power,connect it to your PC via RS485 or Ethernet.
Step3:Click the item you want to check,a table reads BacnetProperty will pop-up on the right.



Modbus Register List

Humidity sensor node with display uses MODBUS protocol to communicate with others. Below table is for HUM-N.

Address	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 microcontroller to determine the product
8	Hardware Revision. This is a read-only register that is used by the microcontroller to determine the hardware rev
9	PIC firmware version
10	PLUG_N_PLAY_ADDRESS, 'plug n play' address, used by the network master to resolve address conflicts. See VC code for algorithms
11-14	Blank
15	Bau - Baudrate, 0=9.6kbaud, 1=19.2kbaud 2=38.4kbaud 3=57.6kbaud 4=115.2kbaud
16	Firmware Update Register, used to show the status of firmware updates
17-20	Reserved
21	Protocol switch. 3 = MODBUS,0=MSTP
22-100	Reserved
101	Adc value of temperature voltage output, not used, read only
102	Adc value of humidity voltage output, not used, read only
103	Reserved
104	Adc value of temperature current output, not used, read only
105	Adc value of humidity current output, not used, read only
106	Adc value of on board thermistor sensor, read only
107	Adc value of on board light sensor, read only
108-109	Reserved
110	Delta value for eliminating the pulse ppm value. The default value is 200
111	Fitler times, make the ppm value go smooth. The default value is 5.
112-114	Reserved
115	The version number of humidity sensor
116	The relative humidity
117	The frequency value read from humidity sensor, read only
118	The number of calibration points of the humidity sensor
119	Degree celsius temperature value of the humidity sensor
120	Degree fahrenheit temperature value of the humidity sensor
121	Celsius degree temperature value of the on board thermistor sensor
122	Fahrenheit degree temperature value of the on board thermistor sensor
123	The offset for calibrating the on board thermistor sensor

Modbus Register List

Address	Register and Description
124	Select the temperature direct to analog output: 0: on board thermistor sensor, default setting; 1: humidity sensor
125	Select the temperature direct to analog output: 0: on board thermistor sensor, default setting; 1: humidity sensor
126	Lighting value, for feature
127	Analog output mode, change it by setting the jumper (J20) on the board, read only
128	The minimum value of temperature directs to the analog outpu
129	The maximum value of temperature directs to the analog output
130	The minimum value of humidity directs to the analog output
131	The maximum value of humidity directs to the analog output
132-135	Reserved
136	The manual value of temperature
137	The manual value of humidity
138-151	Reserved
152	Enable/Disable the password for the menu system operation. 0=Disable, 1=Enable.
153	The first digital of the password. Should be from 0 to 9
154	The second digital of the password. Should be from 0 to 9
155	The third digital of the password. Should be from 0 to 9
156	The fourth digital of the password. Should be from 0 to 9
157-158	Reserved
159	Modbus reply delay time (ms)
160	Modbus receive delay time(ms)
161-501	Reserved
502	Maximum adjustment per day” default is 1ppm, max is 10 ppm, minimum is 1
503	“Number of days to watch for minimum” , default is 7 days. Max is 30 days. Minimum is 2 days

Bacnet Register List of HUM-N

Humidity sensor node with display uses BACNET protocol to communicate with others. Below table is for HUM-N.

Variable	Variable and Description
0	SerialNumber LowByte
1	Product Model
2	SerialNumber HighByte
4	SoftWare Version
5	HardWare Version
6	Humdity Version
7	Uart BaudRate 0=9.6kbaud, 1=19.2kbaud 2=38.4kbaud 3=57.6kbaud 4=115.2kbaud
8	Reset to factory set = 143
9	Protocol switch. 0 = MODBUS,1=MSTP.
10	Auto/Manual, Bit 0 :temperture bit1 :humidity
11	Humidity Value
12	Temperature Value
13	Reserved
14	Dew point
15	Partial Pressure of water at saturation at given temperature, [hPa]
16	Mixing Ratio, the mass of water over the mass of dry gas, [g/kg]
17	Enthalpy of the air, [kJ/kg]
18	OffSet Humdity
19	OffSet Tempeature
20	Reserved
21	Filter Humdity
22	Filter Temperature
23	Reserved
24	Temperature Unit:0 =C, 1=F
25	OutMode: 1=0-10V, 2=0-5V, 3=4-20mA
26	Humdity analog output
27	Temperature analog output
28	Reserved
29	Humdity Min Range
30	Humdity Max Range
31	Temperature Min Range
32	Temperature Max Range

PM2.5/10 Particle Counter

Description

The PM2.5/10 Particle Counter is designed for environmental monitoring in industrial, commercial and institutional buildings. The unit provides accurate readings of particle counts in two important sizes, 2.5µm and 10µm. The sensor uses the laser light scattering method which is not subject to drift or sensor contamination. A fixed volume of air is pumped through the sensor and suspended particulate matter in a given unit volume of air is totalized into two bins, one for particles of 2.5µm and another for larger 10 micron sizes. The results are reported in µg/m^3 of air with all data available over the RS485 port for integration into large systems. It Supports multiple protocols over both RS485 and Ethernet:Modbus over Ethernet,Bacnet over Ethernet,Bacnet MSTP over RS485 and Modbus RTU over RS485.
The fan can be disabled between readings to extend the life of the sensor by adjusting a Modbus register/ bacnet variable. The fan runs for one minute, takes a reading and then goes off for the user defined period which is adjustable from one minute to as long as 250 minutes between readings.



PM2.5/10-D



PM2.5/10-W

Highlights

- Accurate : Laser scatter method, particles are sized with a resolution of 0.3 µm.
- User defined sampling period prolongs sensor life.
- Fast Response : response time less than 10 seconds
- LCD display with backlight for keypad setup and troubleshooting
- High resolution: Particle diameter resolution of 2.5 µm
- Supports Modbus protocol over Ethernet,Supports Bacnet protocol over Ethernet
- Supports Bacnet MSTP protocol over RS485,Supports Modbus RTU protocol over RS485

Specifications

Measurement parameters	PM2.5,PM10
Range	0.0-999.9 µg / m³
Power supply voltage	12-24V +/- 10%, AC or DC, 2 watt typical
Output Signal Type	Jumper select: 4-20mA, 10V, 5V
Output Signal Drive	> 500Ω for ma mode, 75ma max output drive for voltage mode
Operating Temp	-20~+50°C, 0-95% non condensing

PM2.5/10 Particle Counter

Communications	Modbus protocol over Ethernet Bacnet protocol over Ethernet Bacnet MSTP protocol over RS485 Modbus RTU protocol over RS485
Plastic Housing	Flammability rating UL 94V0 file,E194560,halogen free
Air pressure	86KPa~110KPa
Response time	1s
Minimum resolution of particle	< 2.5 μm
Counting yield	70%@0.3μm ;98%@0.5μm
Relative error	Maximum of ±15% and ± 10μg/m3
Display	130x80 dot matrix, backlit
Life Span	Default setting of 50% duty cycle equates to 2 years sensor life 25% duty cycle projects to 4 years sensor life 10% duty cycle works out to 10 years

Note: PM2.5 is particulate matter <2.5 μm in diameter; PM10 is particulate matter <10 μm in diameter.

Part Number Scheme

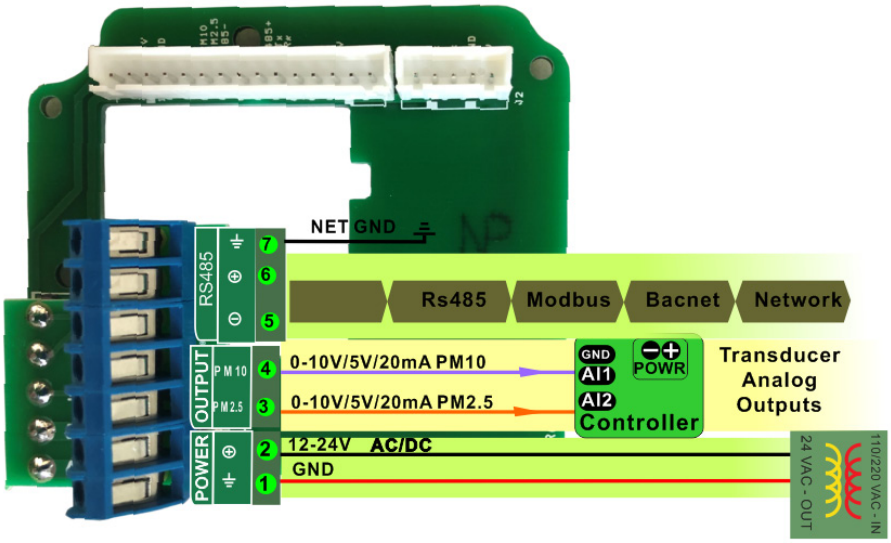
PM2.5/10 - D - 150

Code	Description
PM2.5/10	PM2.5/10 Particle Counter

Code	Module
D	Duct Mount
W	Wall Mount

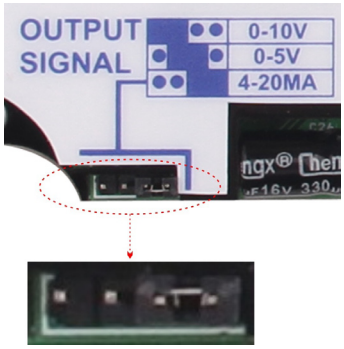
Code	Pitot Length
100	4"
150	6"
200	8"
250	10"
300	12"
*	Other custom lengths are available, no minimum order

Wiring Diagram

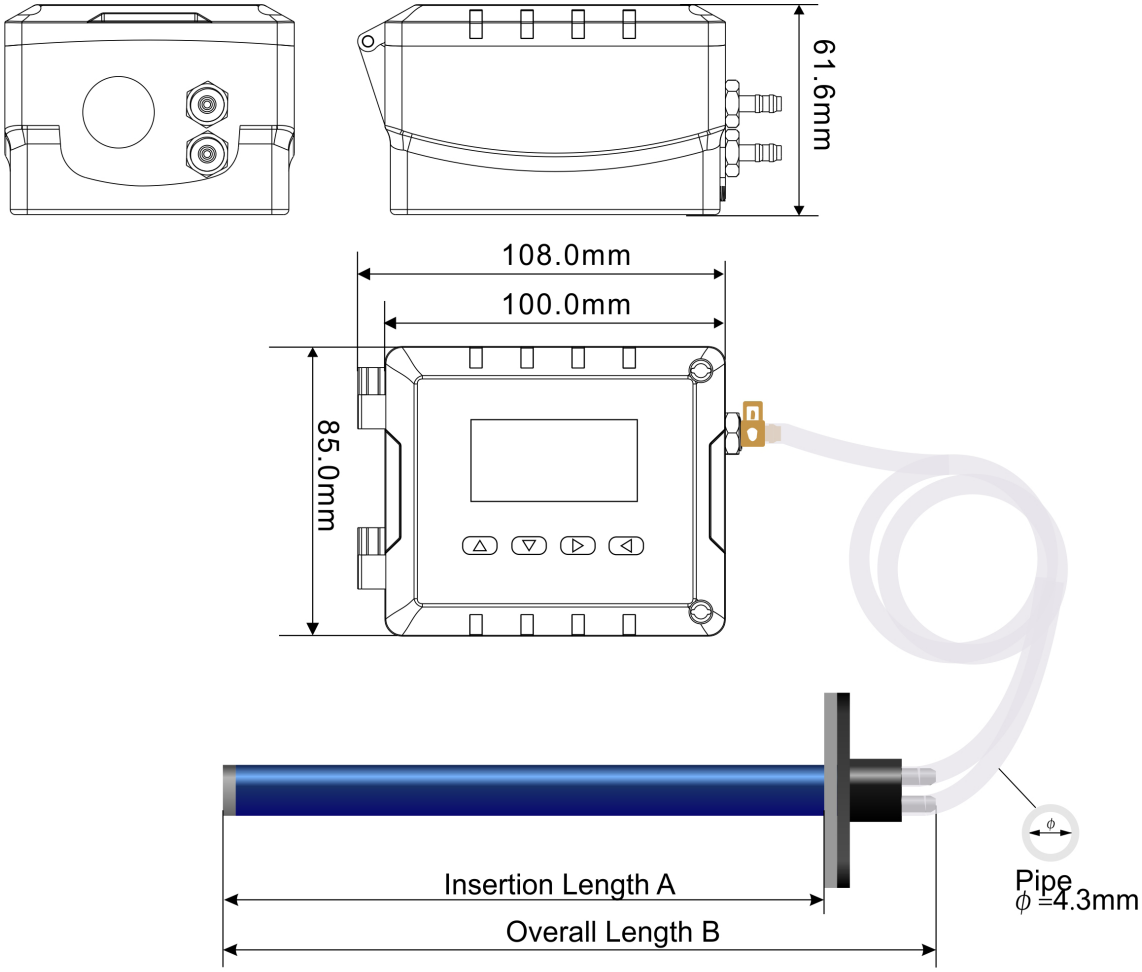


Output Jumper Settings

In this mode the device acts as a traditional transducer where it sends out three analog signals, all you need to do is to set this one single jumper to the appropriate signal type: 4-20mA, 0-10V, or 0-5V.

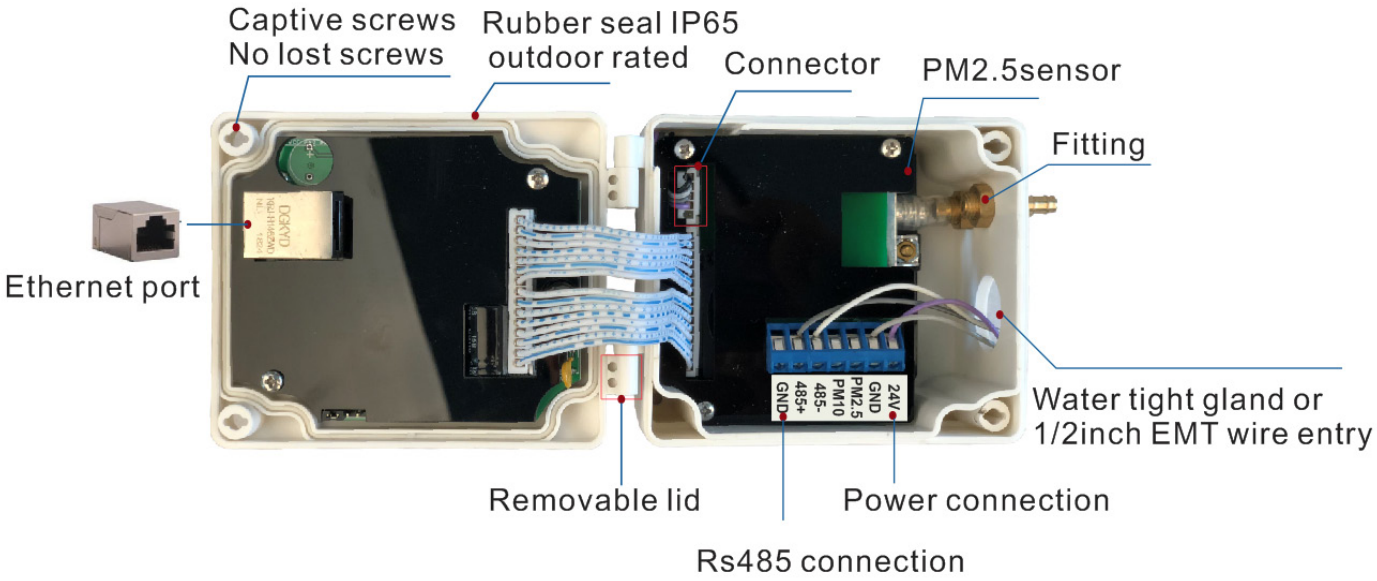


Dimension



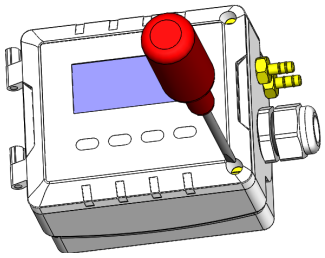
Insertion Length A (mm)	Overall Length B (mm)
150	193
200	243
250	293
300	343
1000	1043

Internal View

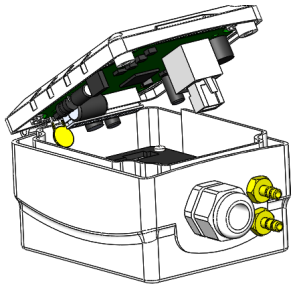


Mounting Installation

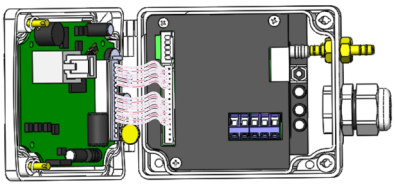
1) Unfasten screw at cover, turn the captive screw 1/2 turn till it pops out.

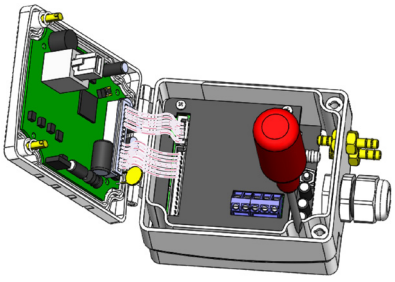


2)Rotate the captive screws with a flat screw driver. These screws are spring loaded and will pop out of their holding position when lined up with a slot in the cover.

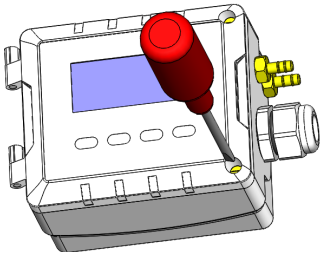


3) When the screws pop up you can raise the lid, you may need to pry the lid off a little with the screw driver if the captive screws are a tight fit.



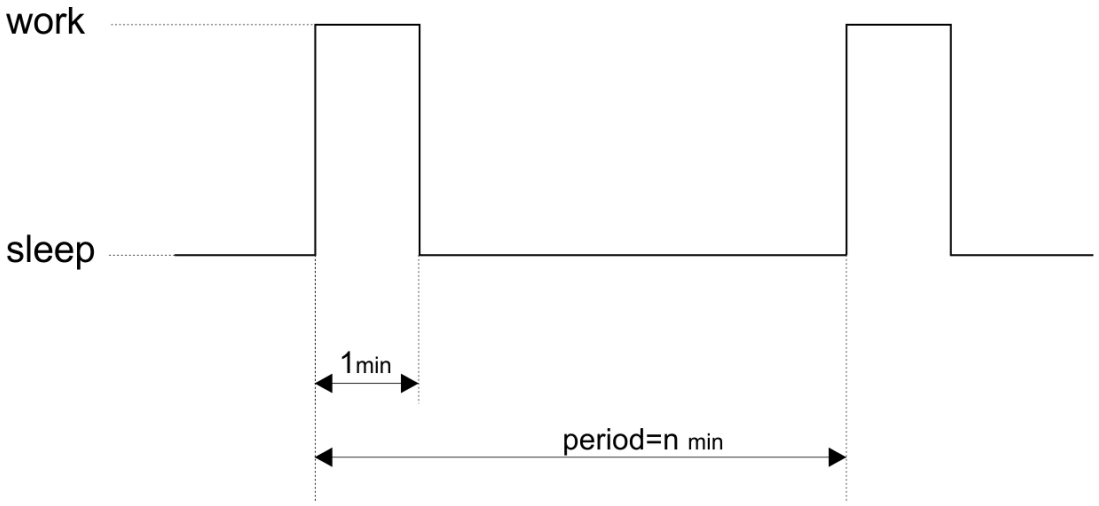


4) Re-fasten screw at cover.



Work Period Setting

Available range of PM2.5 work period setting is 0~30min,default 0(Modbus Register list 104).
When the setting value is *n*,PM2.5 works for 1 minute,the sleep time is *(n-1)* min.

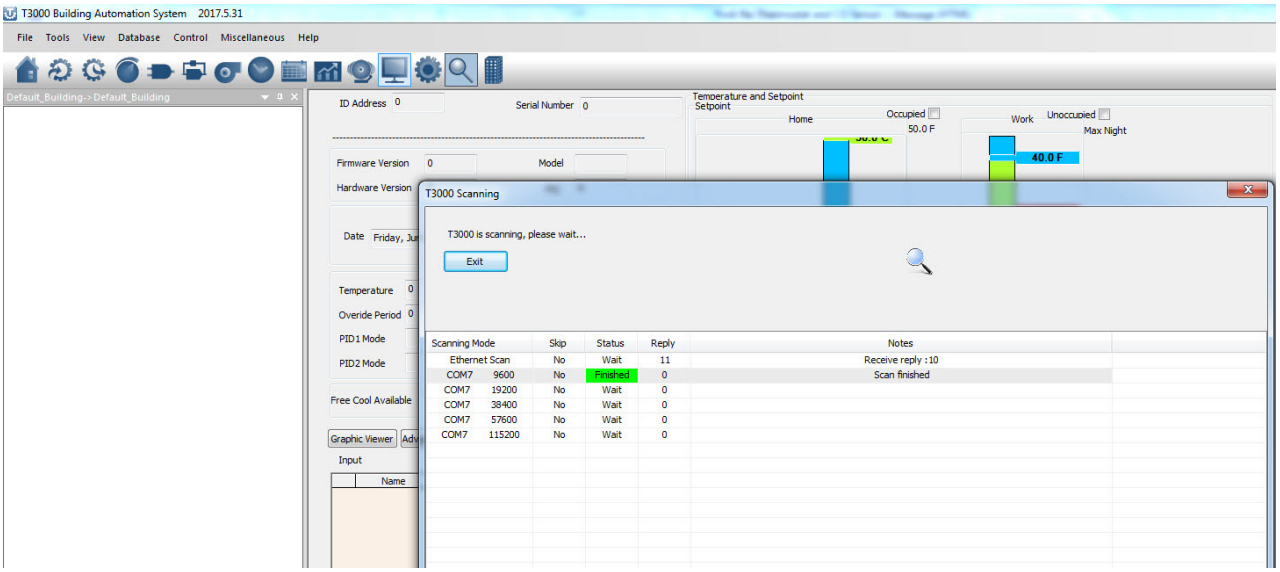


T3000 Operation

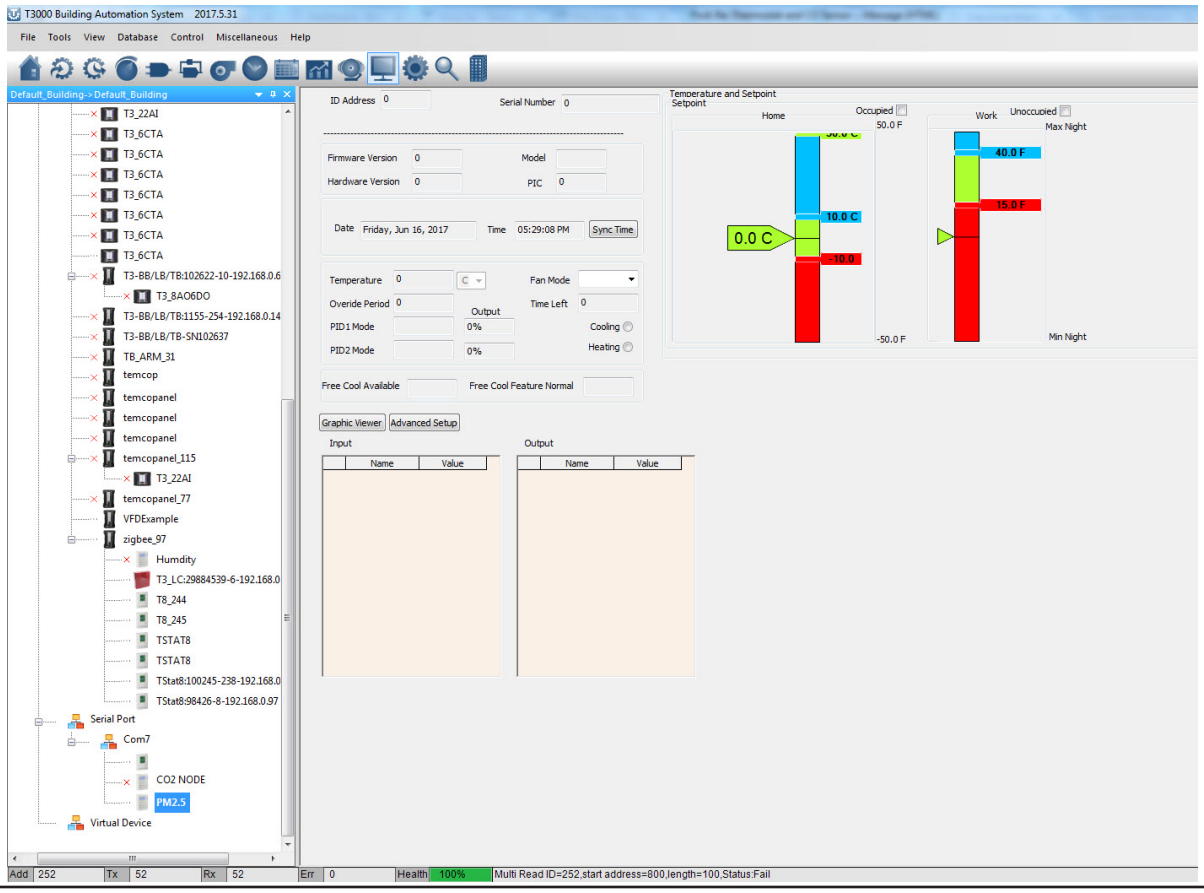
1.Visit https://temcocontrols.com/ftp/software/09T3000Software.zip, download T3000 software and install it;

2.Plug PM2.5 in power,connect it to PC via RS485;

3.Start T3000 software,click  to scan,then you can find PM2.5 as below



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



Modbus Register List

PM2.5 uses MODBUS protocol to communicate with others. Below is modbus the register list .

Address	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 microcontroller to determine the product
8	Hardware Revision. This is a read-only register that is used by the microcontroller to determine the hardware Rev
9	PIC firmware version
10	'Plug n Play' address, used by the network master to resolve address conflicts. See VC code for algorithms
15	Bau - Baudrate, 0=9.6kbaud, 1=19.2kbaud 2=38.4kbaud 3=57.6kbaud 4=115.2kbaud
16	Firmware Update Register, used to show the status of firmware updates
21	Protocol switch. 3 = MODBUS,0=MSTP.
17-39	Blank, for future use
40 to 45	reg40, MAC address, read only normally
46	reg46, IP mode. 0=static IP; 1= DHCP
47 to 48	reg47, upper two bytes of IP address
49 to 50	reg49, lower two bytes of IP address
51 to 52	reg51, right two bytes of SUBNET MASK address
53 to 54	reg53, left two bytes of SUBNET MASK address
55 to56	reg55, right two bytes of GATEWAY address
57 to 58	reg57, left two bytes of GATEWAY address
59	reg59, 0, TCP server, (NO USE)
60	reg60, listen port at TCP server mode
61~75	buffer mirror for changing to a new IP address, copy of reg 46 to 60
76	write 1 to set the ghost settings to the system and start new settings, then clear the ghost registers.
93	Enable for MAC setting. It should be set as 1 before write the new MAC to the MAC registers(100-105), and it will be cleared automatically after setting the MAC address.
94~99	Spare
100	pm2.5 value. ug/m3
101	pm10 value. ug/m3
102	AQI
103	AQI LEVEL. 0 = Good,1=Moderate,2=pool for some,3=unhealthy,4=more unhealthy,5=hazardous.
104	the work period. 0 = work all the time. 1~30 minutes.
105	the pm2.5 sensor id
106	Spare

107	the pm2.5 sensor status. 0 = offline,1=online
108	Spare
109	the main display set . bit0:PM25,bit1:pm10,bit2:AQI,
110	the scroll display set. bit0:sensor status,bit1:rx/tx,bit2:baudrate,bit3:aqi level.
111	main display switch time.1~254 seconds.
112	the pm2.5 offset
113	the pm10 offset
114	the pm2.5 filter
115	the pm10 filter
116	PM output auto or manual 0: auto 1:manual
117	PM output mode 1: 0-10V 2:0-5V 3:4-20mA
118	PM2.5 Min Range
119	PM2.5 Max Range
120	PM10 Min Range
121	PM10 Max Range

Bacnet Register list

PM2.5 uses Bacnet protocol to communicate with others. Below is the Bacnet register list.

Variable	Variable and Description
0	Spare
1	SerialNumber LowByte
2	SerialNumberHighByte
3	SoftWare Version
4	ID Address
5	Product Model
6	Instance
7	Station number
8	Uart BaudRate.0=9.6kbaud, 1=19.2kbaud 2=38.4kbaud 3=57.6kbaud 4=115.2kbaud
9	Update
10	Protocol. 0=MSTP,3= MODBUS
11~19	Spare
20	OffSet_P25
21	OffSet_P10
22~25	Spare
26	Filter_Pm25
27	Filter_Pm10
28~35	Spare
36	Air Quality Index

Input	Input and Description
0~4	Spare
5	PM2.5
6	PM10

CO2 Sensor

Description

The CO2 sensor with Humidity & Temp transmitters are designed for environmental monitoring and controlling in industrial, commercial and other buildings. These transmitters can be used for indoor C02, temperature and humidity monitoring. The modbus interface provides easy setup and integration into large systems. In addtion,both CO2-D and CO2-W have an ethernet port.



CO2-D



CO2-W

Highlights

- High performance sensing elements, temperature compensated, stable
- RS485 for direct digital reading on all models, Ethernet option available for Duct/Wall types
- Easy troubleshooting with pluggable sensors and backplate
- Transducer outputs are jumper selectable: 4-20mA, 0-5V or 0-10V
- LCD display with backlight on all models except 'the Node'
- Automatic background calibration, default CO2 value: 400 ppm
- CO2 D/W style featured as pluggable sensor module with stainless steel sintered filter
- Enthalpy, its calculated automatically and available in the register list and display

Dimensions

CO2-N-TH Highlights:

CO2-N-TH is indoor wall mount CO2, Temp & Hum sensor

High performance sensing elements, temperature compensated, stable



CO2-N-X Highlights:

CO2-N-X is indoor wall mount CO2 sensor

Good quality and low cost

CO2-N-TH & CO2-N-X:

Modbus RS485 with 0-5V, 0-10V and 4-20mA outputs, support Bacnet MS/TP

Available in red and white, other colors optional

Red/yellow/green LED shows the quality and safety of the air, and blue LED shows good communication

Specifications

Sensing	CO2	HUM	TEMP
Sensor Type	Dual Beam NDIR	Capacitive	10k thermister
Range	3,000 ppm, adjustable	0-100% Non-Condensing	-40~150°C(-60~340°F)
Accuracy	±70 ppm or ±5% of reading	5% @25°C, 20~80%	< ±0.5°C @ 25°C
Drift	<50ppm / yr full scale	< 0.5% RH / year	
Display Resolution	1ppm	0.1% RH	0.1Deg

Humidity / Temp Transmitter & Modbus

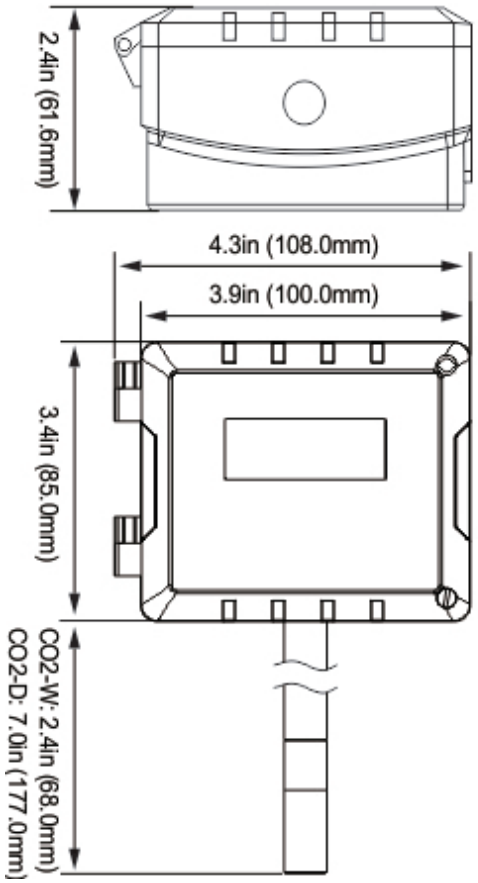
Models	CO2-D	CO2-W	CO2-Node	Tstat6-CO2
Typical Application	Duct	Wall, outside	Wall mount indoors	Wall mount indoors
Outputs	3	3	3	2
Output Signal Type	Jumper select: 4-20mA, 10V, 5V			10V & 5V
Output Signal Drive	> 500Ω for ma mode, 75ma max output drive for voltage mode			75ma @10V
RS485 ports	2	2	1	1
Ethernet Modbus TCP/IP	C02-D-E	CO2-W-E	not available	not available
Power	15-24V +/- 10%, AC or DC , 2 watt typical			
Operating Temp	-30~+70C, 0-95% non condensing			
Plastic Housing	Flammability rating UL 94V0 file E194560, plastic is halogen free			
Display	130x80 dot matrix, backlit		4 leds	2x8char
Control Features	Master/Gateway Mode		N/A	Same as Tstat6

Note:

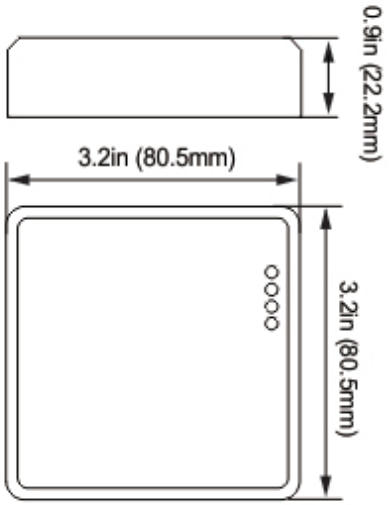
1. The default setting for the transducers is 0 to 10V, over the range 0 to 100 Degrees C. If you're using the 10V transducer output signal, the sensor needs to be powered with at least 15V AC or DC.
2.For application not using the 10V transducer output signal, using 4-20ma signal, 0-5V transducers, or Modbus/Ethernet only, in this case you can use 12V AC or DC.

Dimensions

CO2-D & CO2-W



CO2-N



CO2 Sensor

Part Number Scheme

Co2 - D - T

Code	Description
CO2	CO2 Sensor

Code	Module
D	Duct Mount
W	Wall Mount
N	CO2 Node

Code	Option
X	CO2 only
TH	Temperature & Humidity

Product	Model	Temp	Hum	CO2	RS485	Ethernet	Pitot
CO2-D	-TH-E	✓	✓	✓	✓	✓	✓
	-X-E	×	×	✓	✓	✓	✓
CO2-W	-TH-E	✓	✓	✓	✓	✓	×
	-X-E	×	×	✓	✓	✓	×
CO2-N	-X	×	×	✓	✓	×	×
	-TH	✓	✓	✓	✓	×	×

CO2 - N - TH - W

Code	Description
CO2	CO2 Sensor

Code	Module
N	CO2 Node

Code	Option
W	White Enclosure
O	Other Colors Optional*

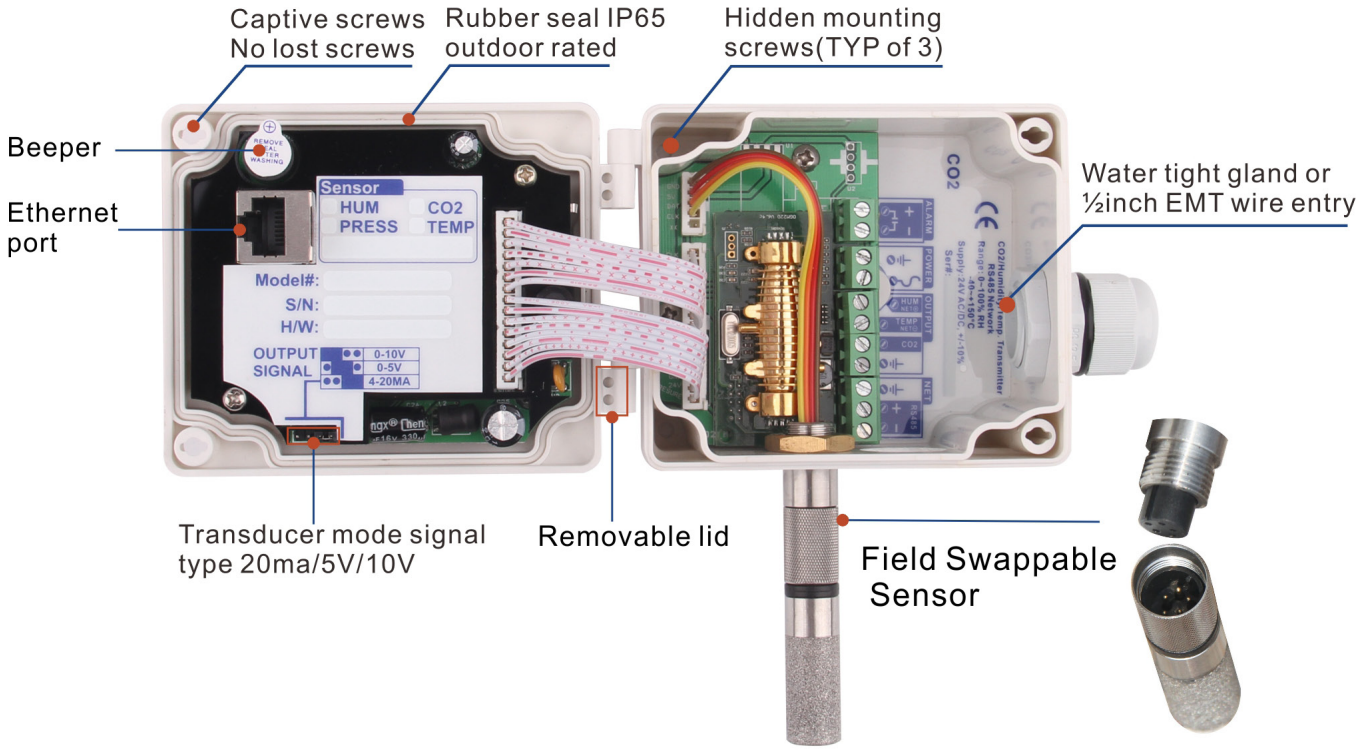
Code	Option
X	RS485
TH	Temp & Hum & RS485

* MOQ: 100pcs

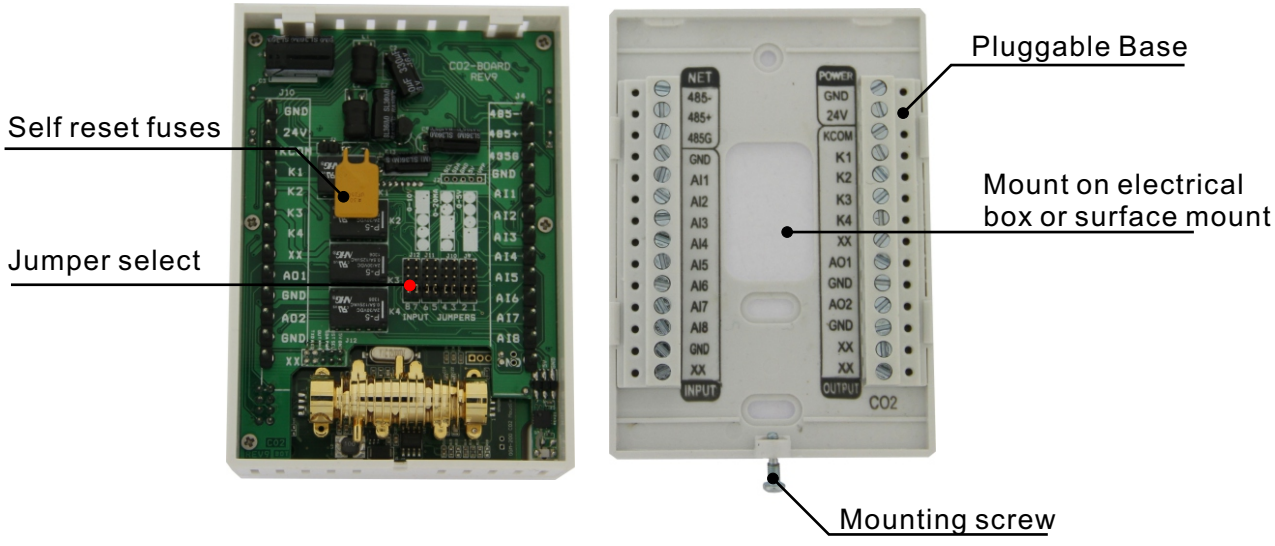
CO2 Sensor

Product Highlights

CO2-W & CO2-D



Tstat6 -CO2



Register List

Modbus

CO2-Humidity-Temp Transmitter w/Bacnet uses MODBUS protocol to communicate with others.Below is the Modbus register list.

Address	Bytes	Register & Description
0..1	2	Lower 2 bytes of the serial number
2..3	2	Upper 2 bytes of the serial number
4	1	firmware version lower byte. eg. FW version = 10.12, so lower byte = 12 AND high byte = 10. Fixid.
5	1	firmware version upper byte. eg. FW version = 10.12, so lower byte = 12 AND high byte = 10. Fixed.
6	1	Modbus device address default:254
7	1	Product ID, Fixed.
8	1	Hardware version
9	1	spare
10	1	spare
14	1	sensor type. Bit0 = co2,Bit1 = Hum,Bit2 = Temp, Bit3 = Pressure.
15	1	Baudrate Setting: 0 = 9600bps, 1 = 19200bps,2 = 38400bps，3 = 57600bps,4 = 115200 bps, default:115.2kbaud
16	1	Firmware Update Register, used to show the status of firmware updates
21	1	Protocol switch. 3 = MODBUS,0=MSTP. Defualt: Modbus
17…39	23	spare
40 to 45	6	reg40, MAC address, read only normally
46	1	reg46, IP mode. 0=static IP; 1= DHCP default: static
47 to 48	2	reg47, upper two bytes of IP address default:192.168
49 to 50	2	reg49, lower two bytes of IP address default: 0.34
51 to 52	2	reg51, right two bytes of SUBNET MASK address
53 to 54	2	reg53, left two bytes of SUBNET MASK address
55 to56	2	reg55, right two bytes of GATEWAY address
57 to 58	2	reg57, left two bytes of GATEWAY address
59	1	reg59, 0, TCP server, (NO USE)
60	1	reg60, listen port at TCP server mode
61~75		buffer mirror for changing to a new IP address, copy of reg 46 to 60
76	1	write 1 to set the ghost settings to the system and start new settings, then clear the ghost registers.
93	1	Enable for MAC setting. It should be set as 1 before write the new MAC to the MAC registers(100-105), and it will be cleared automatically after setting the MAC address.
94…199	7	Reserved for future.
200	1	Temperature sensor selection, 0=external, 1=internal. Read only, it will be set to 1 if the humidity module exists.
201	1	Select the unit of temperature to display on LCD. 0=degree Celsius, 1=degree Fahrenheit
202	2	The value of on board temperature sensor, the unit is degree Celsius. The resolution is 0.1 degree.
203	2	The value of on board temperature sensor, the unit is degree Fahrenheit. The resolution is 0.1 degree.
204	2	The value of external temperature sensor, the unit is degree Celsius. The resolution is 0.1 degree.
205	2	The value of external temperature sensor, the unit is degree Fahrenheit. The resolution is 0.1 degree.
206	2	The temperature offset for calibrating the internal temperature. The resolution is 0.1 degree.
207	2	Relative humidity. The resolution is 0.1%
208	2	Read only. The real frequency read from the humidity module, unuse.
209	1	Read only. The number of the calibration table points.
210	1	Internal CO2 sensor selection. The value is 1 as default. 1 = MAYBE_OGM200;2=MAYBE_TEMCO_CO2;3=OGM200;4=TEMCO_CO2.
211	2	The CO2 ppm value of internal CO2 sensor.
212	2	The CO2 ppm offset for calibrating internal CO2 sensor.
213	2	The setpoint value of fair alarm for internal CO2 sensor.
214	2	The setpoint value of poor alarm for internal CO2 sensor.
215..468	2*254	The CO2 ppm value of the external CO2 sensors if there are/is CO2 nodes connect to it.
469..722	2*254	The CO2 ppm offset for calibrating external CO2 sensors.
723..976	2*254	The setpoint value of fair alarm for external CO2 sensors.
977..1230	2*254	The setpoint value of poor alarm for external CO2 sensors.
1231	2	Reserve
1232	1	The filter of CO2 sensor.
1233	1	Enable/Disable the password for the menu system operation. 0=Disable, 1=Enable.
1234	1	The first digital of the password. Should be from 0 to 9.
1235	1	The second digital of the password. Should be from 0 to 9.
1236	1	The third digital of the password. Should be from 0 to 9.
1237	1	The fourth digital of the password. Should be from 0 to 9.
1238	1	The century of the real time clock.
1239	1	The year of the real time clock.
1240	1	The month of the real time clock.

1241	1	The date of the real time clock.
1242	1	The weekday of the real time clock.
1243	1	The hour of the real time clock.
1244	1	The minute of the real time clock.
1245	1	The secod of the real time clock.
1246	1	Alarm auto/manual control. Bit7: 0 = auto, 1 = manual; bit0:1 = pre_alarm; bit1: 1 = continuous_alarm; bit(1:0): 00 = stop_ alarm
1247	1	The alarm output turn on time, <= 20 seconds.
1248	1	The alarm output turn off time, <= 20 seconds.
1249	1	Alarm output delay time. It delays the alarm output when the alarm is triggered. It is 5 seconds as default.
1250	1	Analog output auto/manual control. Bit 0 directs to temperature output, Bit 1 directs to humidity output, Bit 2 directs to co2 output. 0=Auto, 1=Manual.
1251	2	The manual value of temperature.
1252	2	The manual value of humidity.
1253	2	The manual value of co2.
1254	1	Analog output mode, read only, select by jumper. 1=4-20mA, 2=0-5V, 3=0-10V
1255	2	The Lowest value of temperature for analog output.
1256	2	The Heighest value of temperature for analog output.
1257	2	The Lowest value of humidity for analog output.
1258	2	The Heighest value of humidity for analog output.
1259	2	The Lowest value of co2 for analog output.
1260	2	The Heighest value of co2 for analog output.
1261	1	Reserve
1262	1	The period for the LCD backlight keep on. The backlight turns on when key is triggered, and turns off the it expires.
1263	1	Enable/Disable the plug-and-play feature of the external nodes. 0=disalbe, 1=enable.
1264	1	The number of co2 sensors connect to the unit, includes the internal co2 sensor.
1265	1	Set 1 to reset the scan table.

1266..1270	1*5	The first co2 node information. Normally it is the unit itself.
		register1266: the modbus ID of the co2 sensor.
		register1267..1270: the serial number of the co2 sensor.
1271..1275	1*5	The secod co2 node information. Normally, it is the first external co2 node.
1276..1280	1*5	The third co2 node information.
…		
…		
2531…2535	1*5	The 254th co2 node information.
3000	1	the internal temperature filter.
3001	1	the external temperature filter.
3002	1	the humidity filter.
3003	1	the humidity sensor version.
3004	2	the humidity sensor serial number.
3005	1	the humidity sensor factory calibrate point number.
3006	1	the humidity sensor calibrate table select. 0 = factory table. 1 = user table.
3007~3026	2 * 254	factory calibrate table. Register3007:The 1st Calibration point. Frequency,Register 3008:The 1st Calibration point. RH.
3027	1	user calibrate table point number.
3028~3047	2 * 254	user calibrate table. Register3028:The 1st Calibration point. RH,Register 3029:The 1st Calibration point. Frequency.
3049	2	the dew point. In degree c.
3050	2	the dew point. In degree F.
3051	2	The Lowest value of dew point for analog output.
3052	2	The Heighest value of dew point for analog output.
3053	2	Partial Pressure of water at saturation at given temperature, [hPa]
3054	2	Mixing Ratio, the mass of water over the mass of dry gas, [g/kg]
3055	2	Enthalpy of the air, [kJ/kg]

3056	2	the external temperature offset.
3057	2	the user table humidity offset.
3058	2	the default table humidity offset.
3066	2	the analog output value of humidity.(0.01ma / 0.01 V)
3067	2	the analog output value of temperature.
3068	2	the analog output value of CO2.

CO2 Sensor

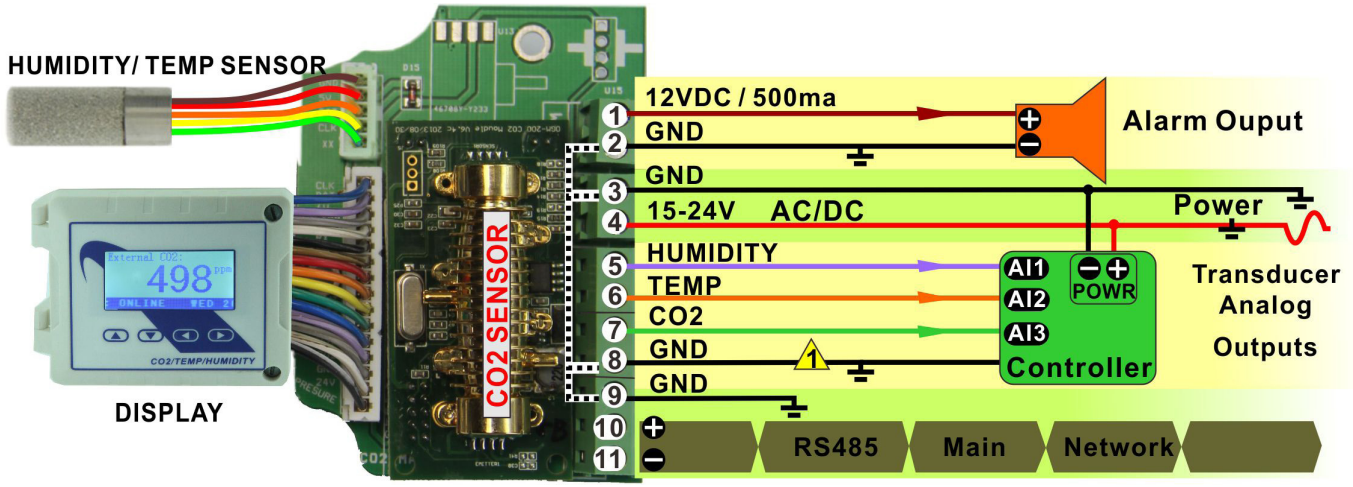
Bacnet

CO2-Humidity-Temp Transmitter w/Bacnet uses Bacnet protocol to communicate with others.Below is the Bacnet register list.

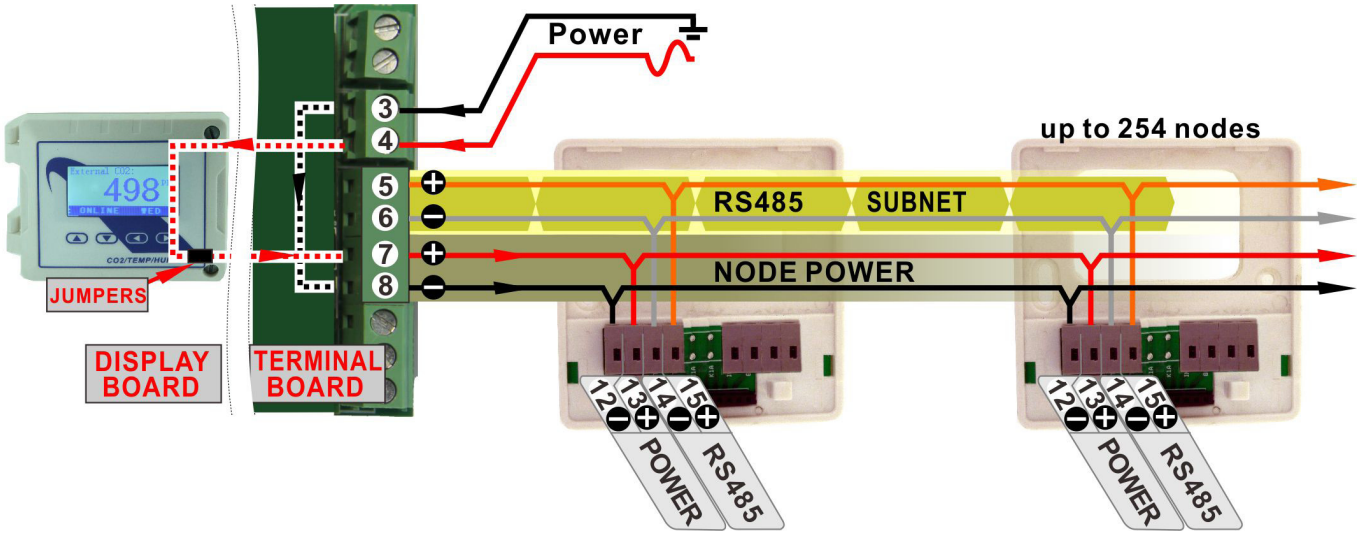
Backed Object	variable and Description
Varialbe1	SerialNumberLowByte
Varialbe2	SerialNumberHighByte
Varialbe3	SoftWare Version
Varialbe4	Device ID
Varialbe5	Product Model
Varialbe6	Instance
Varialbe7	Station number
Varialbe8	Uart BaudRate.0=9.6kbaud, 1=19.2kbaud 2=38.4kbaud 3=57.6kbaud 4=115.2kbaud
Varialbe9	Update
Varialbe10	Protocol
Varialbe11	Auto/Manual
Varialbe12	dew point
Varialbe13	Pws
Varialbe14	Lowest Ratio
Varialbe15	Enthalpy
Varialbe16	OffSet Humdity
Varialbe17	OffSet Tempeature
Varialbe18	OffSet CO2
Varialbe22	Filter Humdity
Varialbe23	Filter Temperature
Varialbe24	Filter CO2
Varialbe28	Temperature Unit .0 = C, 1 =F
Varialbe29	OutMode. 1=0-10V, 2=0-5V, 3=4-20mA
Varialbe30	Output1 Lowest Range
Varialbe31	Output1 Hightest Range
Varialbe32	Output2 Lowest Range
Varialbe33	Output2 Highest Range
Varialbe34	Output3 Lowest Range
Varialbe35	Output3 Highest Range
	Input and Description
Input1	Temperature
Input2	Humidity
Input3	CO2
	Output and Description
Output1	Humidity Analog output
Output2	Temperature Analog output
Output3	CO2 Analog output

Wiring diagram for CO2-D duct and CO2-W wall mount style

The diagram below shows the wiring connection for the usual transducer mode of operation for the CO2-D duct mount and CO2-W wall mount style sensors. The transducer outputs connect to a master controller using traditional analog output signals. The RS485 network is available for transmitting the same values digitally to other controllers in the system by connecting to the RS485 network at Pins 10 and 11.



The next diagram shows the wiring connection in 'Master' mode where the device operates as a gateway to a subnetwork of slave sensors. This is a special mode of operation and most users needn't be concerned about the details of this feature. The main RS485 network is still available on pins 10 and 11 for connecting

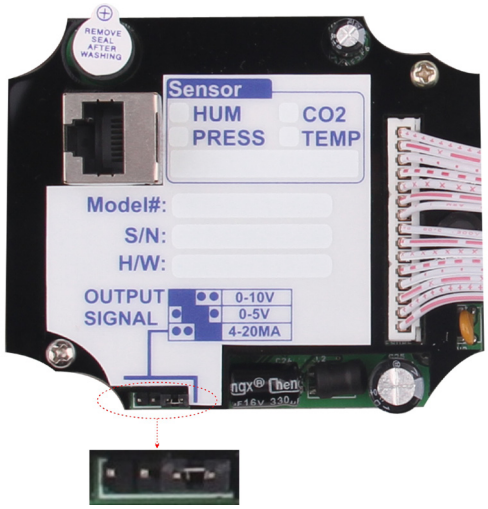


other masters in the system as above,but the transducer analog signals are not available now, instead we now have a second RS485 port which can be used to poll a subnetwork of remote RS485 CO2 sensors. The unit acts as a modbus slave on the main network and a master on the subnetwork. Power to the nodes can be run from Pins 5 and 6 along with the RS485 cable, in this case power makes its way through the display board and jumpers as shown with the dotted lines. If there are more than five

or so sensor nodes it will be best to power the nodes directly from the power supply. If more than one power supply is used in the system,be extra careful to keep all grounds consistent from one node to the next orelse ground loops can damage the sensor. The Duct and Wall mount version of the sensor have two modes of operation,transducer mode and RS485 Master mode. For most applications the sensor will be used in the 'transducer mode' which is the default setting. In this mode the device acts as a traditional transducer where it sends out three analog signals proportional to the humidity, temperature and CO2 readings.

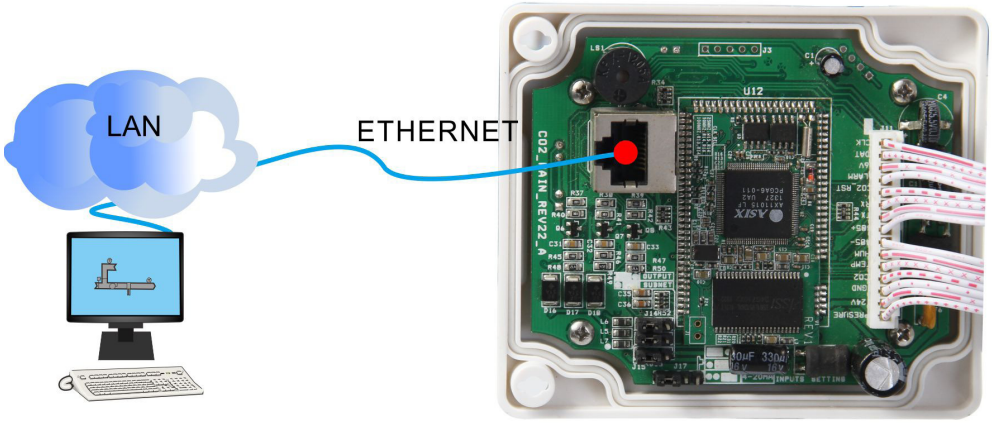
Output Jumper settings

In this mode the device acts as a traditional transducer where it sends out three analog signals, all you need to do is to set this one single jumper to the appropriate signal type: 4-20mA, 0-10V, or 0-5V.



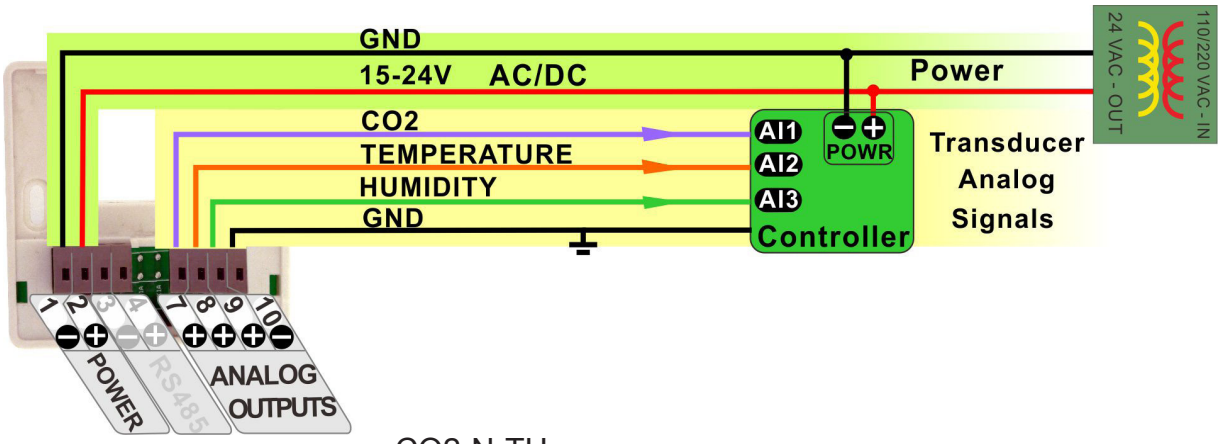
Ethernet Wiring

For Ethernet option, CO2-D/W has two choices,with and without, here we show a photo about how to connect with Ethernet.



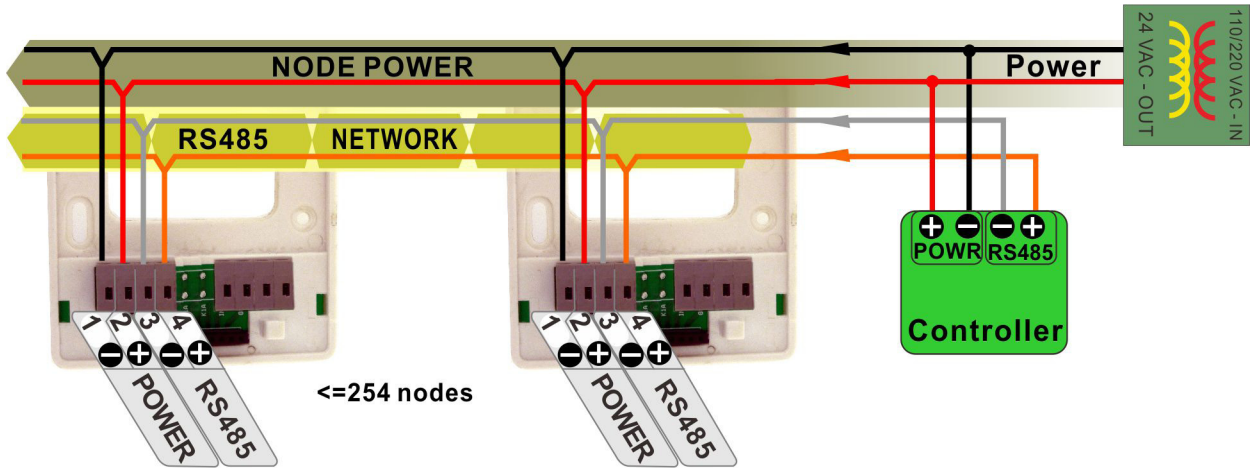
Wiring diagram for CO2-N-TH & CO2-N-X

The diagram below shows the wiring connection for the usual transducer mode of operation for the CO2-N-TH. The transducer outputs is connected to a master controller using the traditional analog output signals while CO2-N-X only have power and RS485 network, without temperature and humidity sensors.



CO2-N-TH

The next diagram shows the CO2-N working in the RS485 network; the node quantity can be up to 255 units. A group of sensors distributed through the building can cooperate friendly through net. The RS485 network is available for transmitting the same values digitally to other controllers.

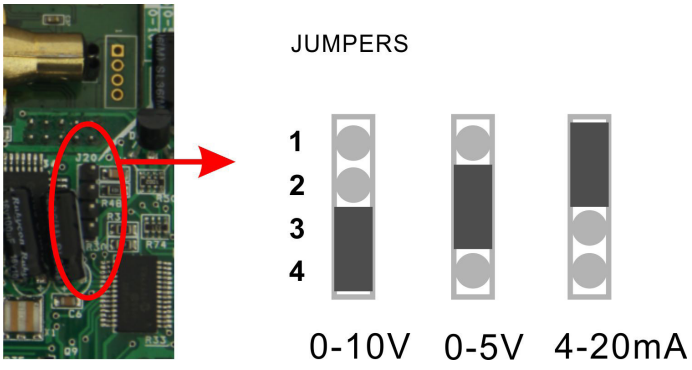


CO2-N-TH

For CO2-N-TH, in this mode the device acts as a traditional transducer where it sends out three analog signals which is humidity, temperature and CO2 readings. All you need to do is to set this one single jumper to the appropriate signal type: 4-20mA, 0-10V, or 0-5V,while for it doesn't have temperature and humidity analog signals for CO2-N-X.

Jumper settings for CO2-N-TH & CO2-N-X

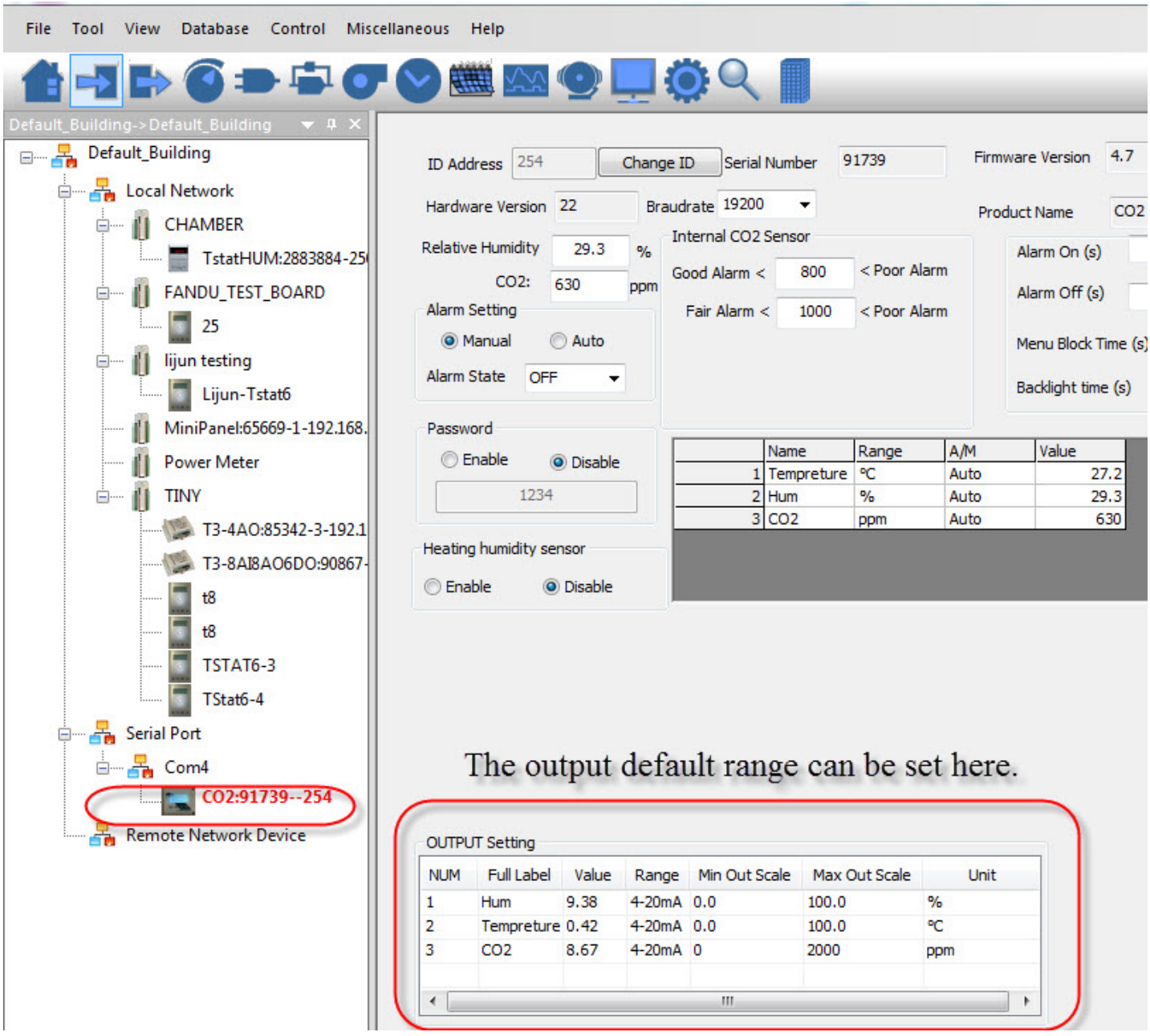
In this mode the device acts as a traditional transducer where it sends out three analog signals, all you need to do is to set this one single jumper to the appropriate signal type: 4-20mA, 0-10V, or 0-5V.



Voltage & Current Formula

The max and min value are the range max and min value, the range can be set by the customer.
Default Temperature Range: 0-1000 (0-100.0C)
Default Humidity Range: 0-1000 (0-100.0% rH)
Default CO2 Range: 0-3000ppm

Also the temperature, humidity, CO2 range value can be set by T3000 software, here follow the screen shot from T3000.



CO2 Sensor

Formula for Analog Outputs

0-10V Output	Temperature(C)=[Voltage * (High_T - Low_T) + 10 * Low_T] /100
	Temperature(F)=(DegC)*9/5+32
	Humidity=[Voltage * (High_H - Low_H)+10 * Low_H)/100
	CO2=Voltage * (High_C-Low_C)/10+Low
0-5V Output	Temperature(C)=[Voltage * (High_T - Low_T) + 5 * Low_T] /50
	Temperature(F)=(DegC)*9/5+32
	Humidity=[Voltage * (High_H - Low_H) + 5 * Low_H)/50
	CO2=Voltage * (High_C - Low_C)/5+Low_C
4-20mA	Temperature(C)=(Current-4) * (High_T - Low_T) + Low_T/10
	Temperature(F)=(DegC)*9/5+32
	Humidity=(Current-4) x (High_H - Low_H) + Low_H/10
	CO2=(Current-4) x (High_C - Low_C)/16 + Low_C

Register List

CO2-D, CO2-W without network	High_T=R286 High_H=R288 High_C=R290 Low_T=R285 Low_H=R287 Low_C=R289
CO2-D, CO2-W with network	High_T=R1256 High_H=R1258 High_C=R1260 Low_T=R1254 Low_H=R1257 Low_C=R1259
CO2-Node	High_T=R129 High_H=R131 High_C=R133 Low_T=R128 Low_H=R130 Low_C=R132

For example
1. Product: CO2-D
2. Output range: 0-10V output (Adjust jumper to select 0-10V in PCB board)
3. The default settings R285 = 0 and R286 = 1000, that means the default output scale is 0C-100.0C, and they can be set by customer.
4. Measuring temperature output voltage: 7.8V
5. Temperature(C)=[Voltage * (High_T - Low_T) + 10 * Low_T] /100
=[7.8 * (1000-0) + 10 * 0]/100
=78C

CO2 Sensor

Instrument Operation

7.1)There are four keys. The first and second keys are used to increase and decrease the value and select the up down list. When click the third key, it will be back to the previous view layer. And click the forth key,it will switch to the next item.

Increase value or select up list

Decrease value or select down list

Back or return

Next or confirm



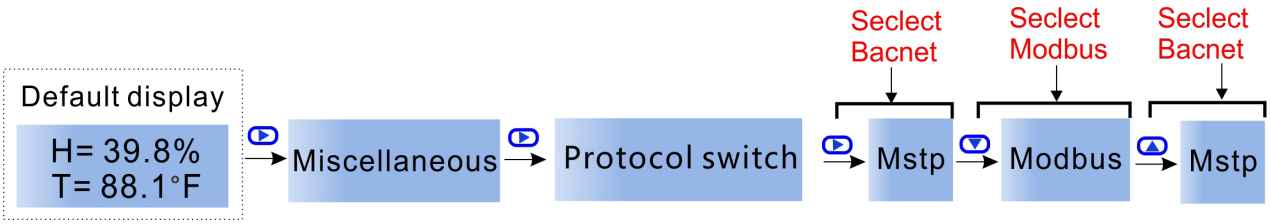
Menu display chart

The following value was taken as an example so you can understand it well.

CO2	Zone 0: Zone 254:	1. Delete node 2. Spt poor: 2500 3. Spt fair: 2500 4. Calibration: 1294
Temperature	1. Int: 23.0°C 2. Ext: 18.2°C 3. Unit: °C/ °F 4. Sensor disp.: Ext./Int.	
Humidity	1. Calibration: 34.9% 2. Heat: ON/OFF	
Miscellaneous	1. Modus ID: 251 2. Date: 2014-12-17 3. Time: 11:00 4. Ring on time: 2 5. Ring off time: 2 6. Baudrate: 19200 7. Factory reset 8. Use password: Yes/No 9. Password	

a.Normal state:

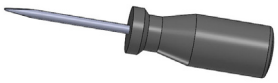
To select the protocol as Modbus or Bacnet,Press ▶ to choose Miscellaneous,then press ▶ to choose Protocol switch,press ▼ ,it reads Mstp,which means you have seclected Bacnet ;if you want to switch to Modbus,press ▼ , or ▲ back to Bacnet.



Or you can check the Bacnet Resgister List,No.9: Protocol switch. 0 = MODBUS,1=MSTP.

Mounting Installation

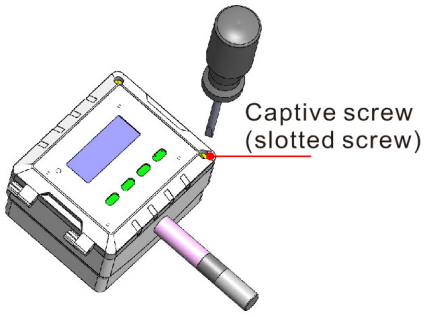
1) Slotted screwdriver.



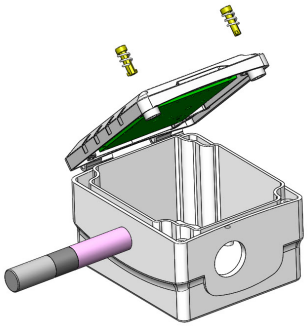
Captive screw (slotted screw)



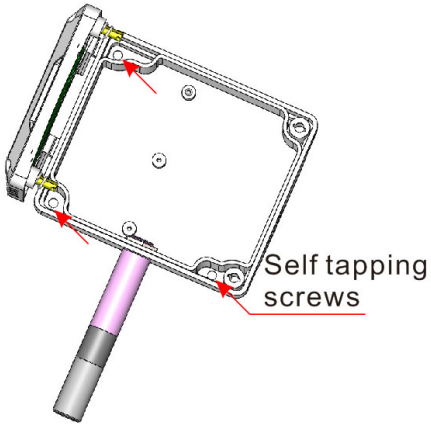
2) Unfasten screw at cover, turn the captive screw 1/2 turn till it pops out.

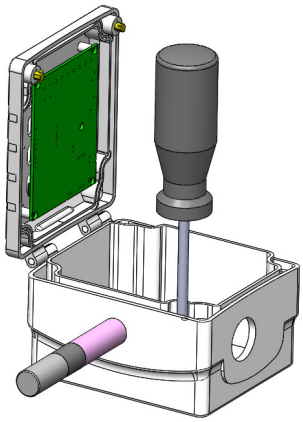


3) Open the cover.

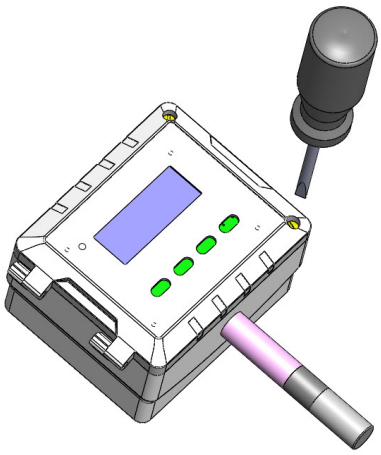


4) There are three small holes as red arrows showed below inside the box for fastening self tapping screws drilling the hole in the duct with a template





5) Re-fasten screw at cover.



CO2 Sensor

Accessories

CO2-W



This new Transmittier brings with it the incorpoation of CO2 Monitoring. When the External CO2 Sensor is attactched,the transmittier can process and display detailed information about the current CO2 count.

You can set the alarm setpoints in the menu using buttons or RS485.There are two alarm setpoints:

1. Fair alarm: the alarm output will be turned on for the ALARM_ON seconds, then be turned off for ALARM_OFF seconds, and go on on-off-on-off .
2. Poor alarm: the alarm output will be turned and kept it on.

AND there are two types of the CO2-W we have, one with ethernet and the other without ethernet.

1)ALARM_ON, you can set it in the register1247 with ethernet or register152 without ethernet.

2)ALARM_OFF, you can set it in the register1248 with ethernet or register153 without ethernet.

3)Fair setpoint you can set it in the register213 with ethernet or register 155 without ethernet.

4)Poor setpoint you can set it in the register214 with ethernet or register156 without ethernet.

CO2-N



This External CO2 Sensor uses the sensor module to calculate the current CO2 levels and uses a simple “Red/Yellow/Green” LED display to show the quality and safety of the air.When connected to the transmitter,it will display detailed information about the current CO2 count.It can also accurately monitor temperature.

External Alarm

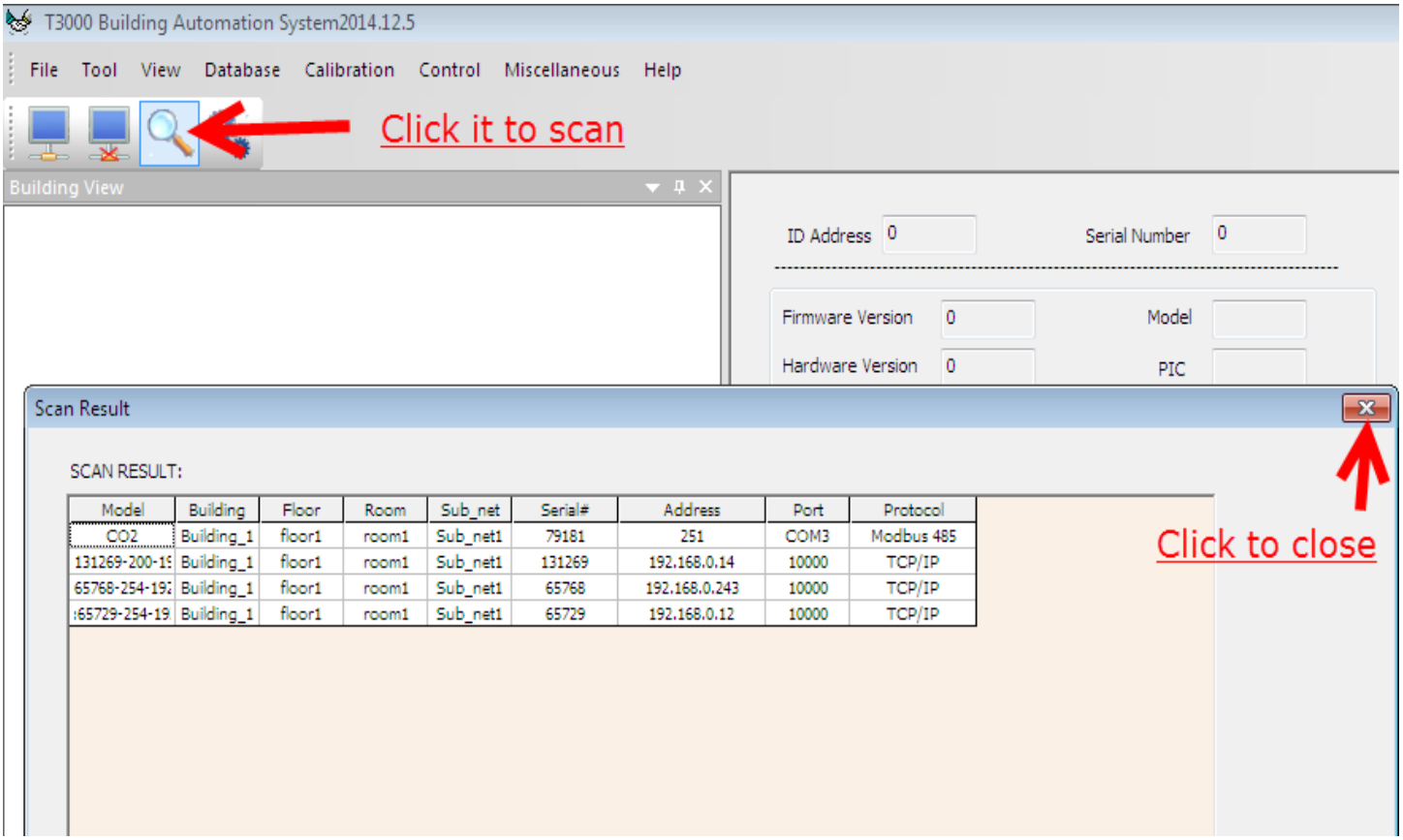


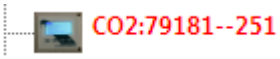
Connected to the transmitter,this external alarm will sound and flash a red light when the CO2 levels become “POOR”. It can be connected with CO2-D, CO2-W.

CO2-D/W in T3000 Operation

1). Connect CO2 to PC by RS485 and start T3000 software.

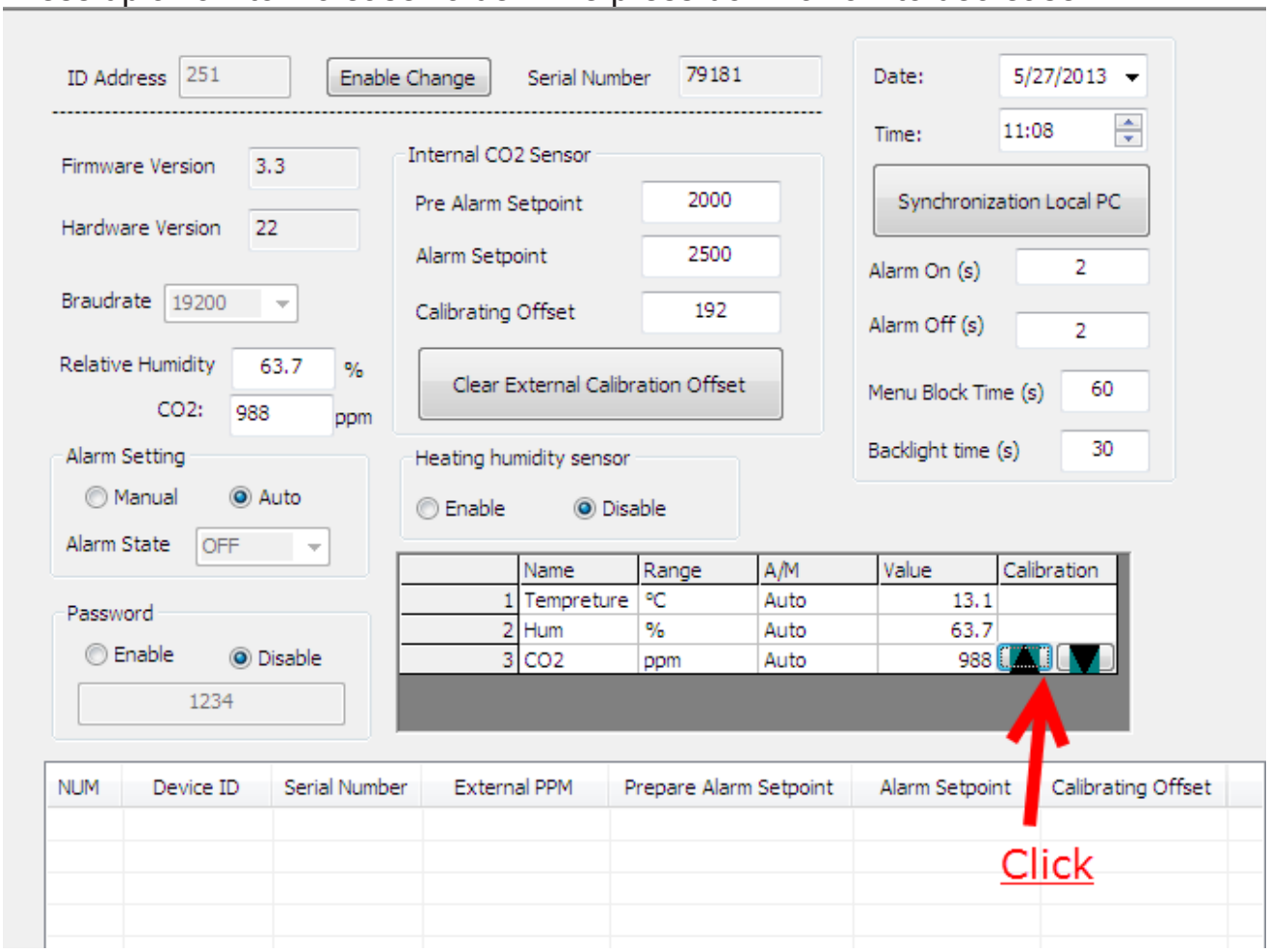
2). Click the button  to scan, the following view will appear and close it as the picture indicates.



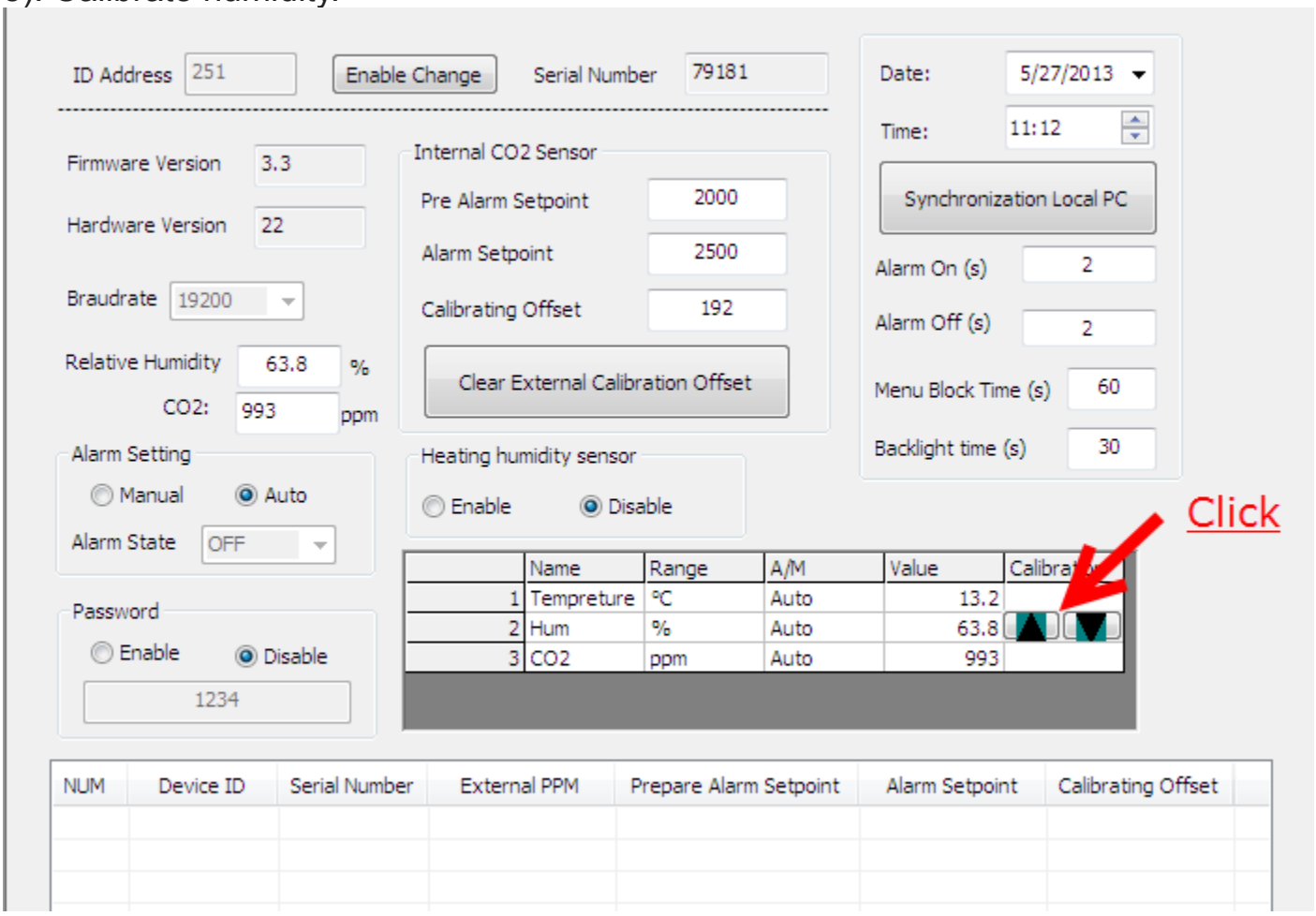
3). Click CO2 log  and the T3000 will show all the information of CO2.

4). Calibrate CO2

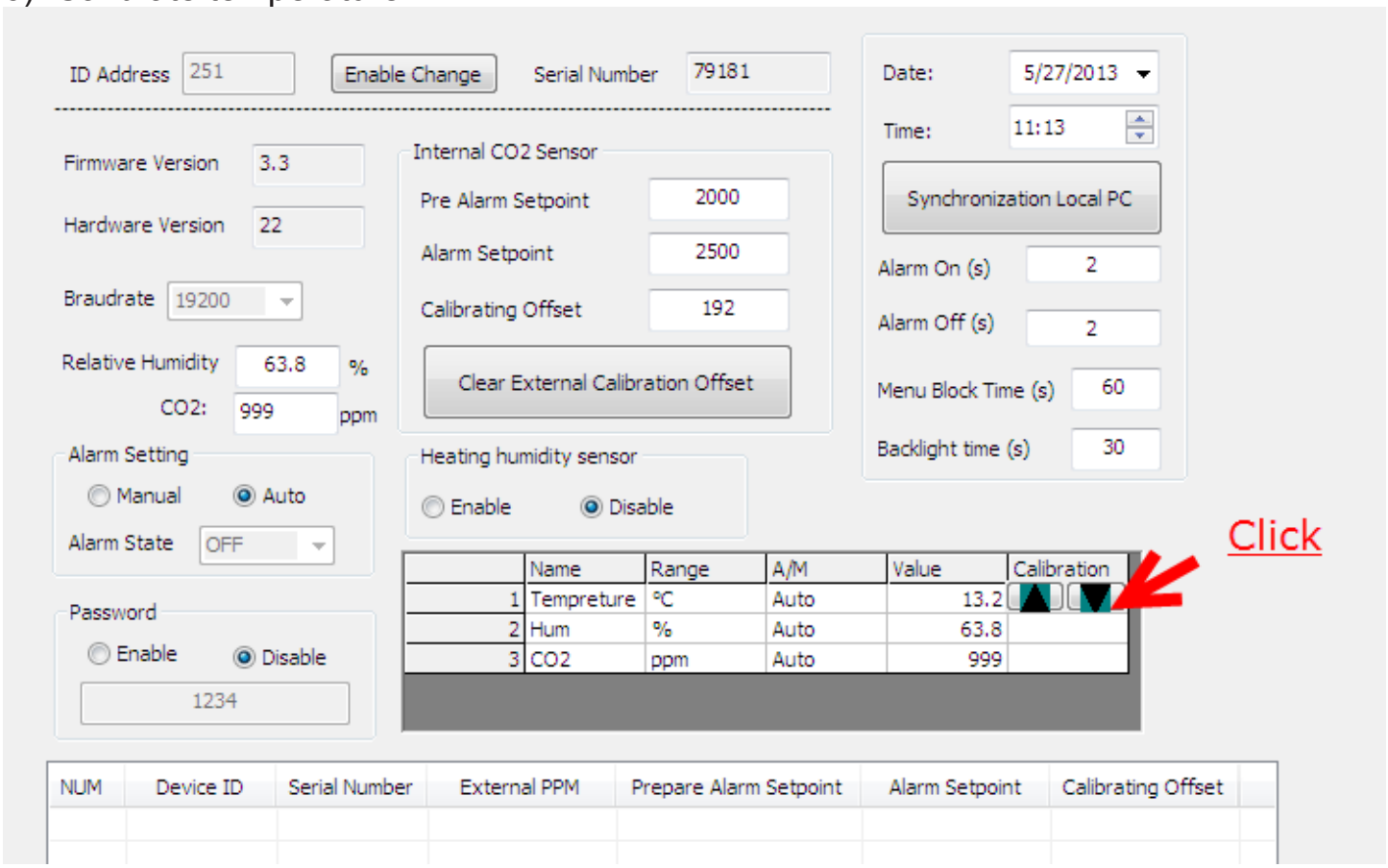
Press up arrow to increase value while press down arrow to decrease.



5). Calibrate humidity.



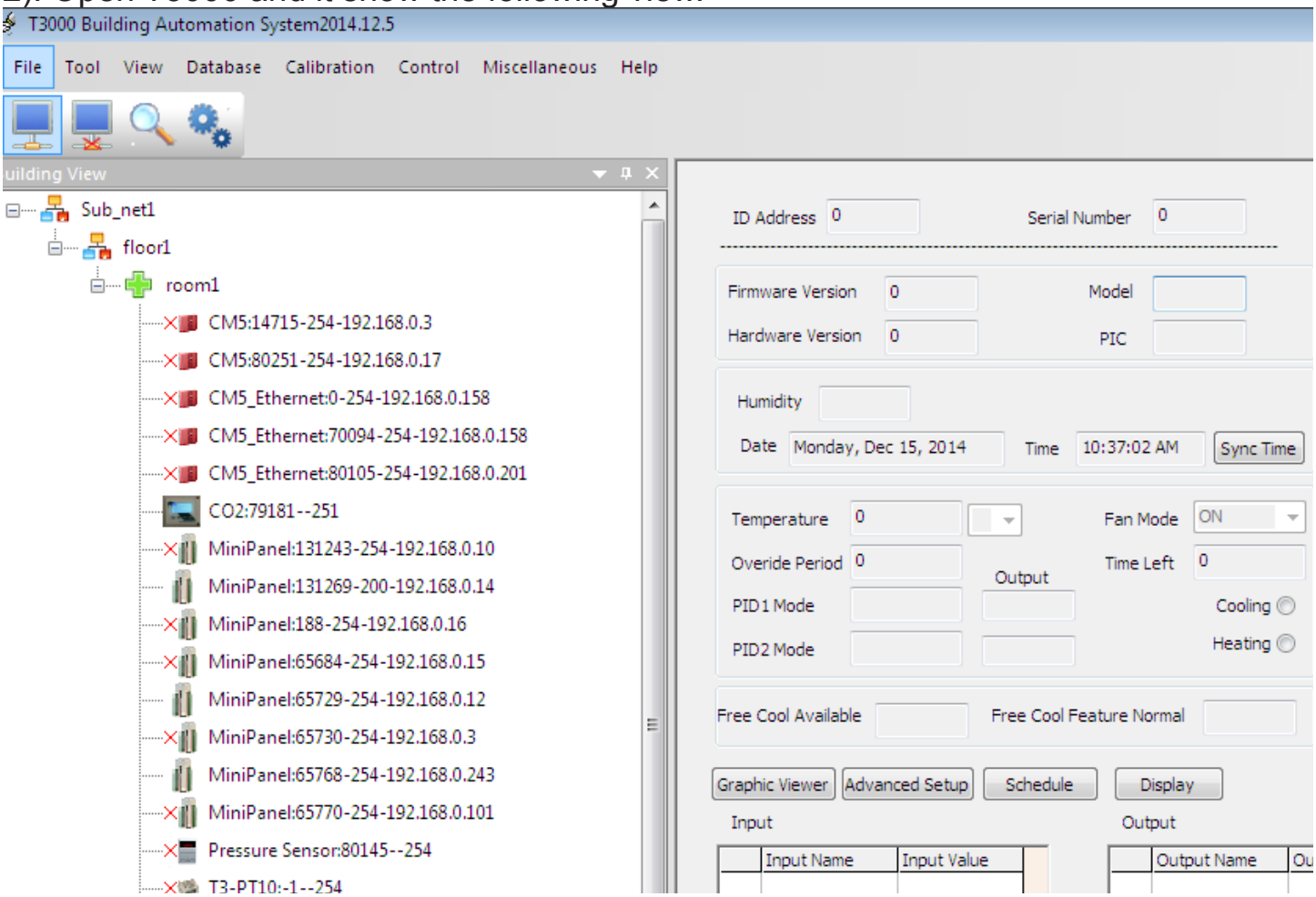
6). Calibrate temperature.



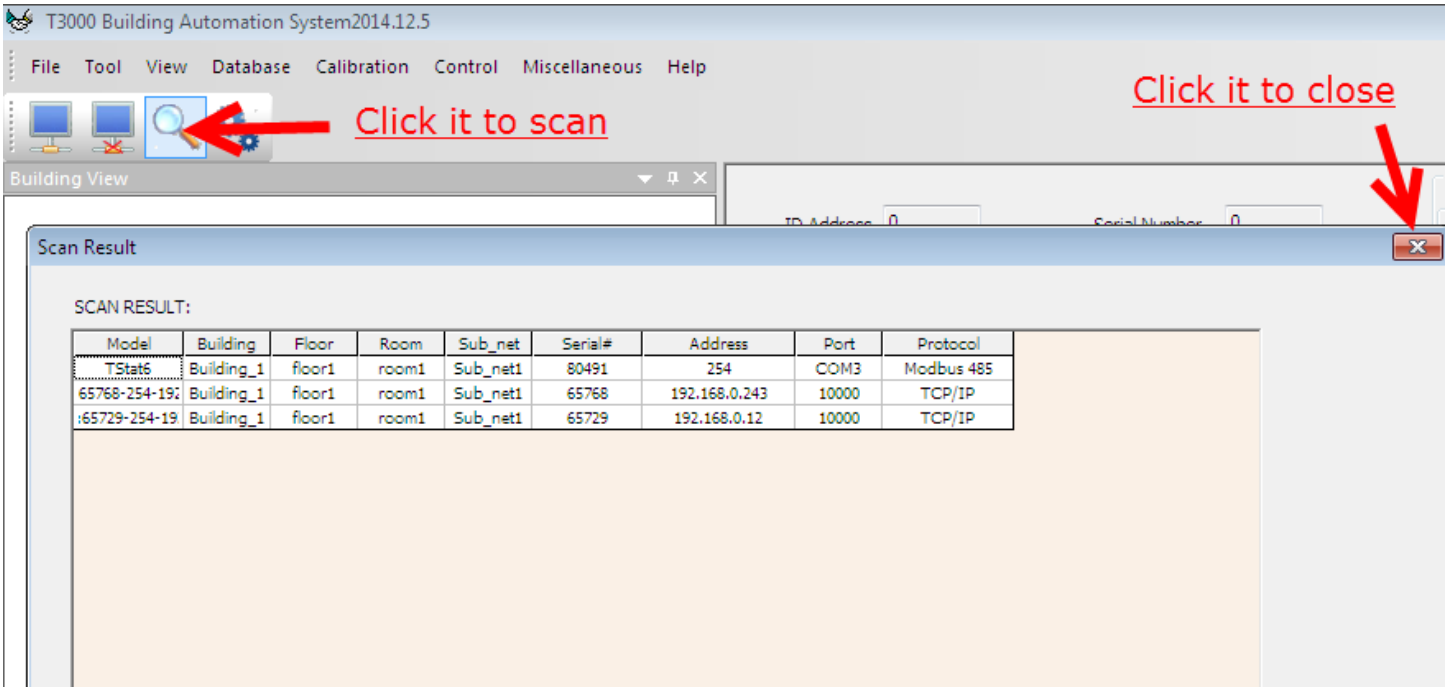
TSTAT6-CO2 in T3000 Operation

1). Connect TSTAT6-CO2 to PC by RS485.

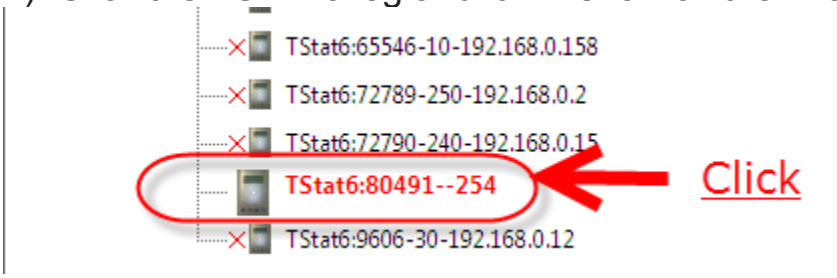
2). Open T3000 and it show the following view.



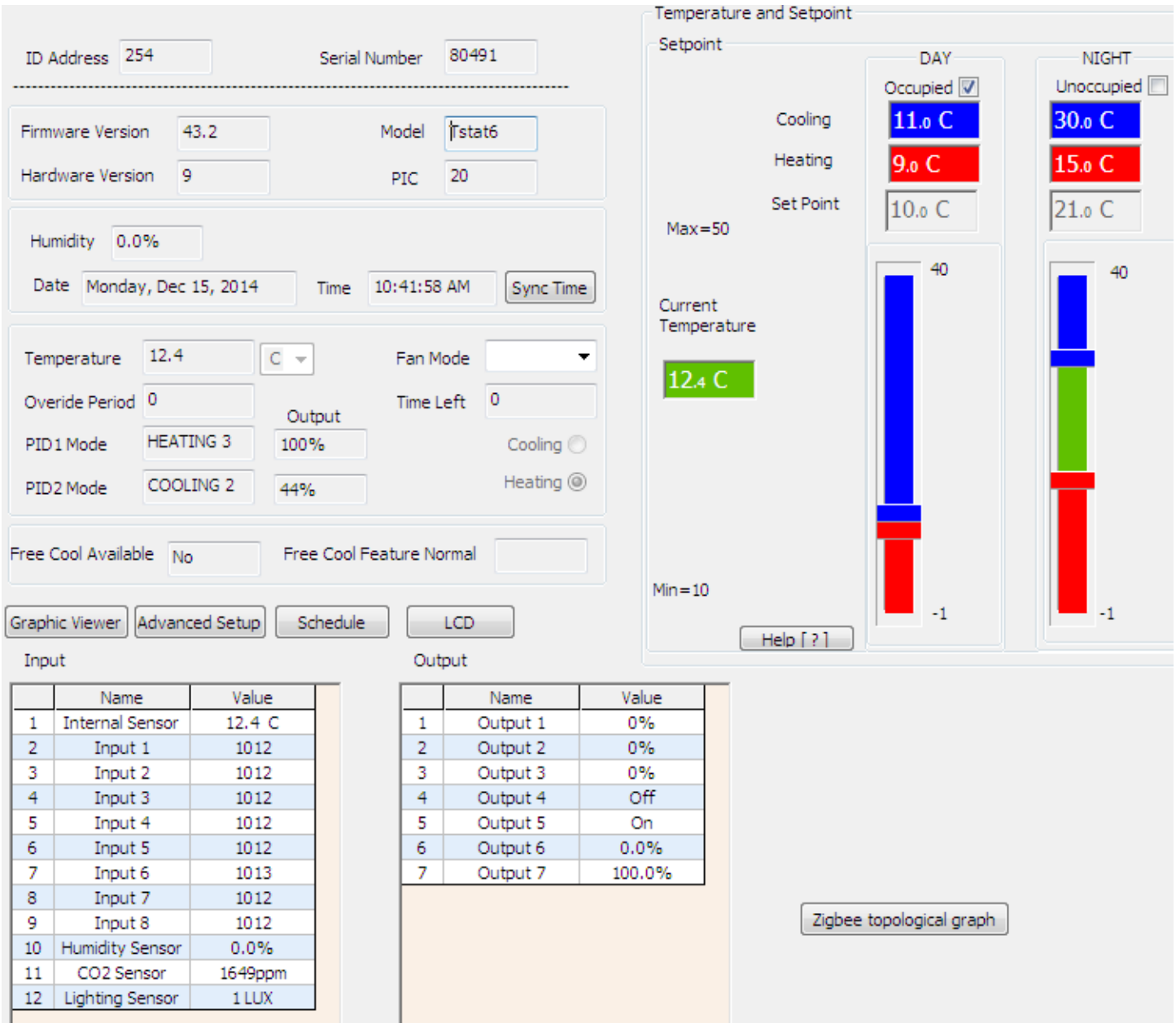
3). Click the button  to scan, the following view will appear and close it as the picture indicates.



4). Click the TSTAT6 log and it will show all the information of TSTAT6.



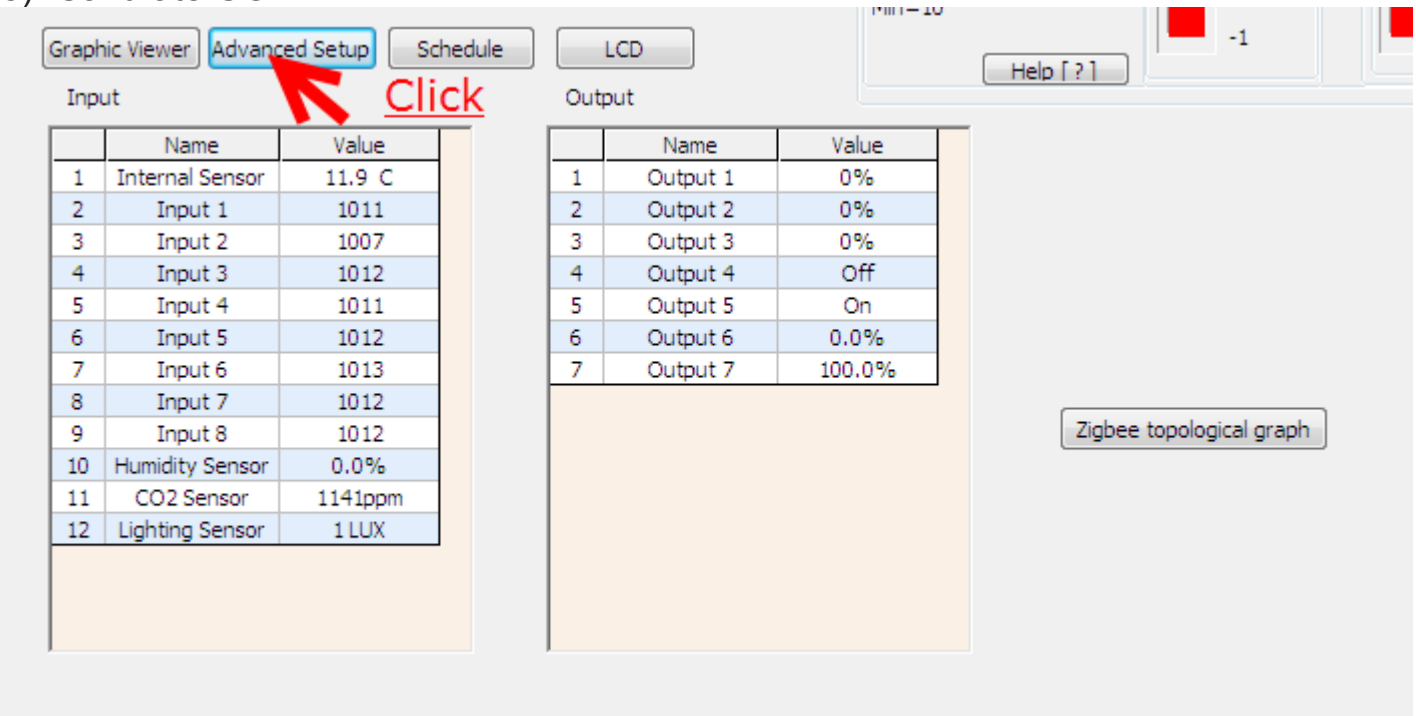
CO2 Sensor



	Name	Value
1	Internal Sensor	12.4 C
2	Input 1	1012
3	Input 2	1012
4	Input 3	1012
5	Input 4	1012
6	Input 5	1012
7	Input 6	1013
8	Input 7	1012
9	Input 8	1012
10	Humidity Sensor	0.0%
11	CO2 Sensor	1649ppm
12	Lighting Sensor	1 LUX

	Name	Value
1	Output 1	0%
2	Output 2	0%
3	Output 3	0%
4	Output 4	Off
5	Output 5	On
6	Output 6	0.0%
7	Output 7	100.0%

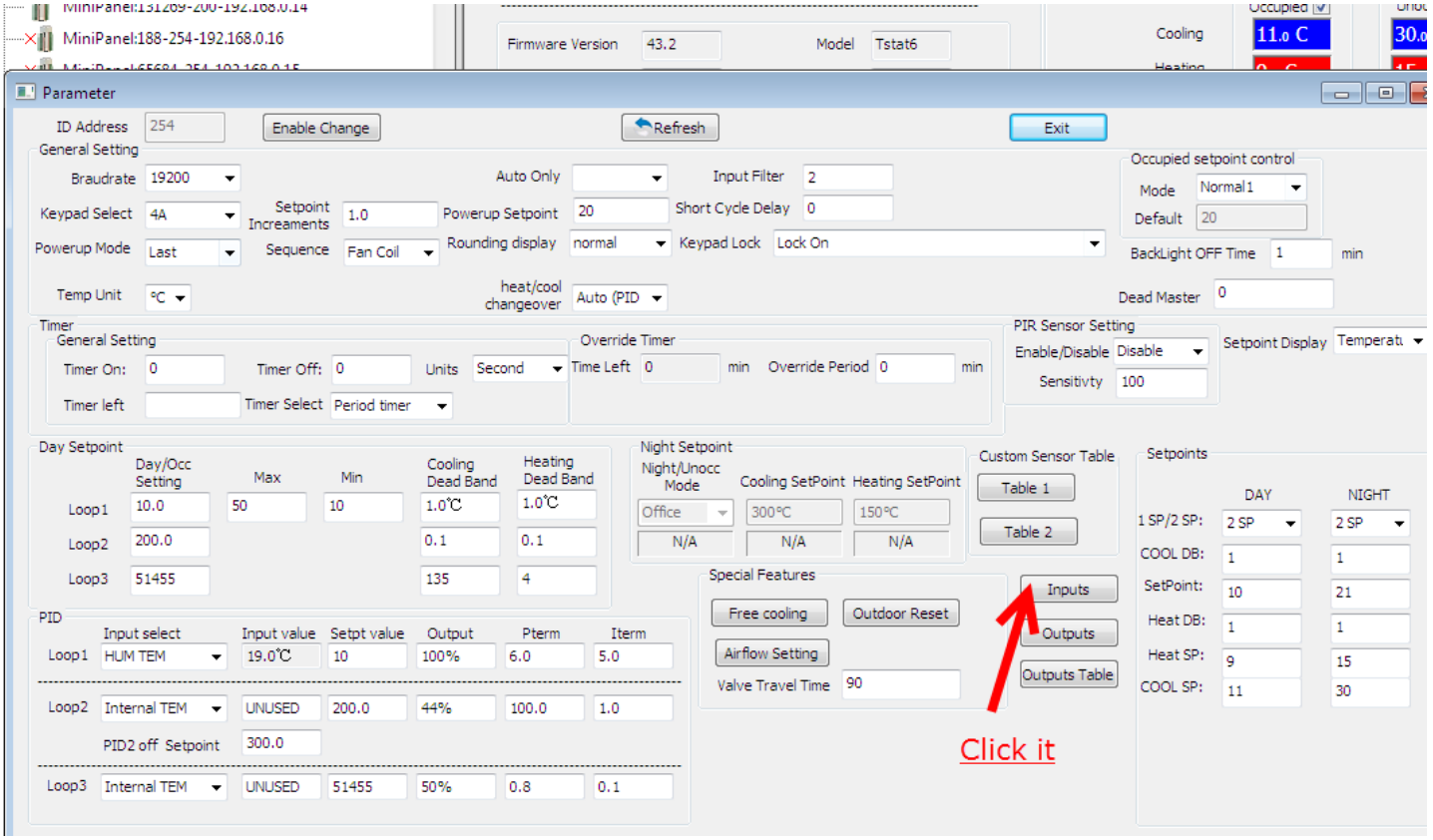
5). Calibrate CO2

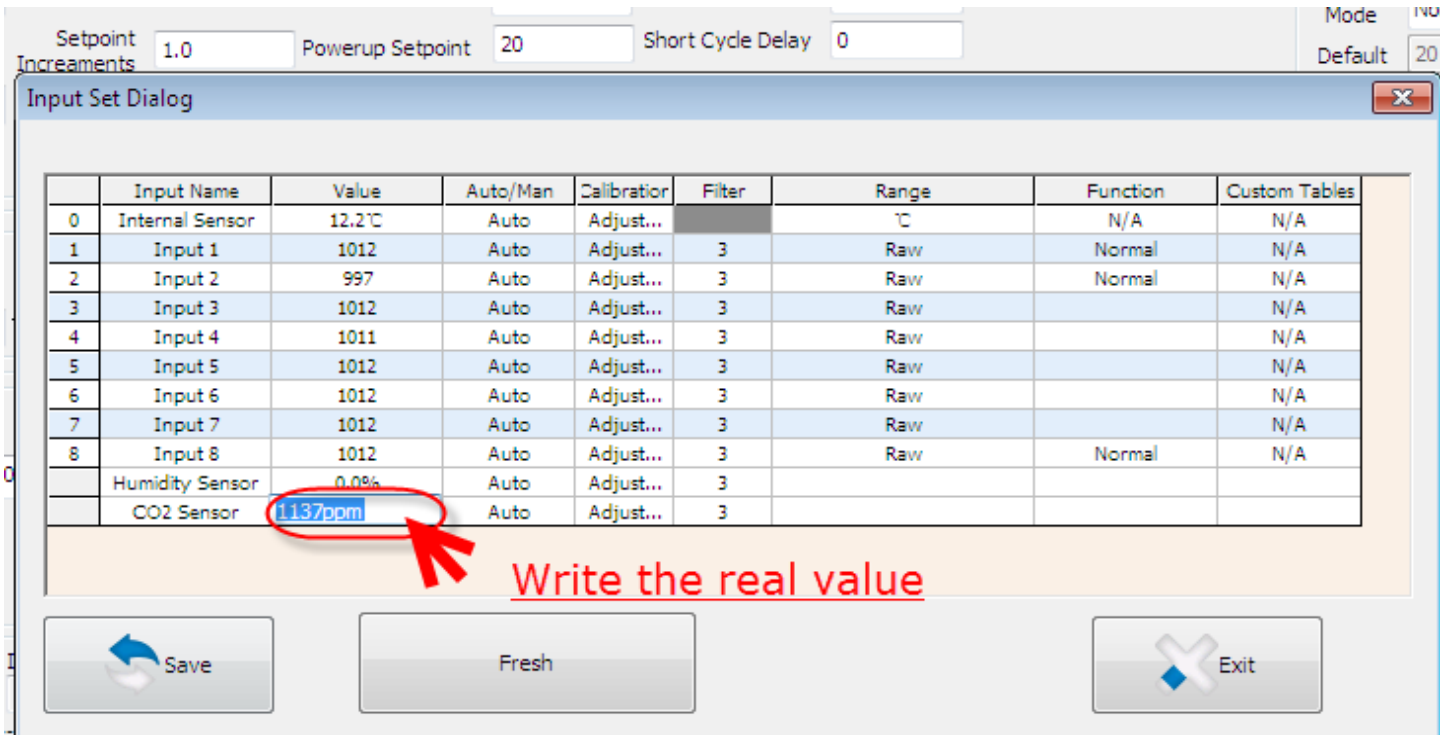


	Name	Value
1	Internal Sensor	11.9 C
2	Input 1	1011
3	Input 2	1007
4	Input 3	1012
5	Input 4	1011
6	Input 5	1012
7	Input 6	1013
8	Input 7	1012
9	Input 8	1012
10	Humidity Sensor	0.0%
11	CO2 Sensor	1141ppm
12	Lighting Sensor	1 LUX

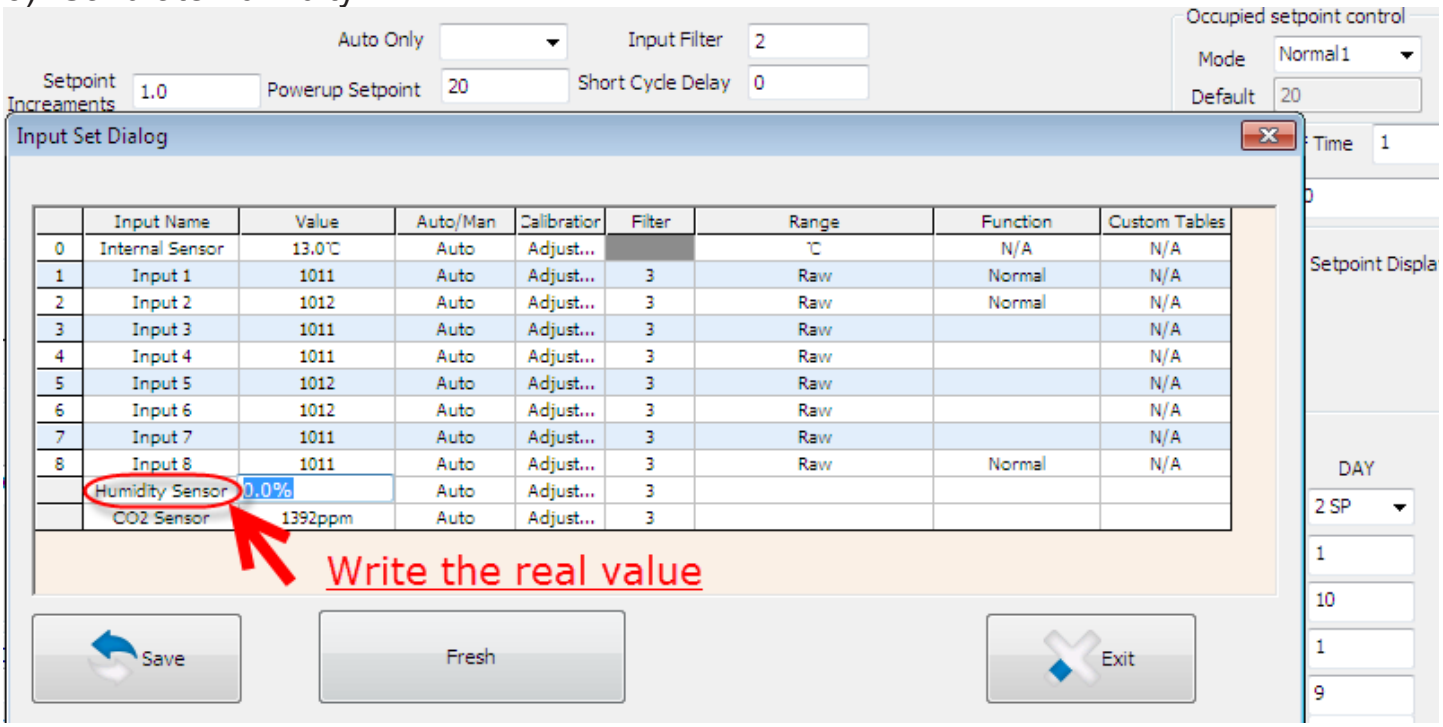
	Name	Value
1	Output 1	0%
2	Output 2	0%
3	Output 3	0%
4	Output 4	Off
5	Output 5	On
6	Output 6	0.0%
7	Output 7	100.0%

CO2 Sensor

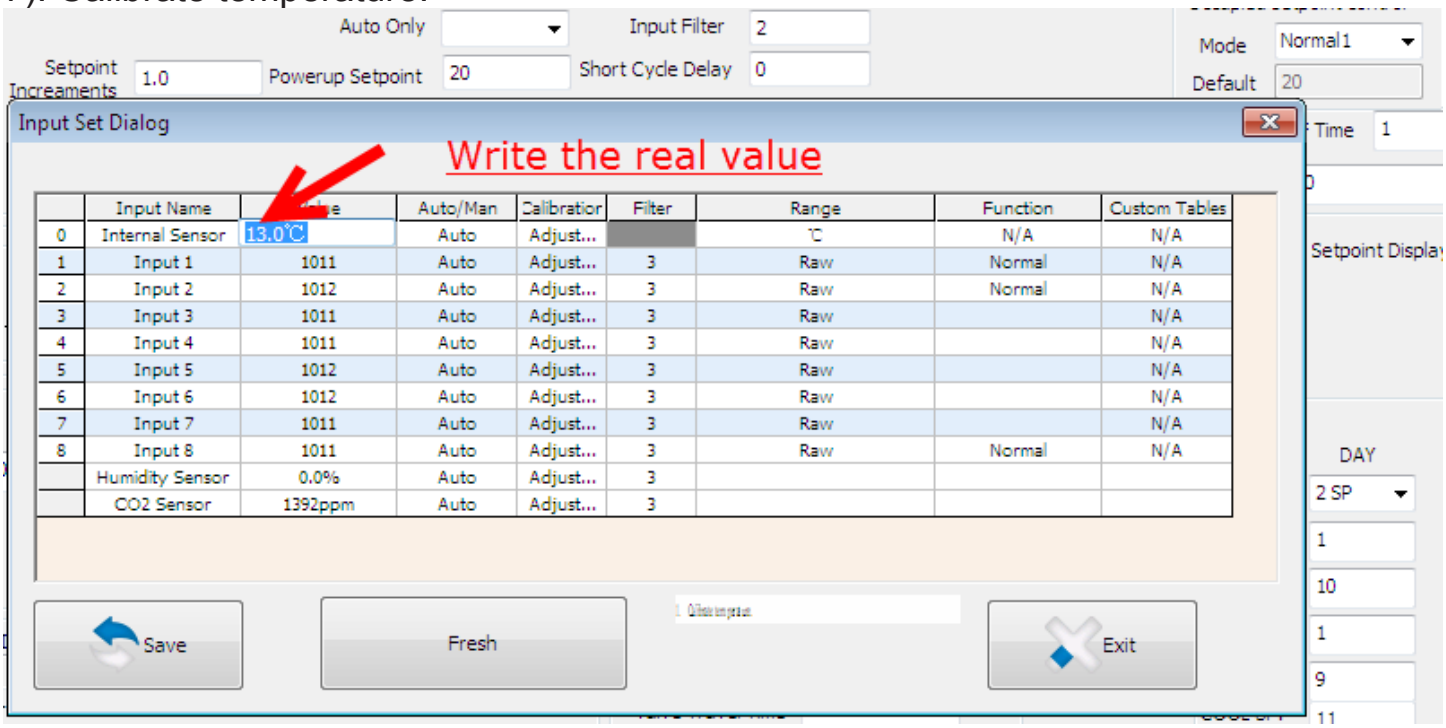

MiniPanel:188-254-192.168.0.16
Firmware Version 43.2
Model Tstat6
Cooling
11.0 C
Parameter
ID Address 254
Enable Change
Refresh
Exit
General Setting
Braudrate 19200
Keypad Select 4A
Powerup Mode Last
Temp Unit °C
Setpoint Increaments 1.0
Sequence Fan Coil
Auto Only
Powerup Setpoint 20
Rounding display normal
heat/cool changeover Auto (PID
Input Filter 2
Short Cycle Delay 0
Keypad Lock Lock On
Occupied setpoint control
Mode Normal1
Default 20
BackLight OFF Time 1 min
Dead Master 0
Timer
General Setting
Timer On: 0
Timer Off: 0
Units Second
Timer left
Timer Select Period timer
Override Timer
Time Left 0 min
Override Period 0 min
PIR Sensor Setting
Enable/Disable Disable
Sensitivty 100
Setpoint Display
Day Setpoint
Day/Occ Setting
Max
Min
Cooling Dead Band
Heating Dead Band
Loop1 10.0 50 10 1.0℃ 1.0℃
Loop2 200.0 0.1 0.1
Loop3 51455 135 4
Night Setpoint
Night/Unocc Mode
Cooling SetPoint
Heating SetPoint
Office 300°C 150°C
N/A N/A N/A
Custom Sensor Table
Table 1
Table 2
Setpoints
DAY NIGHT
1 SP/2 SP: 2 SP 2 SP
COOL DB: 1 1
SetPoint: 10 21
Heat DB: 1 1
Heat SP: 9 15
COOL SP: 11 30
PID
Input select
Input value
Setpt value
Output
Pterm
Iterm
Loop1 HUM TEM 19.0℃ 10 100% 6.0 5.0
Loop2 Internal TEM UNUSED 200.0 44% 100.0 1.0
PID2 off Setpoint 300.0
Loop3 Internal TEM UNUSED 51455 50% 0.8 0.1
Special Features
Free cooling
Outdoor Reset
Airflow Setting
Valve Travel Time 90
Inputs
Outputs
Outputs Table
Click it


Setpoint Increaments 1.0
Powerup Setpoint 20
Short Cycle Delay 0
Mode
Default 20
Input Set Dialog
Input Name
Value
Auto/Man
Calibration
Filter
Range
Function
Custom Tables
0 Internal Sensor 12.2℃ Auto Adjust... ℃ N/A N/A
1 Input 1 1012 Auto Adjust... 3 Raw Normal N/A
2 Input 2 997 Auto Adjust... 3 Raw Normal N/A
3 Input 3 1012 Auto Adjust... 3 Raw N/A
4 Input 4 1011 Auto Adjust... 3 Raw N/A
5 Input 5 1012 Auto Adjust... 3 Raw N/A
6 Input 6 1012 Auto Adjust... 3 Raw N/A
7 Input 7 1012 Auto Adjust... 3 Raw N/A
8 Input 8 1012 Auto Adjust... 3 Raw Normal N/A
Humidity Sensor 0.0% Auto Adjust... 3
CO2 Sensor 1137ppm Auto Adjust... 3
Write the real value
Save
Fresh
Exit

6). Calibrate humidity



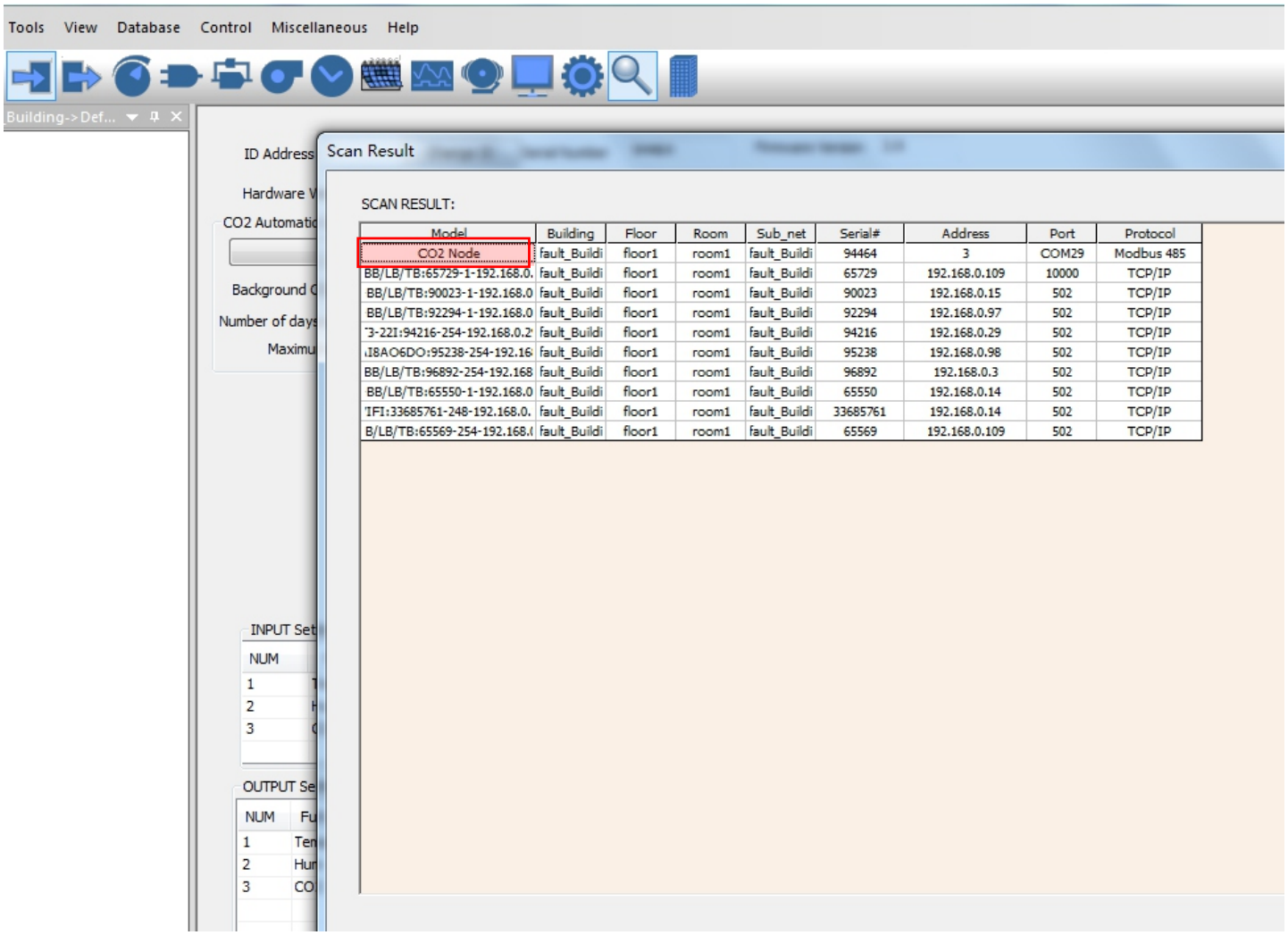
7). Calibrate temperature.



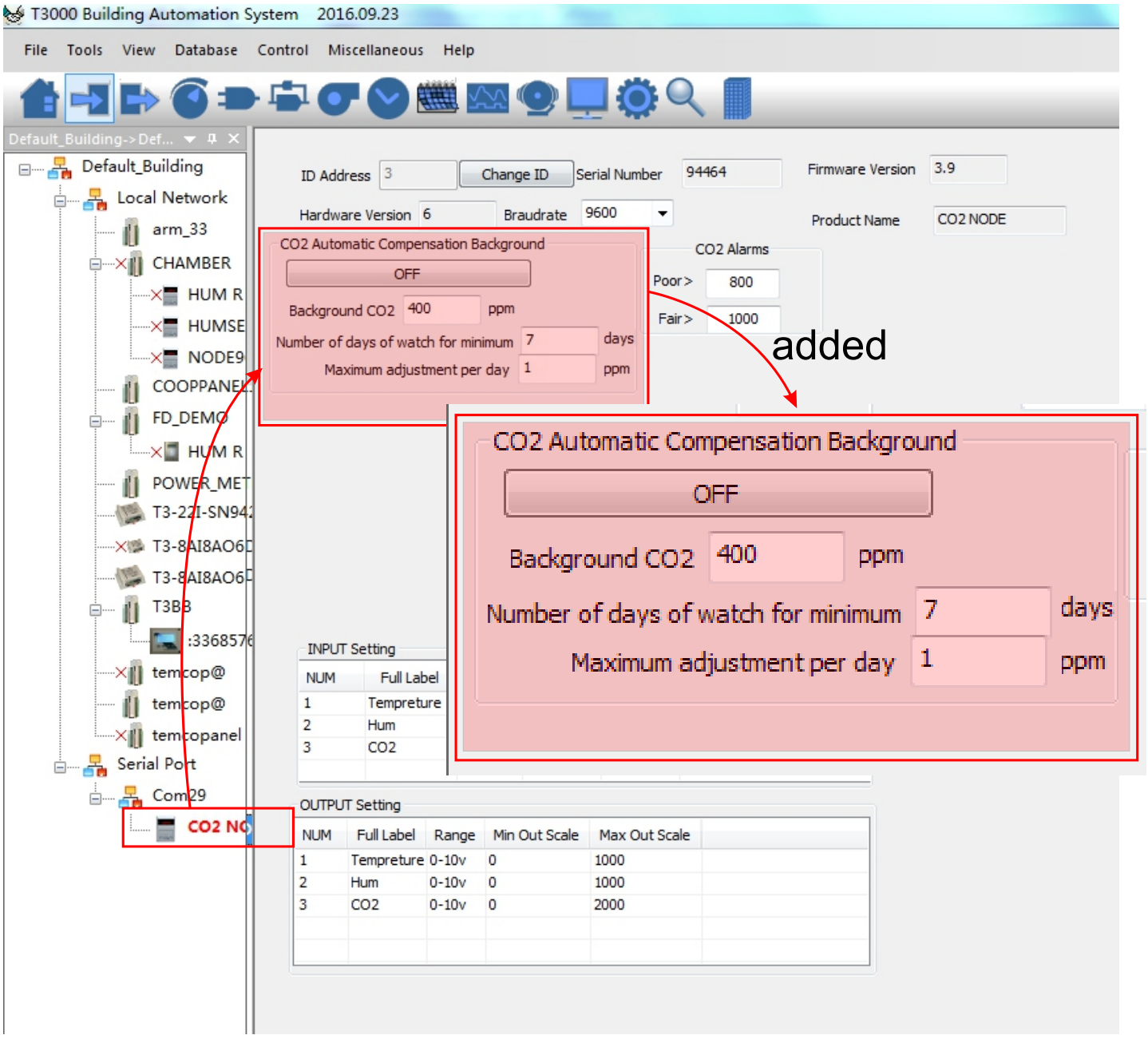
CO2-N in T3000 Operation

1). Connect CO2-N to PC by RS485.

2). Open T3000 and it show the following view.Click the button  to scan, the following view will appear and close it as the picture indicates.

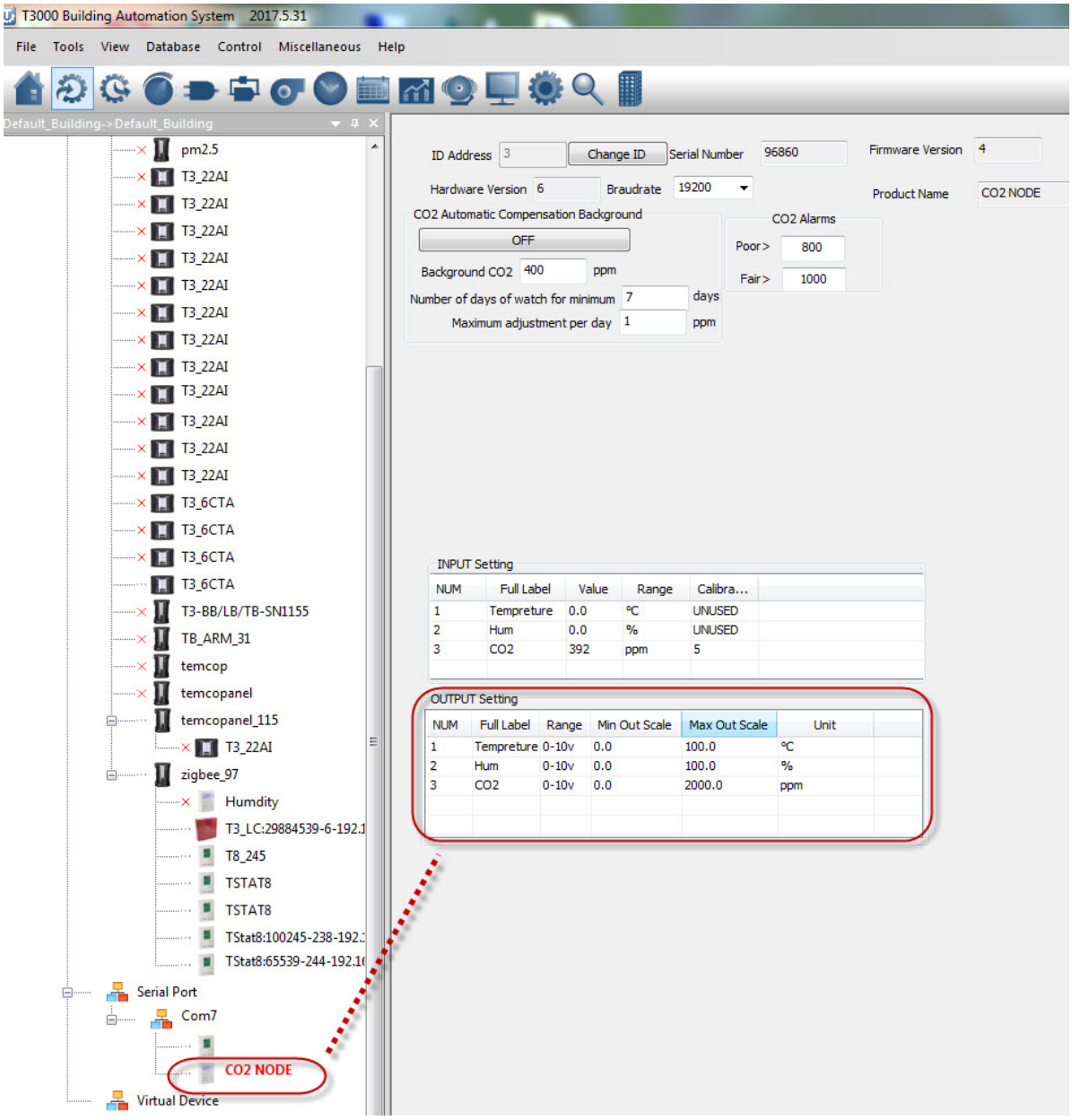


3). The following view shows Background calibration for C02-N added.



3). You can use the t3000 to set the configuration. The following view shows how to set up the span of the analog outputs.

1.We have a jumper on the background of the PCB, you can set it to 0~10V,0~5V or 4 ~20mA.
2.Set the range. For example,If the temperature is 20.0 c, the range you set the min out scale 0, the max out scale 1000(100.0 degree c), then the output= 20.0 / (100.0 – 0 . 0) * 10V = 2V.

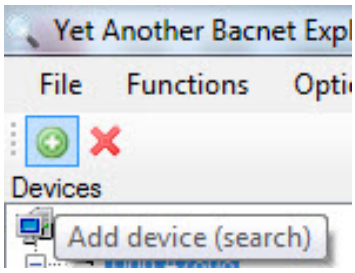


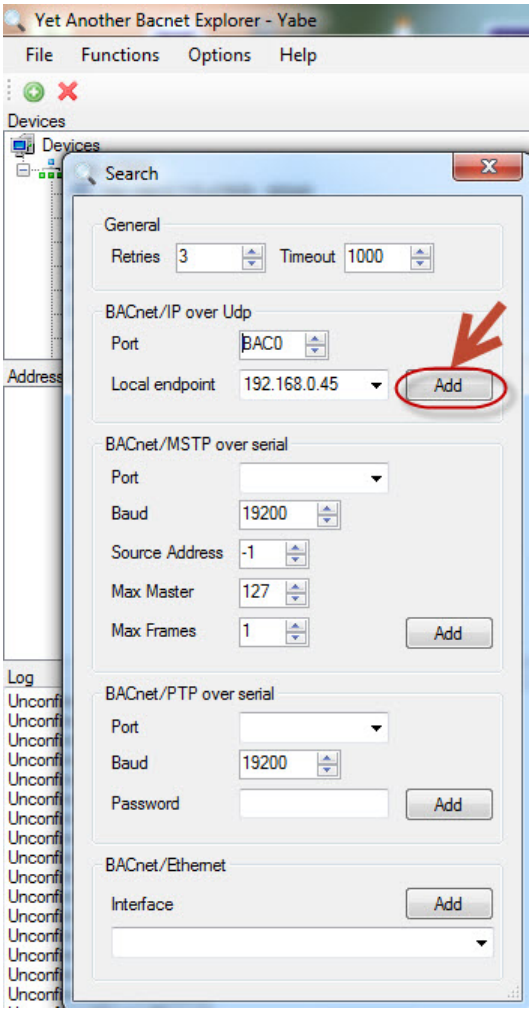
3.Also,you can use the modbus poll to configure it.

127	1	analog output mode, change it by setting the jumper (J20) on the board, read only
128	2	the minimum value of temperature directs to the analog output
129	2	the maximum value of temperature directs to the analog output
130	2	the minimum value of humidity directs to the analog output
131	2	the maximum value of humidity directs to the analog output
132	2	the minimum value of co2 directs to the analog output
133	2	the maximum value of co2 directs to the analog output
		e.g. co2 output: if the co2 ppm is 1000, the (minimum value, maximum value) = (0, 3000), then
		1. setting J20 to select 0V-10V output mode, so the co2 output is about ((1000ppm / (3000ppm - 0ppm)) * (10V - 0V)) + 0V = 3.3V
		2. setting J20 to select 0V-5V output mode, so the co2 output is about ((1000ppm / (3000ppm - 0ppm)) * (5V - 0V)) + 0V = 1.65V
		3. setting J20 to select 4mA-20mA output mode, so the co2 output is about ((1000ppm / (3000ppm - 0ppm)) * (20mA - 4mA)) + 4mA = 9.3mA

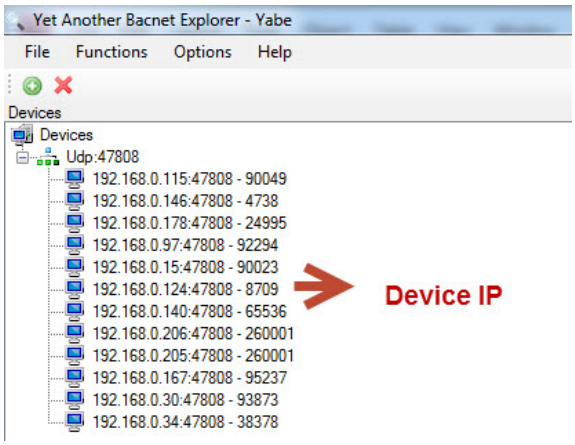
Connecting to the device using Bacnet

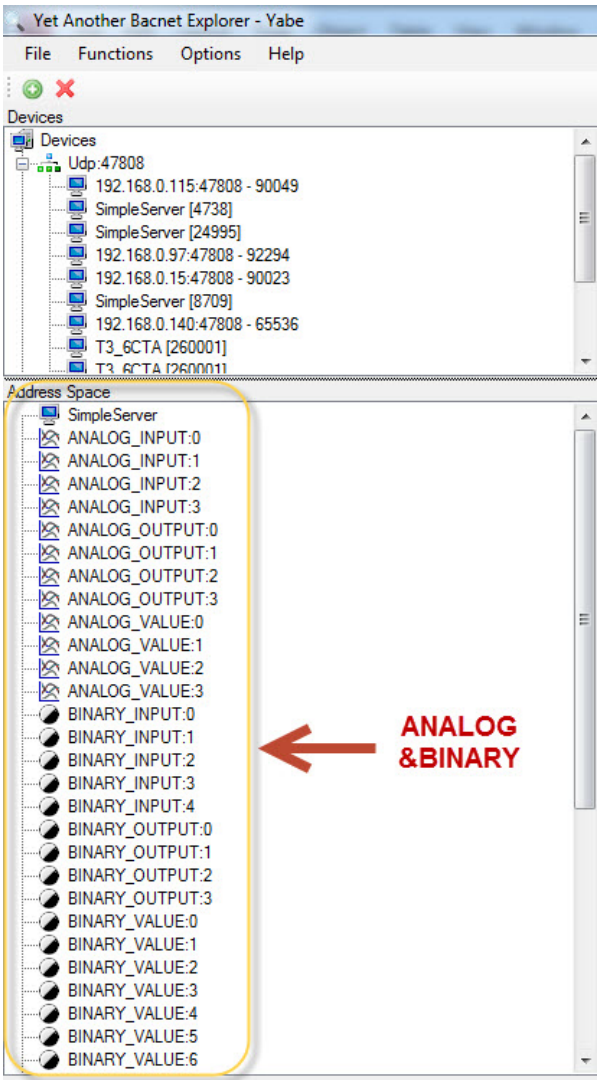
The device can be connected using Bacnet.Below are the steps:
Step1.Download Yabe software as the link:*https://tinyurl.com/ycrt9jep* and install it.
Step2.Connect the device to the computer,select Bacnet protocol.Start the Yabe software,add the device.



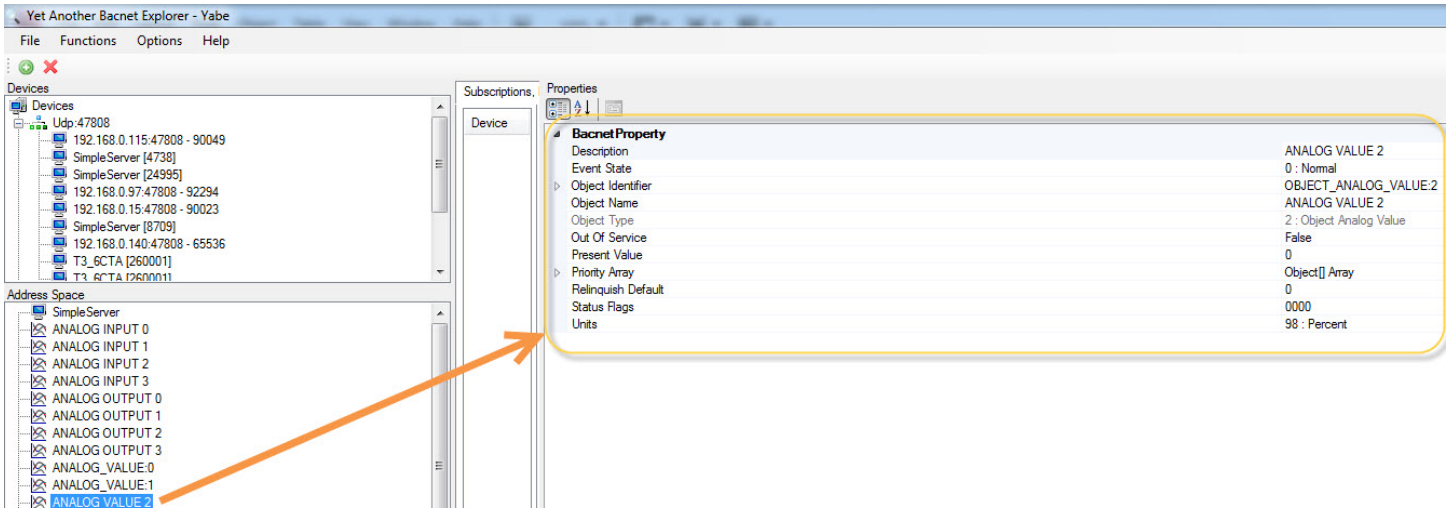


Step3.You can find your device IP as below.Double click the left mouse button,you can find your device and the bacnet information in the “Adress Space” tab.





Step4.In the “Address Space” tab,click the “ANALOG_VALUE” ,it will show the information of “log ANALOG_VALUE”in the BacnetProperty tab. And it ‘s the same with “ANALOG_OUTPUT” and other items.



CO2-D&CO2-W without Ethernet

Address	Bytes	Register Description
200 to 239	2*40	The continuous_alarm ppm setpoint of external co2 sensor. Support 50 external nodes.
240 to 279	2*40	The ppm offset for calibrating the external co2 sensor ppm. Support 50 external nodes.
280	1	"Analog output auto or manual. Bit0 for temperature, 0 = auto, means the output value occording to the temperature read from sensor; 1 = manual, means the output value according to the value set in output_manual_value_temp (register 321). Bit1 for humidity, 0 = auto, means the output value occording to the humidity read from sensor; 1 = manual, means the output value according to the value set in output_manual_value_humidity (register 322). Bit2 for co2, 0 = auto, means the output value occording to the co2 read from sensor; 1 = manual, means the output value according to the value set in output_manual_value_co2 (register 323)."
281	2	output_manual_value_temp
282	2	output_manual_value_humidity
283	2	output_manual_value_co2
284	1	the output mode, (0-5V,0-10V,4-20mA)
285	2	the minimum degree of temperature range corresponding to the temperature output(0-5V,0-10V,4-20mA)
286	2	the maximum degree of temperature range corresponding to the temperature output(0-5V,0-10V,4-20mA)
287	2	the minimum percent of humidity range corresponding to the humidity output(0-5V,0-10V,4-20mA)
288	2	the maximum percent of humidity range corresponding to the humidity output(0-5V,0-10V,4-20mA)
289	2	the minimum ppm of co2 range corresponding to the co2 output(0-5V,0-10V,4-20mA)
290	2	the maximum ppm of co2 range corresponding to the co2 output(0-5V,0-10V,4-20mA)
291	1	INFO_BYTE, TBD.
292	1	RS485 Baudrate, 0 = 9600, 1 = 19200
293	1	RTC second, from 0 to 59.
294	1	RTC minute, from 0 to 59.
295	1	RTC hour, from 0 to 23.
296	1	RTC day, from 1 to 31.
297	1	RTC week, from 0 to 6, 0 = Sunday.
298	1	RTC month, from 1 to 12.
299	2	RTC year, from 0 to 99 (2000 to 2099).
300	1	The password to log in the menu system. 1=Enable. 0=Disable.
301	1	The first password character, from '0' to '9'.
302	1	The second password character, from '0' to '9'.
303	1	The third password character, from '0' to '9'.
304	1	The fouth password character, from '0' to '9'.
305	2	Menu block time. The menu will back to idle state after this seconds.
306	2	Backlight keep time. The backlight will turn off after this seconds
307	1	External node plus&play. 1=Enable, 0=Disable.
308	1	Device number in the scan database, inlcude the master unit itself.
309	1	Set 1 to clear the scan database
310 to 314	5	First device of the database, the display unit take it.
		5 bytes: 1st = address, 2nd..5th = serail number

CO2-D&CO2-W without Ethernet

Address	Bytes	Register Description
315 to 319	5	Second device of the database, the first external sensor.
		5 bytes: 1st = address, 2nd..5th = serail number
		If the address is 0 or 255, that means not device behind.
320 to 324	5	…
…	5	…
…	5	…
510	5	The end of the database

CO2-D-E&CO2-W-E with Ethernet

Address	Bytes	Register Description
0..1	2	Lower 2 bytes of the serial number
2..3	2	Upper 2 bytes of the serial number
4	1	firmware version lower byte. eg. FW version = 10.12, so lower byte = 12 AND high byte = 10. Fixid.
5	1	firmware version upper byte. eg. FW version = 10.12, so lower byte = 12 AND high byte = 10. Fixed.
6	1	Modbus device address
7	1	Product ID, Fixed.
8	1	Hardware version
9	1	spare
10	1	spare
11	1	Time zone
12	1	Baudrate Setting: 0 = 9600bps, 1 = 19200bps
13	1	day lighting switch, 0 =disable day lighting feature, 1= enable
14	1	spare
15	1	reset flash. The unit will clear all configs to zero if this register being set to 0x55 = 85
16	1	Firmware Update Register, used to show the status of firmware updates
17 to 20	4	spare
21	1	Protocol switch. 3 = MODBUS,0=MSTP.
22~39	18	spare
40 to 45	6	reg40, MAC address, read only normally. (they can be written if write the regsiter 93 to 1 first, for the default setting before out of the factory.)
46	1	reg46, IP mode. 0=static IP; 1= DHCP
47 to 48	2	reg47, upper two bytes of IP address
49 to 50	2	reg49, lower two bytes of IP address
51 to 52	2	reg51, right two bytes of SUBNET MASK address
53 to 54	2	reg53, left two bytes of SUBNET MASK address
55 to 56	2	reg55, right two bytes of GATEWAY address
57 to 58	2	reg57, left two bytes of GATEWAY address
59	1	reg59, 0, TCP server, (NO USE)
60	1	reg60, listen port at TCP server mode
61 to 75		buffer mirror for changing to a new IP address, copy of reg 46 to 60
76	1	write 1 to set the ghost settings to the system and start new settings, then clear the ghost registers.
91	1	Set 1 manual to write configurations to flash
92	1	Period of write configurations to flash if configurations changed without setting register to 1. counter by second.
93	1	Enable for MAC setting. It should be set as 1 before write the new MAC to the MAC registers(100-105), and it will be cleared automatically after setting the MAC address.
94 to 99	7	Reserved for future.
100 to 105	6	reg100, MAC address, read only normally. (they can be written if write the regsiter 93 to 1 first, for the default setting before out of the factory.)
106	1	reg106, IP mode. 0=static IP; 1= DHCP

CO2-D-E&CO2-W-E with Ethernet

Address	Bytes	Register Description
111 to 112	2	reg111, right two bytes of SUBNET MASK address
113 to 114	2	reg113, left two bytes of SUBNET MASK address
115 to 116	2	reg115, right two bytes of GATEWAY address
117 to 118	2	reg117, left two bytes of GATEWAY address
119	1	reg119, 0, TCP server, (NO USE)
120	1	reg120, listen port at TCP server mode
121 to 135	1	buffer mirror for changing to a new IP address, copy of reg 106 to 120
136	1	write 1 to set the ghost settings to the system and start new settings, then clear the ghost registers.
137 to 171	40	Reserved
172	1	scan command< =6 start scan>/LHN add
173	1	subnet <add =1rs485 =2zigbee =4all> /LHN add
174	1	NTP command< =6,start ntp >/LHN add
175 to 178	4	Time Server0 ipaddress
179 to 182	4	Time Server1 ipaddress
183 to 186	4	Time Server2 ipaddress
187 to 190	4	Time Server3 ipaddress
191 to 194	4	Time Server4 ipaddress
195 to 198	4	Time Server5 ipaddress
199	1	Time Sync result: 0-Fail 1-Sucessful
200	1	Temperature sensor selection, 0=external, 1=internal. Read only, it will be set to 1 if the humidity module exists.
201	1	Select the unit of temperature to display on LCD. 0=degree Celsius, 1=degree Fahrenheit
202	2	The value of on board temperature sensor, the unit is degree Celsius. The resolution is 0.1 degree.
203	2	The value of on board temperature sensor, the unit is degree Fahrenheit. The resolution is 0.1 degree.
204	2	The value of external temperature sensor, the unit is degree Celsius. The resolution is 0.1 degree.
205	2	The value of external temperature sensor, the unit is degree Fahrenheit. The resolution is 0.1 degree.
206	2	The temperature offset for calibrating the internal temperature. The resolution is 0.1 degree.
207	2	Relative humidity. The resolution is 0.1%
208	2	Read only. The real frequency read from the humidity module, unuse.
209	1	Read only. The number of the calibration table points.
210	1	Internal CO2 sensor selection. The value is 1 as default.
211	2	The co2 ppm value of internal co2 sensor.
212	2	The co2 ppm offset for calibrating internal co2 sensor.
213	2	The setpoint value of fair alarm for internal co2 sensor.
214	2	The setpoint value of poor alarm for internal co2 sensor.
215 to 468	2*254	The co2 ppm value of the external co2 sensors if there are/is co2 nodes connect to it.
469 to 722	2*254	The co2 ppm offset for calibrating external co2 sensors.
723 to 976	2*254	The setpoint value of fair alarm for external co2 sensors.

CO2-D-E&CO2-W-E with Ethernet

Address	Bytes	Register Description
977 to 1230	2*254	The setpoint value of poor alarm for external co2 sensors.
1231	2	The value to eliminate the pulse of the co2 ppm.
1232	1	The filter to make the ppm value smoothly, it is 5 as default.
1233	1	Enable/Disable the password for the menu system operation. 0=Disable, 1=Enable.
1234	1	The first digital of the password. Should be from 0 to 9.
1235	1	The second digital of the password. Should be from 0 to 9.
1236	1	The third digital of the password. Should be from 0 to 9.
1237	1	The fourth digital of the password. Should be from 0 to 9.
1238	1	The century of the real time clock.
1239	1	The year of the real time clock.
1240	1	The month of the real time clock.
1241	1	The date of the real time clock.
1242	1	The weekday of the real time clock.
1243	1	The hour of the real time clock.
1244	1	The minute of the real time clock.
1245	1	The secod of the real time clock.
1246	1	Alarm auto/manual control. Bit7: 0 = auto, 1 = manual; bit0:1 = pre_alarm; bit1: 1 = continuous_alarm; bit(1:0): 00 = stop_ alarm
1247	1	The alarm output turn on time, <= 20 seconds.
1248	1	The alarm output turn off time, <= 20 seconds.
1249	1	Alarm output delay time. It delays the alarm output when the alarm is triggered. It is 5 seconds as default.
1250	1	Analog output auto/manual control. Bit 0 directs to temperature output, Bit 1 directs to humidity output, Bit 2 directs to co2 output. 0=Auto, 1=Manual.
1251	2	The manual value of temperature.
1252	2	The manual value of humidity.
1253	2	The manual value of co2.
1254	1	Analog output mode, read only, select by jumper. 1=4-20mA, 2=0-5V, 3=0-10V
1255	2	The minimun value of temperature for analog output.
1256	2	The miximun value of temperature for analog output.
1257	2	The minimun value of humidity for analog output.
1258	2	The miximun value of humidity for analog output.
1259	2	The minimun value of co2 for analog output.
1260	2	The miximun value of co2 for analog output.
1261	1	The period for the menu system to stay at the submenu. It goes to the main menu when it expires in the submenu.
1262	1	The period for the LCD backlight keep on. The backlight turns on when key is triggered, and turns off the it expires.
1263	1	Enable/Disable the plug-and-play feature of the external nodes. 0=disalbe, 1=enable.
1264	1	The number of co2 sensors connect to the unit, includes the internal co2 sensor.
1265	1	Set 1 to reset the scan table.

CO2-D-E&CO2-W-E with Ethernet

Address	Bytes	Register Description
1266 to 1270	1*5	The first co2 node information. Normally it is the unit itself.
		register1266: the modbus ID of the co2 sensor.
		register1267..1270: the serial number of the co2 sensor.
1271 to 1275	1*5	The secod co2 node information. Normally, it is the first external co2 node.
1276 to 1280	1*5	The third co2 node information.
…		
…		

Outdoor Weather Station

Descriptions



Outdoor weather station with humidity, temperature and light level sensors helps with free cooling strategies and other energy saving routines.The sensor communicates over both Ethernet and RS485, using BOTH Bacnet and Modbus protocols so there are many ways to integrate into the system.The modbus interface is documented and integrator friendly. They also have transducer outputs for connecting as analog inputs to all popular control systems.

Highlights

- Bacnet and Modbus over Ethernet: standard
- Bacnet and Modbus over RS485: standard
- Good long term stability and reliability
- 100% field changeable sensor, free calibration services
- Dew point and enthalpy are calculated and available over the com ports
- Durable ABS Plastic housing with UV protection additives

Specifications

General		
Power	15 to 24V AC or DC, ±10%	
Current Output Load	< 500Ω	
Display	LCD screen for wall outdoor / room mount and duct mount	
Display Resolution	0.1°C, 0.1% RH	
Temperature Limit	-30~60°C, 0~95% RH(Non condensing)	
Protection Degree	IP54	
	Relative Humidity	**Temperature**
Sensor	Capacitance polymer	10K internal
Range	0~100% non condensing	-30~70°C(-22~158°F)
Output	4-20mA, 0-5V or 0-10V, RS 485	4-20mA, 0-5V or 0-10V, RS 485
Accuracy	5% RH (25°C, 20~80% RH)	< ±0.5°C @ 25°C
Hysteresis	< ±1% RH	
Response time	< 10s (25°C, in slow air)	
Drift	< ±0.5% RH / year	

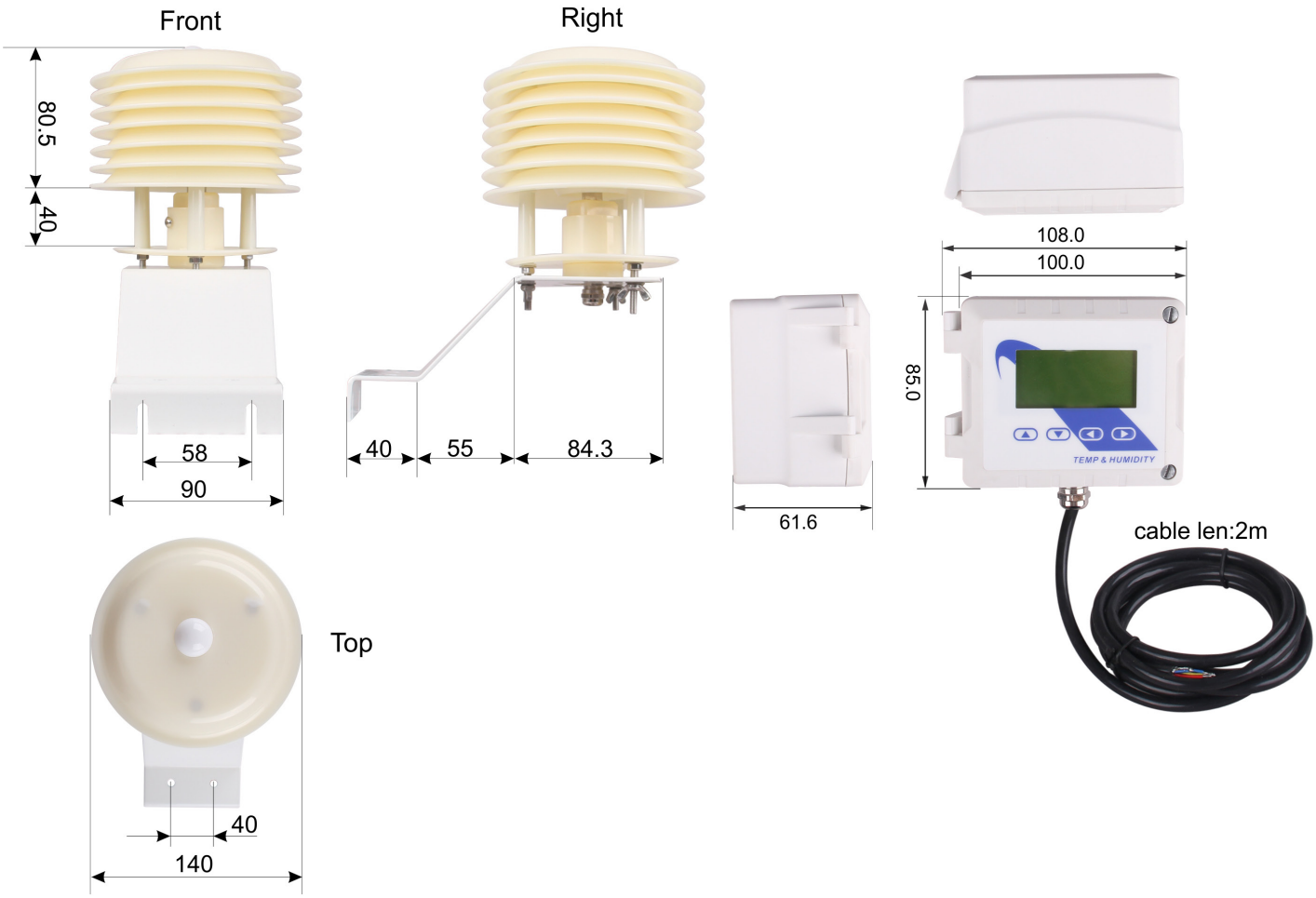
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Note:

1. If you're using the 10V transducer output signal, the sensor needs to be powered with at least 15V AC or DC.
2. For application not using the 10V transducer output signal, using 4-20ma signal, 0-5V transducers, or Modbus/Ethernet only, in this case you can use 12V AC or DC.
3. Default network settings:RS485: Modbus protocol, baud rate 15200k, ID=254;
   Ethernet: IP=192.168.0.34 , Bacnet and Modbus ID = 254

Dimensions

Unit:mm



Register List

Modbus

Humidity/Temp Transmitter w/Bacnet uses MODBUS protocol to communicate with others.Below is the register list.

Address	Register and Description
6	Address. Modbus device address
15	Baudrate. 0=9.6kbaud, 1=19.2kbaud 2=38.4kbaud 3=57.6kbaud 4=115.2kbaud
21	Protocol switch. 3 = MODBUS,0=Bacnet MSTP.
100	Room temperature reading in DegF. Can also write to this register for single point calibration.
373	Relative humidity reading in percentage,the same to register304
482	Dew point in unit C
490	Enthalpy of the air, [kJ/kg]
538	Light sensor value.The resolution is 0.1 lux;

*For more register list details,please downloaded an excel spreadsheet (ModbusBacnetRegisterList. xls) at the following link: *https://tinyurl.com/ybaj9d3u.*

Bacnet

Humidity/Temp Transmitter w/Bacnet also uses Bacnet protocol to communicate with others.Below is the register list.

Variable	Variable and Description
4	Modbus ID
8	Uart BaudRate.0=9.6kbaud, 1=19.2kbaud 2=38.4kbaud 3=57.6kbaud 4=115.2kbaud
10	Protocol
12	Dew point
15	Enthalpy

Input	Input and Description
1	Temperature
2	Humidity
3	CO2
7	Light Value
Output	**Output and Description**
1	Analog output1
2	Analog output2

*For more register list details,please downloaded an excel spreadsheet (ModbusBacnetRegisterList. xls) at the following link: *https://tinyurl.com/ybaj9d3u.*

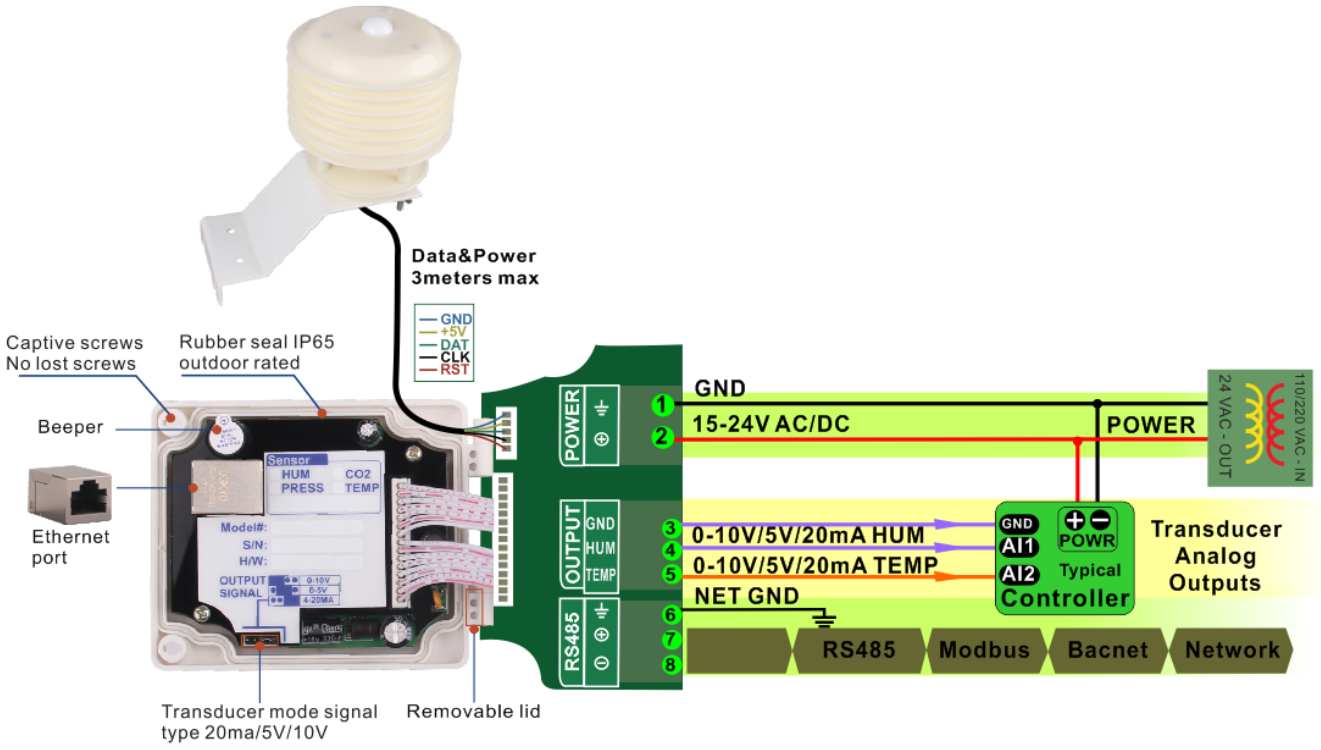
Voltage & Current Formula for HUM (Hardware=Rev22+)	
0-10V output	Voltage = Temperature (C) / Temperature_Range * 10
	Voltage = Humidity / Humidity_Range * 10
0-5V output	Voltage = Temperature (C) / Temperature_Range * 5
	Voltage = Humidity / Humidity_Range * 5
4-20mA output	Current = Temperature (C) / Temperature_Range * 16 + 4
	Current = Humidity / Humidity_Range * 16 + 4

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Temperature (C): Register 101
Humidity: Register 304
Temperature_Range = (Register 286 - Register 285) / 10
Humidity_Range = (Register 288 - Register 287) / 1000
Voltage in V
Current in mA

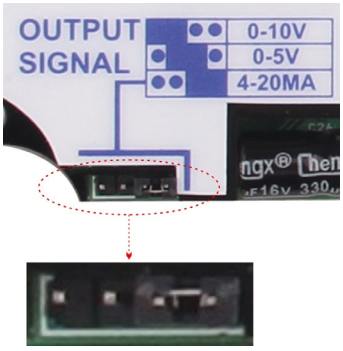
Wiring Diagram

The diagram below shows the wiring for the usual transducer mode of operation for the outdoor light/temp/hum sensor. The transducer outputs connect to a master controller using the traditional analog output signals, 0-5V, 0-10V, 4-20mA.



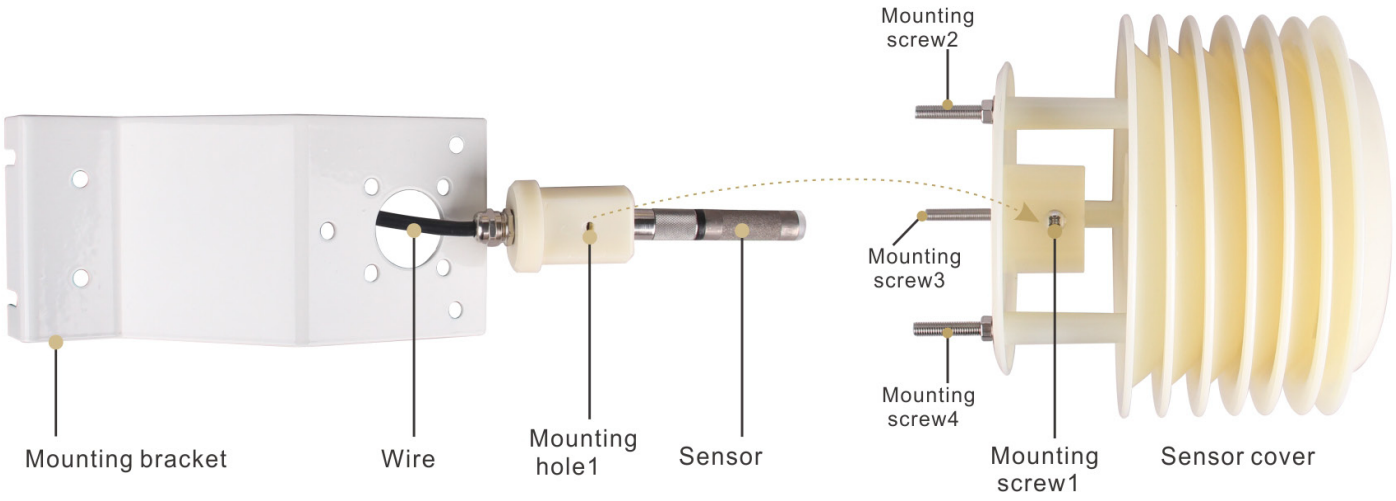
Output Jumper Settings

In this mode the device acts as a traditional transducer where it sends out three analog signals, all you need to do is to set this one single jumper to the appropriate signal type: 4-20mA, 0-10V, or 0-5V.

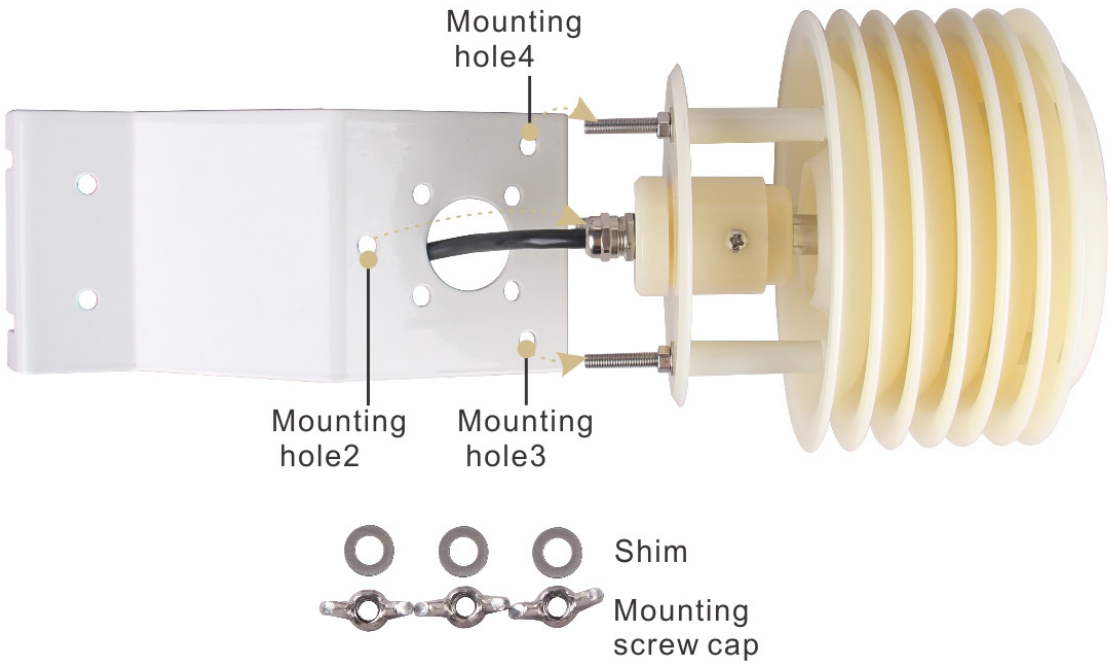


Mounting Installation

Step1.Install mounting screw1 to mounting hole1 as below.



Step2.Install mounting screw2,3,4 to mounting hole2,3,4 as below.



Step3.Then install the shims and mounting scew caps.The installation is finished as below:



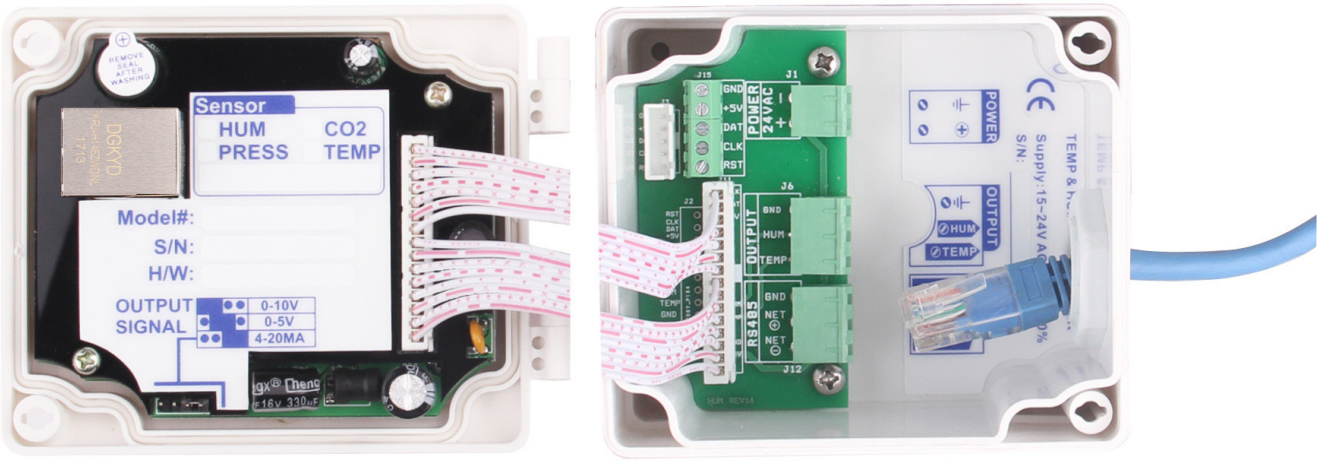
How to use a bigger gland for ethernet connectors

Using a bigger gland for ethernet connectors can make it easier for ethernet cables to enter.Below are the steps:

1.You need to use a electric drill to make the entrance bigger.

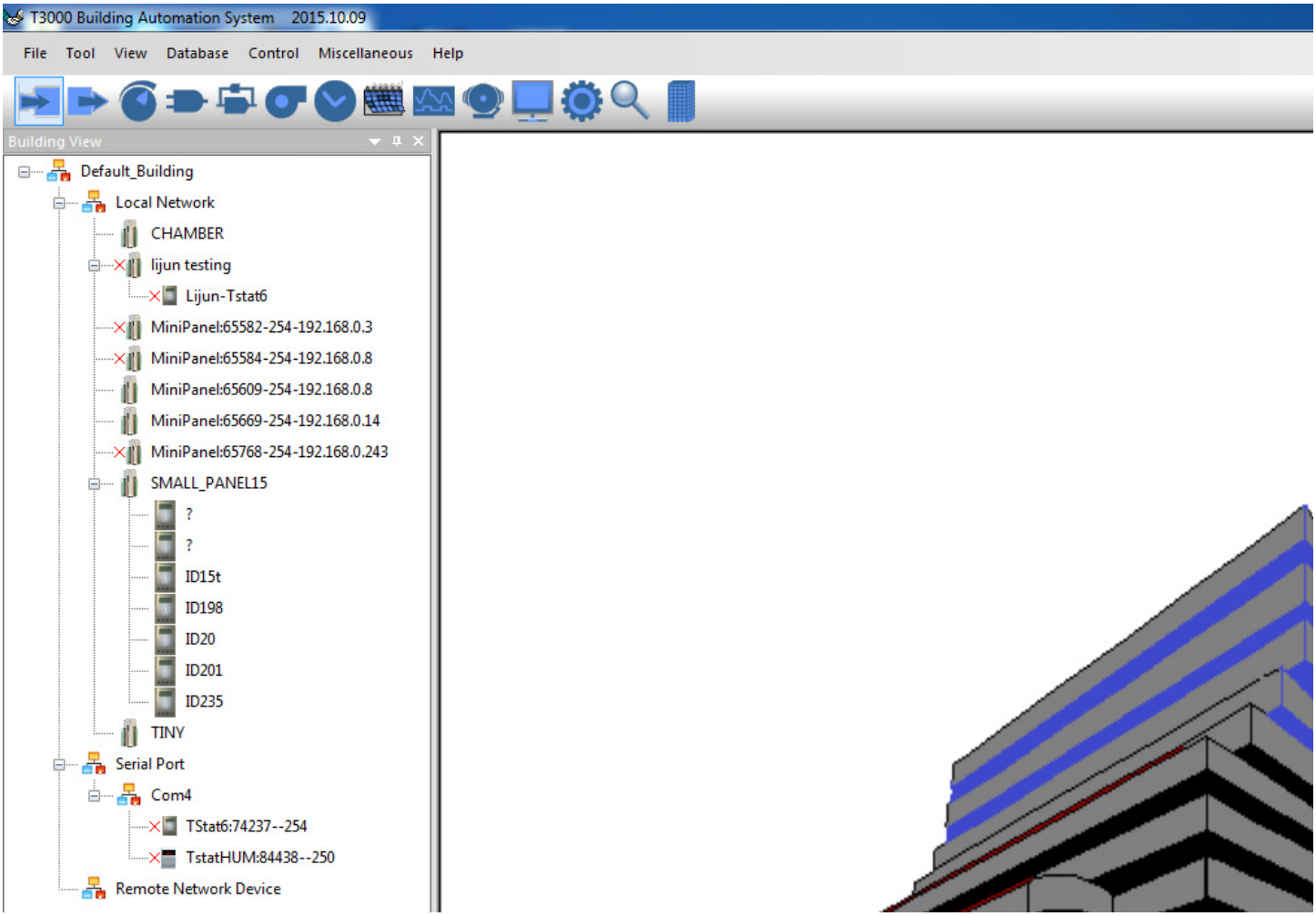


2.Then let the ethernet cable enter through the gland.

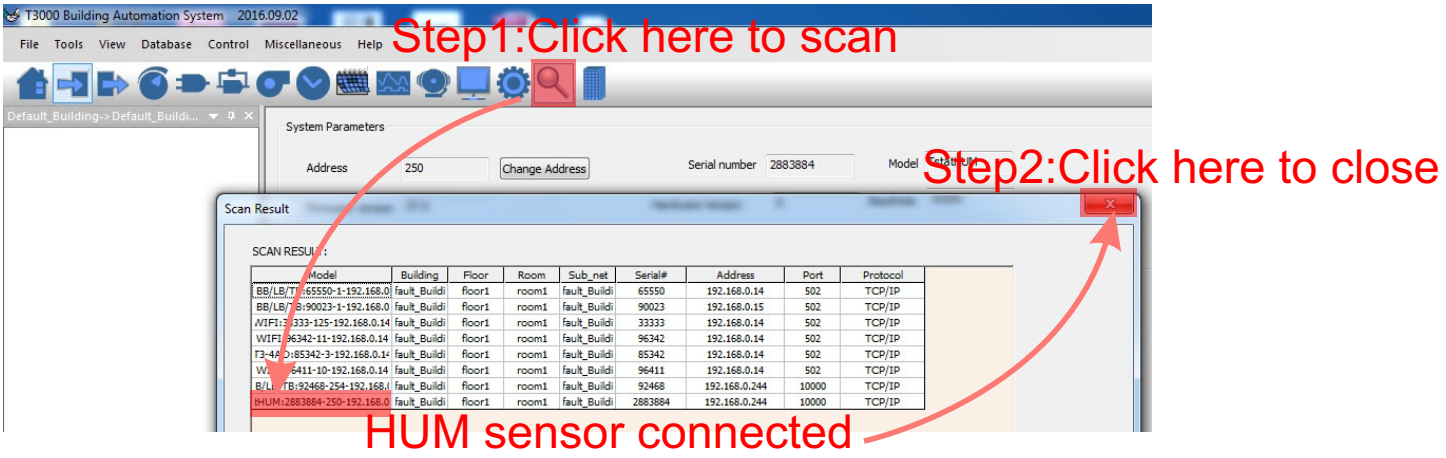


T3000 Operation

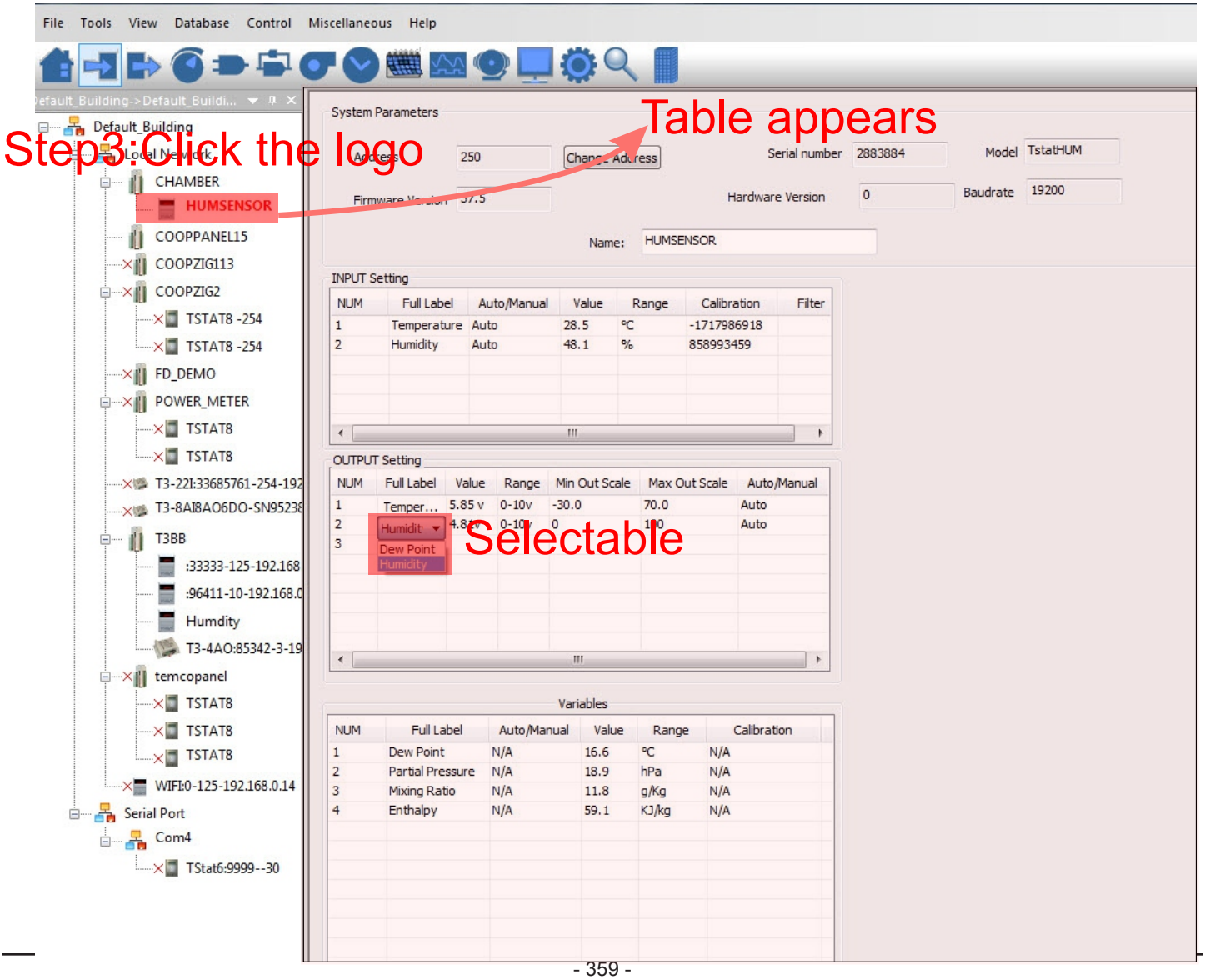
1. Connect to PC by RS485.
2. Open T3000 and it show the following view.



3. Click the button to scan, the following view will appear and close it as the picture shows.

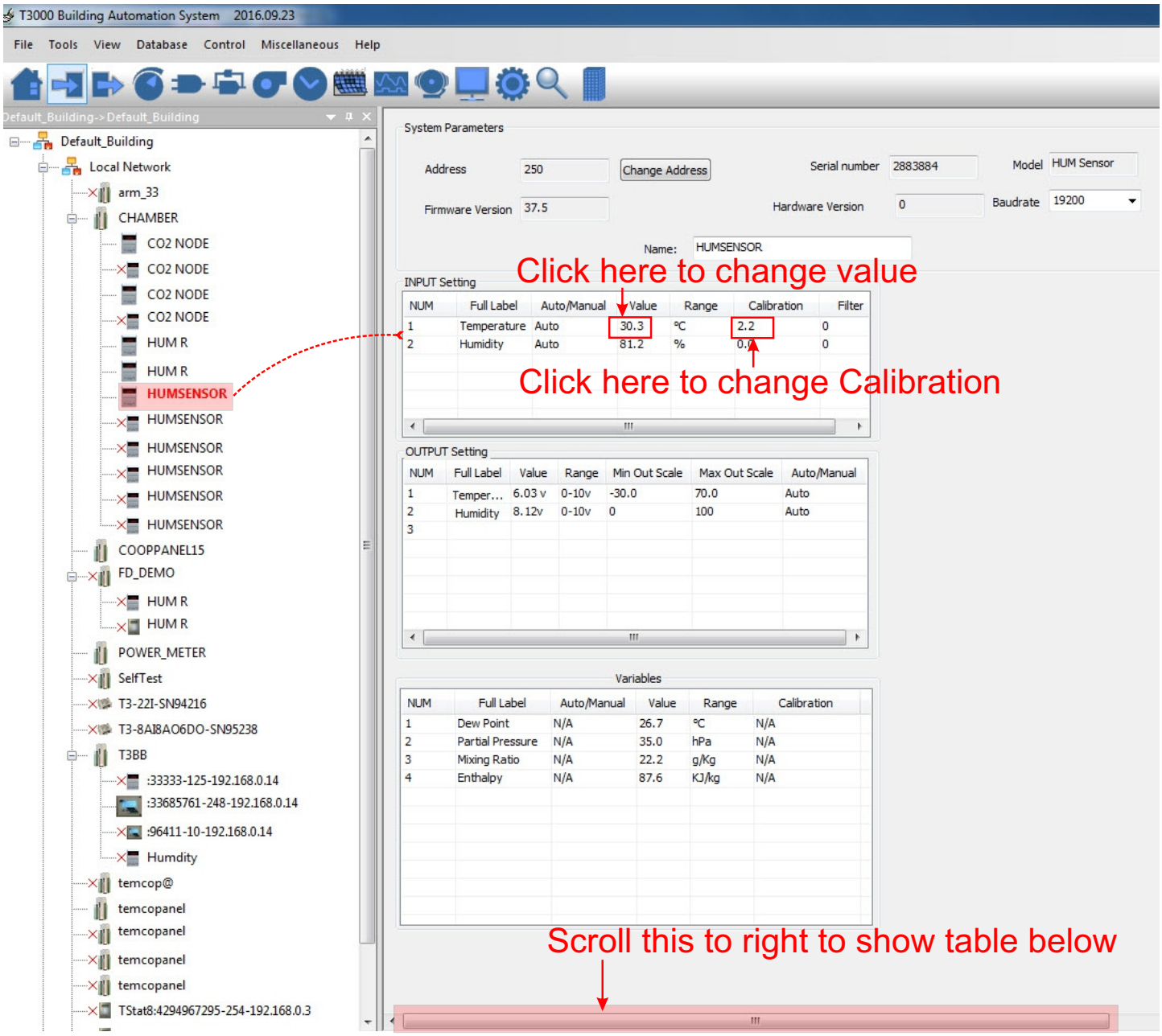


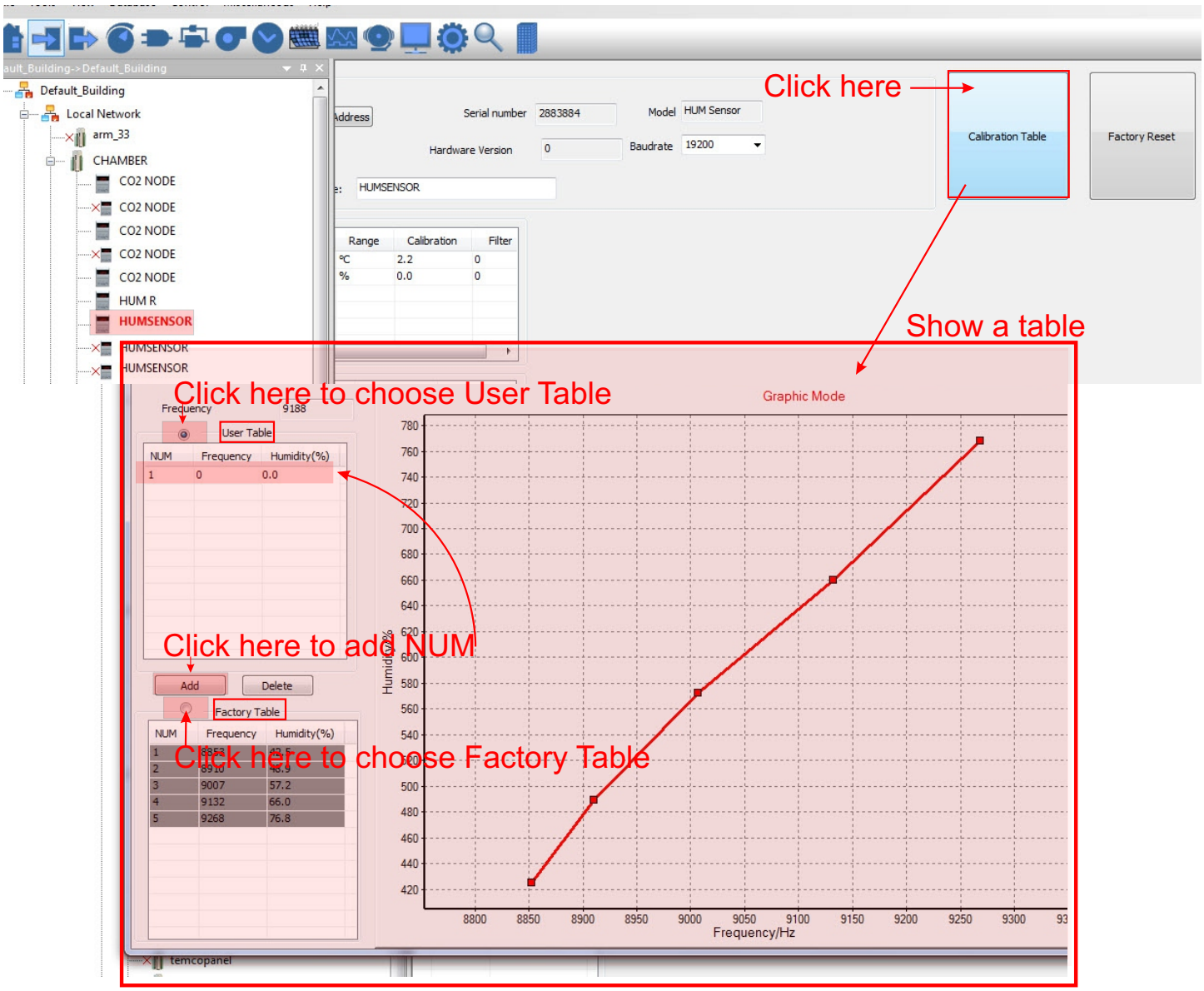
4.Click the HUM log and it will show all the information.
In input setting view, there are temperature, humidity and dew point.In output setting view, when you click the humidity, an arrow appears, you can choose humidity or dew point.



T3000 calibration

The picture shows T3000 calibration of HUM.Do as the follows:
You can click to change value or calibration,also to choose User Table or Factory Table:




Default_Building
Local Network
arm_33
CHAMBER
CO2 NODE
CO2 NODE
CO2 NODE
CO2 NODE
CO2 NODE
HUM R
HUMSENSOR
Serial number
2883884
Model
HUM Sensor
Hardware Version
0
Baudrate
19200
HUMSENSOR
Range
Calibration
Filter
℃
2.2
0
%
0.0
0
Click here
Calibration Table
Factory Reset
Show a table
Click here to choose User Table
Graphic Mode
Frequency
9188
User Table
NUM
Frequency
Humidity(%)
1
0
0.0
Click here to add NUM
Add
Delete
Factory Table
Click here to choose Factory Table
NUM
Frequency
Humidity(%)
1
2
3
9007
57.2
4
9132
66.0
5
9268
76.8
Humidity/%
Frequency/Hz
temcopanel

Modbus Register List

Address	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 microcontroller to determine the product
8	Hardware Revision. This is a read-only register that is used by the microcontroller to determine the hardware Rev
9	PIC firmware version
10	'Plug n Play' address, used by the network master to resolve address conflicts. See VC code for algorithms
15	Bau - Baudrate, 0=9.6kbaud, 1=19.2kbaud 2=38.4kbaud 3=57.6kbaud 4=115.2kbaud
16	Firmware Update Register, used to show the status of firmware updates
21	Protocol switch. 3 = MODBUS,0=MSTP.
17-39	Blank, for future use
40 to 45	reg40, MAC address, read only normally
46	reg46, IP mode. 0=static IP; 1= DHCP
47 to 48	reg47, upper two bytes of IP address
49 to 50	reg49, lower two bytes of IP address
51 to 52	reg51, right two bytes of SUBNET MASK address
53 to 54	reg53, left two bytes of SUBNET MASK address
55 to56	reg55, right two bytes of GATEWAY address
57 to 58	reg57, left two bytes of GATEWAY address
59	reg59, 0, TCP server, (NO USE)
60	reg60, listen port at TCP server mode
61~75	buffer mirror for changing to a new IP address, copy of reg 46 to 60
76	write 1 to set the ghost settings to the system and start new settings, then clear the ghost registers.
93	Enable for MAC setting. It should be set as 1 before write the new MAC to the MAC registers(100-105), and it will be cleared automatically after setting the MAC address.
100	ROOM TEMPERATURE reading in DegF. Can also write to this register for single point calibration.
101	ROOM TEMPERATURE reading in DegC. Can also write to this register for single point calibration.
113	Not used
121	LCD temperature will show C or F, 0 =C, 1=F

Modbus Register List

Address	Register and Description
185	Bau - Baudrate, 0=9600, 1=19.2k baud
186	The factory default is 1. Temperature Transducer output range, 1=0-10V, 2=0-5V, 3=4-20mA
187	The factory default is 1. Humidity Transducer output range, 1=0-10V, 2=0-5V, 3=4-20mA
285	The minimum degree of temperature range corresponding to the temperature output
286	the maximum degree of temperature range corresponding to the temperature output
287	the minimum percent of humidity range corresponding to the humidity output
288	the maximum percent of humidity range corresponding to the humidity output
304	Relative Humidity reading. Writing a humidity value to the register will do calibration, for details, refer to Humidity Calibration.
370	Auto/Manual output calibrate set. 0 : default value 1 : user manual. Bit 0 :temperture bit1 :humidity
371	Temperature manual output value input, releative with register 370
372	Humidity manual output value input, releative with register 370
373	Relative humidity in percentage,the same to register304
374	sensor frequency on time
375~380	spare for futher function
381	Factory 1st Calibration point. RH
382	Factory 1st Calibration point. Frequency
383	Factory 2nd Calibration point. RH
384	Factory 2nd Calibration point. Frequency
385	Factory 3rd Calibration point. RH
386	Factory 3rd Calibration point. Frequency
387	Factory 4th Calibration point. RH
388	Factory 4th Calibration point. Frequency
389	Factory 5th Calibration point. RH
390	Factory 5th Calibration point. Frequency
391	Factory 6tht Calibration point. RH
392	Factory 6th Calibration point. Frequency
393	Factory 7th Calibration point. RH
394	Factory 7th Calibration point. Frequency
395	Factory 8th Calibration point. RH
396	Factory 8th Calibration point. Frequency
397	Factory 9th Calibration point. RH
398	Factory 9th Calibration point. Frequency
399	Factory 10th Calibration point. RH

Modbus Register List

Address	Register and Description
400	Factory 10th Calibration point. Frequency
450	Temperature Calibration Offset for sensor
451	Humidity Calibration Offset for sensor
452	the filter of temperature
453	the filter of humidity
454	calibrate table select,default tabel =0 or customer table = 1
455	user calibrate points number
456 ~ 475	user calibrate points
476	K line
477	B line
478	humidity sensor serial number
479	spare for futher function
480	spare for futher function
481	spare for futher function
482	dew point in unit c
483	dew point in unit F
484	heat control
485	spare for futher function
486	dewpoint output min range
487	dewpoint output max range
488	Partial Pressure of water at saturation at given temperature, [hPa]
489	Mixing Ratio, the mass of water over the mass of dry gas, [g/kg]
490	Enthalpy of the air, [kJ/kg]
491	Modbus reply delay time (ms)
492	Modbus receive delay time(ms)
500	PID1 MODE: 0=COOL MODE,1=HEAT MODE
501	PID1 SetPoint
502	PID1 Pterm
503	PID1 Iterm
504	PID1 Value
510	PID2 MODE:0=COOL MODE,1=HEAT MODE
511	PID2 SetPoint
512	PID2 Pterm
513	PID2 Iterm
514	PID2 Value
536	The light sensor filter
538	The light sensor value .The resolution is 0.1 lux

Outdoor Weather Station

Bacnet Register List

Variable	Variable and Description
0	Spare
1	SerialNumber LowByte
2	SerialNumber HighByte
4	ID Address
5	Product Model
6	Instance
7	Station number
8	Uart BaudRate.0=9.6kbaud, 1=19.2kbaud 2=38.4kbaud 3=57.6kbaud 4=115.2kbaud
9	Update
10	Protocol
11	Auto/Manual
12	Dew point
13	Pws
14	MixRatio
15	Enthalpy
16	OffSet Humdity
17	OffSet Tempeature
18	OffSet CO2
19~21	spare
22	Filter Humdity
23	Filter Temperature
24	Filter CO2
25~27	Spare
28	Temperature Unit .0 = C, 1 =F
29	OutMode. 1=0-10V, 2=0-5V, 3=4-20mA
30	Output1 Min Range
31	Output1 Max Range
32	Output2 Min Range
33	Output2 Max Range
34	Output3 Min Range
35	Output3 Max Range

Outdoor Weather Station

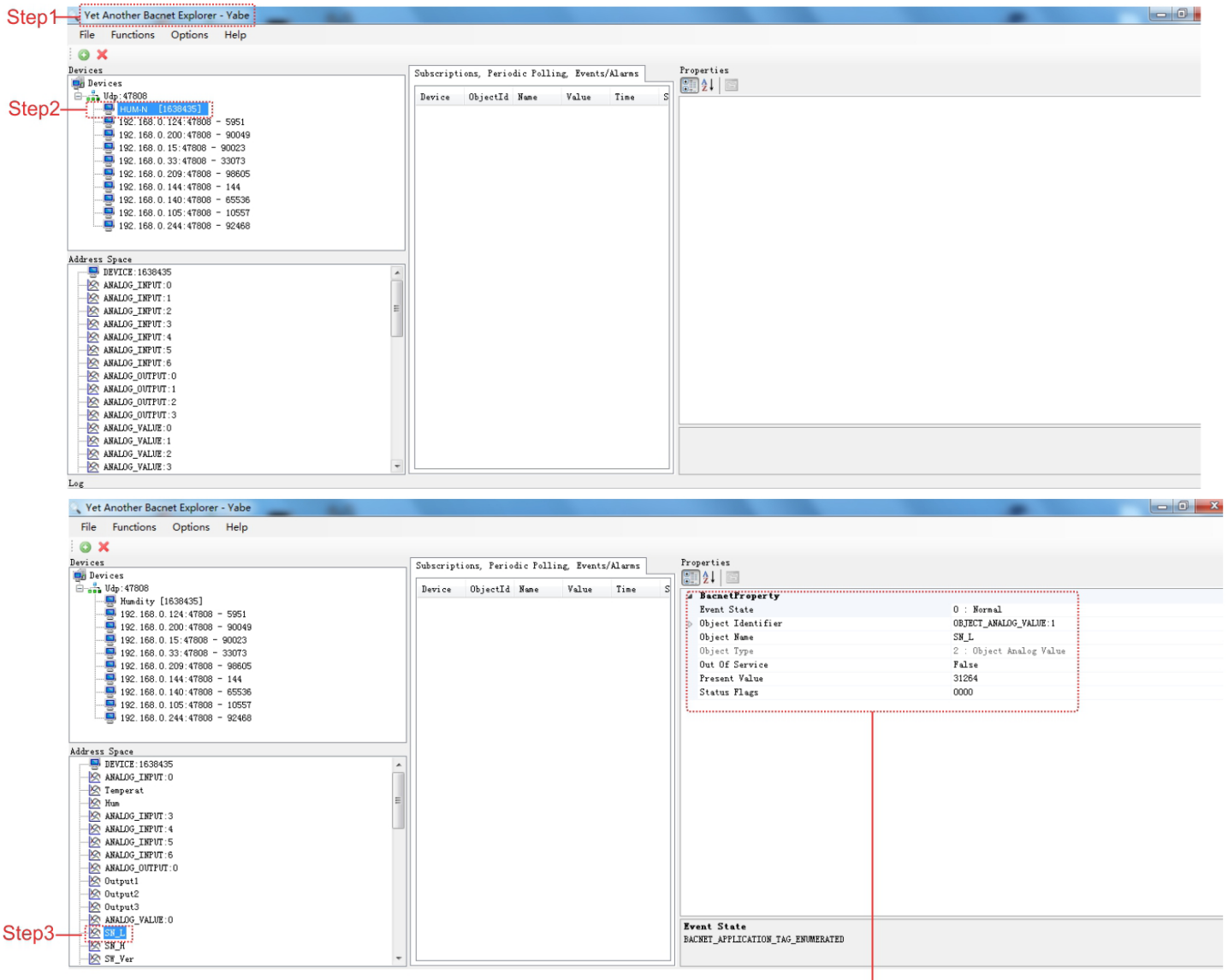
Bacnet Object List

Input	Input and Description
1	Temperature
2	Humidity
3	CO2
7	Light Value
Output	**Output and Description**
1	Analog output1
2	Analog output2
3	Analog output3

Analog Value

To check the analog value,you can use a software”Yet Another Bacnet Explorer-Yabe”.Below are the steps to get the analog value.

*Step1:*Download the software”Yet Another Bacnet Explorer-Yabe” and install it.
*Step2:*Plug the sensor in power,connect it to your PC via RS485 or Ethernet.
Step3:Click the item you want to check,a table reads BacnetProperty will pop-up on the right.



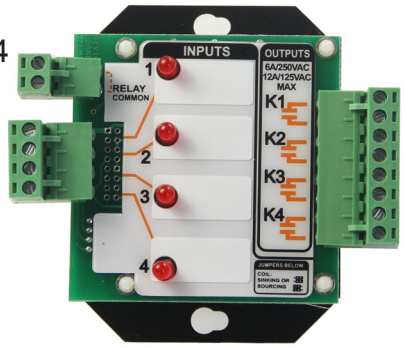
Mechanical Relay Board:8 relay and 4 relay models

Description

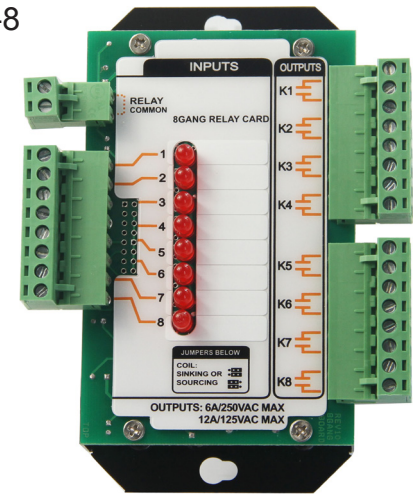
The MRB Mechanical Relay Board comes in two models, the 4 gang and the 8 gang versions. The board features status LEDs and a label with writeable surface where you can mark the name of each output.

The coils are low power, requiring 20ma at 24VAC (30ma at 12VDC). The SPST relay is rated at 12A/125VAC, 6A/250VAC. The relay board has two versions with either 24VAC or 12VDC coils. There are jumpers on the rear of the relay board which allow you to switch from 12VDC to 24VAC or vice versa in the field. The coils are normally configured as sourcing with a common ground but they can also be factory configured to sinking operation, please write us if you would like the sinking version. The terminals are pluggable with full floating cage type wire clamp which grip the wire firmly, not the lower cost spring terminal style.

MRB-4



MRB-8



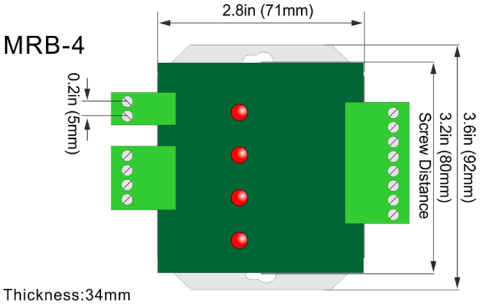
Features:

- Works with positive and negative ground systems.
- Jumpers can set each relay to two different operating
- Modes: common switched 24VAC or dry contact.
- UR approved
- Panel mount base, removable face plate
- LED for each low voltage relay

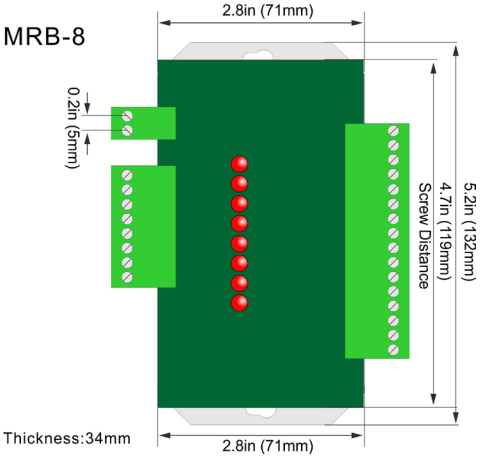
Specifications

CONTACT	
Initial Contact Resistance, (By Voltage Drop 60VDC 1A)	<100mOhm
Contact Material	Silver Cadmium Oxide
Switching Capacity	12A/125VAC, 6A/250VAC, 6A/28VDC
Relay	UL E169380
Operating Time(at nominal voltage)	< 10 ms
Release Time(at nominal voltage)	< 5 ms
Max Switching Power	1500VA/168W
Max Switching Voltage	250VAC/28VDC
COIL DATA	
Coil Voltage	24VAC
Coil Resistance	400ohm(+/-10%)
Nominal Operating Power	0.36W
CHARACTERISTICS	
Operating Temp. Range	-55 to 85°C
Operating Relative Humidity	0 to 93%
4 gang dimensions	92 x 100 x 34mm
8 gang dimensions	132 x 100 x 34mm

MRB-4



MRB-8



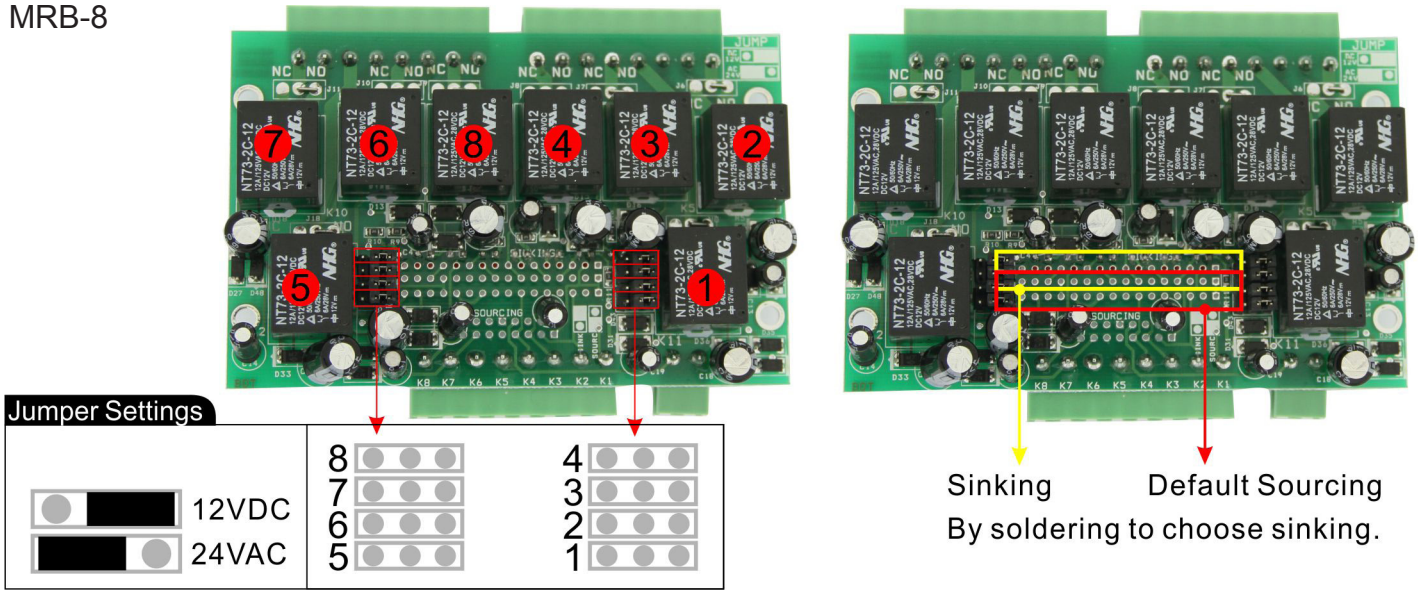
Mechanical Relay Board:8 relay and 4 relay models

Jumper Settings

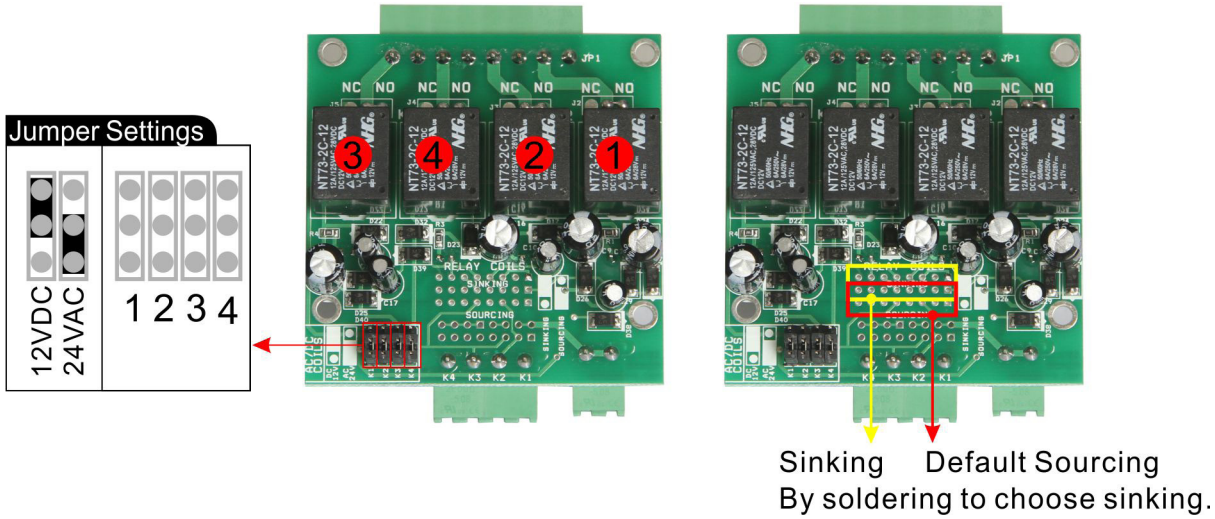
The MRB-8 has 8 relays and 8 jumpers. Each relay has its own jumper that can be configured as shown by the picture below. The default setting is 24VAC for the relay coils. By moving a jumper, the user can select 12VDC coils. When using 12VDC mode, the board can be operated in sourcing or sinking modes, sourcing mode is the default. If you would like to adjust the board to operate in sinking mode this can be done by soldering a jumper and cutting a trace, please review the schematic or contact us for assistance.

Notes about the sinking and sourcing jumpers:
1. The relays can be used with either sourcing or sinking DC sources for the coils, the default setting is sourcing.
2. When using the relays with 24vac coils, the jumpers must be left in their default sourcing setting.
3. The sourcing/sinking jumpers are not actually populated with jumpers since this 'sinking' feature will not be used by the vast majority of users. To use the sinking mode feature you will need to solder some jumper wires to the PCB, the feature is there for those that know how to read the schematic and do this on their own. If you know you need the sinking mode setup you can mention this during ordering and we will pre-configure for you.

MRB-8



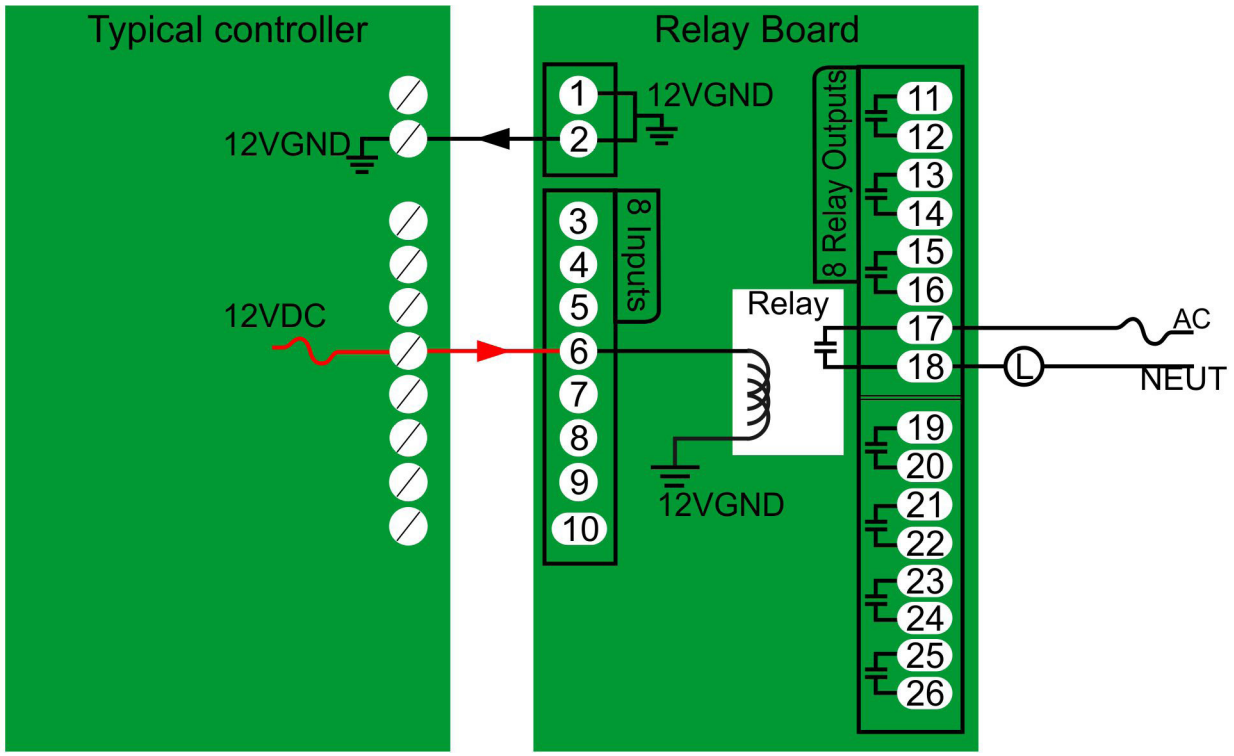
MRB-4



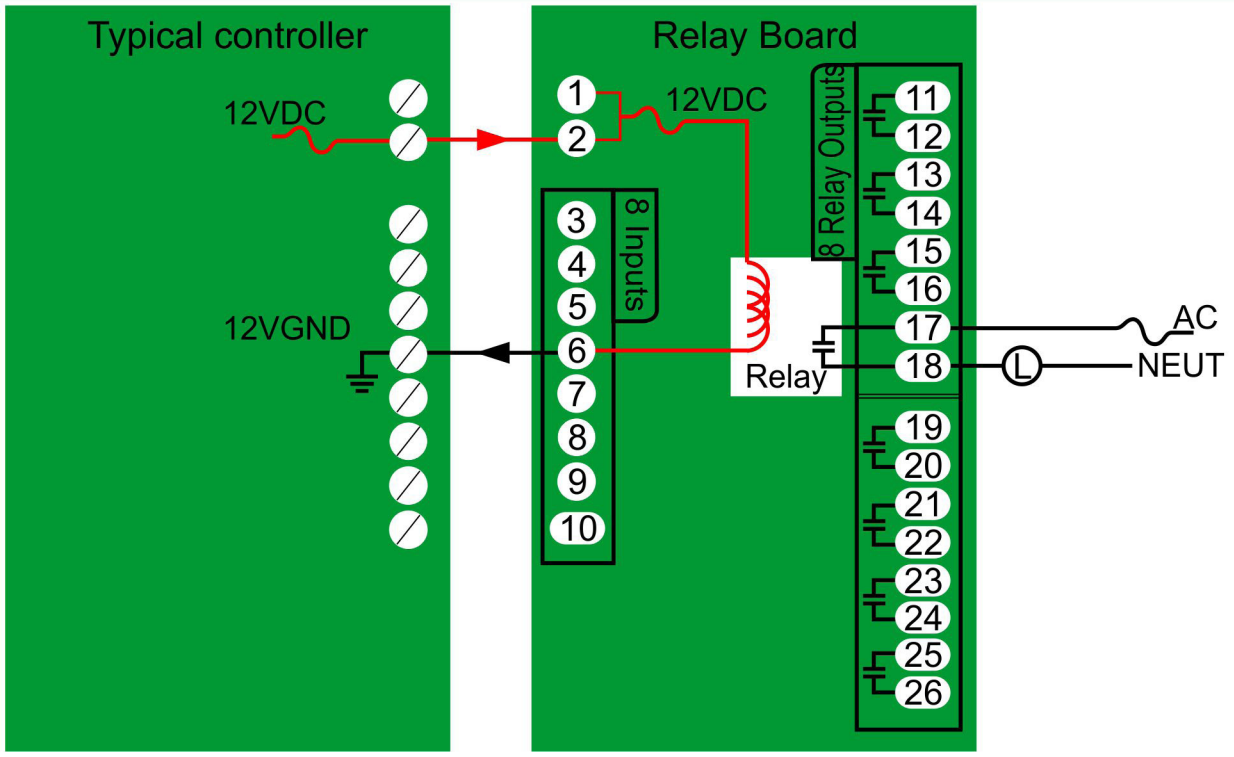
Mechanical Relay Board:8 relay and 4 relay models

Sourcing and Sinking

Default Sourcing



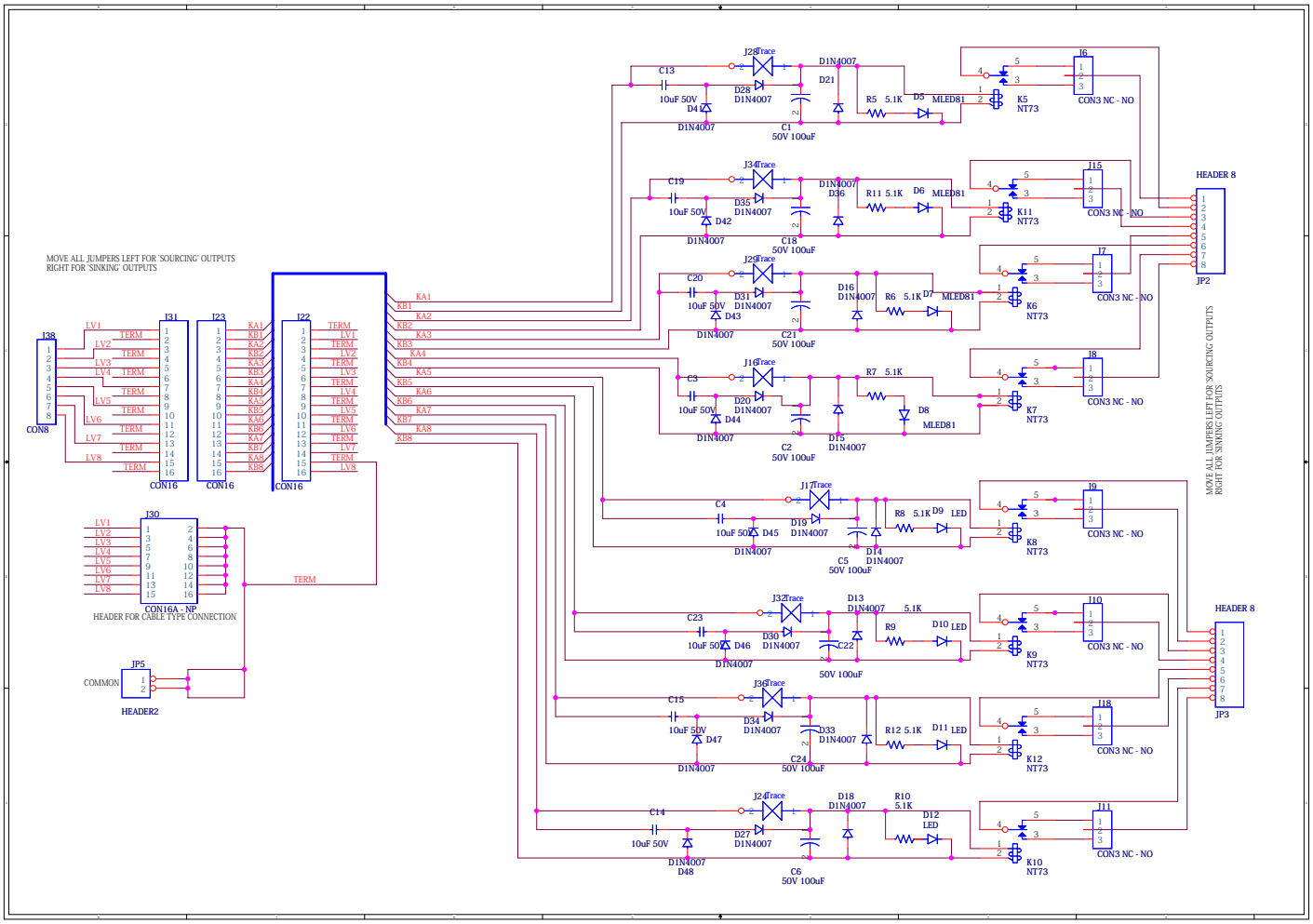
Sinking



Mechanical Relay Board:8 relay and 4 relay models

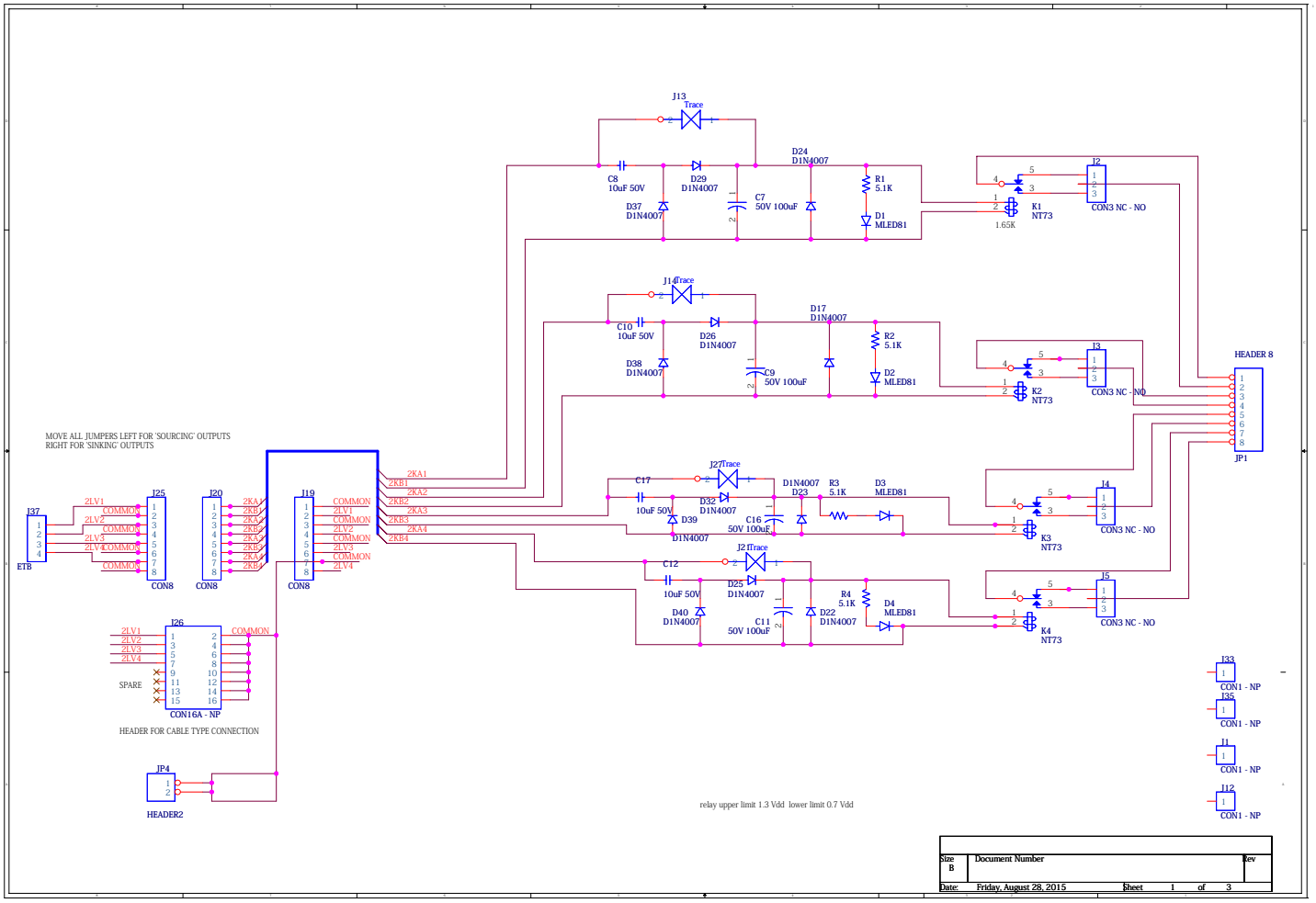
Schematic

MRB-8



Mechanical Relay Board:8 relay and 4 relay models

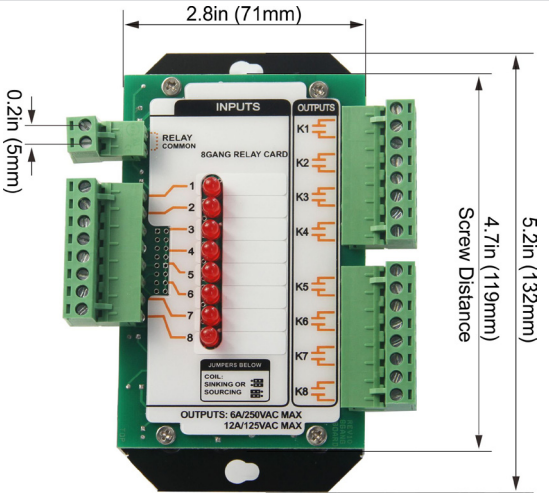
MRB-4



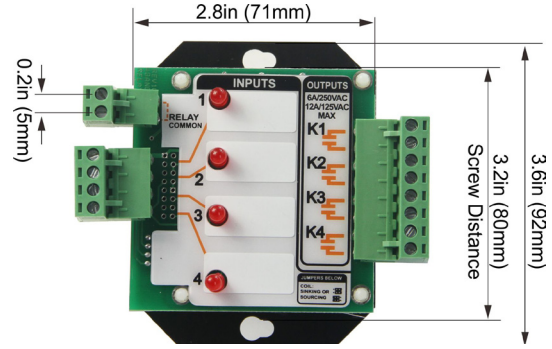
Mechanical Relay Board:8 relay and 4 relay models

Getting Started

CONTACT	
Initial Contact Resistance, (By Voltage Drop 60VDC 1A)	<100mOhm
Contact Material	Silver Cadmium Oxide
Switching Capacity	12A/125VAC, 6A/250VAC, 6A/28VDC
Relay	UL E169380
Operating Time(at nominal voltage)	< 10 ms
Release Time(at nominal voltage)	< 5 ms
Max Switching Power	168W/1500VA
Max Switching Voltage	250VAC /28VDC
COIL DATA	
Coil Voltage	12VDC
Coil Resistance	400ohm(+/-10%)
Nominal Operating Power	0.36W
CHARACTERISTICS	
Operating Temp. Range	-55 to 85°C
Operating Relative Humidity	0 to 93%
4 gang dimensions	92 x 100 x 34mm
8 gang dimensions	132 x 100 x 34mm



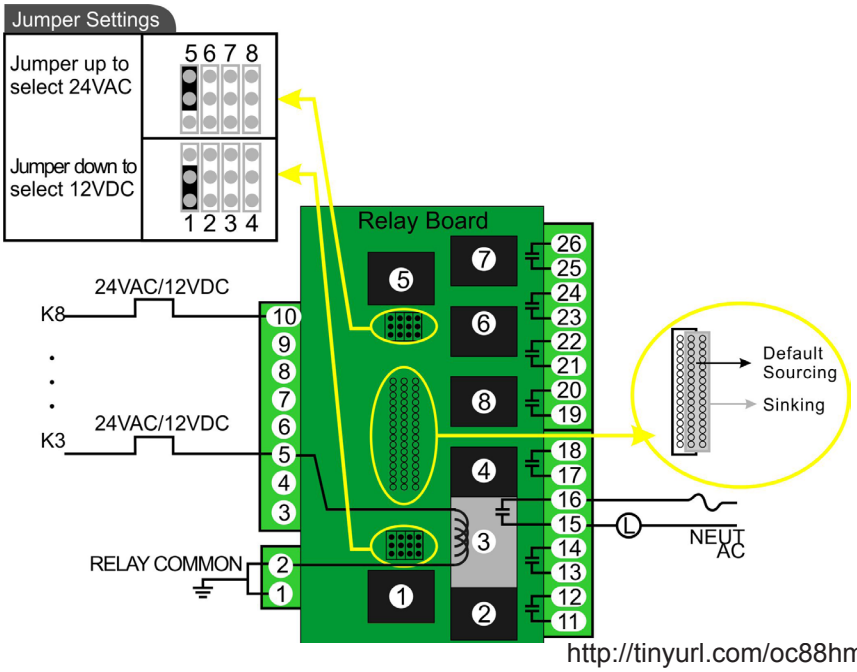
MRB-8



MRB-4

Jumper Settings

The MRB-8 has 8 relays and 8 jumpers. Each relay has its own jumper that can be configured as shown by the picture below. The default setting is 24VAC for the relay coils. By moving a jumper, the user can select 12VDC coils. When using 12VDC mode, the board can be operated in sourcing or sinking modes, sourcing mode is the default.



Notes about the sinking and sourcing jumpers:
1. The relays can be used with either sourcing or sinking DC sources for the coils, the default setting is sourcing.
2. When using the relays with 24vac coils, the jumpers must be left in their default sourcing setting.
3. The sourcing/sinking jumpers are not actually populated with jumpers since this 'sinking' feature will not be used by the vast majority of users. To use the sinking mode feature you will need to solder some jumper wires to the PCB, the feature is there for those that know how to read the schematic and do this on their own. If you know you need the sinking mode setup you can mention this during ordering and we will preconfigure for you.

http://tinyurl.com/oc88hm6

G2R

- Creepage distance of 8.0 mm (0.31) min. between coil and contact.
- Dual-winding latching type available.
- Plug-in and quick-connect terminals available.
- High sensitivity (360 mW) and high capacity (16 A) types available.
- Highly stable magnetic circuit for latching endurance and excellent resistance to vibration and shock.
- Safety-oriented design assuring high surge resistance: 10,000 V min. between coil and contacts.
- UL, CSA approved
  UL File No.E41643;, CSA File No.LR31928
- Current draw:31.6ma@12V DC;71.4ma@24V



Ordering Information

To order: Select the part number and add the desired coil voltage rating (e.g., G2R-14-*DC12*).

Non-Latching

1-Pole - PCB Types

Construction	Model
Semi-sealed	G2R-1
Semi-sealed	G2R-1A
Semi-sealed	G2R-1-E
	G2R-1A-E
	G2R-1-H
Semi-sealed	G2R-1A-H

1-Pole - Plug-in/Quick-connect Types

Terminal	Model
Plug-in	G2R-1-S
	G2R-1-SN
	G2R-1-SD
	G2R-1-SND
Quick connect	G2R-1-T
	G2R-1A-T

Note: 1. AgInSn and gold plated contacts available.
2. Bifurcated button available.
3. For individual product agency approvals consult factory.
4. Class B coil insulation available.
5. Push to test button available on plug-in type. Consult Omron for details.
6. CE mark only on plug-in and quick connect types (G2R- -S).
7. The Plug-in/Quick Connect versions shown here have been discontinued. They have been replaced by the new G2R-S(S) Power Relays. For complete specifications see the data sheet at Omron s Knowledge Center at www.knowledge.omron.com.

2-Pole - PCB Types

Contact form	Construction	Model
DPDT	Semi-sealed	G2R-2
DPST-NO	Semi-sealed	G2R-2A
DPDT	Semi-sealed	G2R-2-H
DPST-NO	Semi-sealed	G2R-2A-H

2 Pole - Plug-in/Quick-connect Types

Type	Contact material	Contact form	Terminal	Model
General purpose	AgCdO	DPDT	Plug-in	G2R-2-S
LED indicator				G2R-2-SN
Surge suppression diode				G2R-2-SD
Led indicator and surge suppression diode				G2R-2-SND

Note: 1. AgInSn and gold plated contacts available.
2. Bifurcated button available.
3. For individual product agency approvals consult factory.
4. Class B coil insulation available.
5. Push to test button available on plug-in type. Consult Omron for details.

• Characteristics

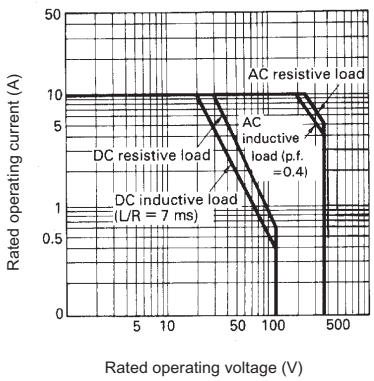
Item		Non-latching	Latching
Contact resistance		100 mΩ	
Operate (set) time		15 ms. max.	20 ms max.
Release (reset) time		AC: 10 ms max.; DC: 5 ms max.	20 ms max.
Bounce time	Operate	---	Mean value approx. 3 ms
	Release	---	Mean value approx. 8 ms
Operating frequency	Mechanical	18,000 operations/hour	
	Electrical	1,800 operations/hour (under rated load)	
Insulation resistance		1,000 MΩ min. (at 500 VDC)	
Dielectric strength		5,000 VAC, 50/60 Hz for 1 minute between coil and contacts	
		1,000 VAC, 50/60 Hz for 1 minute across contacts of same pole	
		3,000 VAC, 50/60 Hz for 1 minute between contact sets, 2-pole non-latching	
		1,000 VAC, 50/60 Hz for 1 minute between set and reset coils of dual coil latching	
Vibration	Mechanical durability	10 to 55 Hz; 1.50 mm (0.06) double amplitude	
	Malfunction durability	10 to 55 Hz; 1.50 mm (0.06) double amplitude	
Shock	Mechanical durability	1,000 m/s^2 (approx. 100G)	
	Malfunction durability	200 m/s^2 (approx. 20 G) when energized 100 m/s^2 (approx. 10 G) when de-energized	500 m/s^2 (approx. 50 G) at set 100 m/s^2 (approx. 10 G) at reset
Ambient temperature		-40 to 70 C (-40 to 158 F)	
Humidity		35% to 85% RH	
Service life	Mechanical	AC: 10,000,000 operations min. DC: 20,000,000 operations min. (at 18,000 operations/hour)	10,000,000 operations min. (at 18,000 operations/hour)
	Electrical	See Characteristics Data	
Weight		Approx. 17 g (0.60 oz.)	Approx. 17 g (0.60 oz.)

Note: Data shown are of initial value.

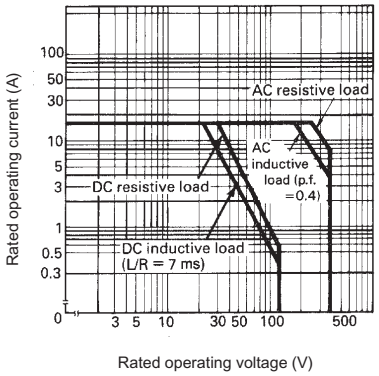
Characteristic Data

Maximum Switching Capacity - Non-latching Types

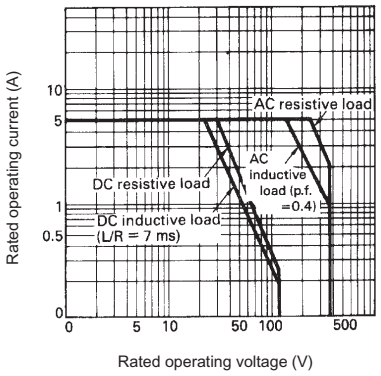
PCB: Single-pole general purpose
Semi-sealed
Plug-in: Single-pole single button
Quick-connect



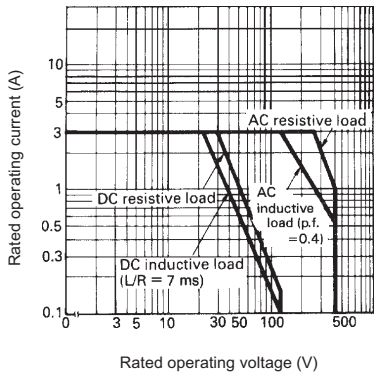
High capacity



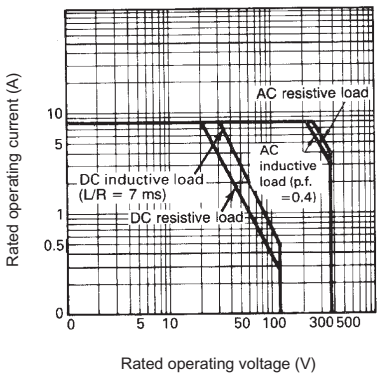
PCB: Single-pole high sensitivity
Two-pole general purpose
Plug-in: Two-pole single button



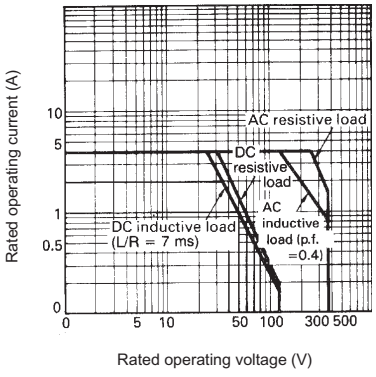
PCB: Two-pole high sensitivity



PCB: Single-pole general purpose
Sealed

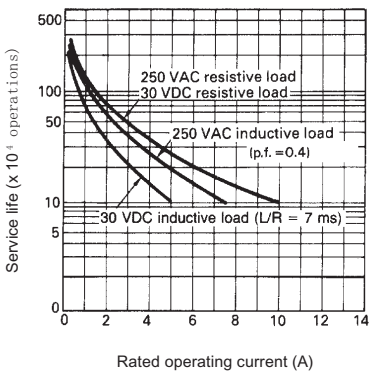


PCB: Two-pole general purpose
Sealed

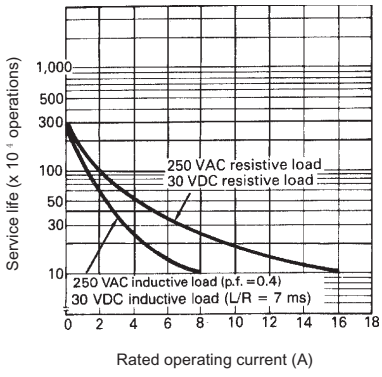


Electrical Service Life - Non-latching Types

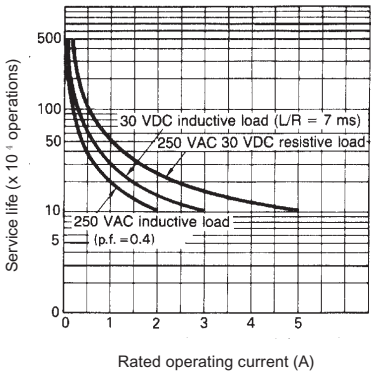
PCB: Single-pole general purpose
Semi-sealed
Plug-in: Single-pole single button
Quick connect



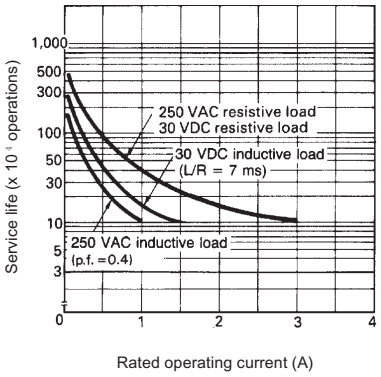
High capacity



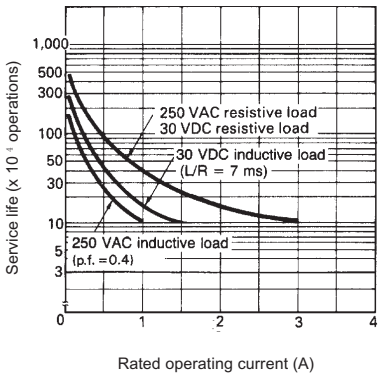
PCB: Single-pole high sensitivity
Two-pole general purpose
Plug-in: Two-pole single button



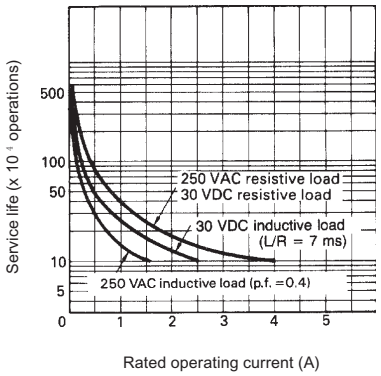
PCB: Two-pole high sensitivity



PCB: Single-pole general purpose Sealed

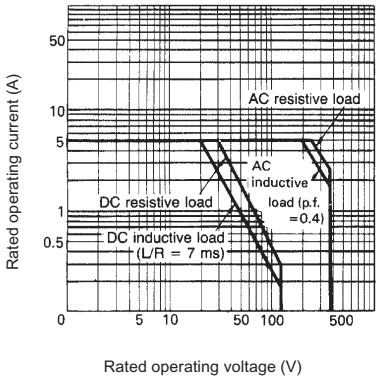


PCB: Two-pole general purpose Sealed

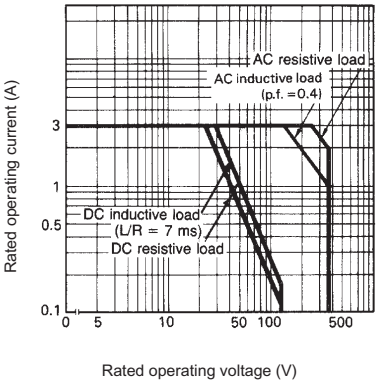


Maximum Switching Capacity - Latching Types

One pole

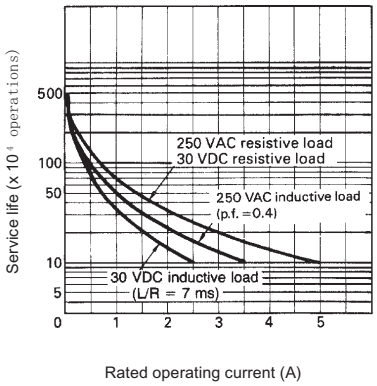


Two-pole

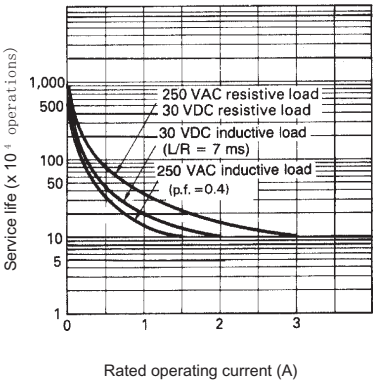


Electrical Service Life - Latching Types

One pole



Two-pole

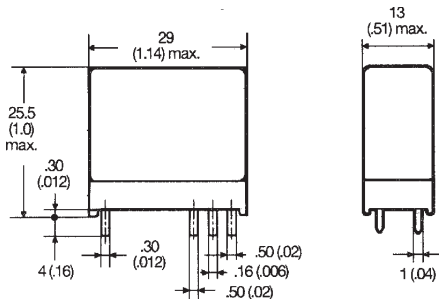


Dimensions

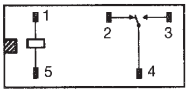
Unit: mm (inch)

Non-latching

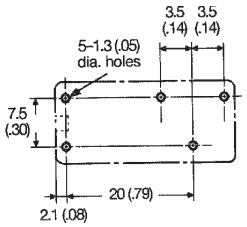
PCB Terminal: SPDT, general purpose & high sensitivity



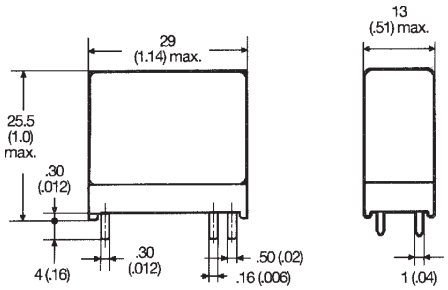
Terminal arrangement/
Internal connections
(Bottom view)



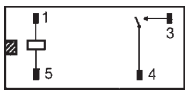
Mounting holes
(Bottom view)



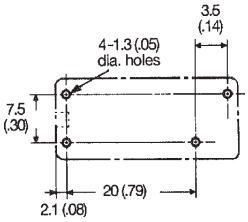
PCB Terminal: SPST-NO, general purpose & high sensitivity



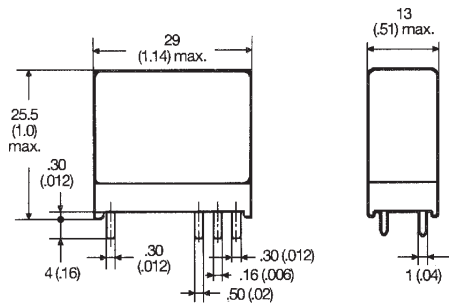
Terminal arrangement/
Internal connections
(Bottom view)



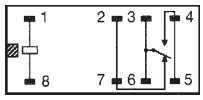
Mounting holes
(Bottom view)



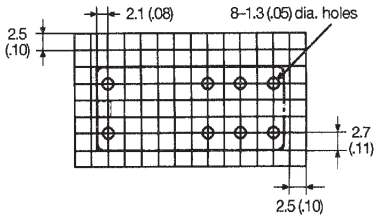
PCB Terminal: SPDT, high capacity



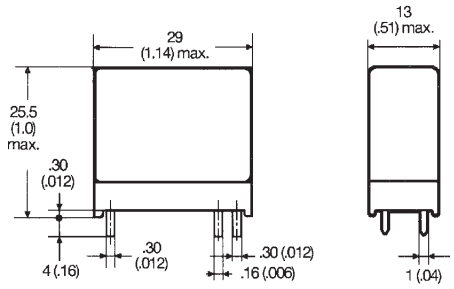
Terminal arrangement/
Internal connections
(Bottom view)



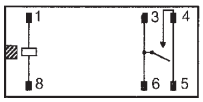
Mounting holes
(Bottom view)



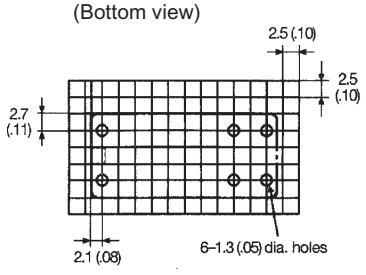
PCB Terminal: SPST-NO, high capacity



Terminal arrangement/
Internal connections
(Bottom view)



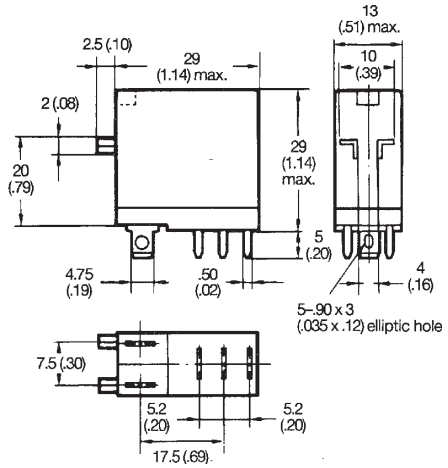
Mounting holes
(Bottom view)



Note: 1. ▨ and [ ] indicate mounting orientation marks.
2. A tolerance of 0.10 (0.004) applies to the above dimensions.

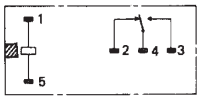
Omron G2R Relay

Plug-in: SPDT, single button general purpose, LED indicator, surge suppression diode

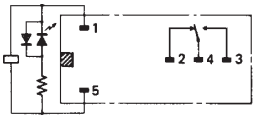


Terminal arrangement/Internal connections
(Bottom view)

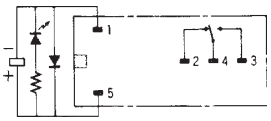
G2R-1-S



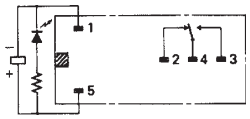
G2R-1-SN(AC)



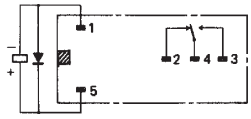
G2R-1-SND(DC)



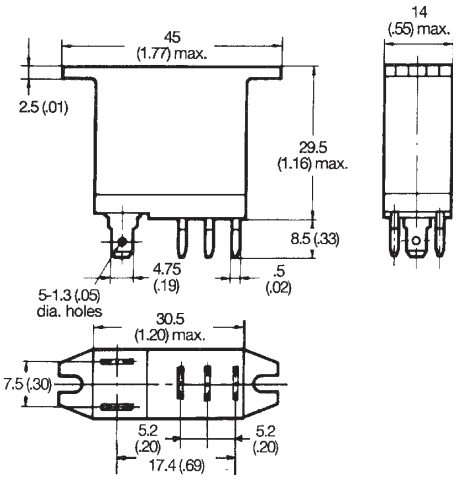
G2R-1-SN(DC)



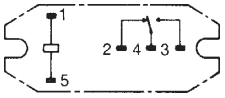
G2R-1-SD(DC)



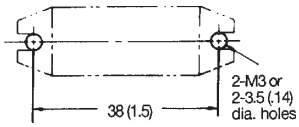
Quick-connect: SPDT



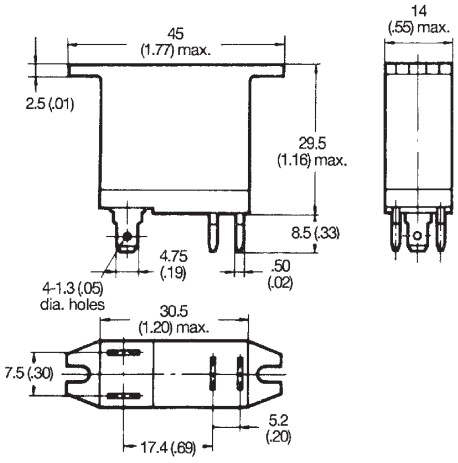
Terminal arrangement/
Internal connections
(Bottom view)



Mounting holes
(Bottom view)



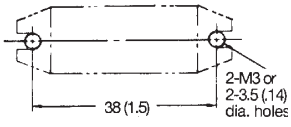
Quick-connect: SPST-NO



Terminal arrangement/
Internal connections
(Bottom view)



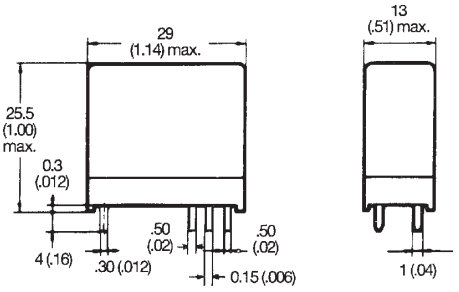
Mounting holes
(Bottom view)



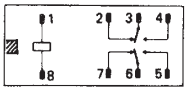
Note: 1. ▨ and [ ] indicate mounting orientation marks.
2. A tolerance of 0.10 (0.004) applies to the above dimensions

Omron G2R Relay

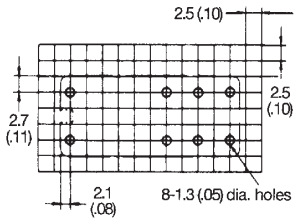
PCB Terminal: DPDT, general purpose & high sensitivity



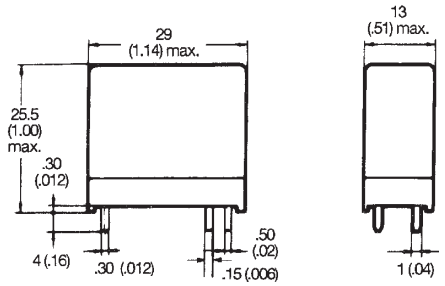
Terminal arrangement/
Internal connections
(Bottom view)



Mounting holes
(Bottom view)



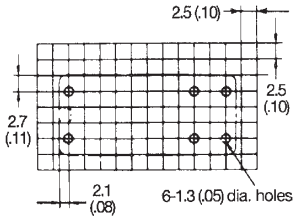
PCB Terminal: DPST-NO, general purpose & high sensitivity



Terminal arrangement/
Internal connections
(Bottom view)



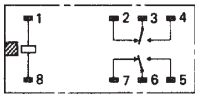
Mounting holes
(Bottom view)



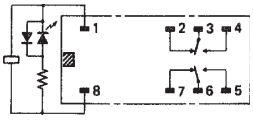
Plug-in: DPDT

Terminal arrangement/Internal connections
(Bottom view)

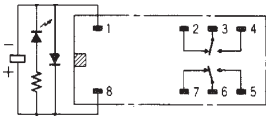
G2R-2-S



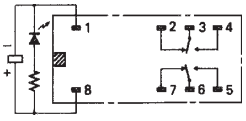
G2R-2-SN(AC)



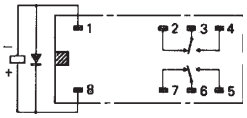
G2R-2-SND(DC)

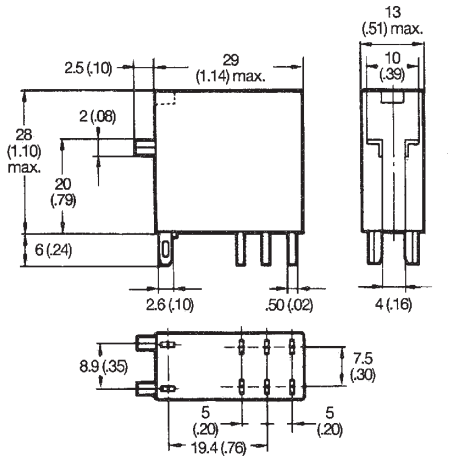


G2R-2-SN(DC)



G2R-2-SD(DC)

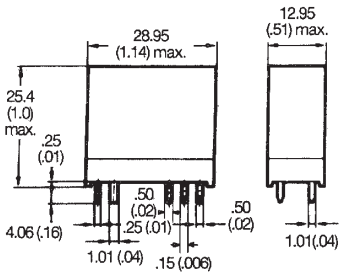




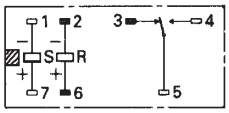
Note: 1. ▨ and [ ] indicate mounting orientation marks.
2. A tolerance of 0.10 (0.004) applies to the above dimensions.

Latching

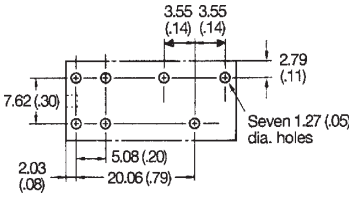
SPDT, Dual coil latching
G2RK-1



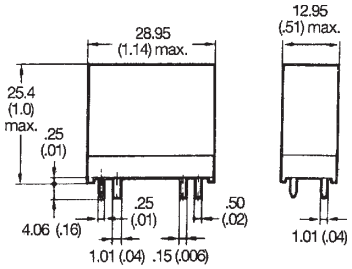
Dual coil



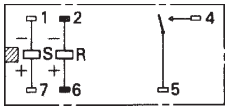
Dual coil



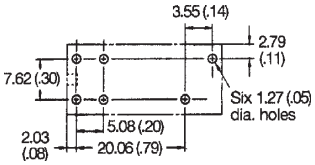
SPST-NO, Dual coil latching
G2RK-1A



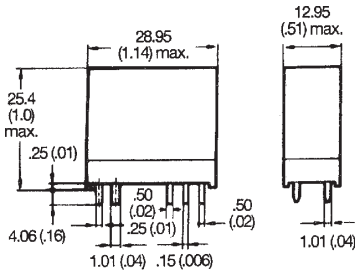
Dual coil



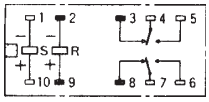
Dual coil



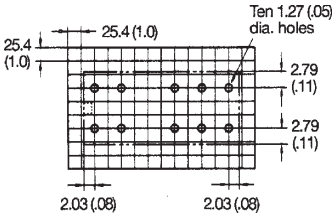
DPDT, Dual coil latching
G2RK-2



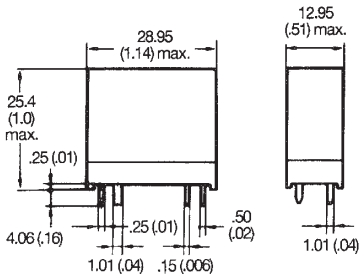
Dual coil



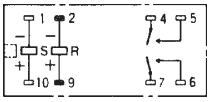
Dual coil



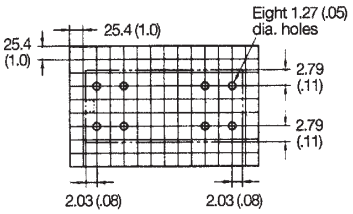
DPST-NO, Dual coil latching
G2RK-2A



Dual coil



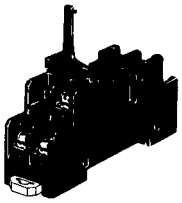
Dual coil

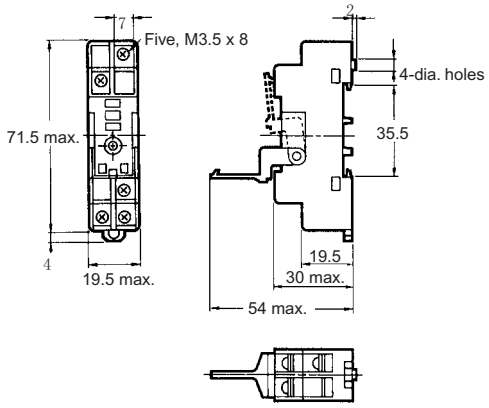


Note: 1. ▨ and [ ] indicate mounting orientation marks.
2. A tolerance of 0.10 (0.004) applies to the above dimensions.

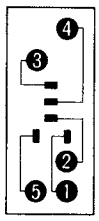
Accessories

Track mounted socket
P2RF-05 (UL E87929/CSA LR31928)

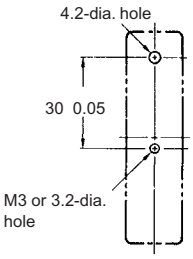




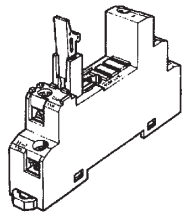
Terminal arrangement
(Top view)

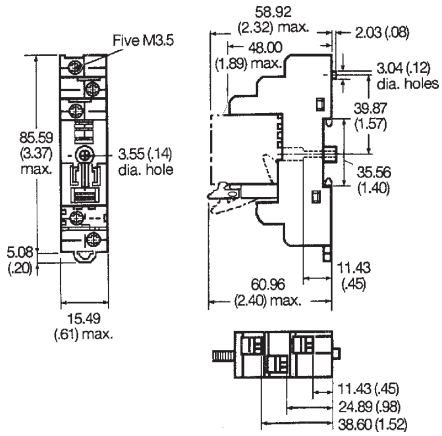


Mounting holes
(for surface mounting)

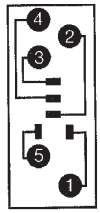


Track mounted socket
P2RF-05-E (UL E87929/CSA LR31928)

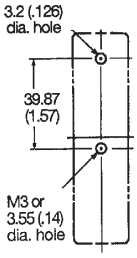




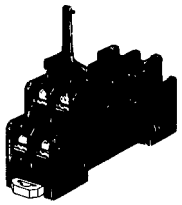
Terminal arrangement

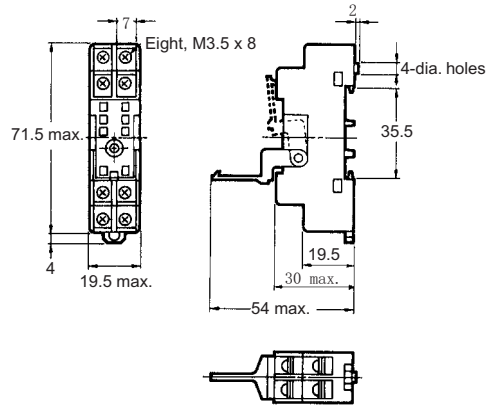


Mounting holes

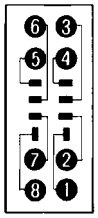


Track mounted socket
P2RF-08 (UL E87929/CSA LR31928)

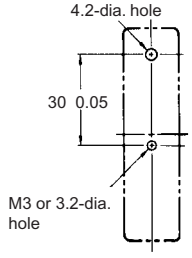




Terminal arrangement
(Top view)

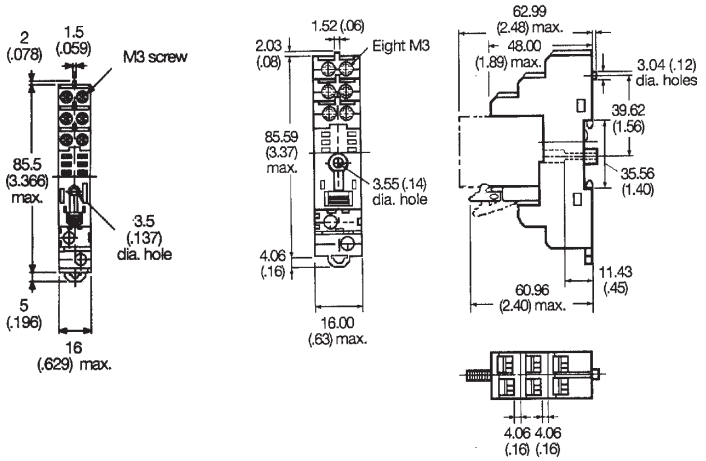


Mounting holes
(for surface mounting)

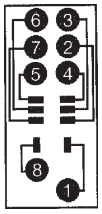


Note: 1. ▨ and [ ] indicate mounting orientation marks.
2. A tolerance of 0.10 (0.004) applies to the above dimensions.

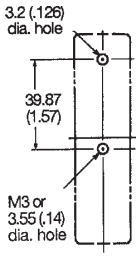
Track mounted socket
P2RF-08-E (UL E87929/CSA LR31928)



Terminal arrangement

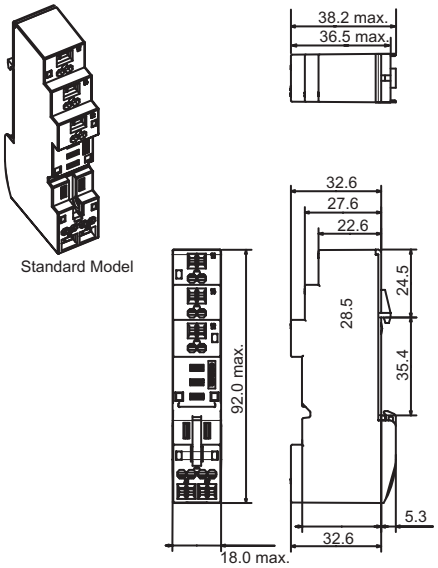


Mounting holes

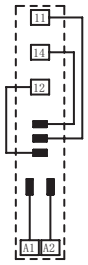


Note: 1. ▨ and [ ] indicate mounting orientation marks.
2. A tolerance of 0.10 (0.004) applies to the above dimensions.

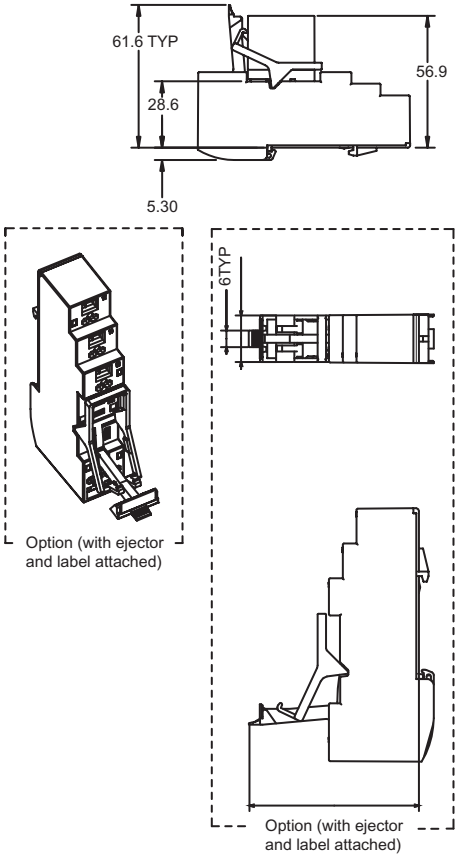
Screwless Clamp Terminal Socket
P2RF-05-S (UL E8729/CSA LR31928)



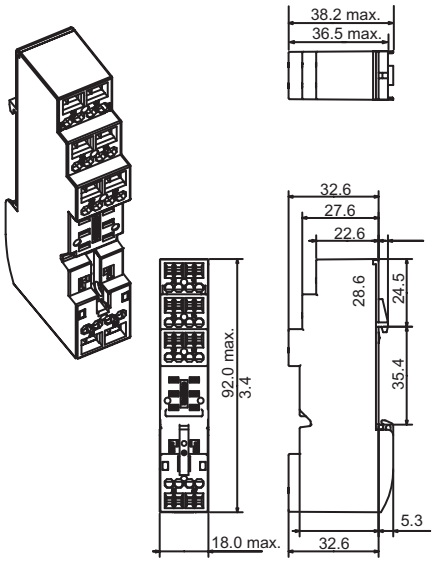
Terminal Arrangement



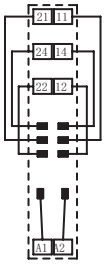
Mounting Height (with lever)



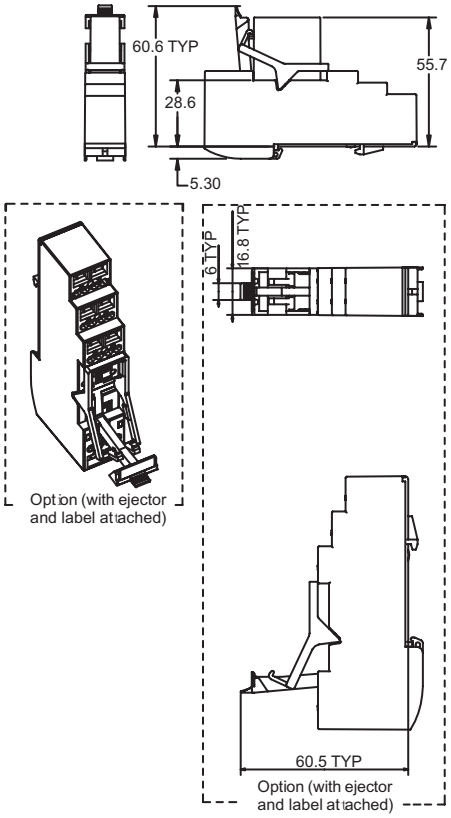
Screwless Clamp Terminal Socket
P2RF-08-S (UL E8729/CSA LR31928)



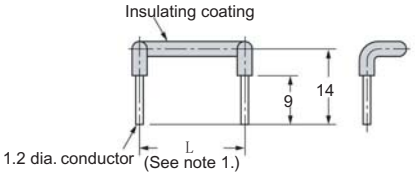
Terminal Arrangement



Mounting Height (with lever)



Socket Bridge



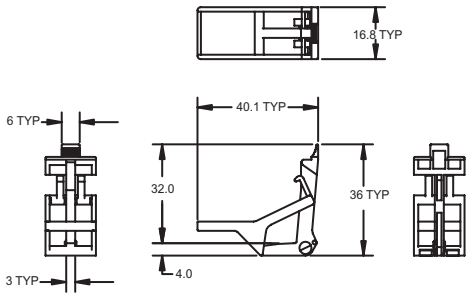
Note: 1. The relationship between the model, the length L, and the color of the insulating coating is shown in the following table.

Model	Length (L) mm	Color of insulating coating
P2RM-SR	14.3	Red
P2RM-SB		Blue

2. The insulating coating must be able to withstand a voltage of 3,000 V for 1 minute. Use either PE or PA as the material of the insulating coating.
3. The positions of the ends of the insulating coating must not vary more than 0.5 mm.
4. The characteristics of the socket bridge are shown in the following table.

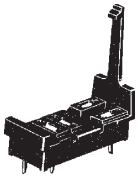
Item	Characteristic
Rated ON current	10 A
Rated insulation voltage	250 VAC
Temperature rise	35 C max.
Dielectric strength	3,000 VAC for 1 minute
Ambient operating temperature	-55 to 70 C

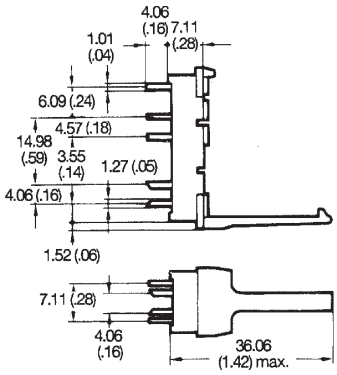
Clip and Release Lever

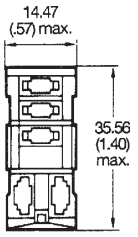


Back connecting socket

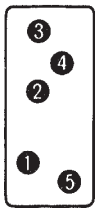
P2R-05P (1-pole) (UL E87929/CSA LR31928)



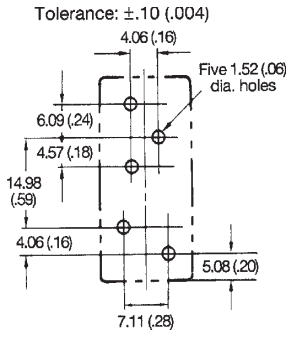




Terminal arrangement

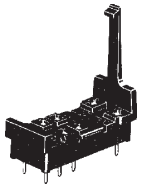


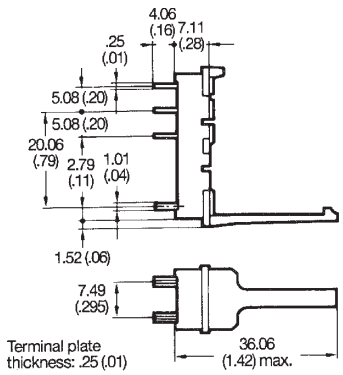
Mounting holes

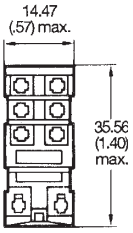


Note: 1. ▨ and [ ] indicate mounting orientation marks.
2. A tolerance of 0.10 (0.004) applies to the above dimensions.

Back connecting socket
P2R-08P (2-pole) (UL E87929/CSA LR31928)



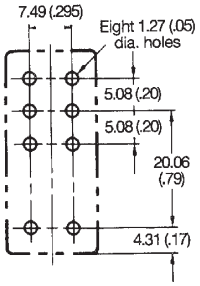




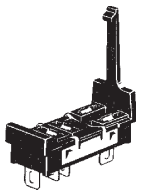
Terminal arrangement

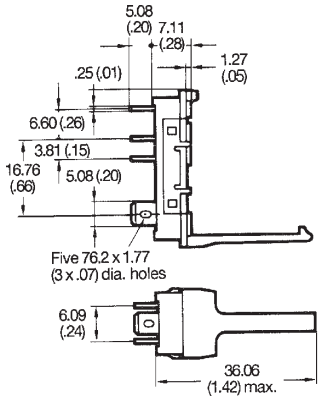


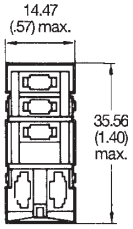
Mounting holes



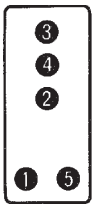
Back connecting socket
P2R-05A (1-pole) (UL E87929/CSA LR31928)



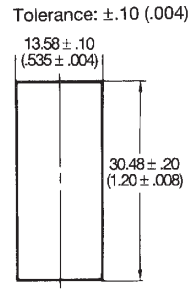




Terminal arrangement

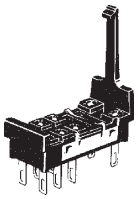


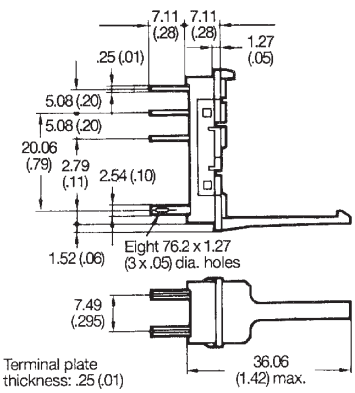
Mounting holes
(Bottom view)

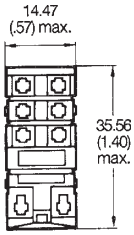


Recommended thickness of the panel is 1.52 (.06) to 2.03 (.08)

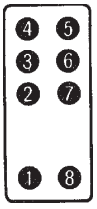
Back connecting socket
P2R-08A (2-pole) (UL E87929/CSA LR31928)



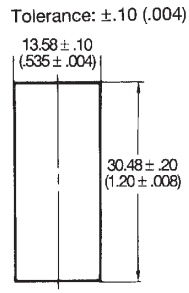




Terminal arrangement



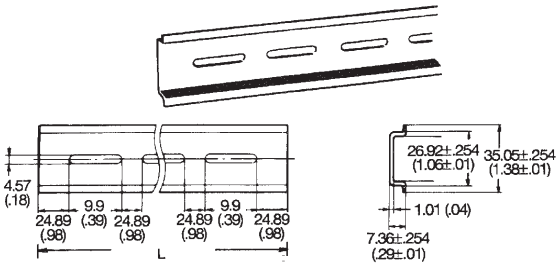
Mounting holes
(Bottom view)



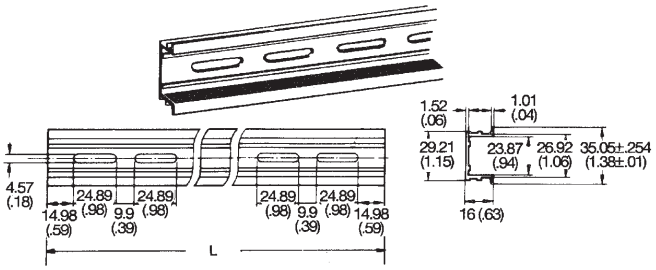
Recommended thickness of the panel is 1.52 (.06) to 2.03 (.08)

Note: 1. ▨ and [ ] indicate mounting orientation marks.
2. A tolerance of 0.10 (0.004) applies to the above dimensions.

Mounting track
PFP-100N, PFP-50N

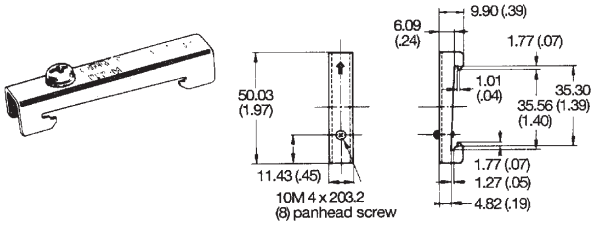


Mounting track
PFP-100N2

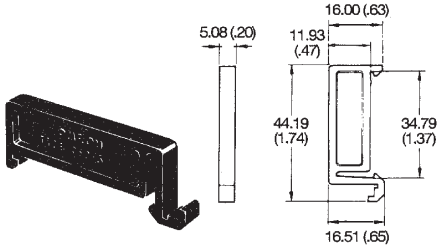


Note: 1. It is recommended that a panel thickness of 0.06 to 0.08 mm (0.002 to 0.003 in) be used.
2. L = Length
PFP-100N ..... L = 990.60 mm (39.00 in)
PFP-50N ..... L = 497.84 mm (19.60 in)
PFP-100N2 ..... L = 990.60 mm (39.00 in)

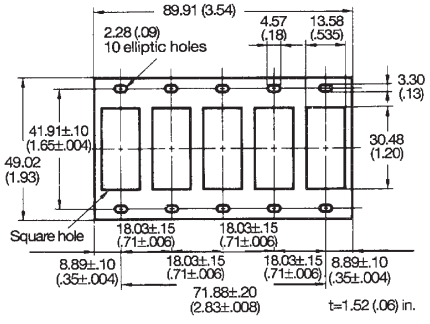
End plate
PFP-M



Spacer
PFP-S



Connecting socket mounting plate
P2R-P



Approvals

UL (File No. E41643)/ CSA (File No. 31928)

Type	Contact form	Coil rating	Contact ratings
G2R-1 G2R-14 G2R-1-H G2R-14-H G2R-1-S G2R-1-T	SPDT	3 to 110 VDC 3 to 240 VDC	10 A, 30 VDC (Resistive) 10 A, 250 VAC (General purpose) 10 A, 277 VAC (General purpose) TV-3, 120 VAC (NO contact) 360 WT, 120 VAC (Tungsten) 1/3 HP, 125 VAC (NO contact) 1/2 HP, 250 VAC (NO contact) 1/2 HP, 277 VAC (NO contact) TV-8, 120 VAC (NO contact, ASI contacts) B300 (Pilot duty)
G2R-1A G2R-1A4 G2R-1A-H G2R-1A4-H G2R-1A-T	SPST-NO		
G2R-1-E	SPDT	3 to 110 VDC 3 to 240 VAC	20 A, 277 VAC (General purpose) 16 A, 30 VDC (Resistive) 16 A, 250 VAC (General purpose) 360 WT, 120 VAC (Tungsten) TV-3, 120 VAC (NO contact) 1/2 HP, 240 VAC 1 HP, 240 VAC TV-8, 120 VAC (No contact, ASI contacts)
G2R-1A-E	SPST-NO		
G2R-2 G2R-24 G2R-2-H G2R-24-H G2R-2-S G2R-2-A G2R-2A4 G2R-2A-H G2R-2A4-H	DPDT	3 to 110 VDC 3 to 240 VAC	10 A, 30 VDC (Resistive) 10 A, 277 VAC (General purpose) 5 A, 250 VAC (General purpose) TV-3, 120 VAC (NO contact) 1/6 HP, 120 VAC 1/3 HP, 240 VAC 1/3 HP, 265 VAC 250 VA, 120 VAC (Pilot duty) B300 (Pilot duty)
G2RK-1	SPDT	3 to 24 VDC	10 A, 30 VDC (Resistive) 10 A, 250 VAC (General purpose) TV-3 (NO contact) 1/6 HP, 120 VAC 1/2 HP, 120 VAC A300 (Pilot duty)
G2RK-1A	SPST-NO		
G2RK-2	DPDT	3 to 24 VDC	5 A, 30 VDC (Resistive) 5 A, 250 VAC (General purpose) TV-3 (NO contact) 1/6 HP, 120 VAC 1/3 HP, 240 VAC
G2RK-2A	DPST-NO		

Note: 1. The rated values approved by each of the safety standards (e.g., UL and CSA) may be different from the performance characteristics individually defined in this catalog.

2. In the interest of product improvement, specifications are subject to change.

Omron G2R Relay

■ Reduces wiring work by 60% when combined with the P2RF- @-PU Push-In Plus Socket (according to actual OMRON measurements).
■ Lockable test button models available.
■ Built-in mechanical operation indicator.
■ Provided with nameplate.
■ AC type is equipped with a coil-disconnection self-diagnostic function (LED type).
■ High switching power (1-pole: 10 A)



Specifications

Coil Ratings

Rated voltage		Rated current*		Coil resistance	Coil inductance (H) (ref. value)		Must operate voltage	Must release voltage	Max. voltage	Power consumption (approx.)
		50 Hz	60 Hz		Armature OFF	Armature ON	% of rated voltage			
AC	24 V	43.5 mA	37.4 mA	253 Ω	0.81	1.55	80% max.	30% max.	110%	0.9 VA at 60 Hz
	110 V	9.5 mA	8.2 mA	5,566 Ω	13.33	26.83				
	120 V	8.6 mA	7.5 mA	7,286 Ω	16.13	32.46				
	230 V	4.4 mA	3.8 mA	27,172 Ω	72.68	143.90				
	240 V	3.7 mA	3.2 mA	30,360 Ω	90.58	182.34				

Rated voltage		Rated current*	Coil resistance	Coil inductance (H) (ref. value)		Must operate voltage	Must release voltage	Max. voltage	Power consumption (approx.)
				Armature OFF	Armature ON	% of rated voltage			
DC	6 V	87.0 mA	69 Ω	0.25	0.48	70% max.	15% min.	110%	0.53 W
	12 V	43.2 mA	278 Ω	0.98	2.35				
	24 V	21.6 mA	1,113 Ω	3.60	8.25				
	48 V	11.4 mA	4,220 Ω	15.2	29.82				

Note:
1. The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of +15%/-20% for the AC rated current and ±10% for the DC coil resistance.
2. The AC coil resistance and inductance values are reference values only (at 60 Hz).
3. Operating characteristics were measured at a coil temperature of 23°C.
4. The maximum voltage is the maximum possible value of the voltage that can be applied to the relay coil.

Coil Ratings

Number of poles	1 pole		2 poles	
Load	Resistive load (cosϕ = 1)	Inductive load (cosϕ = 0.4; L/R = 7 ms)	Resistive load (cosϕ = 1)	Inductive load (cosϕ = 0.4; L/R = 7 ms)
Rated load	10 A at 250 VAC; 10 A at 30 VDC	7.5 A at 250 VAC; 5 A at 30 VDC	5 A at 250 VAC; 5 A at 30 VDC	2 A at 250 VAC; 3 A at 30 VDC
Rated carry current	10 A		5 A	
Max. switching voltage	440 VAC, 125 VDC		380 VAC, 125 VDC	
Max. switching current	10 A		5 A	
Max. switching power	2,500 VA, 300 W	1,875 VA, 150 W	1,250 VA, 150 W	500 VA, 90 W
Failure rate (reference value) *	100 mA at 5 VDC		10 mA at 5 VDC	

Omron G2R Relay

Note:

P level: λ60 = 0.1 x 10-6/operation

* This value was measured at a switching frequency of 120 operations per minute.

Characteristics

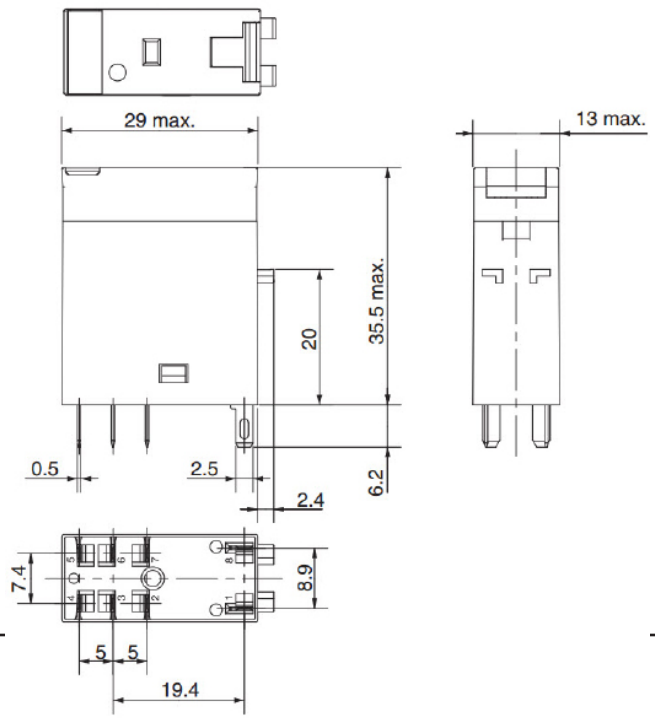
Item	1 pole	2 poles
Contact configration	SPDT	
Contact structure	Single	
Contact resistance	100 mΩ max.	
Operate (set) time	15 ms max.	
Release (reset) time	AC: 10 ms max.; DC: 5 ms max. (w/built-in diode: 20 ms max.)	AC: 15 ms max.; DC: 10 ms max. (w/built-in diode: 20 ms max.)
Max. operating frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr (under rated load)	
Insulation resistance	1,000 MΩ min. (at 500 VDC)	
Dielectric strength *	5,000 VAC, 50/60 Hz for 1 min between coil and contacts; 1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity	5,000 VAC, 50/60 Hz for 1 min between coil and contacts; 3,000 VAC, 50/60 Hz for 1 min between contacts of different polarity 1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75 mm single amplitude (1.5 mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75 mm single amplitude (1.5 mm double amplitude)	
Shock resistance	Destruction: 1,000 m/s² Malfunction: 200 m/s² when energized; 100 m/s² when not energized	
Endurance	Mechanical: AC coil: 10,000,000 operations min.; DC coil: 20,000,000 operations min. (at 18,000 operations/hr) Electrical: 100,000 operations min. (at 1,800 operations/hr under rated load)	
Ambient temperature	Operating: –40°C to 70°C (with no icing or condensation)	
Ambient humidity	Operating: 5% to 85%	
Weight	Approx. 20 g	

Note:

Values in the above table are the initial values.

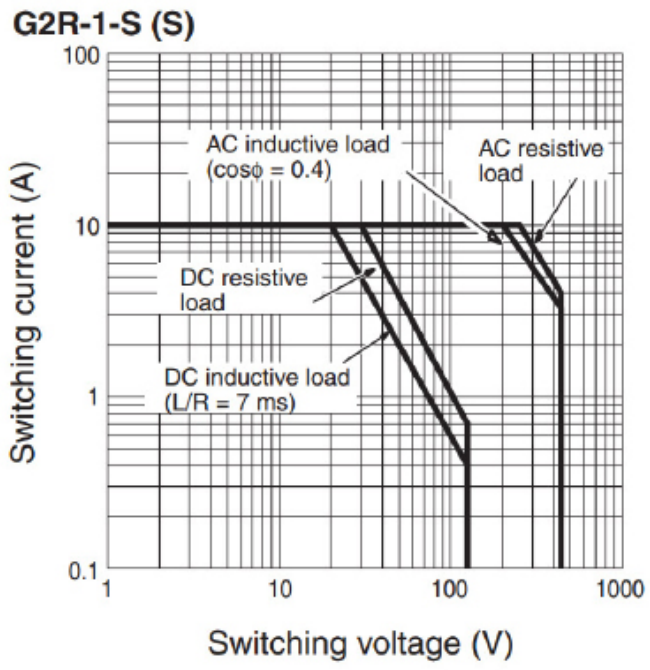
* These values are relay only. Prease refer to the “Products Related to Common Sockets and DIN Tracks Data Sheet” for connecting sockets.

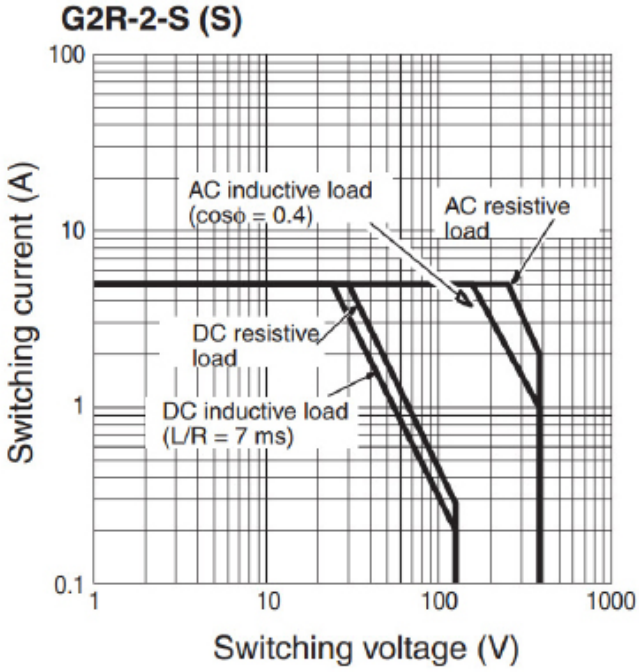
Dimension



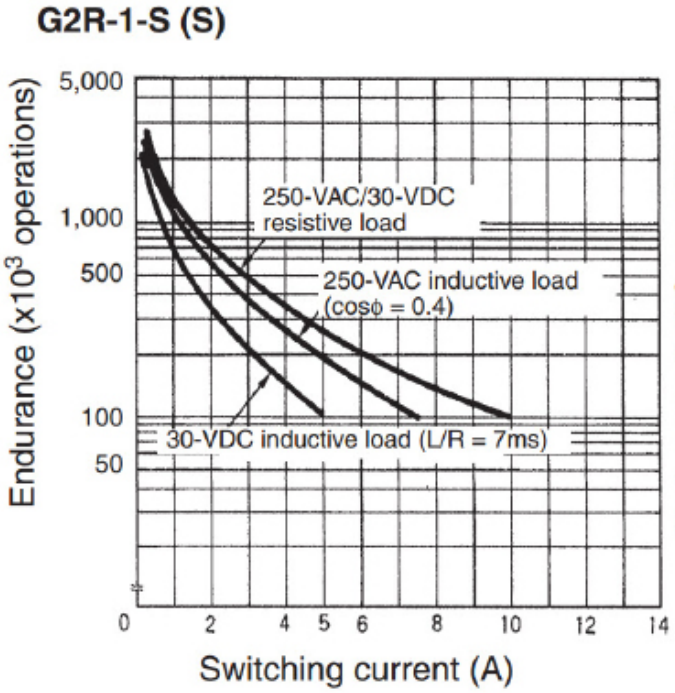
Engineering Data

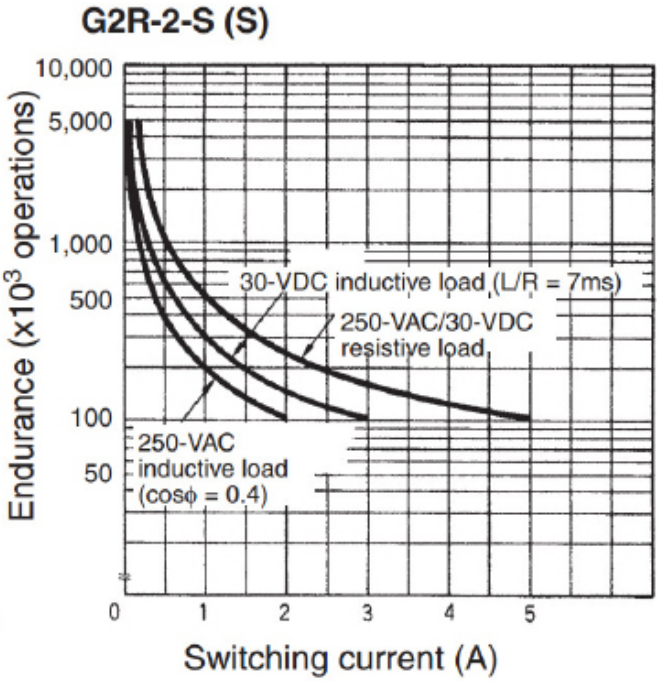
Maximum Switching Power



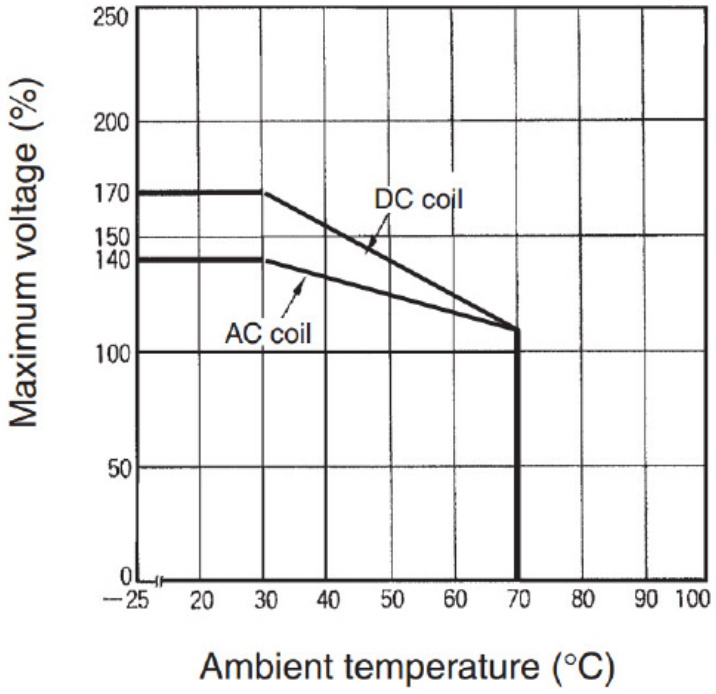


Endurance



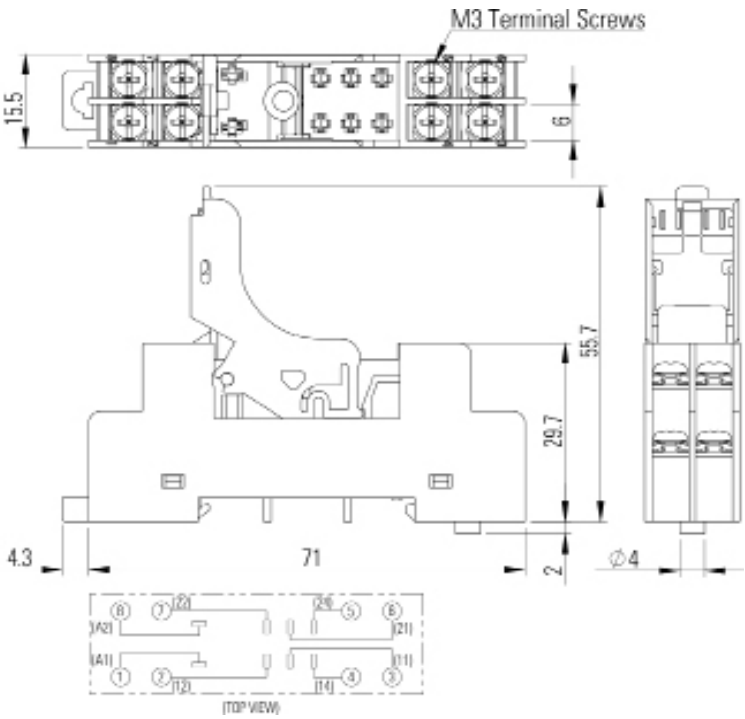


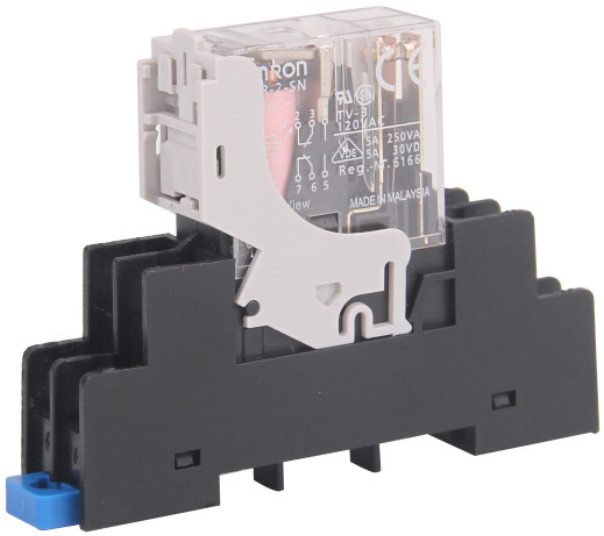
Ambient Temperature vs Maximum Coil Voltage



Track/Surface Mounting Sockets

Unit:mm





Mounting with relay

Medhanical Relay With LED and Base

Descriptions

The MR Mechanical Relay is a general purpose relay suitable for both low voltage and power switching. It features a low power coil, the12VDC version requires only 100ma to energize. The DPDT relay is rated at 10A,120VAC. Each relay has an LED showing the low voltage status.



Features:

- 10ˆ8 Mechanical operations (DC type)
- Switch low and high level loads from 100 microAmps to 7Amps
- UL (file No.: E169380) recognized
- Pluggable base is panel mount or din rail
- The low voltage side has a handy status LED

Specifications

CONTACT

Initial Current Resistance,
(By Voltage Drop 60VDC 1A) . . . . . .
30mOhm
Contact Material. . . . . .Gol-flash silver ally
Switching Capacity . . . . . .
7A/250VAC
Max Switching Power . . . . . .
1,750VA
Max Switching Voltage 120VAC
Max Switching Current. . . . . .
7A



COIL DATA

Coil Voltage 12VDC-
120VAC¬220VAC
Coil Resistance . . . . . 160ohm(+/-
10%)
Nominal Operating Power . . . . . approx 90 ma



CHARACTERISTICS

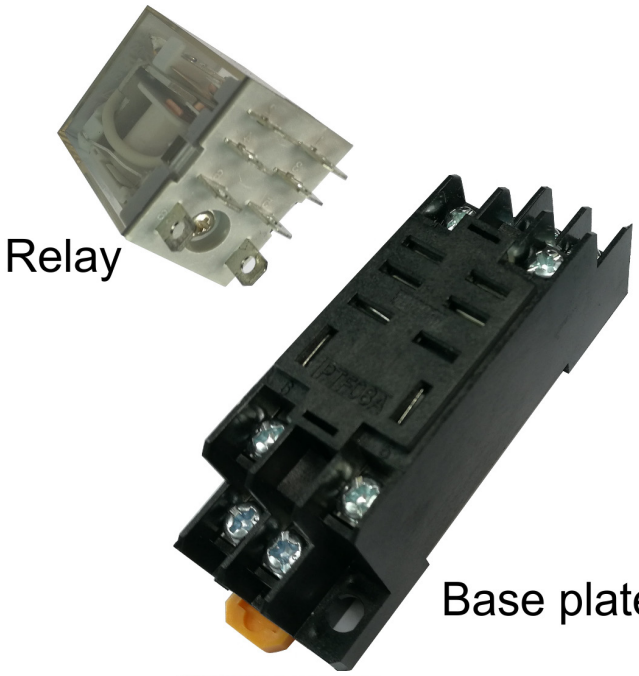
Max Operating Speed 20cpm

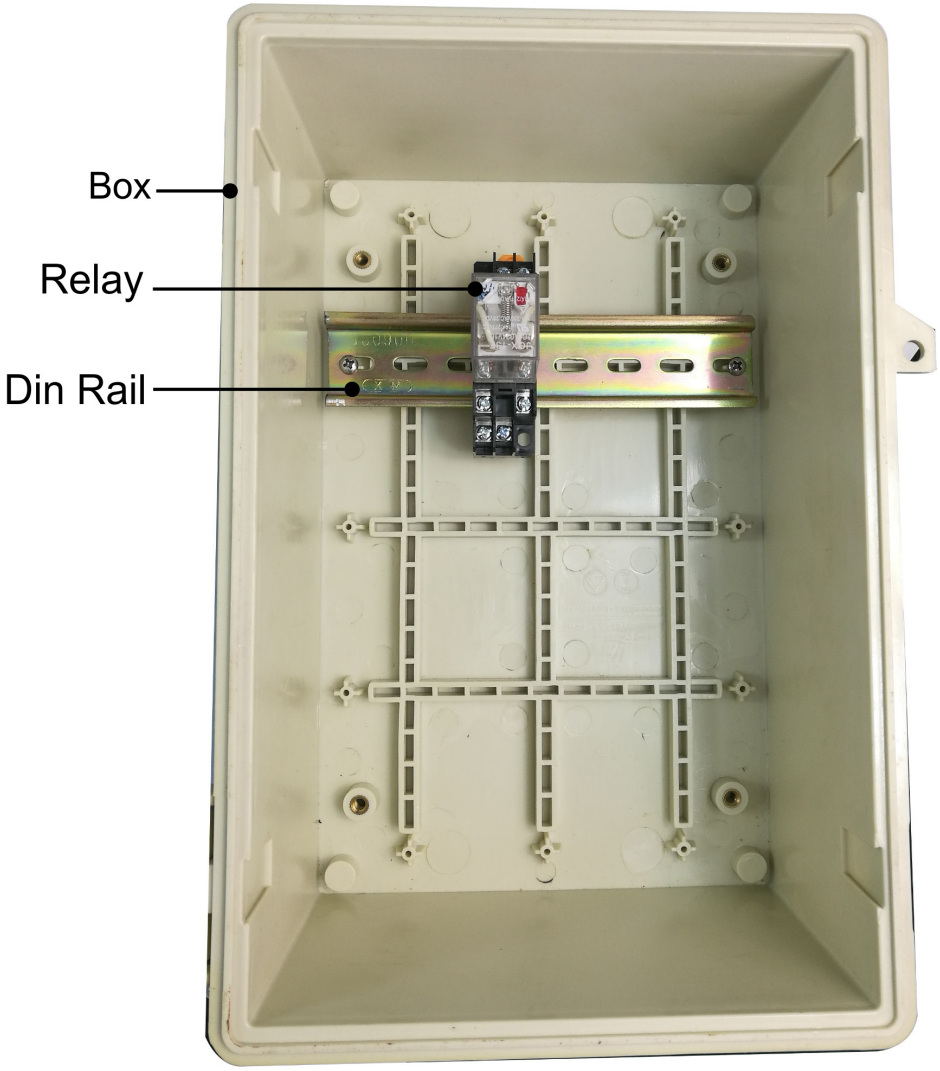
Specify

MR-DC12V MECHANICAL RELAY with base,12VDC coil
MR-AC24V MECHANICAL RELAY with base, 24VAC coil
MR-AC120V MECHANICAL RELAY with base, 120VAC coil

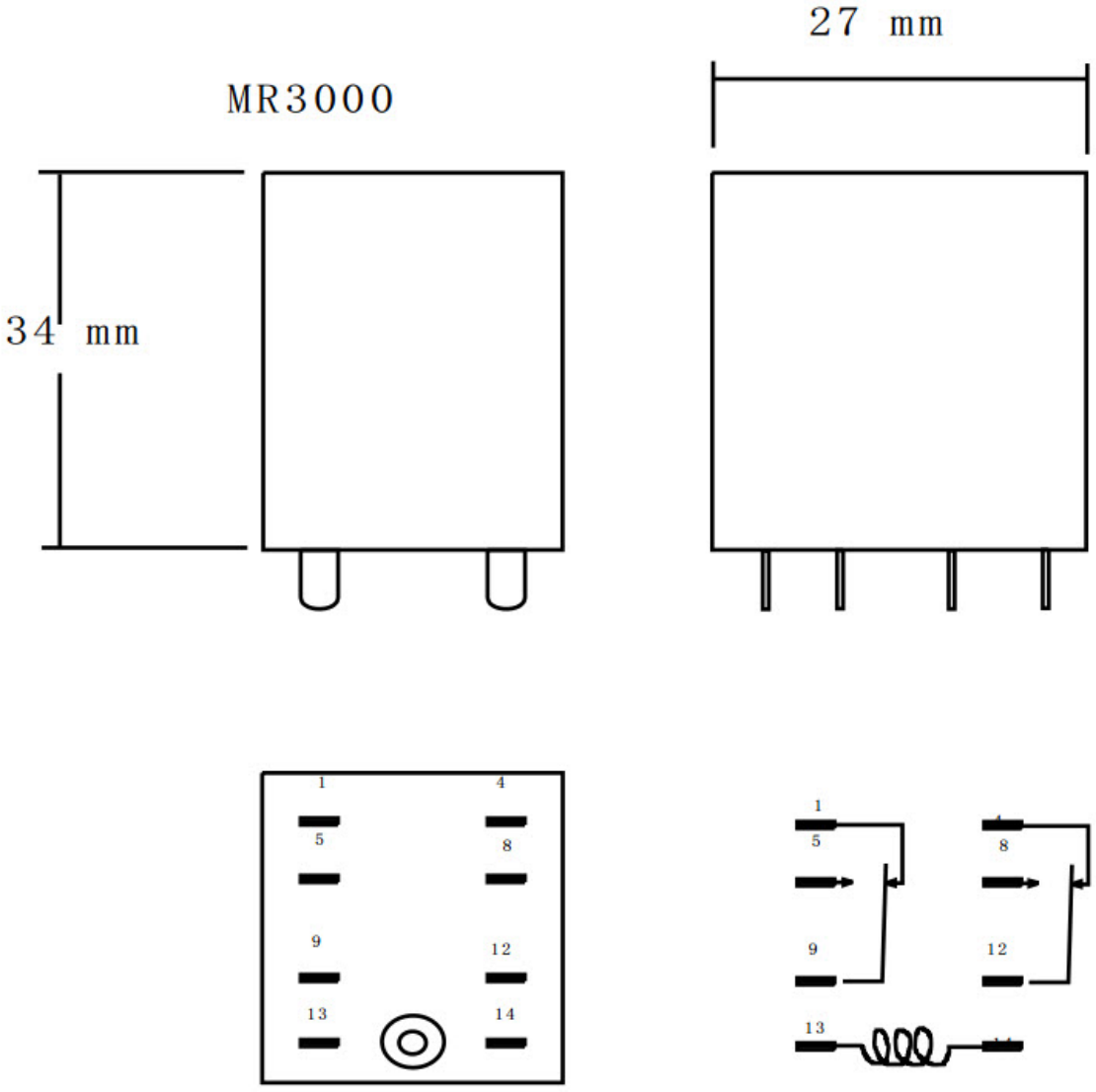
Medhanical Relay With LED and Base

Installation





Wiring diagram



HID Lighting Control Relay

Description

This latching, HID lighting control relay is equipped with permanent magnetic latching technology. It is rated for a 25A circuit at 300VAC.



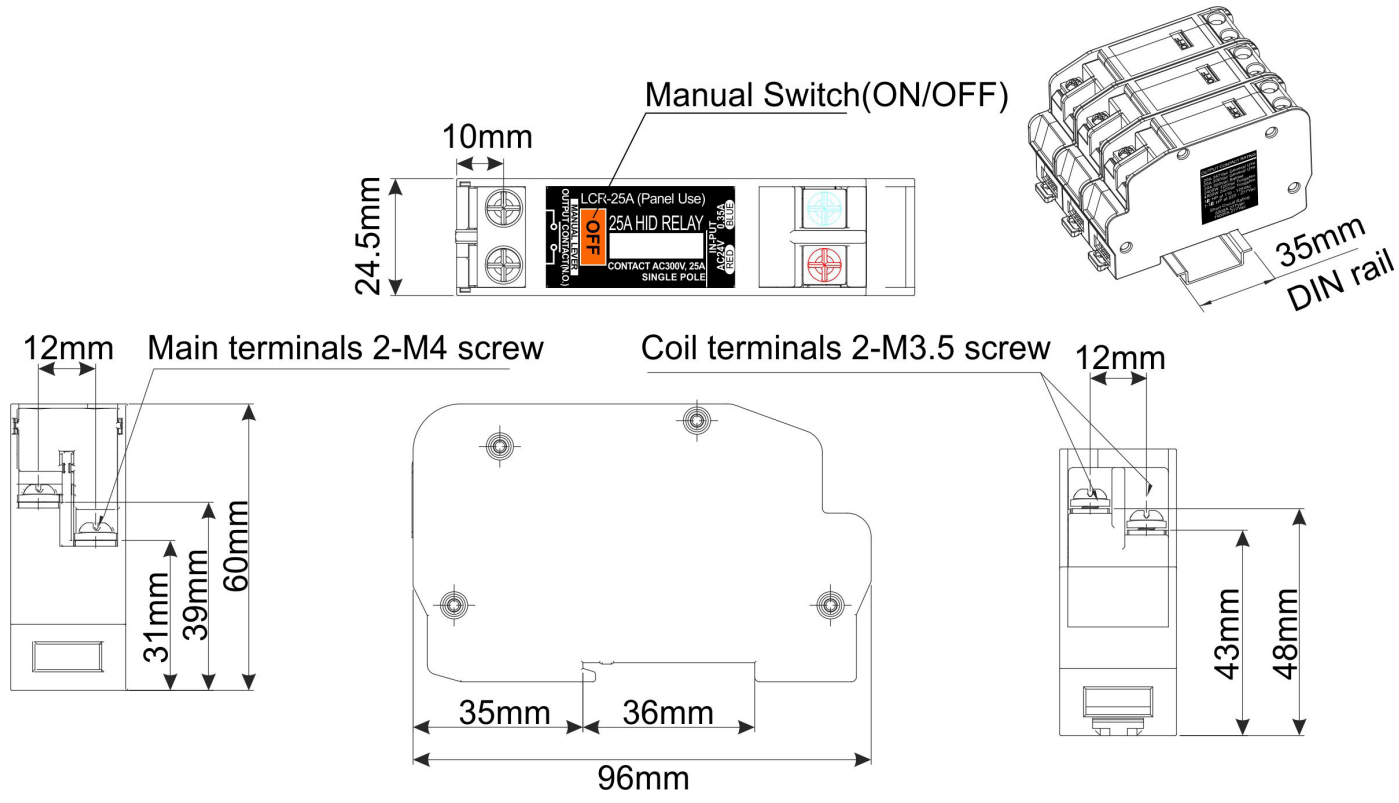
Highlights:

- Permanent Magnetic-Latching Technology
- Extended-Life Contact Design
- Threaded Contact for Easy Wiring
- 24V AC Operating Voltage
- Short circuit rating: 5000A 277VAC, 14000A 277VAC
- Support manual switch: on/off

Application:

Electrical heating, compressor controls, Latching controls

Dimensions



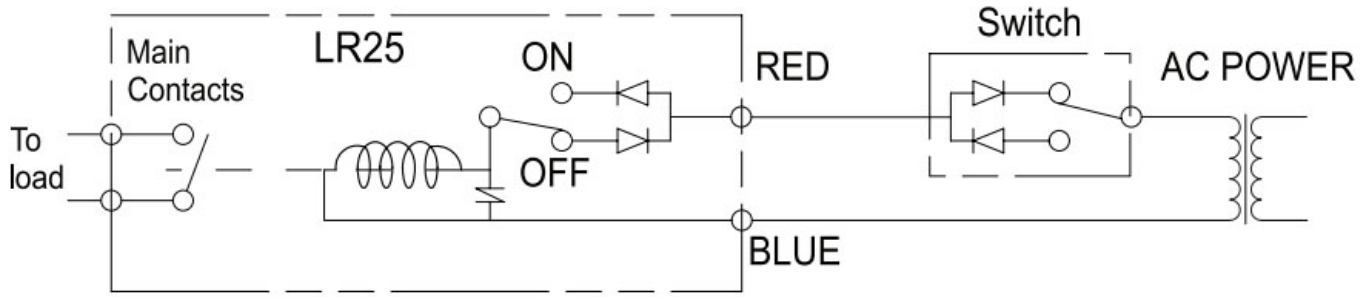
HID Lighting Control Relay

Specification

Spec.	Nominal voltage VAC	Sset voltage VAC(Min.)	Reset voltage VAC(Min.)	Nominal operating current (A)	Nominal operating power (VA)	Maximum allowable voltage
Coil ratings	24	18	18	0.35	8.4	30.0
Contact ratings	Maximum switch current			25(A)		
	Maximum switch voltage			AC 300(V)		
	Max. Switching capacity			7.5KVA		
	Resistive load (Cosø=1)			25(A) 300V AC		
	Inductive load			25(A) 300V AC		
	Incandescent lamp load			25(A) 220V AC		
	Fluorescent lamp load			25(A) 270V AC		
	Motor load			1/2HP 110 ~ 125V AC		
				1-1/2HP 220 ~ 277V AC		
	Short Circuit Rating			5000A 277V AC		
				14000A 277V AC		
	Insulation resistance			Min. 100Ω(DC 500V Meggre)		
	Dielectric strength			AC 2000V (50/60Hz) for 1 minute (AC 1800V between same pole contacts)		
	Mechanical life			Min. 200,000 operations		
	Electical life			Min. 50,000 operations		
	Operatating ambient temperature			-55C ~ +60C (in case, it should not be forzen)		
	Humidity			35% ~ 85% RH		

Note: 1. Nominal operating current and coil resistance are measured at + 20C
2. Operating Coil (AC 6, 12, 24, 48, 100/100, 200/200V, 50/60Hz

Circuit Diagram



HID Lighting Control Relay







HVAC Contactors

Descriptions

Definite Purpose contactors are electrically operated
switching devices specifically designed for the heating,
ventilation, air conditioning, heat pump and refrigeration
(HVAC) industry.



Features:
Current Range: FLA20A - FLA90A
Poles Range: 1pole, 2poles, 3poles, 4poles
Contactor: UL File Number: E246810

Part Number Scheme

DPC - 30 - F - P3 - 24

Code	Description
DPC	Definite Purpose Contactor

Code	Contact Rating
20	20FLA
25	25FLA
30	30FLA
40	40FLA
50	50FLA
60	60FLA
75	75FLA
95	95FLA
120	120FLA
150	150FLA

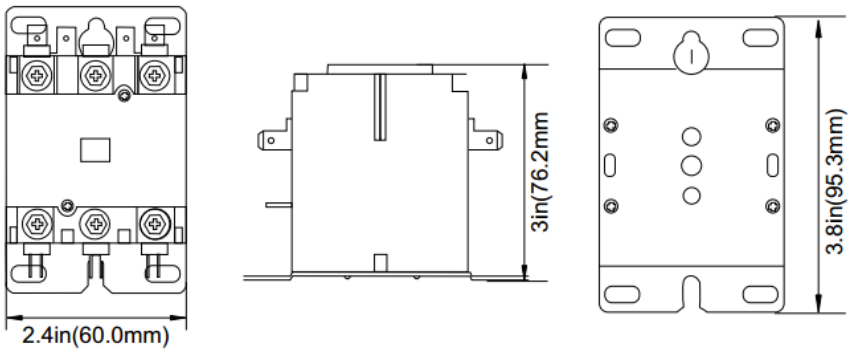
Code	Coil Voltage
24	24V
120	120V
240	208-240V
277	277V
480	480V
600	600V

Code	Poles
P1	1 Pole
P2	2 Poles
P3	3 Poles
P4	4 Poles

Code	Option
F	Form NO

Dimensions

3 Pole dimensions



HVAC Contactors

Specifications

Common specifications	
Initial dilelectric strength	Between Contacts & Coils: 2,200VAC Between Poles: 2,200VAC (1-, 2- pole includes shunt) Between Open Contacts: 2,200VAC (1-, 2- pole no shunt)
Insulation system	130C Class B
Temperature range	-40C to +65C(-40F to +150F)



	1-, 2- Poles 20-40FLA	3-, 4- Poles 20-40FLA	3- Poles 50-90FLA
ARC cover	Optional on 20 - 30 FLA Standard on 40 FLA	Standard on 40 FLA	Standard
Unit weight	1 Pole 0.5 lb 2 Pole 0.6 lb	3 Pole 1 lb 4 Pole 1.25 lb	50-60FLA 2 lb 75-90FLA 4 lb
Power pole terminations	#10-32 screw or box lug	#10-32 screw or box lug	Aluminum box lug
Wire size	#10-32 screw 16-8* Box lug 14-4 *must use ring terminal	#10-32 screw 16-8* Box lug 14-4 *must use ring terminal	50-60FLA Box Lug 14-2 75-90FLA Box Lug 14-1
Recommended tightening torque	#10-32 screw 22 in. Lbs Box lug 40 in. lbs	#10-32 screw 22 in. Lbs Box lug 40 in. lbs	Box lug 50 in. lbs
Quick connects	Coil terminals Dual: 0.250" QC Power terminals 1 Pole: Quad 0.250" QC 2 Pole: Dual or Quad 0.250" QC	Coil terminals Dual: 0.250" QC or # 6-32 screw/0.250" QC Power terminals Quad 0.250" QC	Coil terminals Dual: 0.250" QC or # 6-32 screw/0.250" QC Power terminals Quad 0.250" QC

HVAC Contactors

1-,2-Poles 20-40FLA

Contact Data

Arrangements: 1 Form X (SPST-NO) with or without shunt ; 2 Form X (DPST-NO).
Material: (1)AgCdO ; (2) AgSnO2In2O3
Contact Ratings:

Full Load Amps (FLA)	Poles	Line Voltage	Locked Rotor Amperes (LRA)	Resistive Amps	Max.HP	
					Voltage	1 Phase
20	2	240/277 480 600	120 100 80	30 30 30	120 240	2 3
25	1	240/277 480 600	150 50 40	30 30 30	120 240	1 2
25	2	240/277 480 600	150 125 100	35 35 35	120 240	2 3
30	1	240/277 480 600	150 75 50	40 40 40	120 240	1 2
30	2	240/277 480 600	150 125 100	40 40 40	120 240	2 3
40	1	240/277 480 600	240 200 160	50 50 50	120 240	2 3
40	2	240/277 480 600	240 200 160	50 50 50	120 240	2 3

Coil Data

Voltage: 24 - 480 VAC, 50/60 Hz. See Coil Data Table below(480V un-listed)
Insulation Class: UL Class B (130 C)
Coil Data:

	1 Pole Contactors				2 Pole Contactors			
Nominal Coil Voltage	24	120	208/240	277	24	120	208/240	277
Nominal Coil Resistance Ohms	18	420	1800	2500	18	420	1800	2500
Maximum Pick Up Voltage	18	88	177	221	18	88	177	221
Minimum Drop Out Voltage	6-15	20-70	40-140	50-165	6-15	20-70	40-140	50-165
Minimum Inrush VA@50Hz	31	31	31	31	31	31	31	31
Minimum Inrush VA@60Hz	28	28	28	28	28	28	28	28
Nominal Sealed VA @ 50 Hz	6	6	6	6	6	6	6	6
Nominal Sealed VA @ 60 Hz	5	5	5	5	5	5	5	5
Nominal Coil Voltage	30	132	264	300	30	132	264	300

3-,4-Poles 20-40FLA

Contact Data

Arrangement: 3 Form X (3PST-NO); 4 Form X (4PST-NO).
Material: 1) AgCdO; 2) AgSnO2In2O3
Contact Ratings:

Full Load Amps (FLA)	Poles	Line Voltage	Locked Rotor Amperes (LRA)	Resistive Amps	Max.Horsepower		
					Voltage	1 Phase	3 Phase
20	3	240/277 480 600	120 100 80	30 30 30	110/120 200/240 480/600	1.5 3 –	– 7.5 7.5
25	3 4	240/277 480 600	150 125 100	35 35 35	110/120 200/208 240/277 480 600	2 – 5 – –	– 7.5 10 15 20
30	3 4	240/277 480 600	180 150 120	40 40 40	110/120 200/208 240/277 480 600	2 – 5 – –	– 10 10 15 20
40	3 4	240/277 480 600	240 200 160	50 50 50	110/120 200/208 240/277 480 600	3 – 7.5 – –	– 10 10 20 25

Coil Data

Voltage: 24 - 480 VAC, 50/60 Hz. See Coil Data Table below(480V un-listed)
Insulation Class: UL Class B (130 C)
Coil Data:

	3 Pole Contactors				4 Pole Contactors			
Nominal Coil Voltage	24	120	208/240	277	24	120	208/240	277
Nominal Coil Resistance Ohms	7	180	720	900	6	150	600	750
Maximum Pick Up Voltage	18	88	177	221	18	88	177	221
Minimum Drop Out Voltage	6-15	20-70	40-140	50-165	6-15	20-70	40-140	50-175
Minimum Inrush VA@50Hz	65	65	65	65	60	60	60	60
Minimum Inrush VA@60Hz	60	60	60	60	55	55	55	55
Nominal Sealed VA @ 50 Hz	7.5	7.5	7.5	7.5	9	9	9	9
Nominal Sealed VA @ 60 Hz	6	6	6	6	7	7	6	7
Nominal Coil Voltage	30	132	264	300	30	132	264	300

3-,4-Poles **20-40FLA**

Auxiliary Switches

Available auxiliary switches for 3- and 4-pole contactors (20-40FLA)

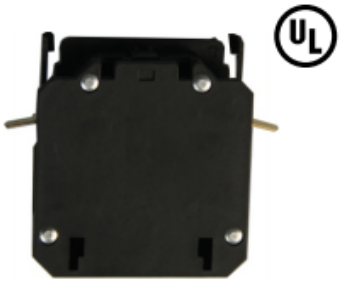
Description	Contact arrangement	Termination
Single unit interlock configuration. One on each side - max set up two switches	1NO/1NC break before make	250" quick connects
Single unit interlock configuration. One on each side - max set up two switches	1NO/1NC break before make	#6-32screw terminals
SPDT circuit One switch on each side	SPDT	250" quick connects
SPDT circuit One switch on each side	(2) SPDT	250" quick connects

Contact Rating

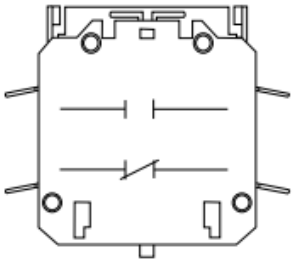
Single circuit 1 NO/1NC

Voltage rating	120VAC	240VAC	480VAC	600VAC
Amperes-Break	3.0	1.5	0.75	0.6
Amperes-Make	30	15	75	6
Amperes-Continuous	10	10	10	10

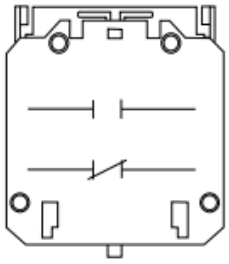
SPDT
10A, 1/3 HP, 125 or 250VAC
1/2A, 125VDC
1/4A, 250VDC



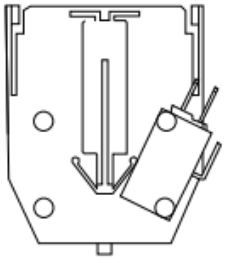
1 NO/1NC
quick connects



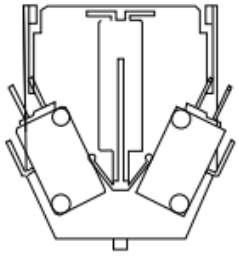
1 NO/1NC
screw terminals



One SPDT
switch per side



Two SPDT
switches per side



HVAC Contactors

3-Poles 50-90FLA

Contact Data

Arrangements: 3 Form X (SPST-NO)
Material: (1)AgCdO ; (2) AgSnO2In2O3
Contact Ratings:

Full Load Amps (FLA)	Poles	Line Voltage	Locked Rotor Amperes (LRA)	Resistive Amps	Max.Horsepower		
					Voltage	1 Phase	3 Phase
50	3	115 240 480 600	300 300 250 200	65 65 65 65	110/120 200/208 240/277 480 600	3 7.5 10 – –	– 15 15 30 30
60	3	115 240 480 600	360 360 300 240	75 75 75 75	110/120 200/208 240/277 480 600	5 7.5 10 – –	– 20 20 40 40
75	3	115 240 480 600	450 450 375 300	93 93 93 93	110/120 200/208 240/277 480 600	7.5 15 20 – –	– 20 25 40 40
90	3	115 240 480 600	540 540 450 360	120 120 120 120	110/120 200/208 240/277 480 600	5 7.5 10 – –	– 20 30 50 50

Coil Data

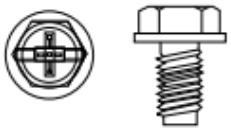
Voltage: 24 - 480 VAC, 50/60 Hz. See Coil Data Table below(480V un-listed)
Insulation Class: UL Class B (130 C)O
Coil Data:

	50-60FLA Contactors				75-90FLA Contactors			
Nominal Coil Voltage	24	120	208/240	277	24	120	208/240	277
Nominal Coil Resistance Ohms	7	180	720	900	0.65	16	64	85
Maximum Pick Up Voltage	18	88	177	235	18	88	177	221
Minimum Drop Out Voltage	6-15	20-70	40-140	50-165	6-15	20-70	40-110	65-180
Minimum Inrush VA@50Hz	140	140	140	140	285	285	285	285
Minimum Inrush VA@60Hz	132	132	132	132	240	240	240	240
Nominal Sealed VA @ 50 Hz	20	20	20	20	42	42	42	42
Nominal Sealed VA @ 60 Hz	14	14	14	14	27	27	27	27
Nominal Coil Voltage	30	132	264	300	30	132	264	300

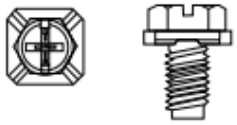
Definite Purpose Contactor

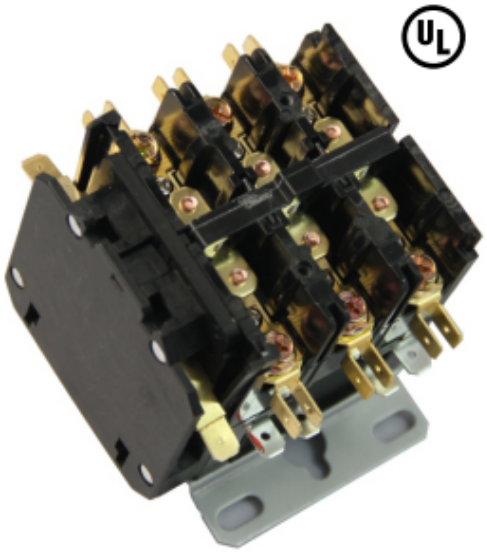
Terminations

Standard on 20-30FLA
#10-32 commination phillips, slotted and 5/16 hex head with #12 washer

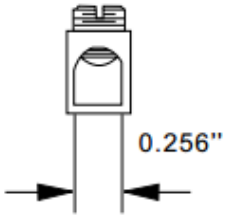


Optional on 20-40FLA
#10-32 sems screw with pressure plate

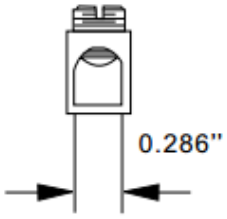




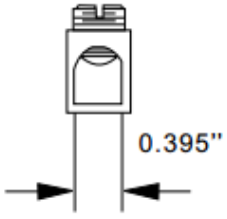
40FLA Box Lug
14-4 AWG Cu/Al



50-60FLA Box Lug
14-2 AWG Cu/Al



75-90FLA Box Lug
14-1 AWG Cu/Al



Relay Board and Transformer

Descriptions

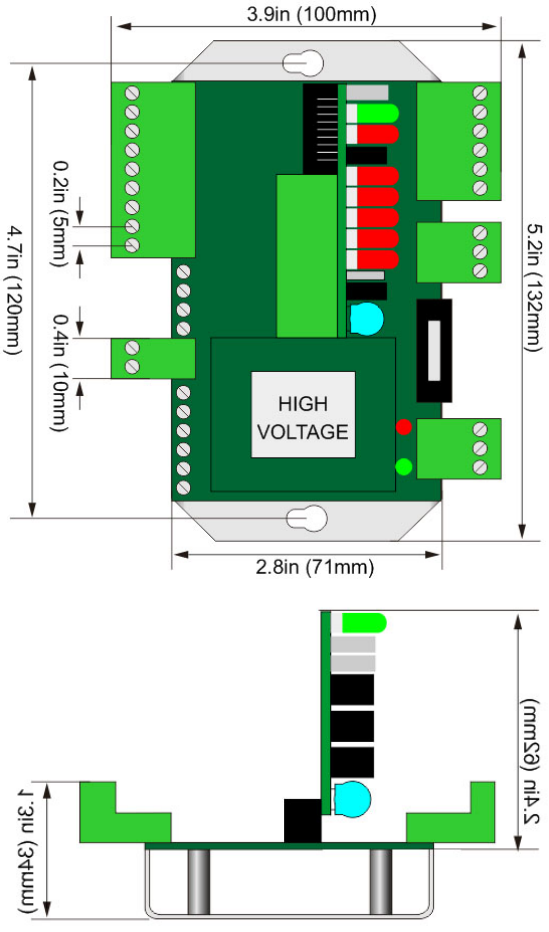
The Relay Board comes in two versions, one with transformer of 110V or 220V and one without. The board features an area to put your own label. The coils are very low power, requiring less than 30ma at 24VAC. The SPST relay is rated at 12A/125VAC, 6A/250VAC. Each relay has an status LED. The relay board is designed mainly for isolation between thermostat and a fan coil or air handler, 3 relays @ 12A/125VAC, 6A/250VAC, 2 @110V 1A. There is a 24V/18VA transformer on RB-F.



Features:
- Control Modes: 24VAC 30ma coil or dry contact.
- Panel mount base, removable face plate
- LED for each low voltage relay

Specifications

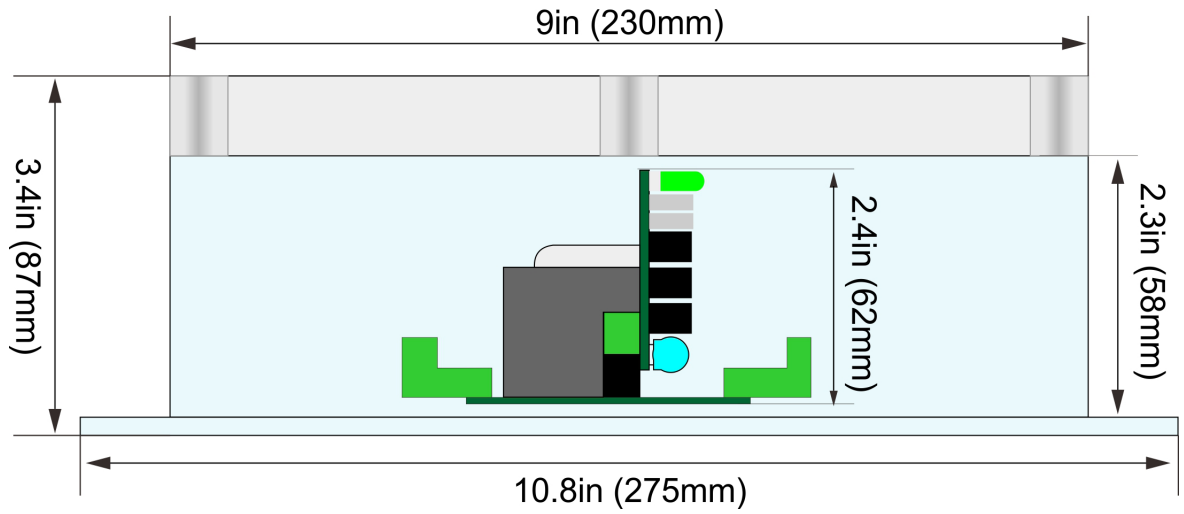
CONTACT	
Initial Contact Resistance (By Voltage Drop 60VDC 1A)	<100mOhm
Contact Material	Silver Cadmium Oxide
Switching Capacity	12A/125VAC, 6A/250VAC, 6A/28VDC
Relay UL File	UL E169380
Operate Time(at nominal voltage)	< 10 ms
Release Time(at nominal voltage)	< 5 ms
Max Switching Power	1500VA/168W
Max Switching Voltage	250VAC/28VDC
COIL DATA	
Coil Voltage	24VAC
Coil Resistance	400ohm(+/-10%)
Coil Power Consumption	0.36W
Nominal Operating Power	less than 30 ma
CHARACTERISTICS	
Operating Temp. Range	-55 to 85°C
Operating Relative Humidity	0 to 93%
RB dimensions	132 x 100 x 62mm
RB-F dimensions	132 x 100 x 62mm
RB-F-PB dimensions	132 x 100 x 62mm



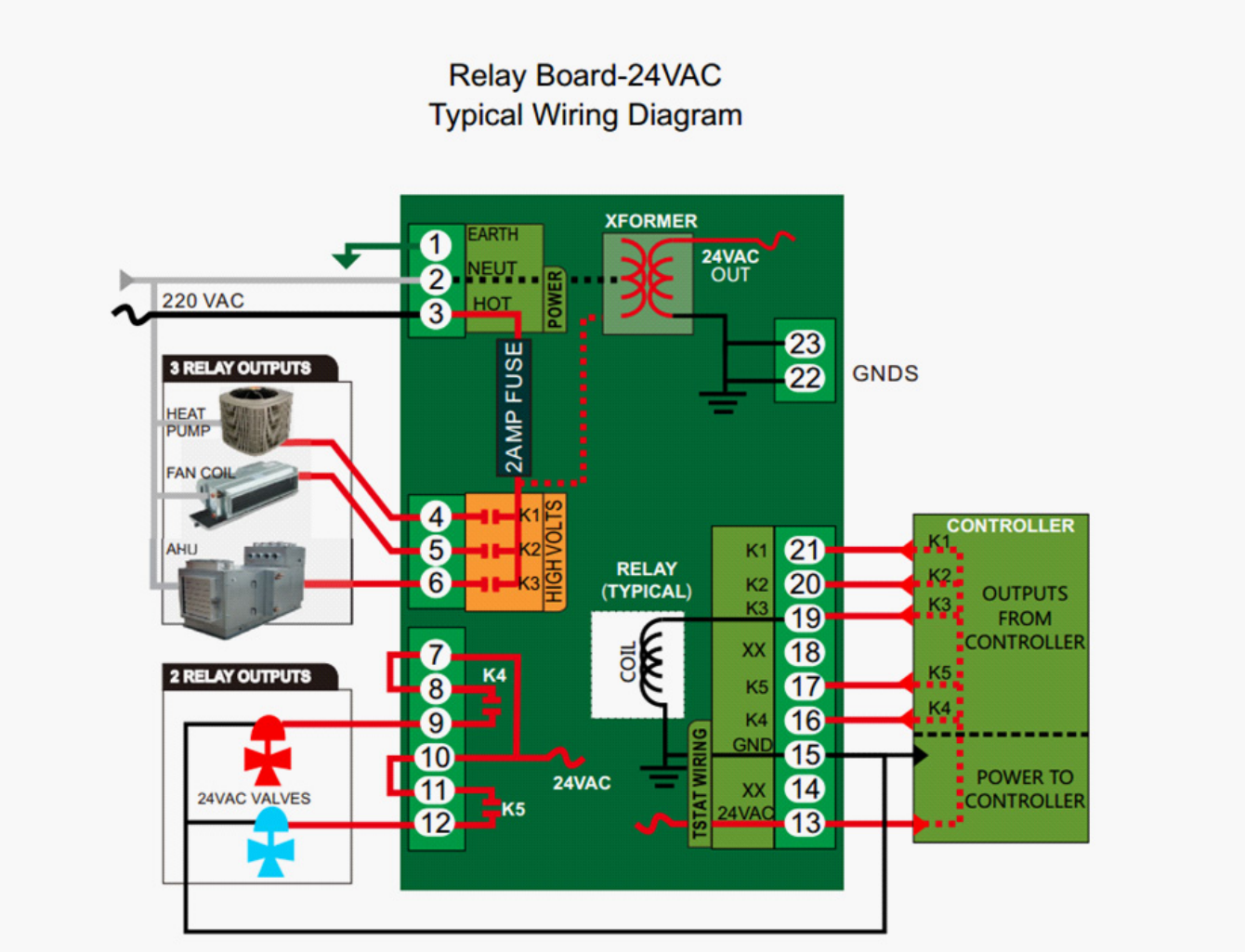
RB & RB-F

Relay Board and Transformer

RB-F-PB

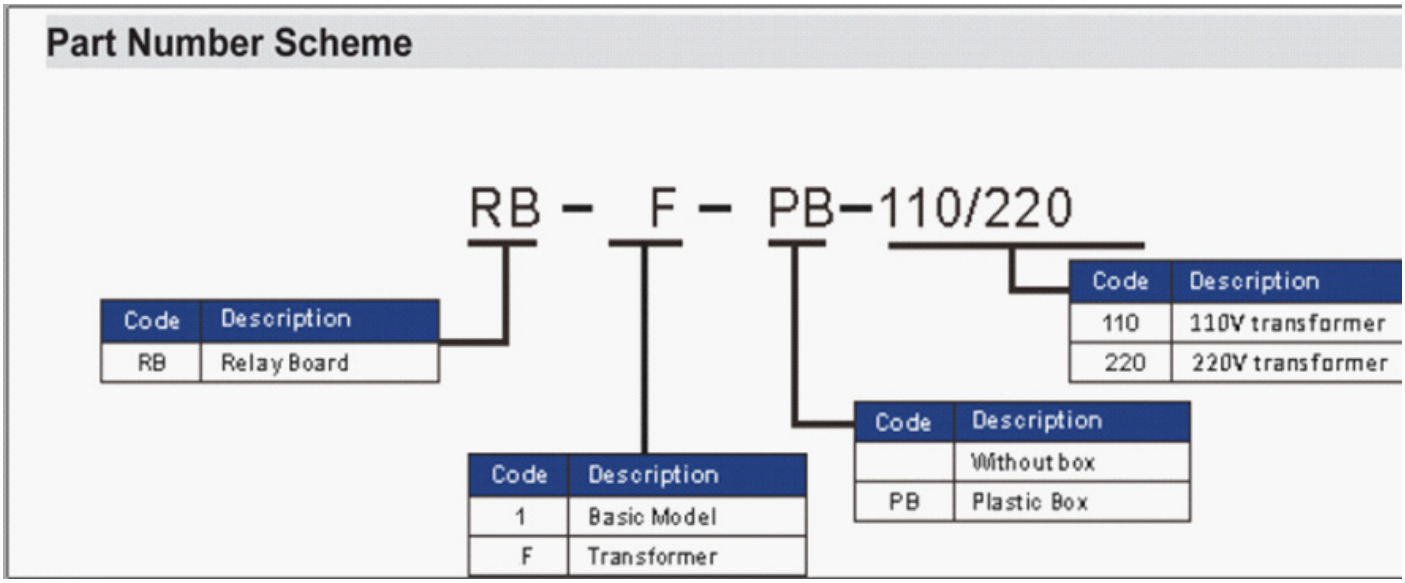


Wiring Diagram



Relay Board and Transformer

Part Number Scheme



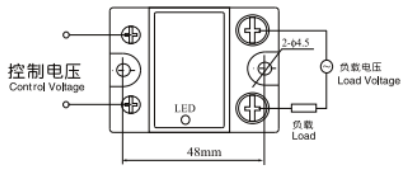
Solid State Relay



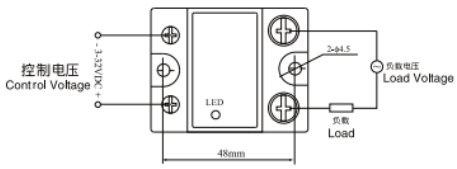



Classification	AC Solid State Series		DC Solid State Series		
Model	LRSSR-AA	LRSSR-DA	LRSSR-DD		
(V) Load Voltage	28~285 36~530	28~285 36~530 48~660	50, 100 300, 400	50, 600 700, 800, 900	
(A) Load Current	5, 10, 20, 30, 40, 50, 60, 80, 100		5, 10, 20, 30, 40, 50, 60, 80, 100	5, 10, 20, 30, 40,	5, 10, 20,
(Vac) Dielectric Strength	2500				
(MΩ) Insulation Resistance	100				
(Vdc) Control Voltage	90-265	3-32	3-32		
(mA)Control Current	≤10	3-35	5-20		
(V) On Voltage Drop	≤10	≤1.5	≤2.5		
(mA) Off Leakage Current	≤4	≤2	≤1		
(Hz)Frequency Range	47~63				
(ms)on-off Time	≤10		≤0.8		
Action State Indication	LED				
Ambient Temperature	-30℃+75℃				
Mounting Method	Bolt Fixation				
Same Reference	SSR, G3NA-420B, LSAP3810A, LSAP2210A		SSR, JGX-1572F, JGX-1554F, JGX-1598F, JG53FA, JGX-54FA		
Directions	Load Current Resistance Above DC 5A Must Be Set Radiator				

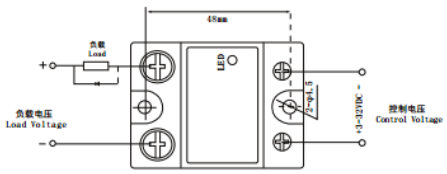
LRSSR-AA Connection diagram



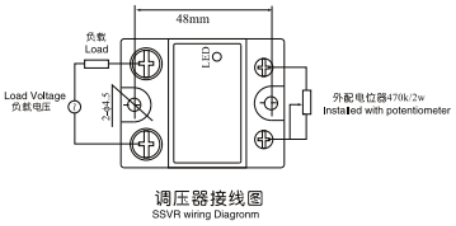
LRSSR-DA Connecting diagram



LRSSR-DD Connecting diagram

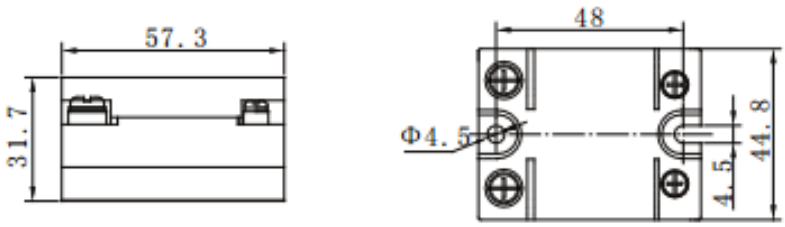


LRSSVR Connecting diagram

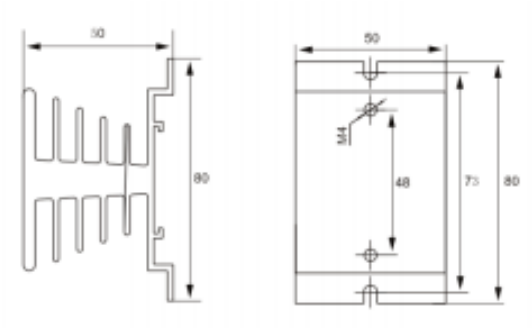


Remark:Thermal silicone grease should be spread between solidity and radiator for heat rejection.

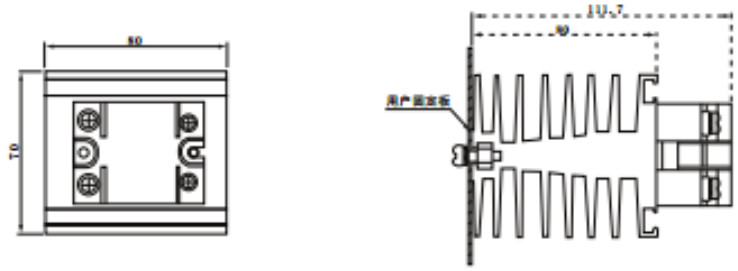
LRSSR Series dimension and
installation dimensions



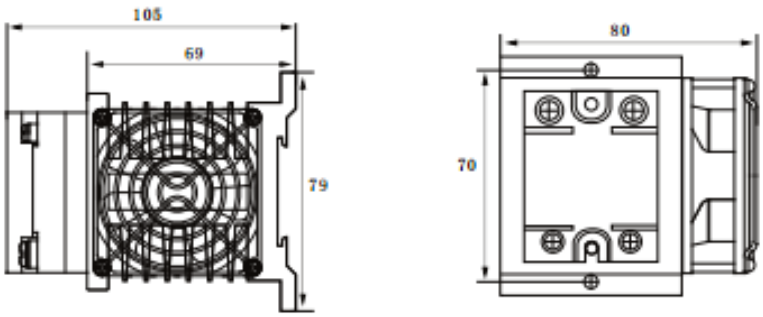
5A~25A Dimensions of the equippedradiator



25A~40A Dimensions of the equipped radiator



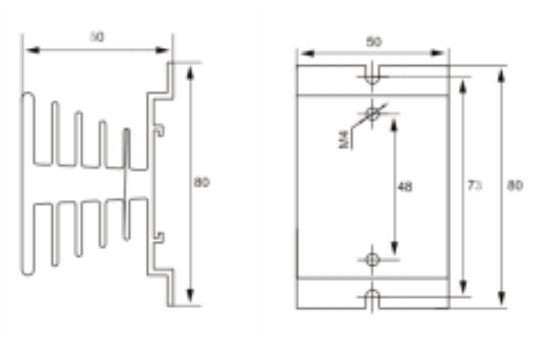
40A~100A Dimensions of the equipped radiator



Heat Sink For LRSSR

Dimensions 50 x 80 mm heat sink for 5A~25A relay

UNIT: mm



Solid State Relay

ONLINE CERTIFICATIONS DIRECTORY

NRNT2.E256962
Switches, Industrial Control - Component

Page Bottom

Switches, Industrial Control - Component

See General Information for Switches, Industrial Control - Component

ZHEJIANG LIERD RELAYS ENTERPRISE CO LTD E256962
NO 6 ZHENXING RD
XINGUANG AVE
LIUSHI TOWN
YUEQING, ZHEJIANG 325604 CHINA

Relays, Cat. No. L followed by HH52P, HH53P, HH54P, HH62P or JQX-13F, followed by 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B and 4C, followed by 3A, 5A and 10A, followed by 6VDC, 9VDC, 12VDC, 18VDC, 24VDC, 36VDC, 48VDC, 60VDC, 110VDC, 6VAC, 9VAC, 12VAC, 18VAC, 24VAC, 36VAC, 48VAC, 60VAC, 110VAC and 220VAC, followed by 0.9W(DC) and 1.2VA(AC), followed by none or L.

Solid state relay, for use in industrial control applications , Type LR SSR-DA.

Marking: Company name or "E256962" or trademarks LIRRD or LIRRD and catalog designation.

Last Updated on 2006-05-30

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Pluggable Power Relay

MY2N Relay

Highlights



- DPDT, LED Indicator, Plug-In/Solder Terminal, 24VDC, 5A
- UL & CSA Approvals, UL File No. 41515; CSA File No. LR31928
- Versatile and Function-filled Miniature Power Relay for Sequence Control and Power Switching Applications.
- Many variations possible through a selection of operation indi-cators (mechanical and LED indicators), lockable test button, built-in diode and CR (surge suppression), bifurcated contacts, etc.
- Arc barrier standard on 4-pole Relays.
- Dielectric strength: 2,000 VAC (coil to contact).
- Environment-friendly cadmium-free contacts.
- Safety standard approvals obtained.

Characteristics

Item	All Relays
Contact resistance/Coil Rating	100 mΩ/0.5Watts
Operate time	20 ms max
Release time	20 ms max
Max. operating frequency	Mechanical:18,000 operations/hr Electrical:1,800 operations/hr (under rated load)
Insulation resistance	1,000 MΩ min. (at 500 VDC)
Dielectric strength	2,000 VAC, 50/60 Hz for 1.0 min (1,000 VAC between contacts of same polarity)
Vibration resistance	Destruction:10 to 55 to 10 Hz, 0.5 mm single amplitude (1.0 mm double amplitude) Malfunction:10 to 55 to 10 Hz, 0.5 mm single amplitude (1.0 mm double amplitude)
Shock resistance	Destruction:1,000 m/s2 Malfunction:200 m/s2
Endurance	See the following table
Ambient temperature	Operating: –55°C to 70°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 35 g

Endurance Characteristics

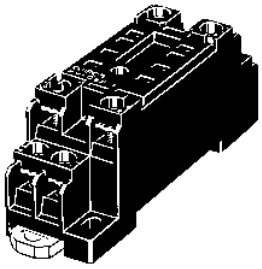
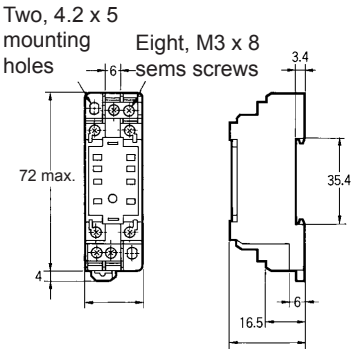
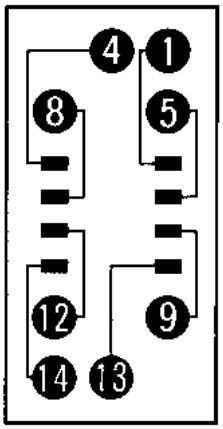
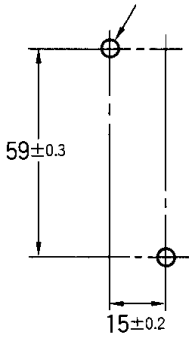
Pole	Mechanical life (at 18,000 operations/hr)	Electrical life (at 1,800 operations/hr under rated load)
2-pole	AC:50,000,000 operations min. DC:100,000,000 operations min.	500,000 operations min.

Socket for MY



• Snap into position along continuous sections of any mounting track.
• Facilitates sheet metal design by standardized mounting dimensions.
• Design with sufficient dielectric separation between terminals eliminates the need of any insulating sheet.

Dimensions

Socket	Dimensions	Terminal arrangement/ Internal connections (top view)	Mounting holes
			 (TOP VIEW) **Note:** Track mounting is also possible. Refer to page 12 for supporting tracks.

Tstat8 Bacnet Thermostat

Description

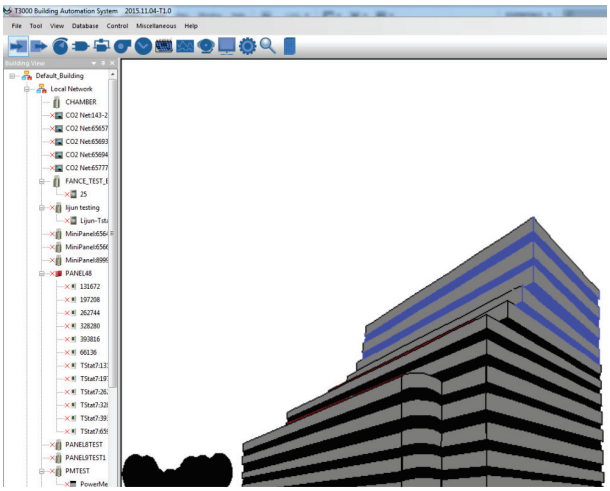
This full-featured thermostat is designed for cooling and heating systems in residential and commercial buildings. The thermostat can be configured for use with air handlers,fan coils, VAV's, modulating valves and many other HVAC applications. All models support BACnet and Modbus protocols which allows 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

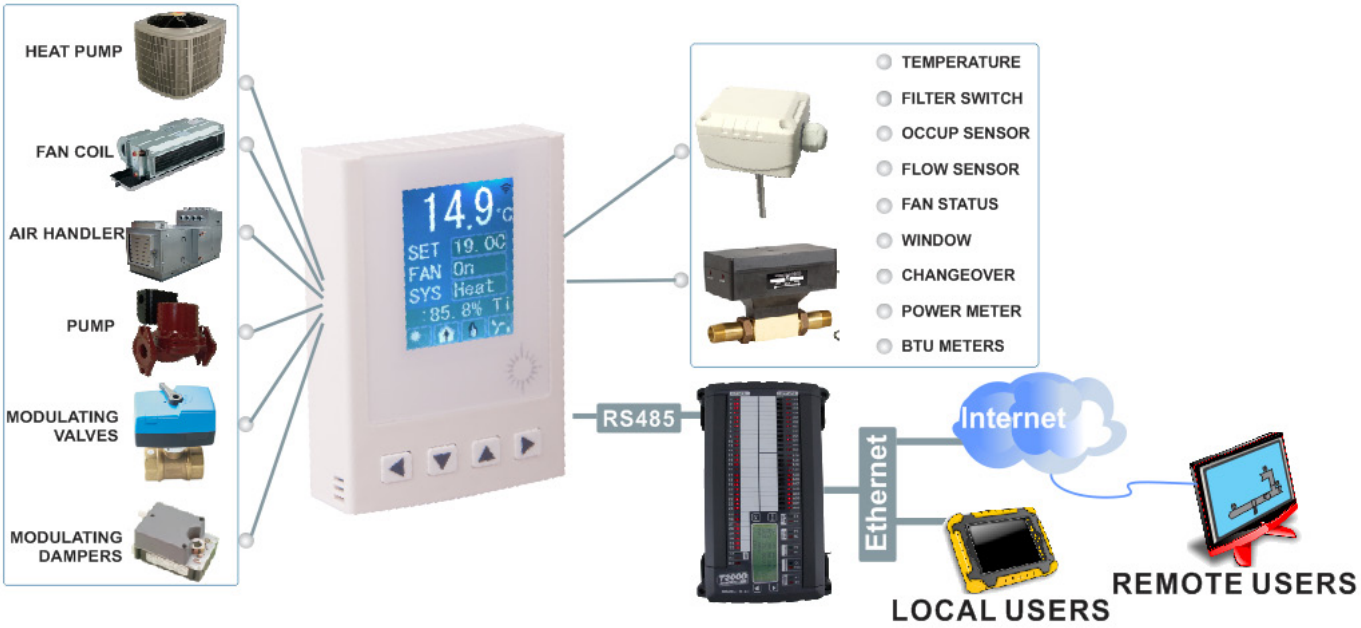
- BACnet MS/TP and Modbus RTU protocols over RS485.
- Baudrates of 1.2k,4.8k,9.6k,14.4k,19.2k, 38.4k, 57.6k, 76.8k and 115.2k.
- Well documented register list for easy integration with other systems.
- 8 universal inputs for external temperature, voltage, contacts, etc.
- 5 relay outputs, rated at 12~24vac @ 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



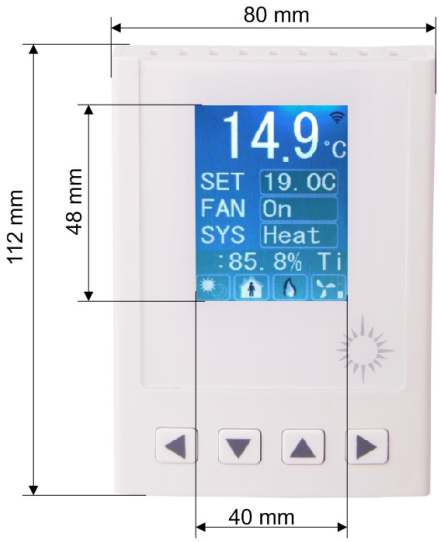
Tstat8 Bacnet Thermostat

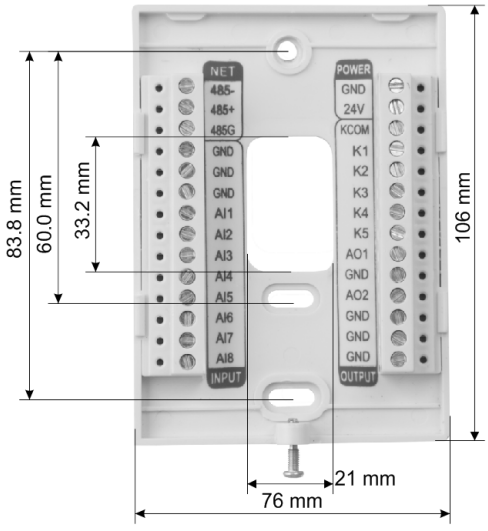
Typical Applications



Specifications

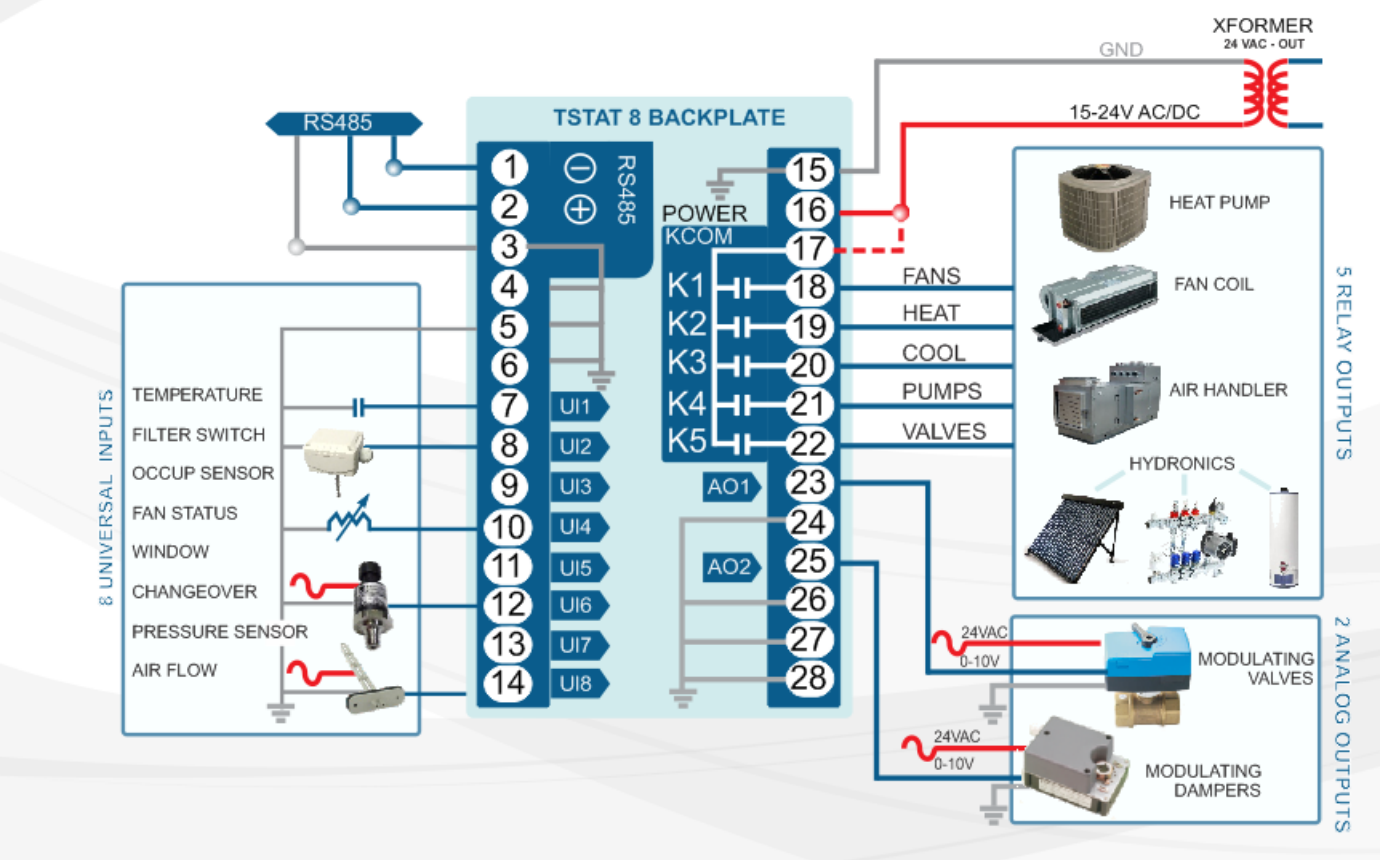
Outputs	5 relay outputs 24vac @ 2 amps; 2 analog outputs 10V @100mA
8 Universal Inputs	10k therm, contacts, 4-20ma, 0-5V,0-10V
Operating range	-30~70°C(-22~158°F) / 0 to 99% RH
Supply voltage	12~24VAC/DC ±20%, 50-60Hz
Power consumption	100mA at 12VDC
Relay contacts	5 relays, 2A @ 24VAC UL File No.: E169380
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





Tstat8 Bacnet Thermostat

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

Tstat8 Bacnet Thermostat

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

Tstat8 – H– OCC– B

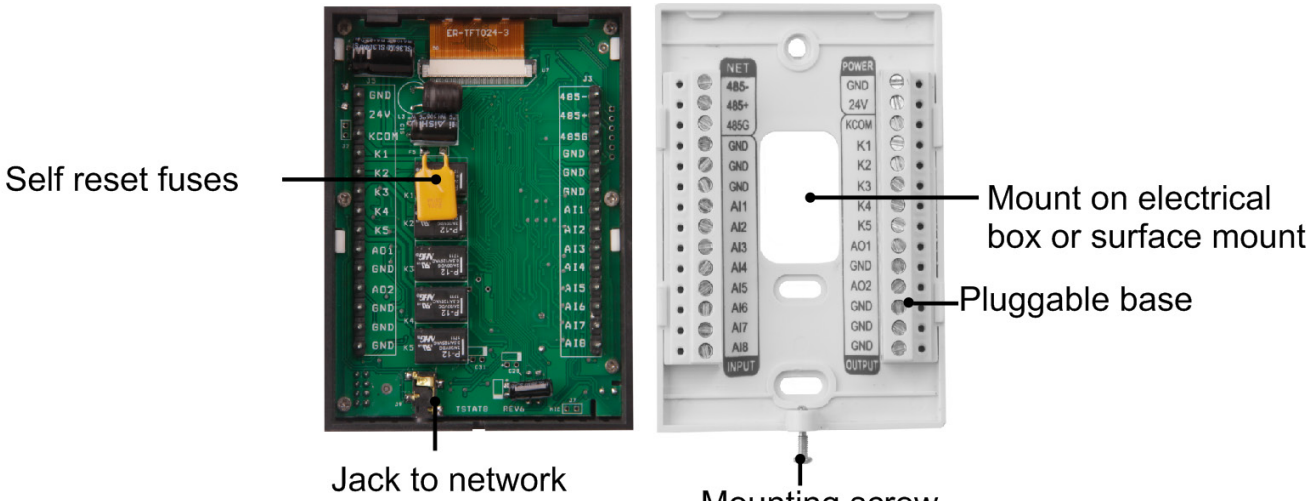
Code	Description
Tstat8	Thermostat

	Description
H	Humidity

	Description
	Basic model temperature and clock
WIFI	WIFI
OCC	Occupancy sensor
220	220V
ZIG	Zigbee

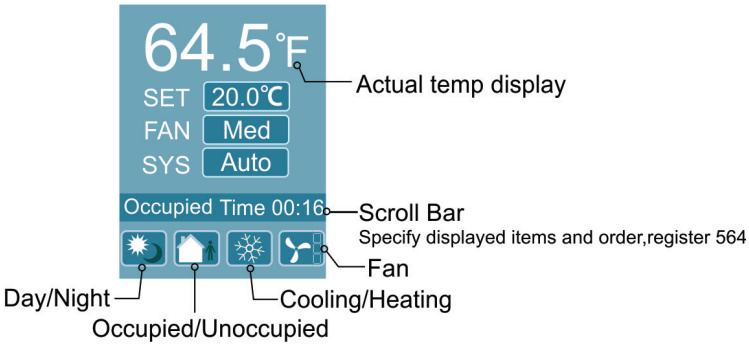
	Description
B	Black color

Structure Highlights



Menu Item Details

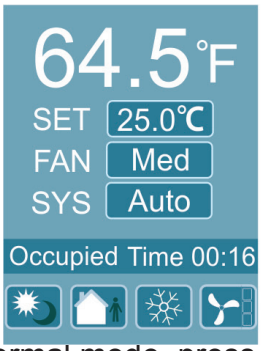
Tstat8 have several advanced menu items which can be adjusted in the field to suit the specific application and tune the operation of the thermostat. All the parameters are set up at the factory on an order-by-order basis and will give satisfactory results out of the box.

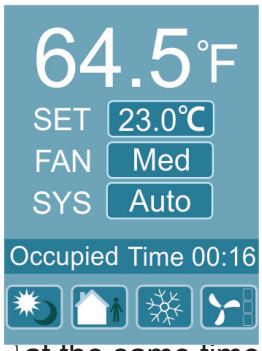


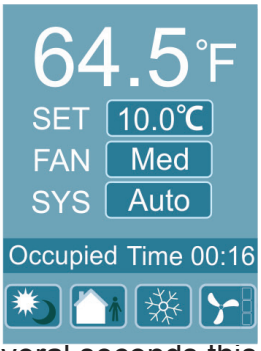


LCD Screen Display

1 .When you press ◀ or ▶ , 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 ▼ to increase or decrease the unit’s address from 1 to 254.

To change the baudrate, locate ‘bAU’ within the menu and use ▲ and ▼ to choose 1 9200 or 9600.









Custom Enclosures and Logos



Black



Tstat8



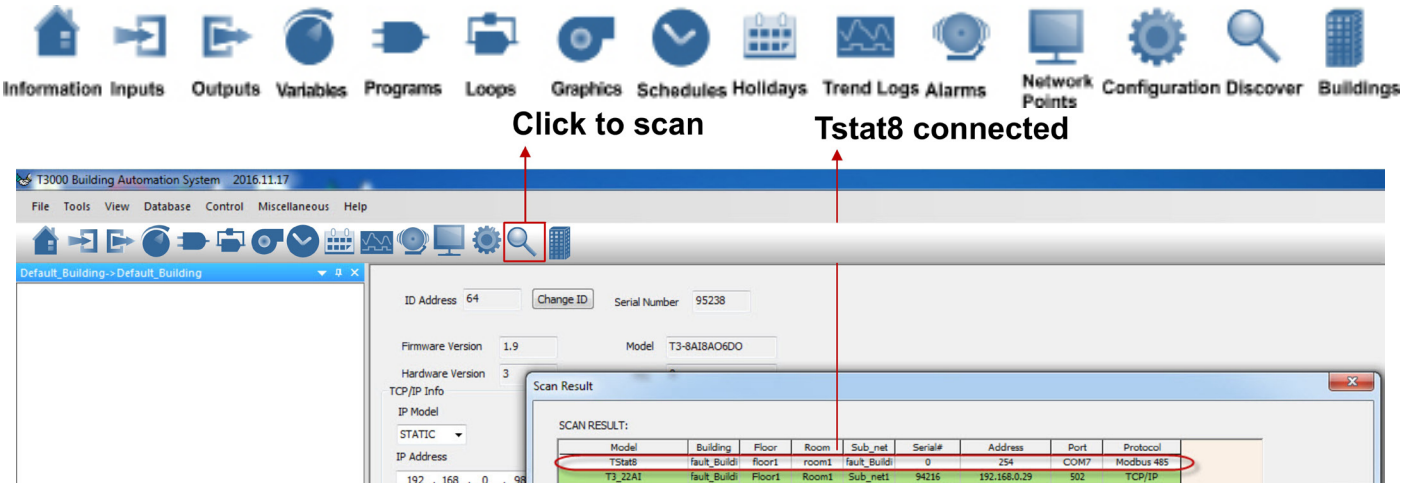
Tstat8-H-OCC

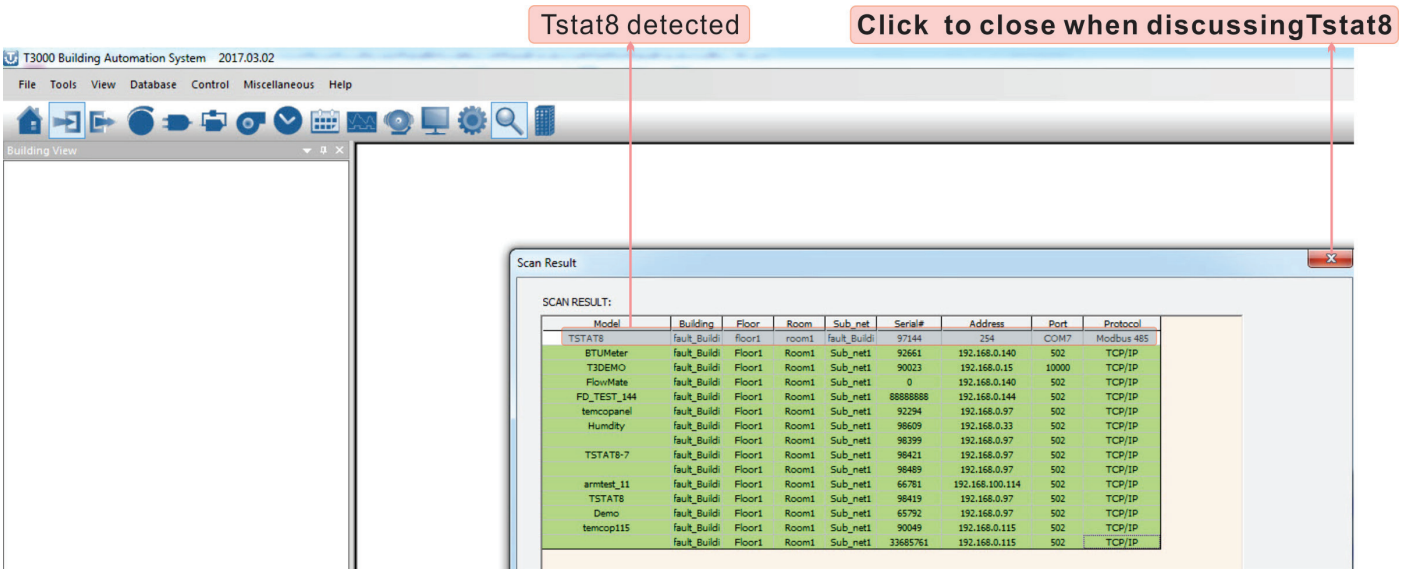


Tstat8-H-Zigbee

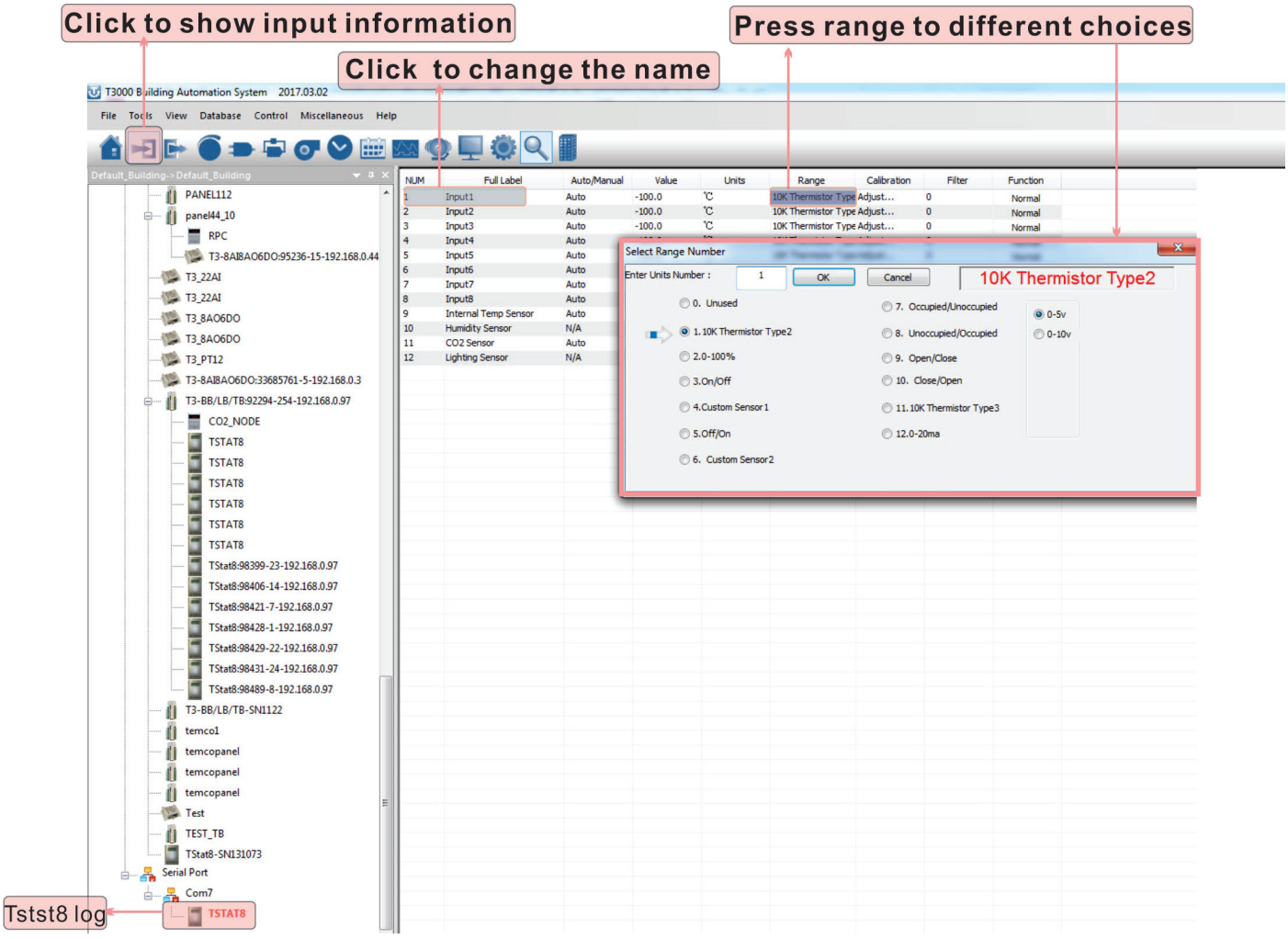
T3000 operation

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 to scan,the following view will appear. Close after the scan is complete.

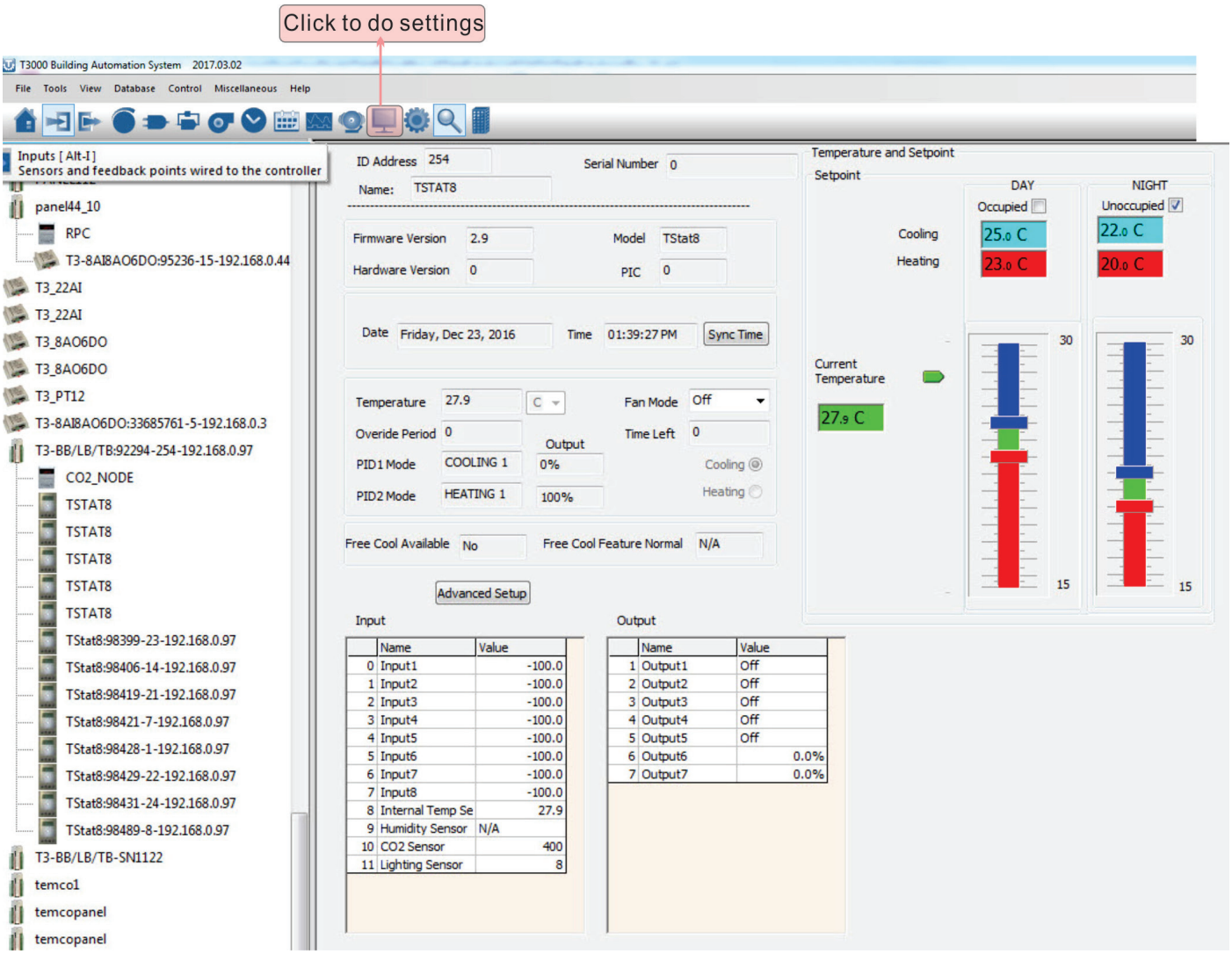




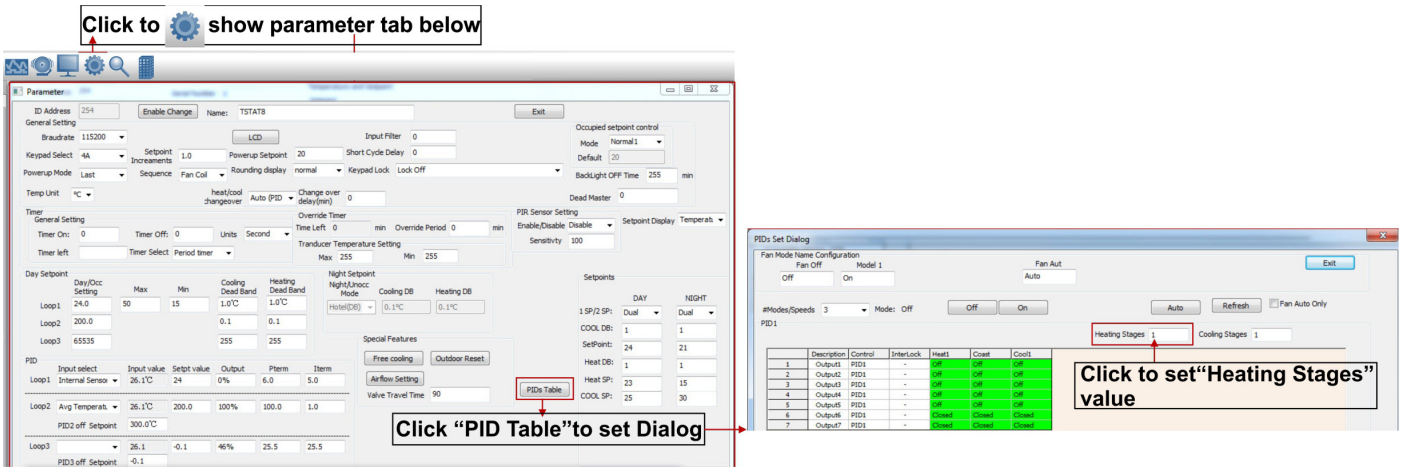
4. Click Tstat8 log, then click , this will display all of the Tstat8 inputs. Change the name of the input and range that fits the application.



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

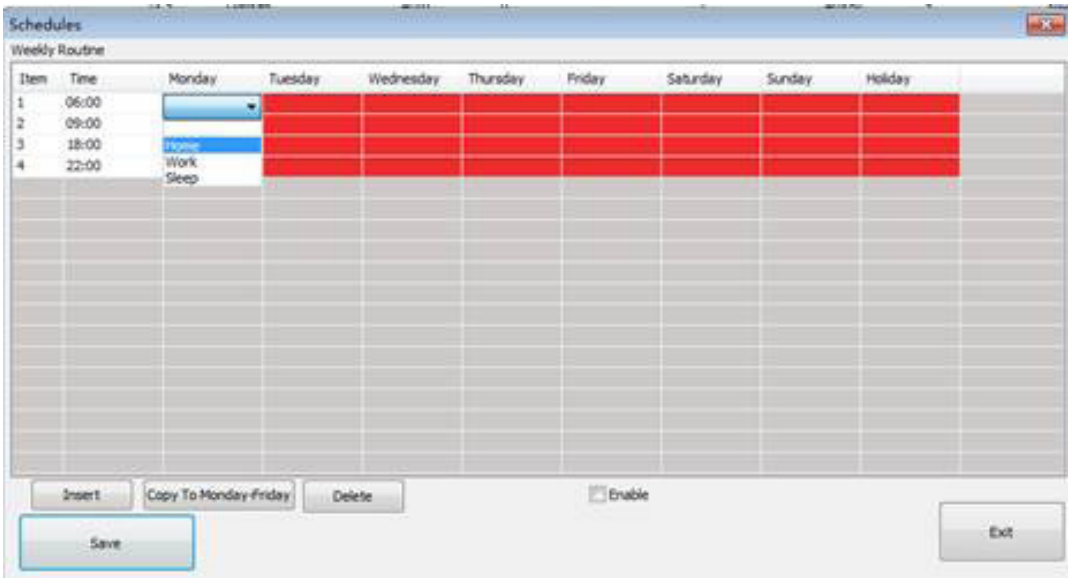


6.Click  to to edit advanced settings. The window below will open. Click “PIDs Tables” to edit PIDs and change the function of the outputs.

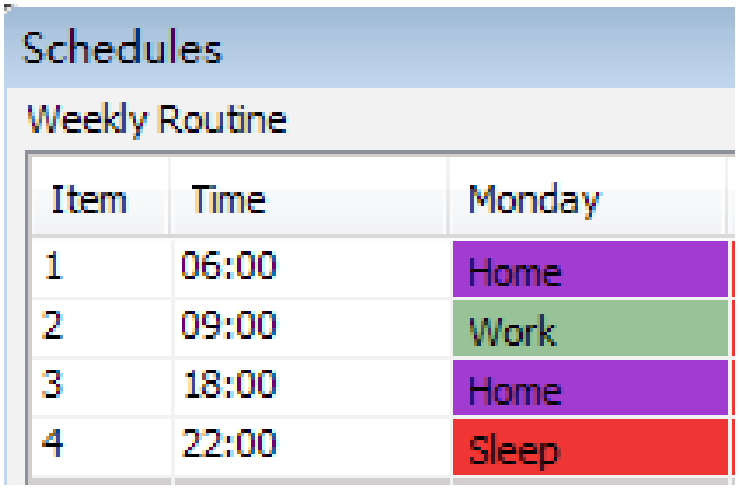


7.Click the schedule icon to go to schedule window,you can do schedule settings.

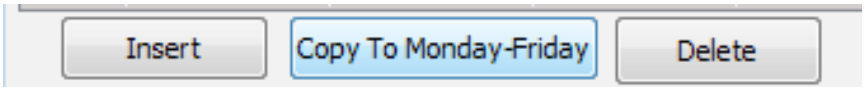
Each day we support 6 events, and you can select the mode for each event:
For home mode, unit will use day setpoint to control the outputs;
For work mode, it will use night setpoint to control the outputs;
For sleep mode, it will use sleep setpoint to control the outputs.

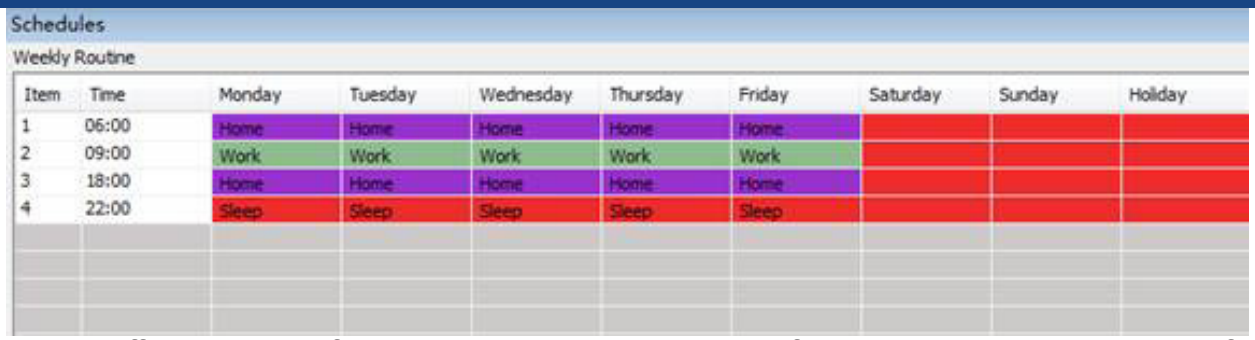


For example as below:
when time is between 6:00 to 9:00, unit will work on home mode;
when time is between 9:00 to 18:00, unit will work on work mode;
when time is between 18:00 to 22:00, unit will work on home mode;
when time is between 22:00 to Tuesday 6:00, unit will work on sleep mode.

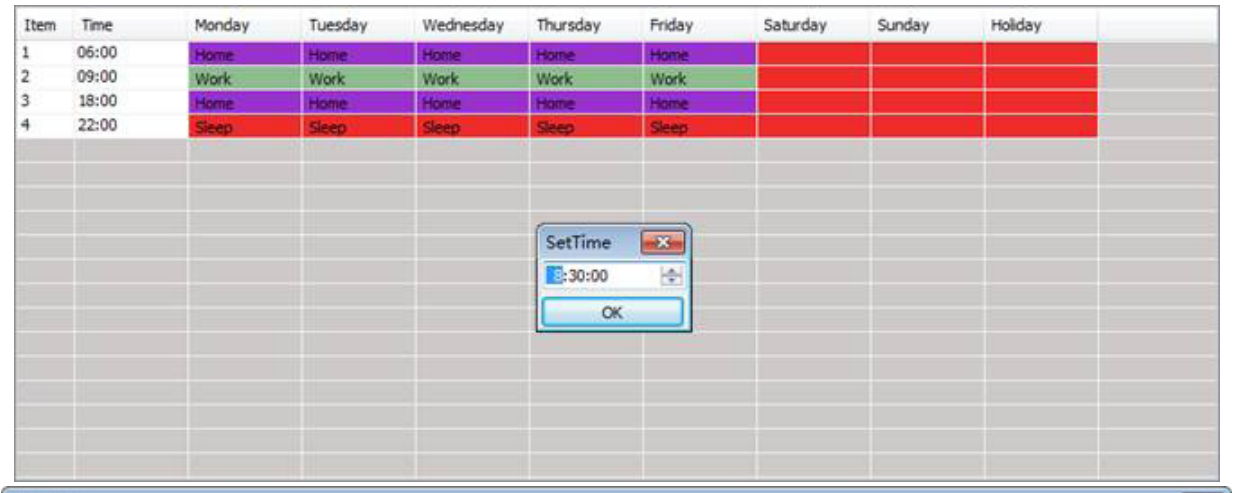


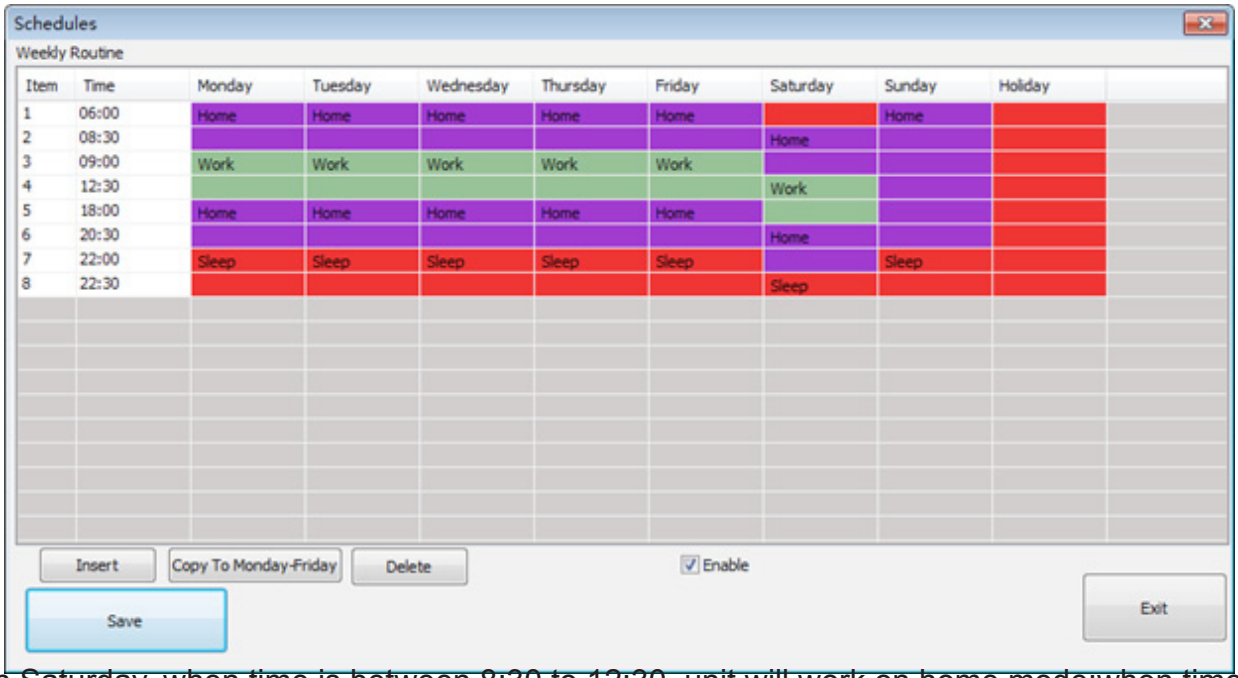
After you setup the Monday schedule, you can copy the Monday setting from Tuesday to Friday, then you can use the “Copy To Monday-Friday” function to copy the setting.





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.





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 !

Tstat8-wifi Set Up

1.Configuration Settings

To set the password and IP address of the Tstat8, two methods are available:Key setting and AD-hoc setting, or using the T3000 software Key setting.

ADhoc setting

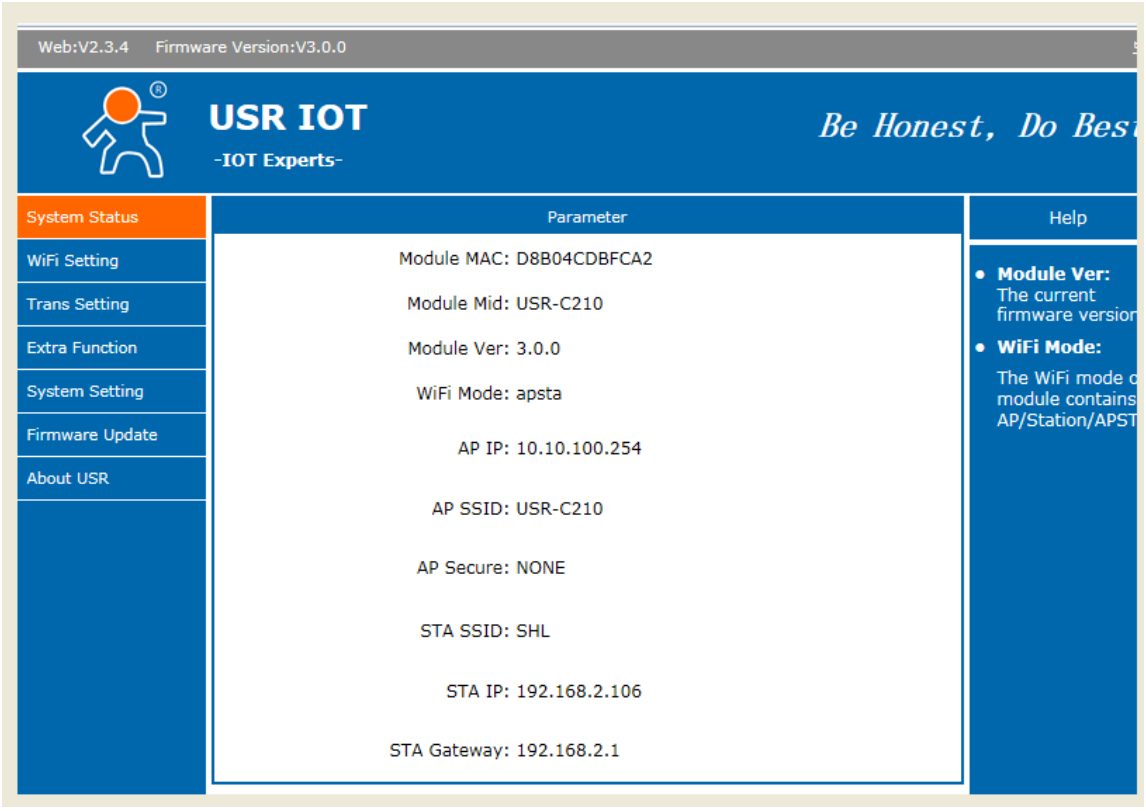
ADhoc is a singel hot model,which supports iphone,win7&8.The IP default address is 10.10.10.254

Step1.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.

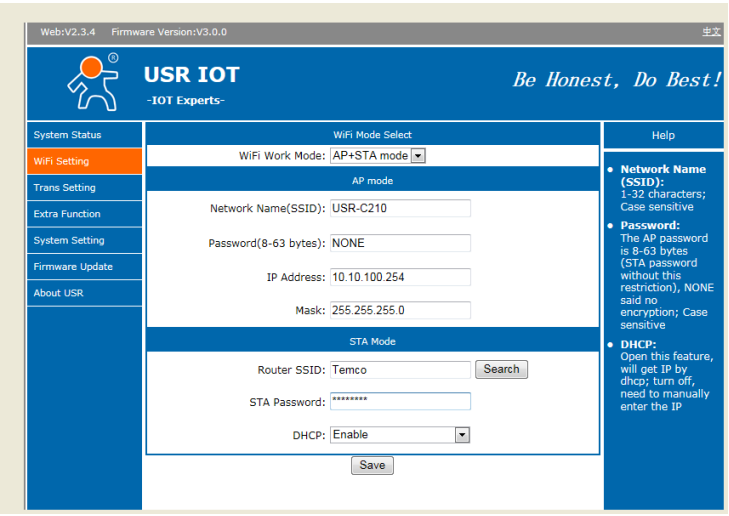


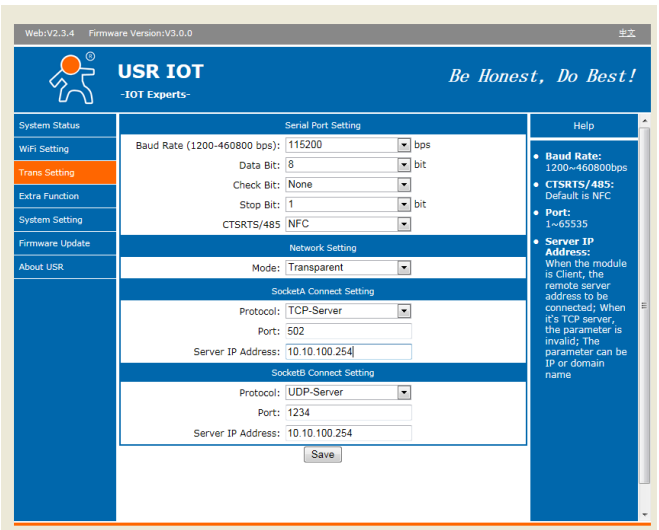


Step2.Enter the Module MAC. The Module MAC:D8B04CDBFCA2



Step3.Open your browser,enter IP 10.10.100.254,then you can set your password and IP as below:





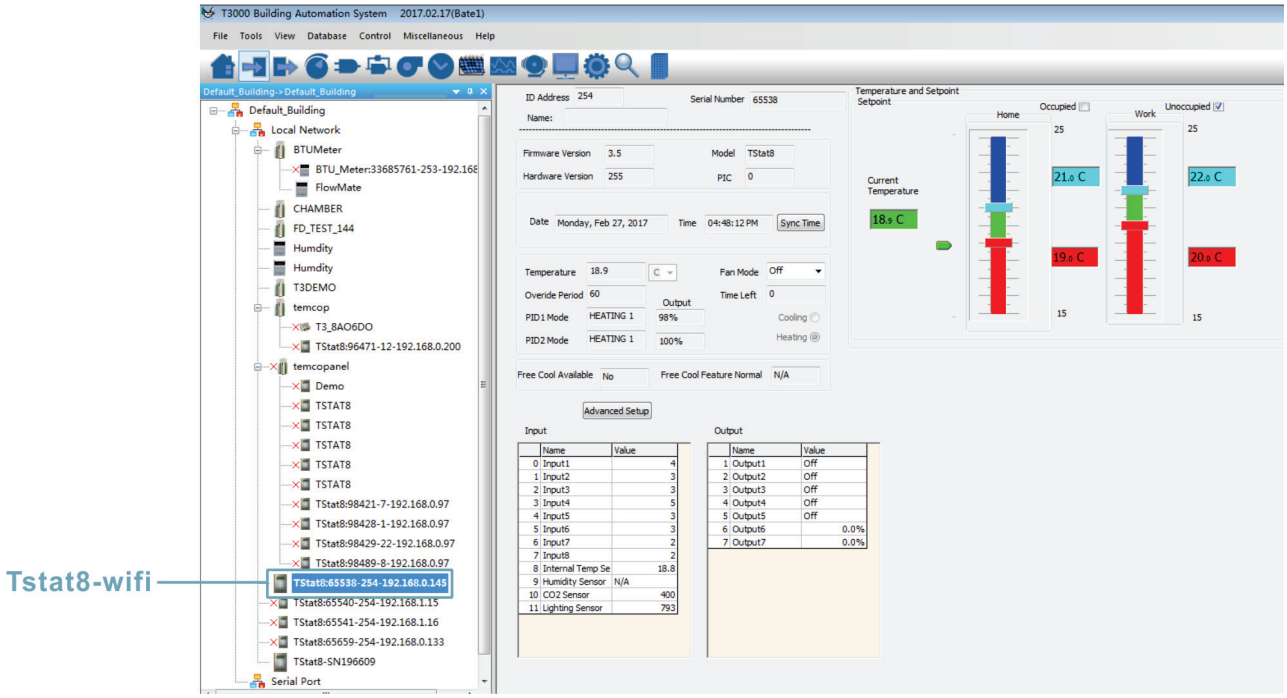
T3000 setting

The T3000 software also has the ability to set the password and IP of the Tstat8.

Step1.Visit https://temcocontrols.com/ftp/software/T3000.zip, download T3000 software and install it;

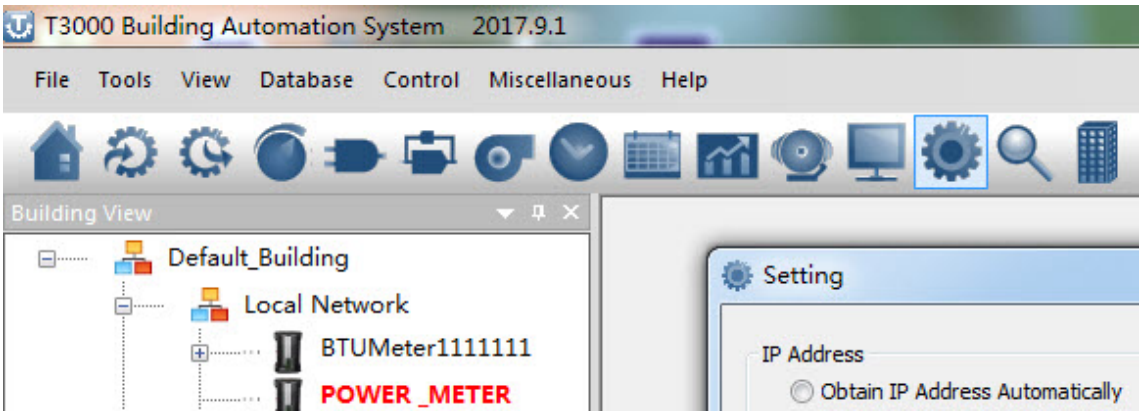
Step2. Apply power to the Tstat8, connect the Tstat8 to a PC via RS485 or Ethernet;

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

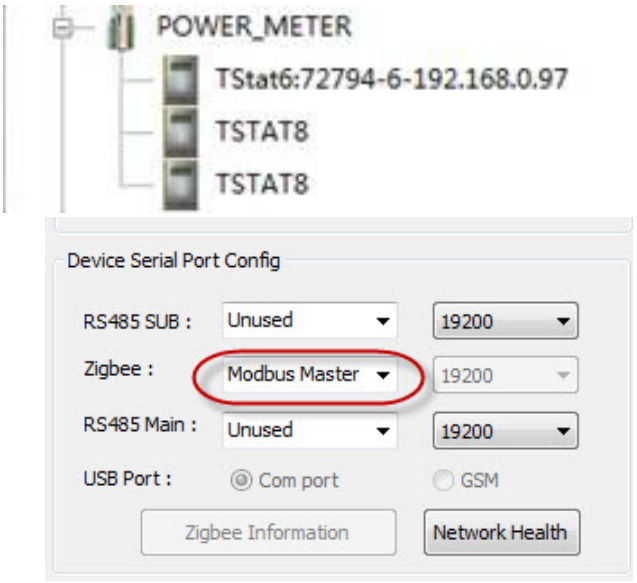


Zigbee Setup

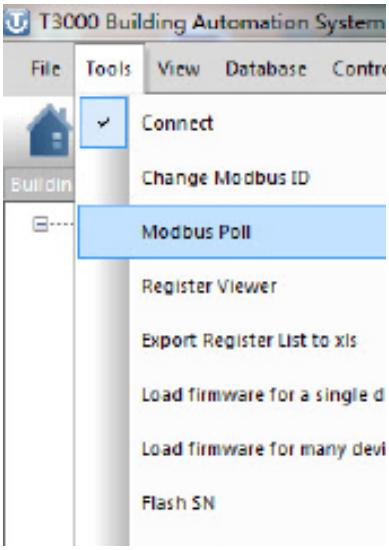
Click to scan,you can find the Zigbee BB.



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



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

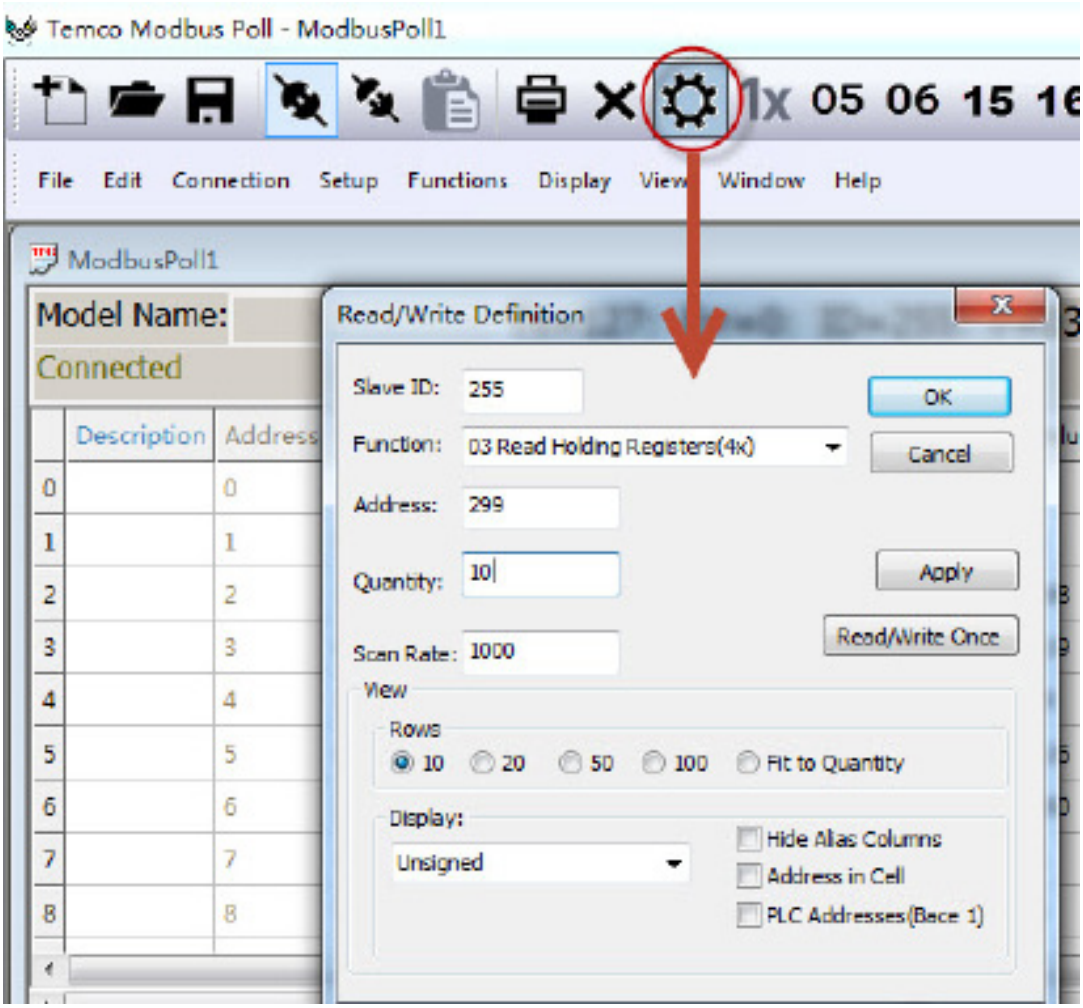


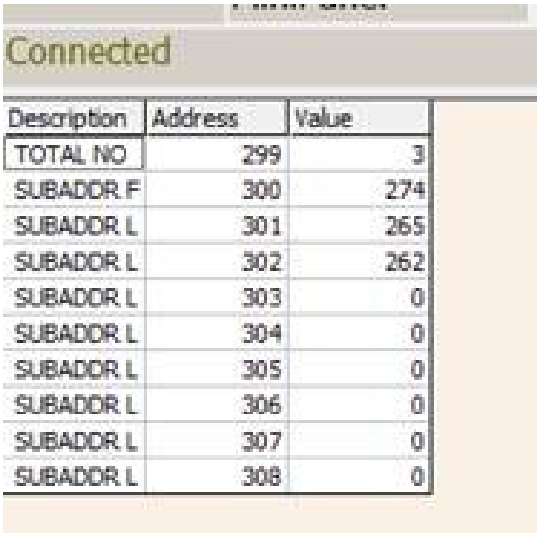
As below,ID 255 means reading zigbee BB itself. Address 299 indicates how many units are connecting

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.





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

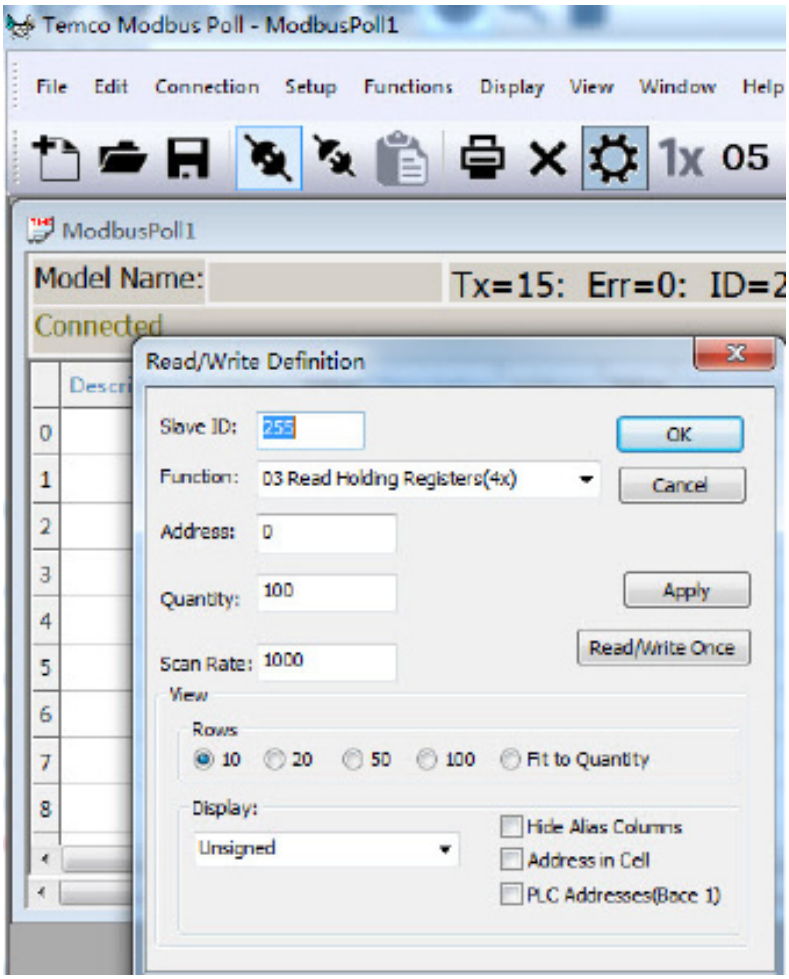
For debugging:

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

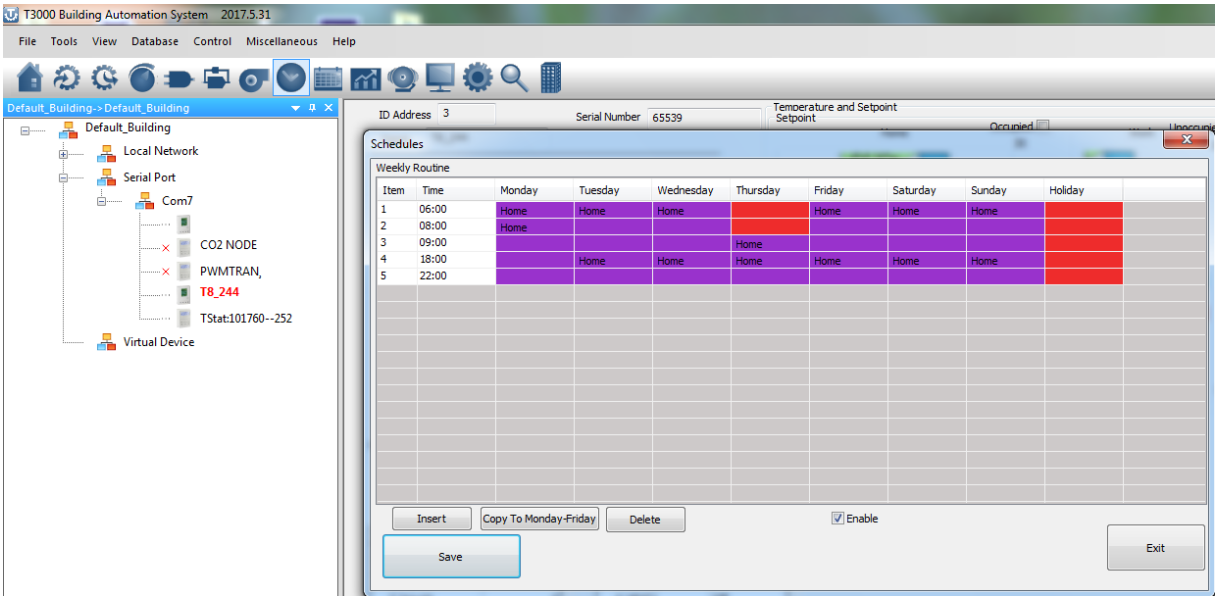
B. If you find the units by T3000,but when you click the unit icon you can not access them.

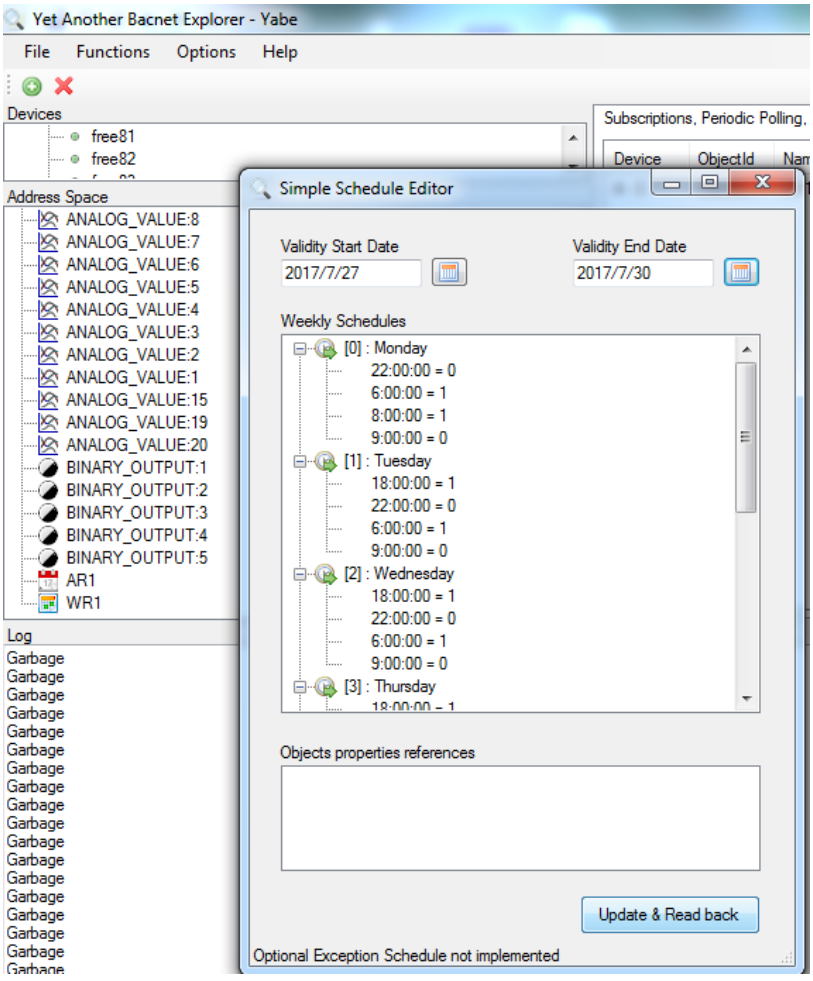
3. Using modbus poll to access each of the unit



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.

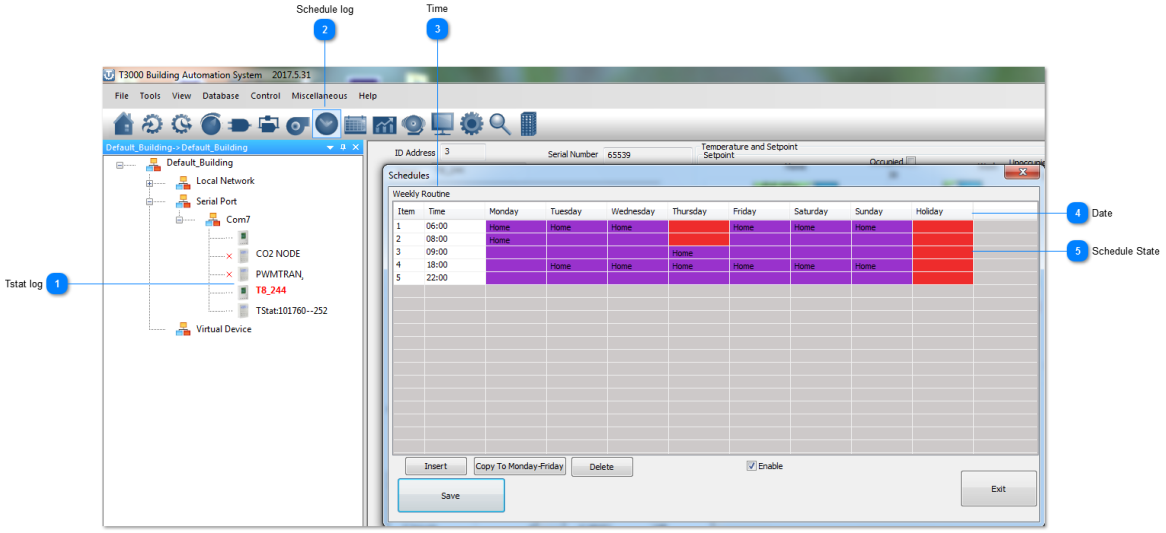




Managing schedules in T3000

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.



1 Tstat log

T8_244

Click to select the thermostat.

2 Schedule log



Click to show schedule details.

3 Time

Weekly Routine

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

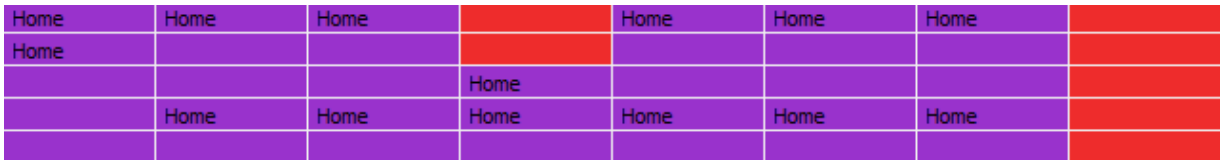
This is the time list.

4 Date

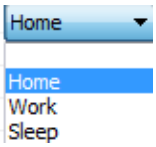
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Holiday

The date diaplays from Monday to Sunday and Holiday.

5 Schedule State

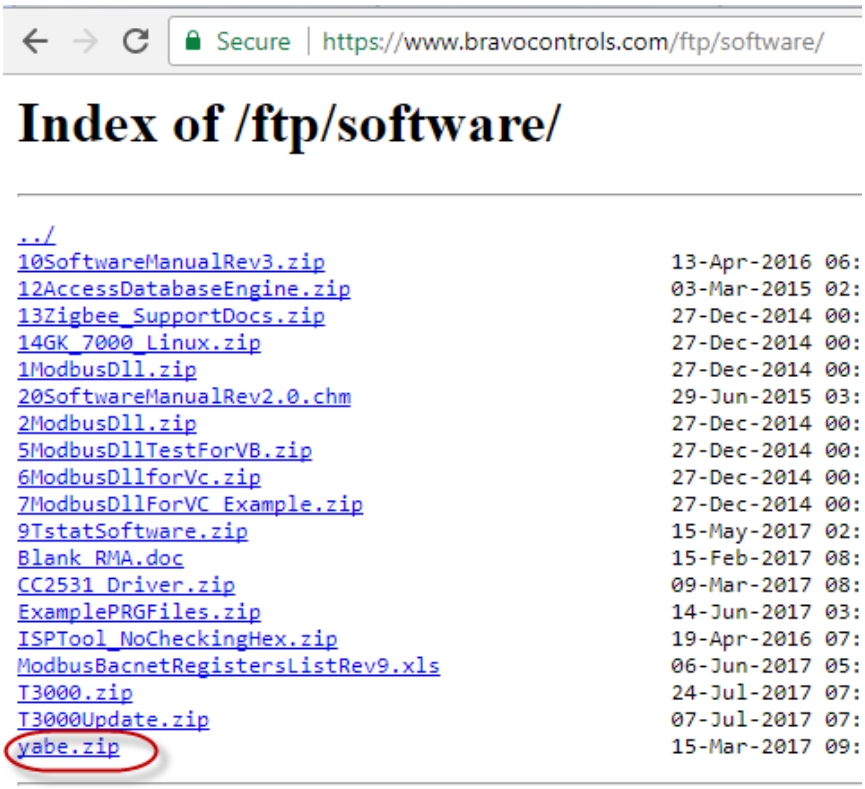


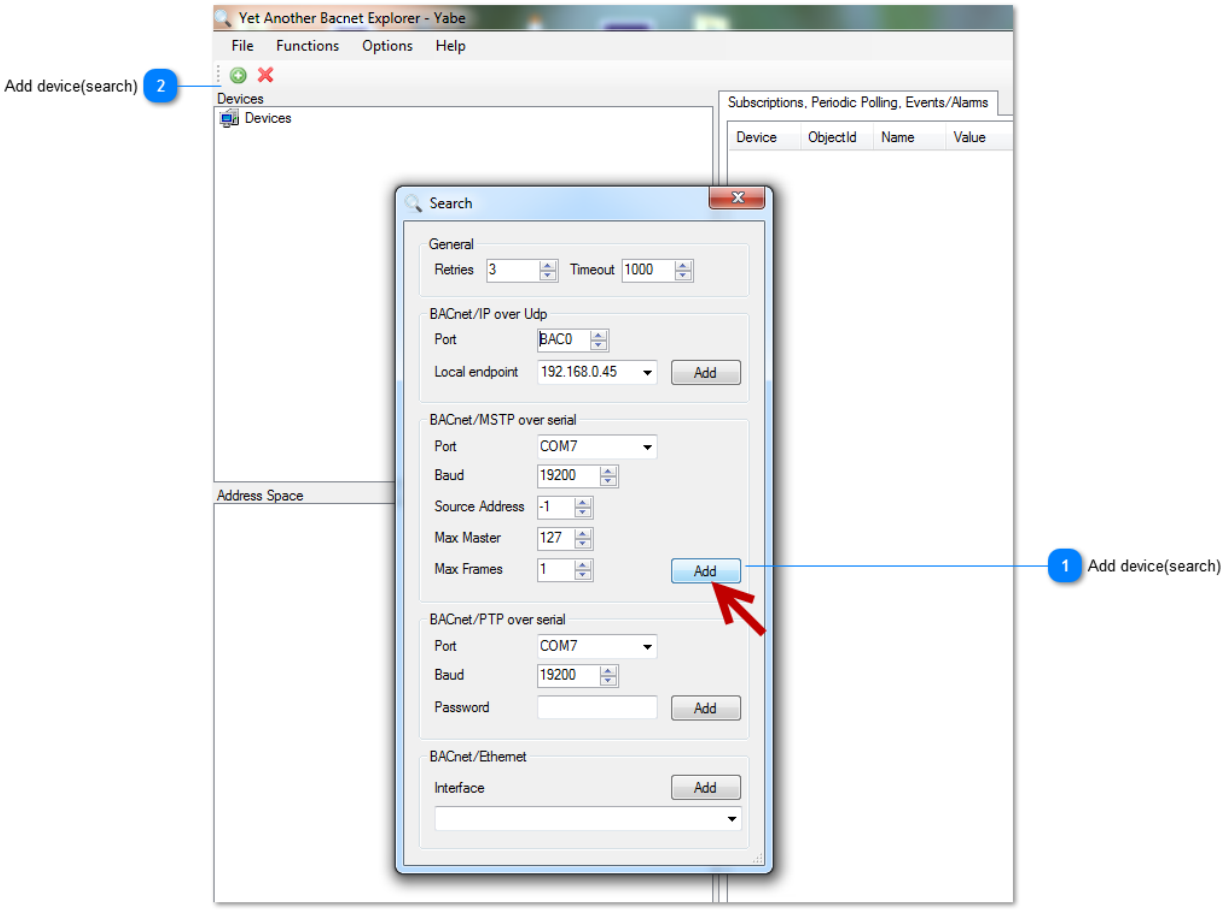
The tab shows the schedule state:Home/Work/Sleep.



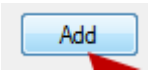
Managing schedules using Bacnet

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.


Secure | https://www.bravocontrols.com/ftp/software/
Index of /ftp/software/
../
10SoftwareManualRev3.zip 13-Apr-2016 06:
12AccessDatabaseEngine.zip 03-Mar-2015 02:
13Zigbee_SupportDocs.zip 27-Dec-2014 00:
14GK_7000_Linux.zip 27-Dec-2014 00:
1ModbusDll.zip 27-Dec-2014 00:
20SoftwareManualRev2.0.chm 29-Jun-2015 03:
2ModbusDll.zip 27-Dec-2014 00:
5ModbusDllTestForVB.zip 27-Dec-2014 00:
6ModbusDllforVc.zip 27-Dec-2014 00:
7ModbusDllForVC_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-Jul-2017 07:
T3000Update.zip 07-Jul-2017 07:
yabe.zip 15-Mar-2017 09:


Add device(search)
2
Yet Another Bacnet Explorer - Yabe
File
Functions
Options
Help
Devices
Devices
Subscriptions, Periodic Polling, Events/Alarms
Device
ObjectId
Name
Value
Address Space
Search
General
Retries
3
Timeout
1000
BACnet/IP over Udp
Port
BAC0
Local endpoint
192.168.0.45
Add
BACnet/MSTP over serial
Port
COM7
Baud
19200
Source Address
-1
Max Master
127
Max Frames
1
Add
BACnet/PTP over serial
Port
COM7
Baud
19200
Password
Add
BACnet/Ethernet
Interface
Add
1
Add device(search)

1 **Add device(search)**



Click to add via BACnet/MSTP .

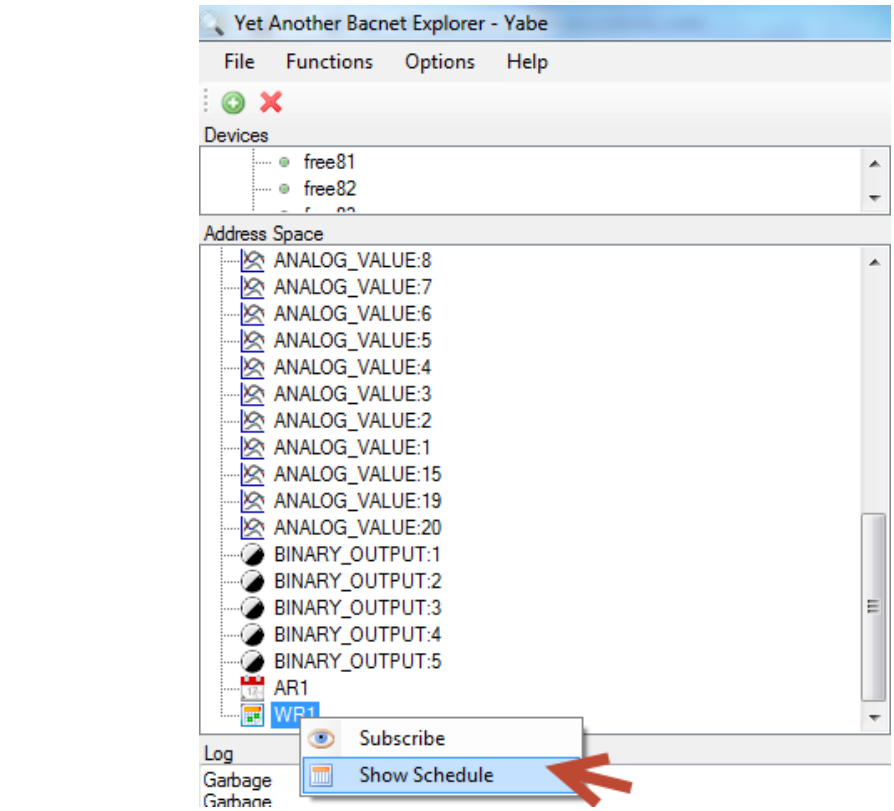
2 **Add device(search)**

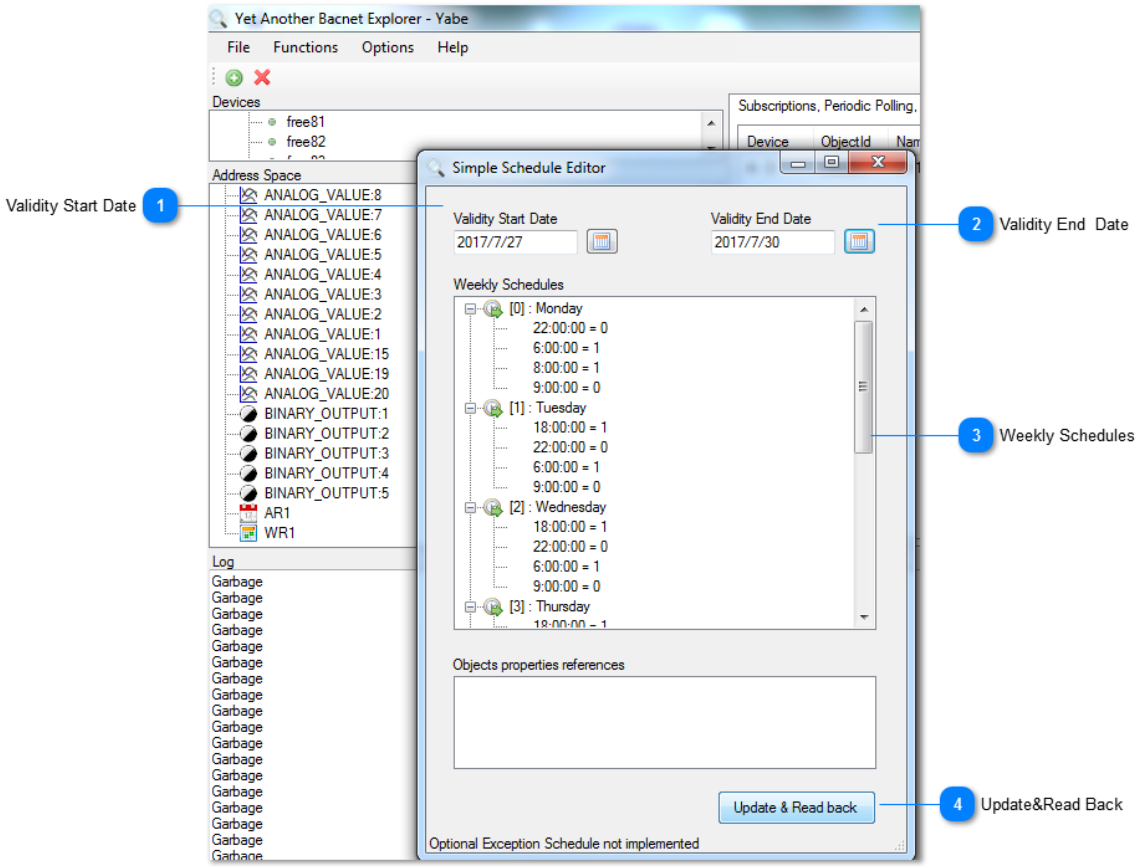


Click to add device.

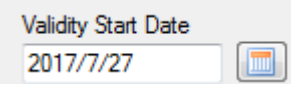
Weekly routines schedule

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.


Yet Another Bacnet Explorer - Yabe
File
Functions
Options
Help
Devices
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:3
BINARY_OUTPUT:4
BINARY_OUTPUT:5
AR1
WR1
Subscribe
Show Schedule
Log
Garbage
Garbage

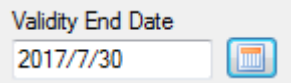

Validity Start Date
1
Yet Another Bacnet Explorer - Yabe
File
Functions
Options
Help
Devices
free81
free82
Address Space
ANALOG_VALUE:8
ANALOG_VALUE:7
ANALOG_VALUE:6
ANALOG_VALUE:5
ANALOG_VALUE:4
ANALOG_VALUE:3
ANALOG_VALUE:2
ANALOG_VALUE:1
ANALOG_VALUE:15
ANALOG_VALUE:19
ANALOG_VALUE:20
BINARY_OUTPUT:1
BINARY_OUTPUT:2
BINARY_OUTPUT:3
BINARY_OUTPUT:4
BINARY_OUTPUT:5
AR1
WR1
Log
Garbage
Subscriptions, Periodic Polling,
Device
ObjectId
Simple Schedule Editor
Validity Start Date
2017/7/27
Validity End Date
2017/7/30
2
Validity End Date
Weekly Schedules
[0] : Monday
22:00:00 = 0
6:00:00 = 1
8:00:00 = 1
9:00:00 = 0
[1] : Tuesday
18:00:00 = 1
22:00:00 = 0
6:00:00 = 1
9:00:00 = 0
[2] : Wednesday
18:00:00 = 1
22:00:00 = 0
6:00:00 = 1
9:00:00 = 0
[3] : Thursday
3
Weekly Schedules
Objects properties references
Update & Read back
4
Update&Read Back
Optional Exception Schedule not implemented

1 Validity Start Date



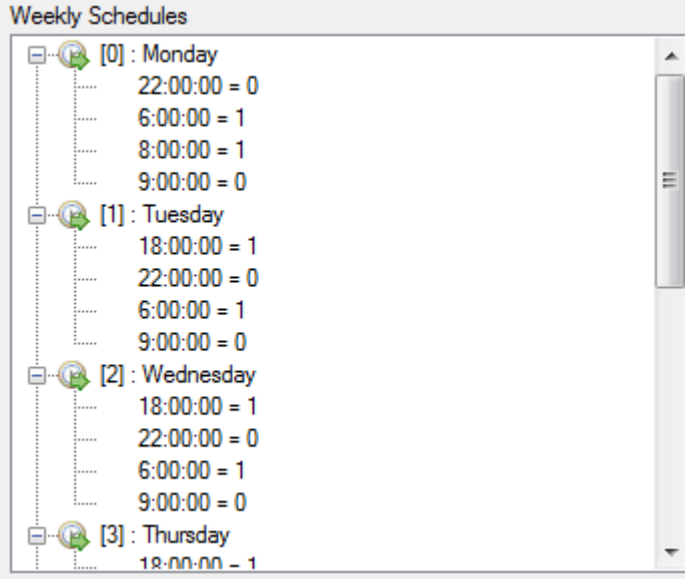
Click to set the start date.

2 Validity End Date



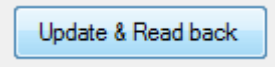
Click to set the End date.

3 Weekly Schedules



This tab shows the Weekly Schedules details.

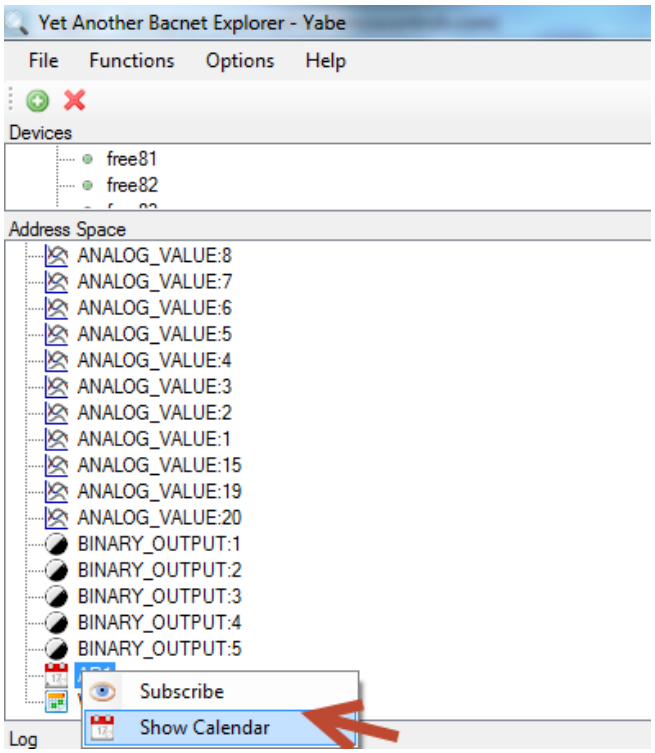
4 Update&Read Back

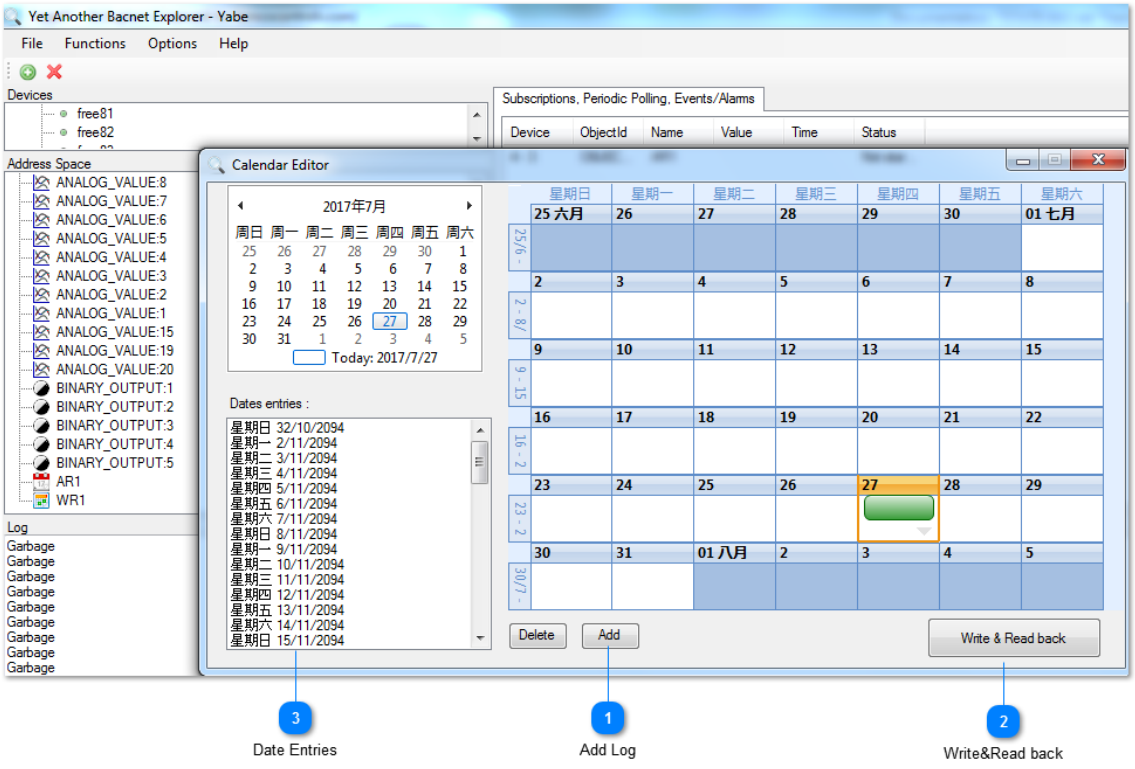


Click the log to update &Read Back.

Annual routine schedule

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



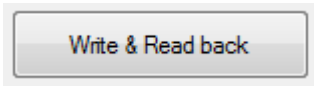


1 Add Log



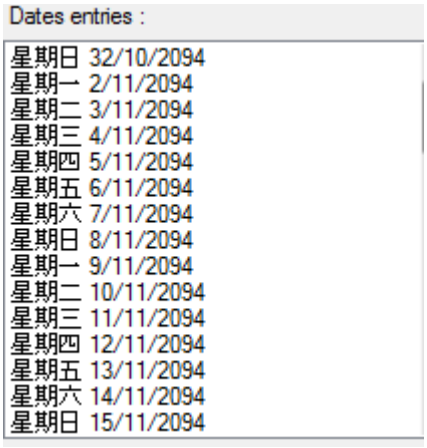
Click to add the date.

2 Write&Read back



Click to write & read back.

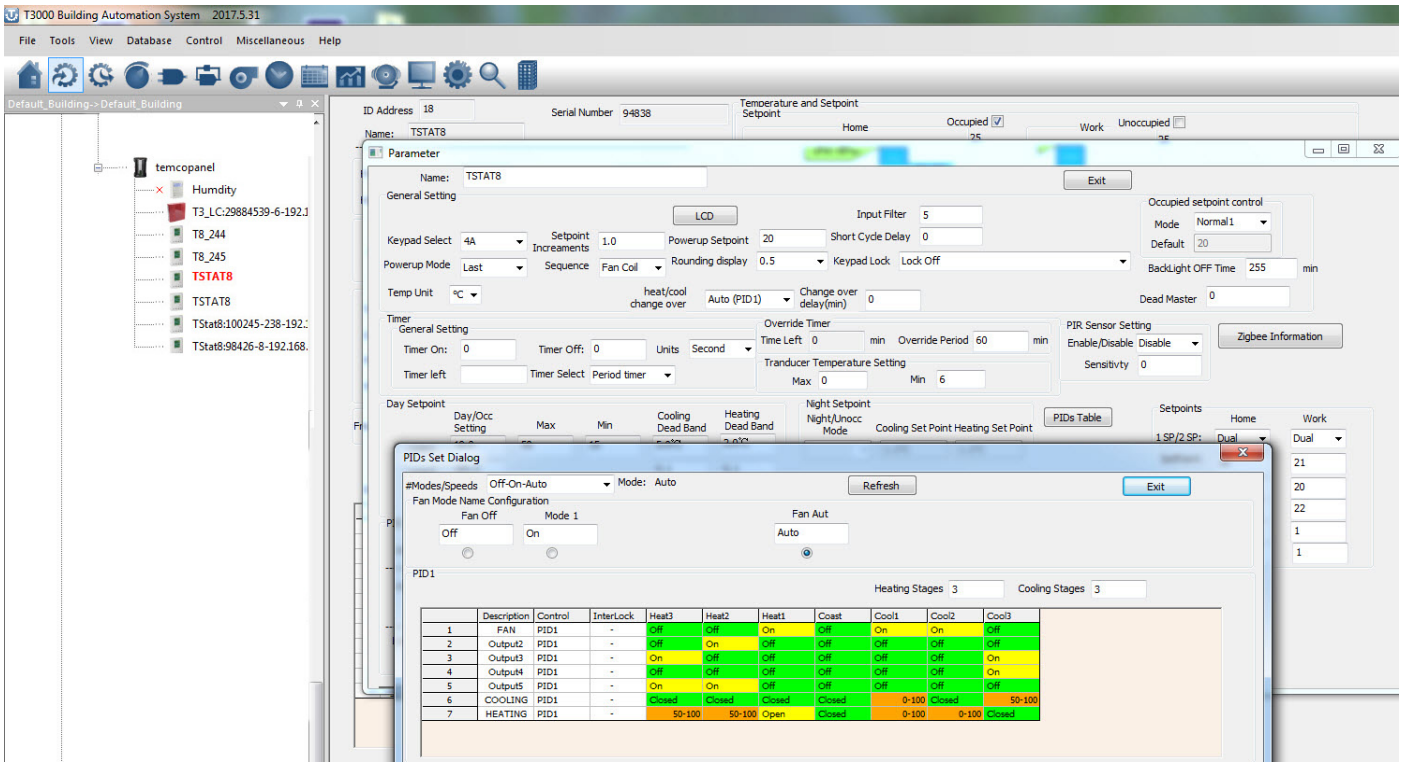
3 Date Entries



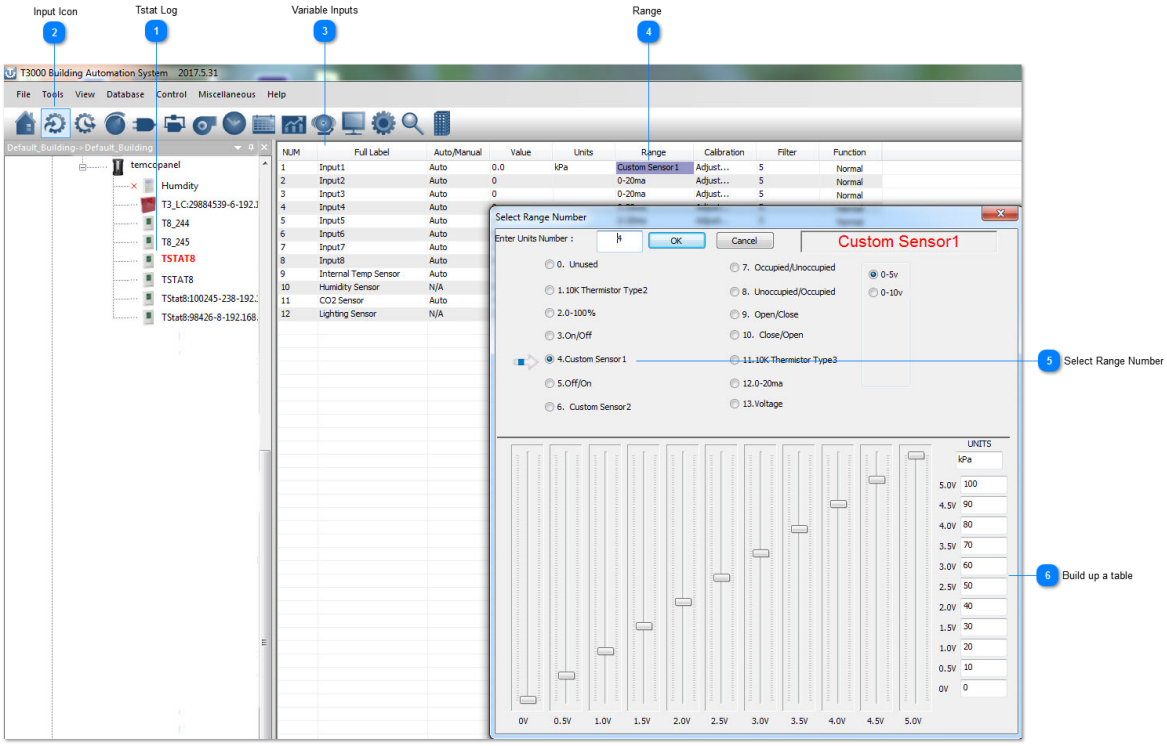
Click to choose the date.

Heating/Cooling Configuration

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



Input 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.

1 Tstat Log



Select the thermostat from the tree.

2 Input Icon



Click on the INPUTS icon.

3 Variable Inputs

NUM	Full Label
1	Input1
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

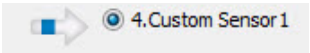
Give each input a name.

4 Range



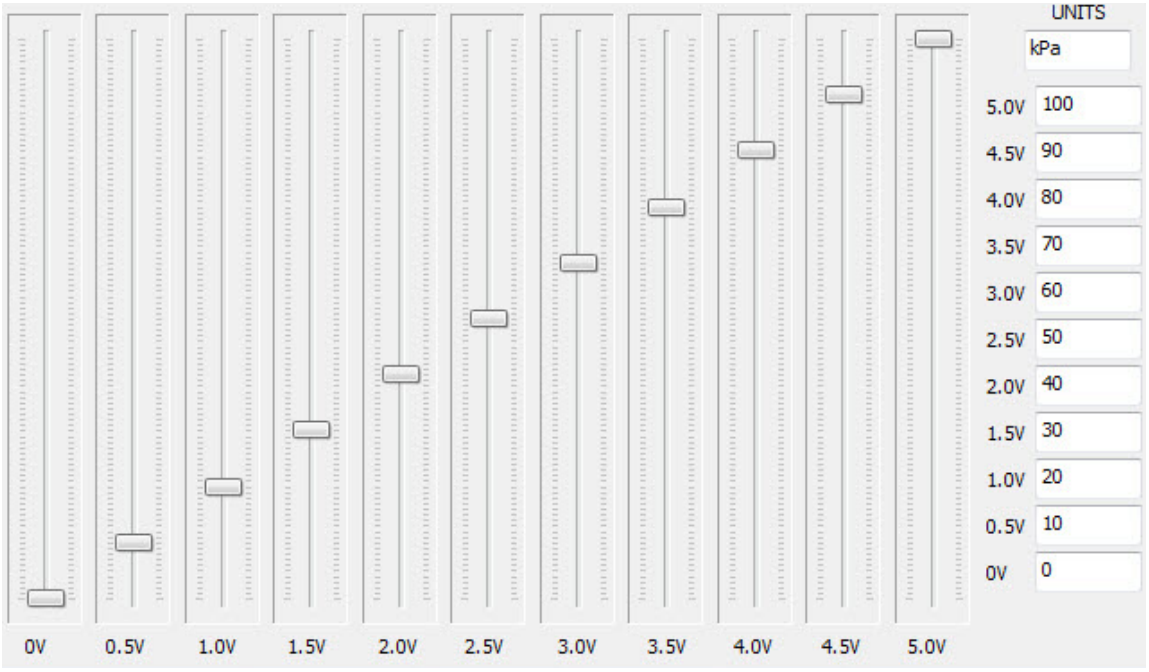
Set the range for the input by clicking on this column.

5 Select Range Number



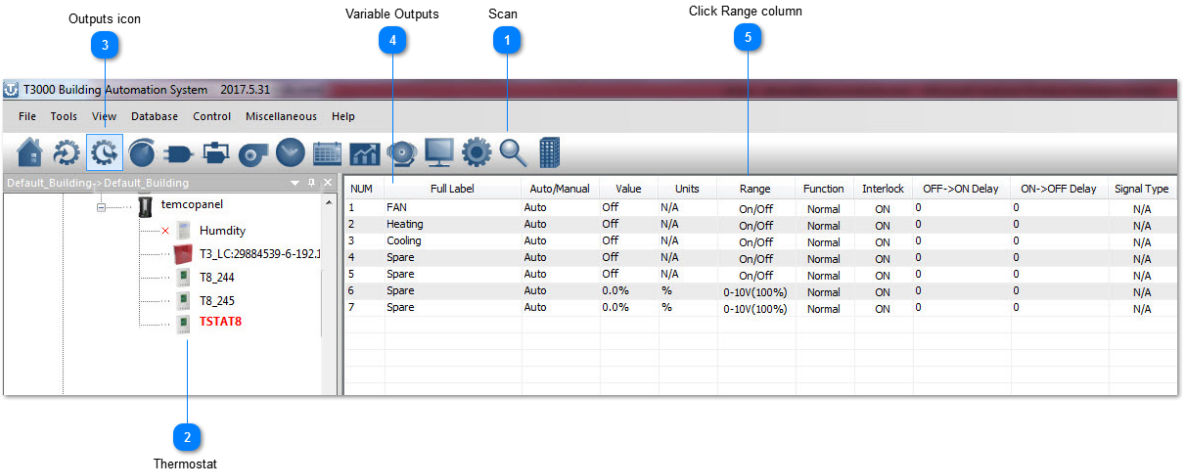
Select from the various ranges or build your own.

6 Build up a table



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



1 Scan

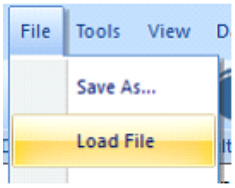


Scan the network and discover all devices.

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.



3 Outputs icon



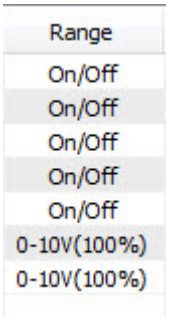
Select the outputs icon.

4 Variable Outputs

NUM	Full Label
1	FAN
2	Heating
3	Cooling
4	Spare
5	Spare
6	Spare
7	Spare

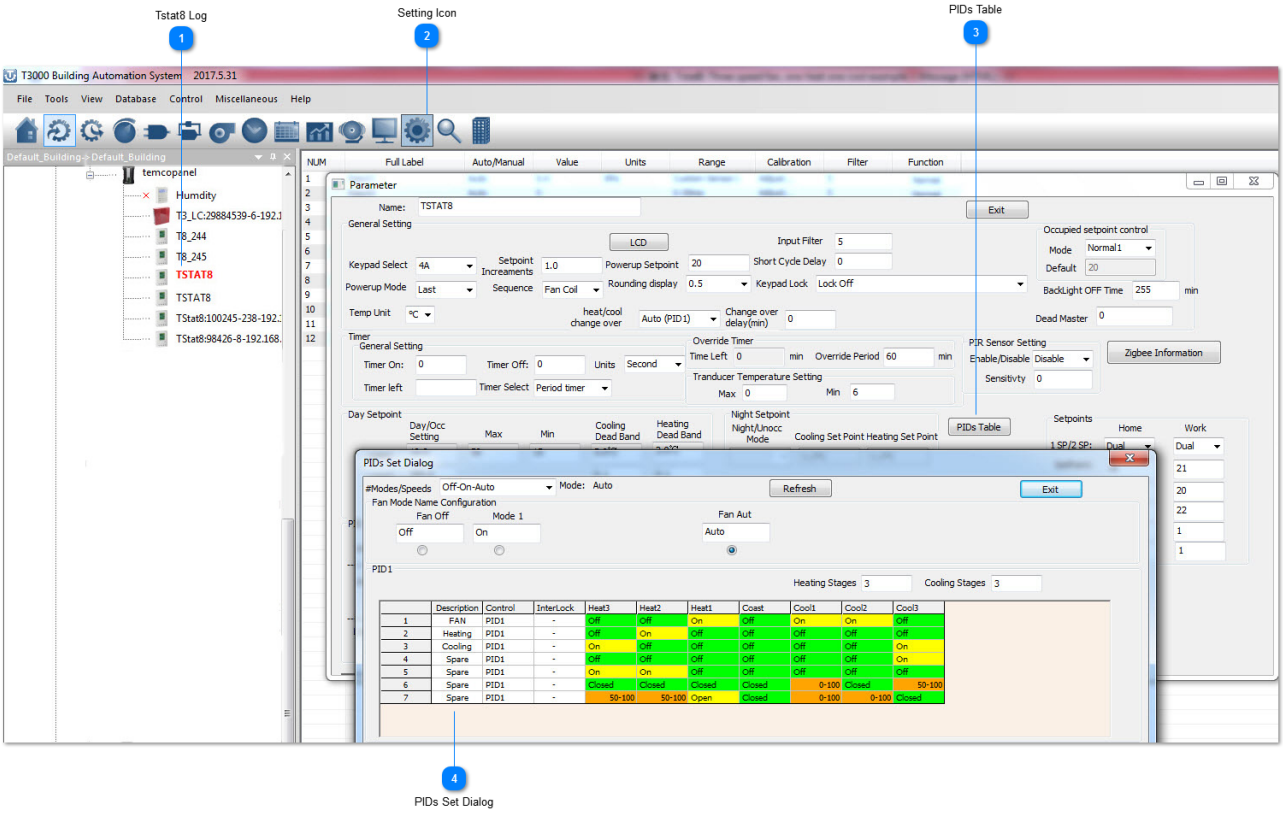
Click to give each output a name and a range, in the case of the fan the outputs are on-off and the valves are modulating 0-10V = 0-100% which are the default ranges already.

5 **Click Range column**



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



1 Tstat8 Log



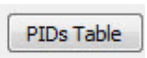
Select the thermostat from the tree.

2 Setting Icon



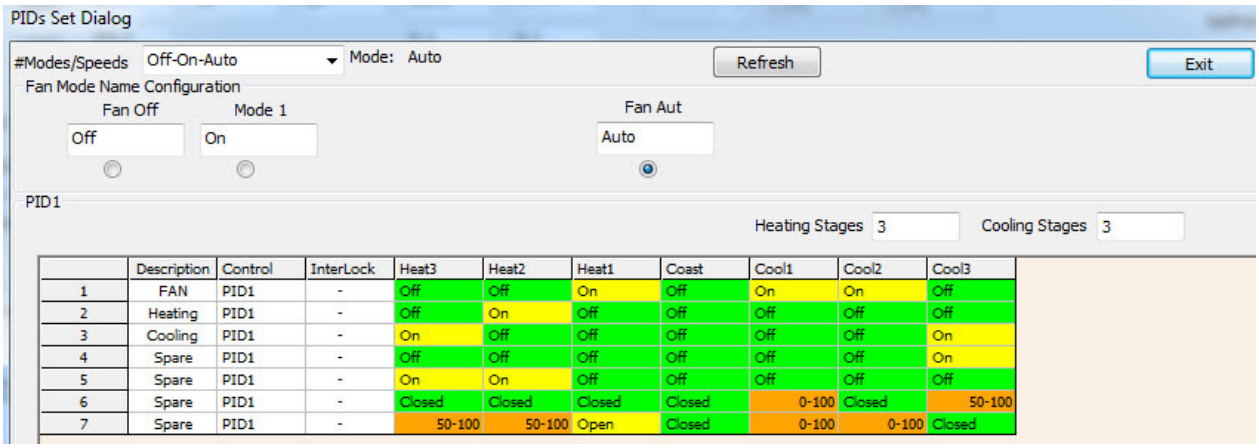
Click on the gear icon to get to the advanced settings.

3 PIDs Table



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

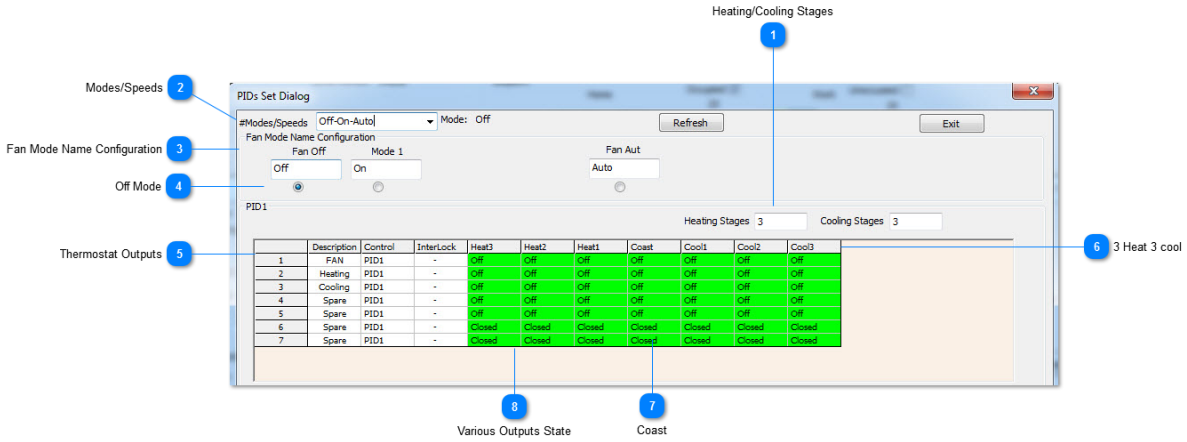
4 PIDs Set Dialog



	Description	Control	InterLock	Heat3	Heat2	Heat1	Coast	Cool1	Cool2	Cool3
1	FAN	PID1	-	Off	Off	On	Off	On	On	Off
2	Heating	PID1	-	Off	On	Off	Off	Off	Off	Off
3	Cooling	PID1	-	On	Off	Off	Off	Off	Off	On
4	Spare	PID1	-	Off	Off	Off	Off	Off	Off	On
5	Spare	PID1	-	On	On	Off	Off	Off	Off	Off
6	Spare	PID1	-	Closed	Closed	Closed	Closed	0-100	Closed	50-100
7	Spare	PID1	-	50-100	50-100	Open	Closed	0-100	0-100	Closed

PIDs Set Dialog shows the details of the setting.

OFF Mode

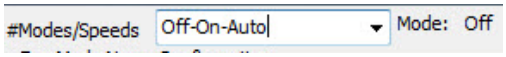


1 Heating/Cooling Stages



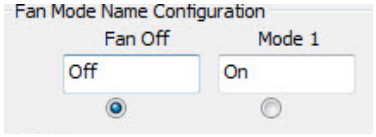
Here we set how many stages of heating and cooling the system will have. Since this is a three speed fan we can set three heating/cooling at this tab.If we set 2 or other number of heating and cooling stages,there will be corresponding quantity of tabs.

2 Modes/Speeds



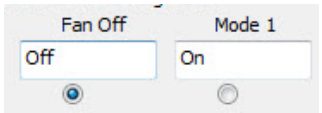
Select here from the available options, this establishes the various modes the thermostat will operate in and also whether the user will be able to set the stat in certain modes or not. For example if you select OFF-ON-AUTO the user will be able to select up to three modes from the keypad: OFF, ON and 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 Fan Mode Name Configuration



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

4 Off Mode



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.

5 Thermostat Outputs

	Description
1	FAN
2	Heating
3	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	Cool1	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.

7 Coast

Coast
Off
Off
Off
Off
Off
Closed
Closed

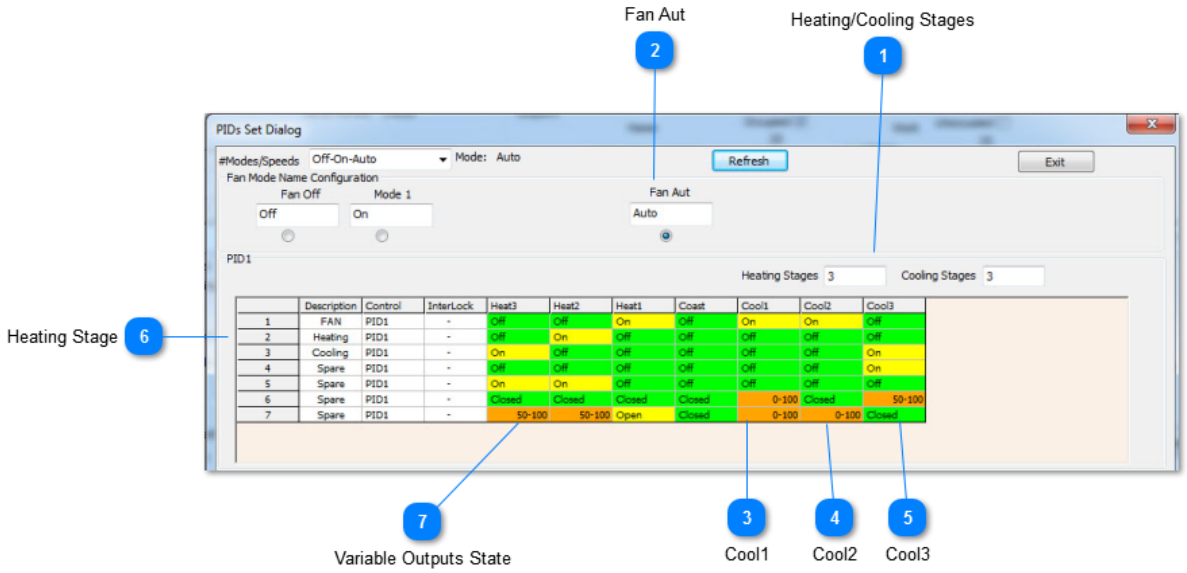
The center column represents the thermostat at rest, the setpoint is satisfied and the system is coasting.

8 Various Outputs State

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	Off	Off	Off
Off	Off	Off	Off	Off	Off	Off
Closed	Closed	Closed	Closed	Closed	Closed	Closed
Closed	Closed	Closed	Closed	Closed	Closed	Closed

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.

AUTO Mode

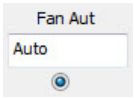


1 Heating/Cooling Stages



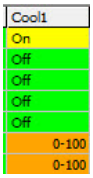
Here we set how many stages of heating and cooling the system will have. Since this is a three speed fan we can set three heating/cooling at this tab.If we set 2 or other number of heating and cooling stages,there will be corresponding quantity of tabs.

2 Fan Aut



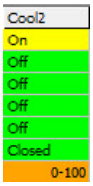
Now select the Auto mode. The state of each of the outputs has been set to on, off or modulating on all of the various states.

3 Cool1



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

4 Cool2



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

5 Cool3

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% .

6 Heating Stage

2	Heating	PID1	-	Off	On	Off	Off	Off	Off	Off

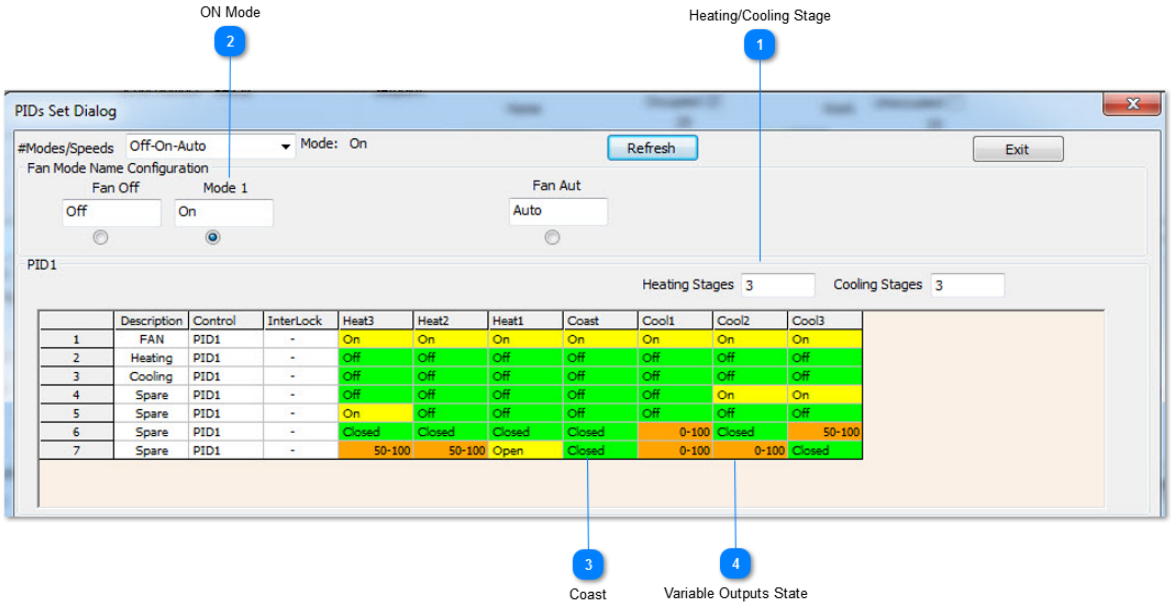
The same sequence is set up to the right of the table for the three stages of heating. The heating valve modulates open as shown and the cooling valve is closed for all stages of heating.

7 Variable Outputs State

Off	Off	On	Off	On	On	Off
Off	On	Off	Off	Off	Off	Off
On	Off	Off	Off	Off	Off	On
Off	Off	Off	Off	Off	Off	On
On	On	Off	Off	Off	Off	Off
Closed	Closed	Closed	Closed	0-100	Closed	50-100
50-100	50-100	Open	Closed	0-100	0-100	Closed

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.

ON Mode

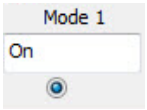


1 Heating/Cooling Stage



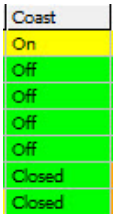
Here we set how many stages of heating and cooling the system will have. Since this is a three speed fan we can set three heating/cooling at this tab.If we set 2 or other number of heating and cooling stages,there will be corresponding quantity of tabs.

2 ON Mode



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.

3 Coast



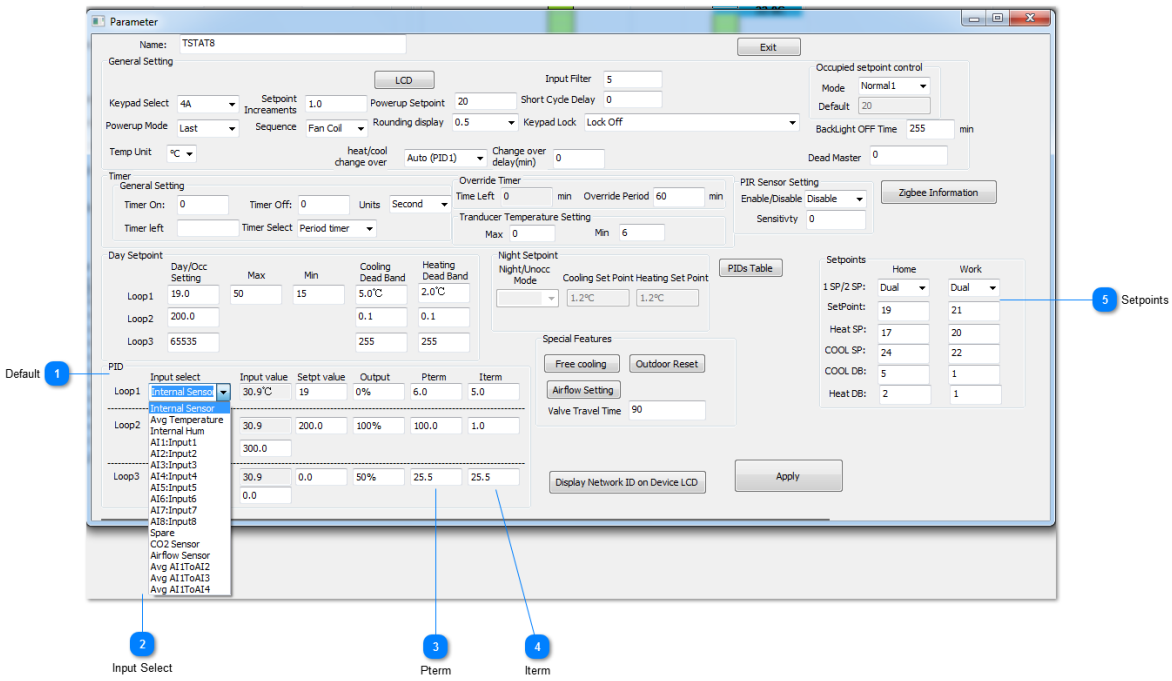
The stages of heating and cooling are set up exactly as everything was done in the Auto mode,the only difference is the Coast tab, you can see that the fan will be on in the coasting mode. This means even when the setpoint is satisfied at least the low speed fan will be on and the heating & cooling valves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

4 Variable Outputs State

On	On	On	On	On	On	On
Off	Off	Off	Off	Off	Off	Off
Off	Off	Off	Off	Off	Off	Off
Off	Off	Off	Off	Off	On	On
On	Off	Off	Off	Off	Off	Off
Closed	Closed	Closed	Closed	0-100	Closed	50-100
50-100	50-100	Open	Closed	0-100	0-100	Closed

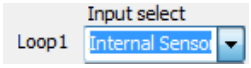
In all other stages of heating stage three on over to cooling stage3, the fan and valve are sequenced just like they were in the auto table.

PID Loop Setting



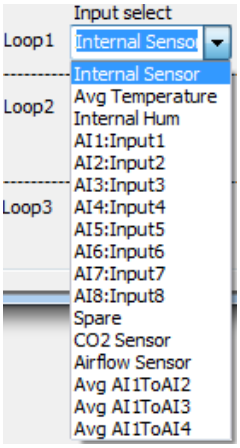
PID loop

1 Default



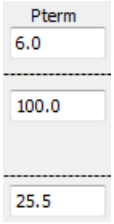
Now we set up the PID loop, for the most part you can leave the settings at their default.
You can select which of the inputs will provide feedback for the PID loop, the default is the internal temperature sensor.

2 Input Select



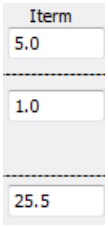
For the PID feedback you can select from many options such as the average of some sensors, any of the 8 external sensors or the internal humidity or C02 sensor if it has one.

3 Pterm



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.

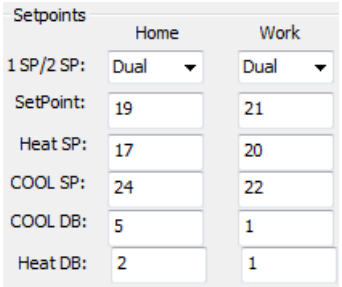
4 **Iterm**



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 = hyperactive
Small I = lazy, over time.

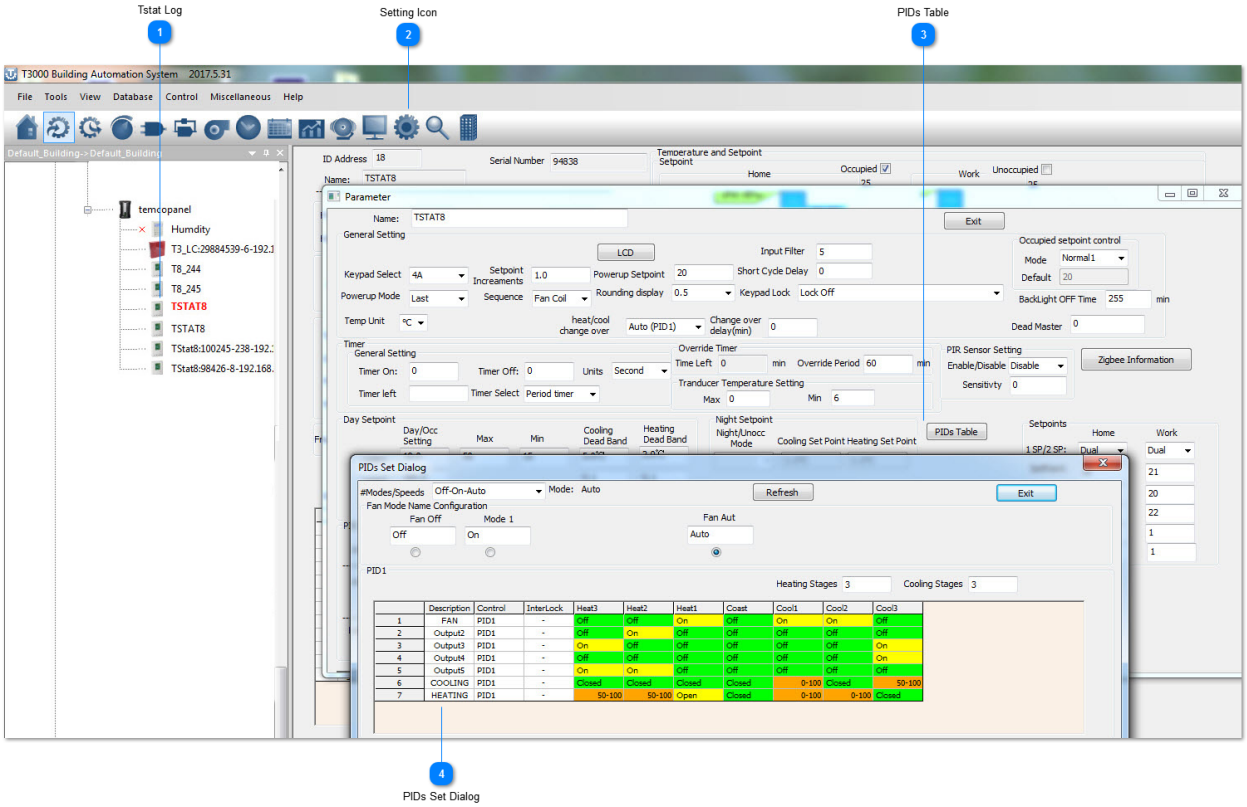
5 **Setpoints**



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



1 Tstat Log



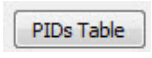
Click on the gear icon to get to the advanced settings.

2 Setting Icon



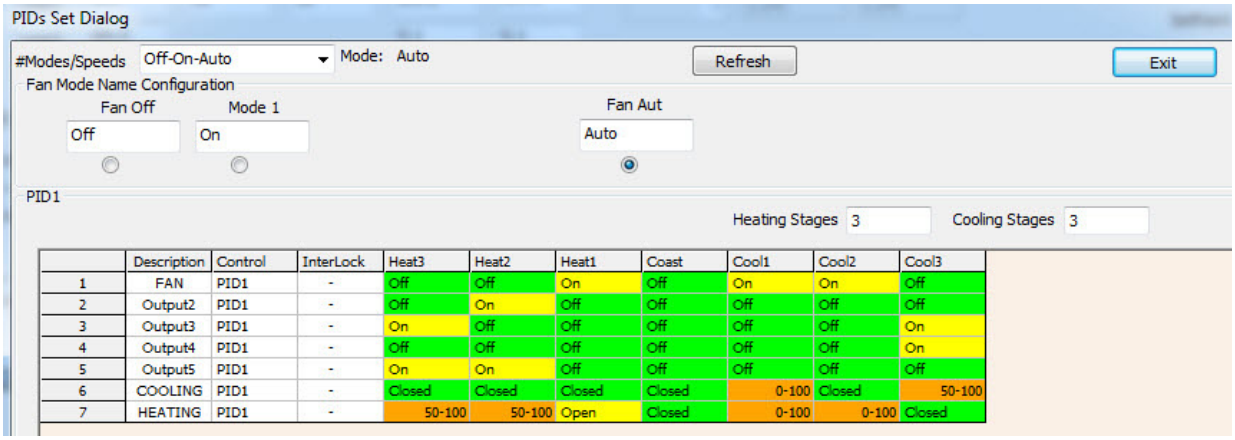
Click to get to the PID tables, this is where we assign outputs to act over each stage of heating and cooling.

3 PIDs Table



<TODO>: Insert description text here...

4 PIDs Set Dialog



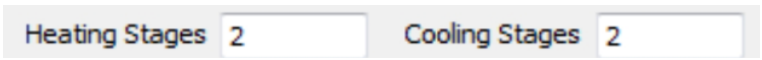
	Description	Control	InterLock	Heat3	Heat2	Heat1	Coast	Cool1	Cool2	Cool3
1	FAN	PID1	-	Off	Off	On	Off	On	On	Off
2	Output2	PID1	-	Off	On	Off	Off	Off	Off	Off
3	Output3	PID1	-	On	Off	Off	Off	Off	Off	On
4	Output4	PID1	-	Off	Off	Off	Off	Off	Off	On
5	Output5	PID1	-	On	On	Off	Off	Off	Off	Off
6	COOLING	PID1	-	Closed	Closed	Closed	Closed	0-100	Closed	50-100
7	HEATING	PID1	-	50-100	50-100	Open	Closed	0-100	0-100	Closed

PIDs Set Dialog shows the details of the setting.

OFF Mode



1 Heating/Cooling Stage



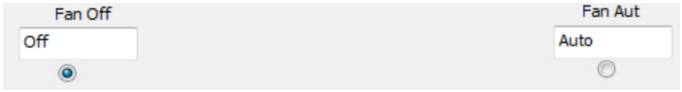
Set the number of stages of heating and cooling.

2 Modes Setting



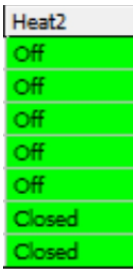
You can set the number of modes at the tab, two modes have been selected here with the default names as Off and Auto.

3 OFFSelecting



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.

4 Heat2



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

5 Various Outputs State

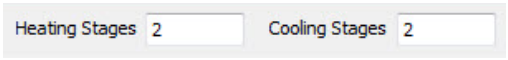
Heat2	Heat1	Coast	Cool1	Cool2
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
Off	Off	Off	Off	Off
Closed	Closed	Closed	Closed	Closed
Closed	Closed	Closed	Closed	Closed

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.

AUTO Mode



1 Heating/Cooling Stage



Set the number of stages of heating and cooling.

2 Fan Aut



Fill in the grid for the Auto mode.

3 Heat2

Heat2
On
Off
Off
Off
Off
Closed
Open

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.

4 Coast

Coast
Off
Off
Off
Off
Off
Closed
Closed

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 respond to when receiving serial communication. Each tstat must have a unique address on the network.
Temperature Calibrate	**[CAL] Calibration of the on board Temperature Sensor (0-1000, 500)** 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 and the thermometer should be left near the thermostat for the same amount of time. The 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. *Make sure the tstat is mounted in a location free of drafts. Drafts from the back will also affect readings.
Temperature Select	**[tSS] Temperature Sensor Select (0-3, 0)** The tstat has an extra input which can be used as an external temperature sensor. 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)
Temperature Filter	**[FIL] Temperature Sensor Filter (0-10, 5)** Filter used for the raw temperature being read by the sensor. 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 readings more but make them respond more slowly. This setting should not need to be adjusted for most applications.
Baudrate Select	**[bAU] Baud Rate (1200-115200, 9600)** This will adjust the speed (baud rate) of which the thermostat communicates. This value must match the device it is connected too.
Short Cycle Delay	**[dSC] Short Cycle Delay (0-20, 0)** This parameter adjusts the delay between cycling between the modes of operation. 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-Over Delay	**[dCH] Changover Delay (0-200, 0)** This parameter adjusts the delay between switching from a heating mode of operation 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.
Proportional Term	**[PPr] Proportional Term (10-255, 20)** The proportional term is the 'P' term of the familiar PID control strategy and determines 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 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 described 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)
Integral Term	**[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 setpoint. 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 example, 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 opposite 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 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.
Operation Sequence	**[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, Coasting, 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.temcocontrols.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 analog 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 commissioning 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 rotation. 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 Config	**[HC] Heating Cooling Mode Configuration (0-5, 0)** This item configures the method by which the tstat determines the heating or cooling 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 keypad configurations in which the user or serial comminication can manually set heating 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 supply 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 Deadband Cooling Deadband	**[Cdb] [Hdb] Heating & Cooling Deadbands (1-200, 10)** If there is one setpoint then heating setpoint follows the cooling setpoint and is calculated by: Heating Setpoint = Setpoint - Heating Deadband. Cooling Setpoint = Setpoint + Cooling Deadband. If there are two setpoints heating and cooling are separately adjusted. The setpoints 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 Deadband NightCool Deadband	**[nCd] [nHd] Night Cooling Deadband (0-99, 10) for deg C and F / Night Heating Deadband (0-35, 10) for deg C, (0-95, 10) for deg F.** When the tstat is in unoccupied mode and APP is set to 0 then the heating setpoint is adjusted downwards by the amount of the nHd. The cooling setpoint is adjusted

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 Setpoint NightCool Setpoint	**Set night heating setpoint and night cooling setpoint, in degree C or degree F**
Applica-tion Mode	**[APP] Application (0-1, 0)** 0 - OFFICE applications 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 setpoints Night Heating Setpoint = Cooling Setpoint - nHd value. Night Cooling Setpoint = Cooling Setpoint + nCd value.
PowerUp Setpoint	**[POS] Power on setpoint (0-255, 20) for deg C, (0-255, 68) for deg F** 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 On/Off	**[POn] Power on Mode (0-3, 3)** 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 to power up in whatever state it was in before the power outage.
Analog-Out1 Setting Analog-Out2 Setting	**[Ou1] [Ou2] Output settings (0-4, 0)** Sets the full-scale voltage of the analog outputs. Ou1 sets analog out 1 (Cooling). Ou2 sets analog out 2 (Heating). This setting is used to match the analog outputs to various types of actuators, transducers or other controllers. For example, by set-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 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.

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-point	**[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 cannot 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 experimenting 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 anything 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.
Valve-Travle Time	**[Vtt] Valve Transient Time (10-255, 0)** 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 microcontroller 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:*http://tinyurl.com/ybaj9d3u*

Tstat8 Bacnet Thermostat

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 576=57600 1152=115200 unit:bps
1	Station Number
2	Protocol switch. 0 = MODBUS,1=MSTP.
3	Instance Number
4	Schedule enable/disable 1:enable 0:disable
5	Occupied/Home/Day setpoint
6	Unoccupied/Work/Night setpoint
7	Fan mode setting 0:unoccupied mode,1:user mode1,2:user mode2,3:user mode3,4:occupied mode
8	Firmware Version
9	Current Mode of Operation 0:coast mode 1: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 only mode
12	spare
13	Override Timer Unit:minute
14	Pid loop2 occupied setpoint
15	Pid loop2 unoccupied setpoint
16	Output Manual/Auto, each bit indicate each output 0:auto 1:manual

AI	description
AI1	Analog input 1
AI2	Analog input 2
AI3	Analog input 3
AI4	Analog input 4
AI5	Analog input 5
AI6	Analog input 6
AI7	Analog input 7
AI8	Analog input 8
AI9	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 1: on 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
AO1	Analog output1 value
AO2	Analog output2 value

Tstat7 Thermostat

Description



Tstat7 keypad open



Tstat7 keypad close



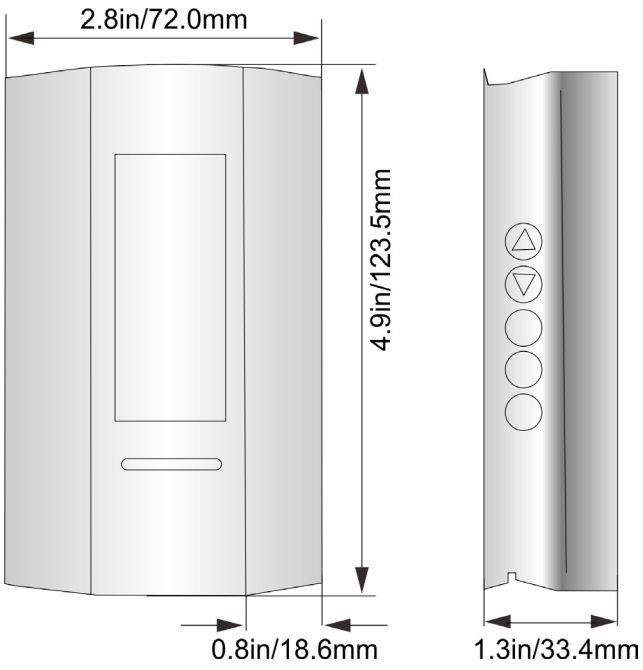
Tstat7

Excellent thermostat with high accuracy temperature sensor and PI algorithm provide a comfortable indoor environment with its built in sensor, which is located in the controller and it will not be affected by the temperature off the wall on which it is mounted on. It is possible to connect an external sensor for monitoring the temperature of different locations.

This full-featured CPU based thermostat is designed for small cooling and heating air handling systems in residential and commercial facilities. The unit provides features which eclipse standard mechanical thermostats at a price that fits conventional HVAC projects.BACnet MS/TP and Modbus RTU protocols over RS485.

Specifications

Relays x 1amps @24V	8 analog inputs
2 analog outputs	(10V @100ma)
Temperature range	40~100°C (-40~212°F)
Supply voltage	24VAC ±20%, 50-60Hz
Power consumption	100mA at 12VDC
Relay contacts rating	Max 6A
Operation	0~70°C (32~158°F)
Controlling	40~100°C (-40~212°F)
Storage	2~50°C (35~120°F)
Ambient humidity	10-90 % Rh
Operating Environment	0 ~ 99% humidity (non condensing)
Material enclosure	Flame proof plastic
Enclosure rating	IP31
Temperature sensor	10K thermistor ±0.5°C
Weight	200 grams
Color	White and off-white



Tstat7 Thermostat

Part Number Scheme

TSTAT7-H

Code	Description
TSTAT7	Thermostat

Code	Option
	Temperature&Clock
Occ	Clock&Temperature&Occupancy sensor
H	Clock&Temperature&humidity

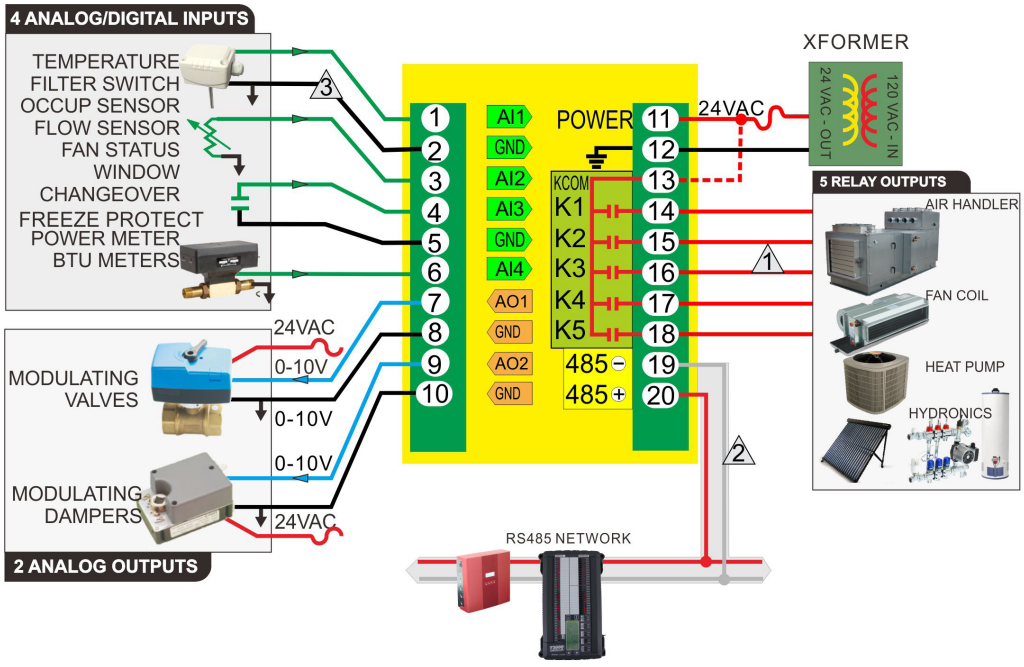
Typical Wire Routing

For proper safety all wiring and controllers should be installed separately to avoid accidently contact with one another. Make sure to keep wiring and equipment/controllers six feet from power distribution, motors, etc. If these conditions are not satisfied; irregularities can occur with the system.

With this easy to install and manage product, building developers/managers can deliver a system that exceeds expectations. Comfort control is made possible at a cost savings like no other.



Wiring Diagram



1. Relay outputs: 24VAC@1amp max, 3 amp combined max for all 5 outputs
2. RS485 network, 2 conductor with optional shield, 1200 meters and 64 devices max
3. Sensors, valves, dampers and equipment all share one common ground

Tstat7 Thermostat

The wiring diagram above outlines the basic functions the TSTAT7 thermostat can do for you. With four analog/digital inputs you can plug in occupancy sensors, flow sensors, fan status, freeze protection, power meters and BTU meters just to name a few. There are 2 analog outputs that can be used for modulating valves and modulating dampers. It comes equipped with a RS485 network that can be connected to a controller like a boiler as illustrated above.

On the other side we have five relay output capabilities which can be used for air handler units, fan coil units, heat pumps and many other different types of hydronic applications.

The TSTAT7 thermostat is compatible with any desire you need and the perfect fit for your next installation.

Operational Functions

1) Adjustable set-points

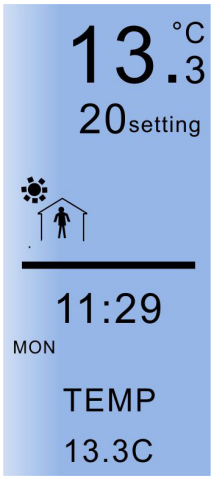
The buttons both the up arrow and down arrow allow the consumer to increase or decrease the desired set-point they wish to have. To adjust the set-point on the room sensor can only be done when the occupied symbol is being displayed on the LCD display. To increase the set-point temperature by a degree simply hit the up arrow button. To decrease the set-point temperature by a degree simply hit the down arrow button and continue either step until desired set-point is achieved. After the set-point is increased or decreased the LCD screen will display the current set-point, until the temperature in the room reaches the desired set-point (warmer/cooler) of the occupant.



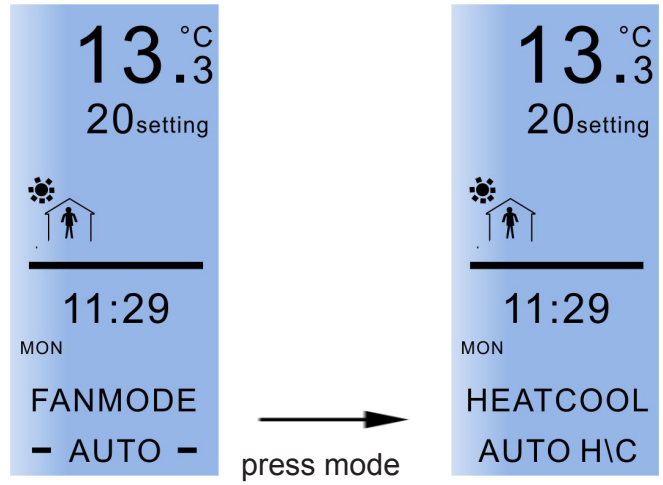
2) There are six buttons that operate the Tstat7:

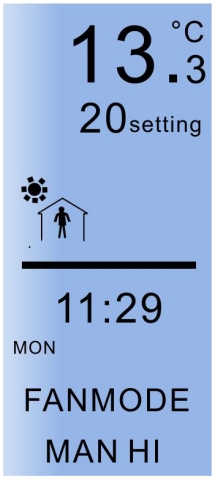
Buttons		Functions
△	Top button (right side)	Increases setpoint
▽	Second button from top (right side)	Decreases setpoint
MODE	FAN Mode: Middle button (right side)	Adjusts manually/automatically the fan speed to satisfy cool air temperature
MENU	Main MENU: Second button from bottom (right side)	Optimizes the settings of heating/cooling, clock, schedule, etc
OK	Ok: First button from bottom (right side)	To save or enter a setting in the main menu
▬	Override switch unmarked (center of front cover)	For new occupancy adjustments

a. Normal state

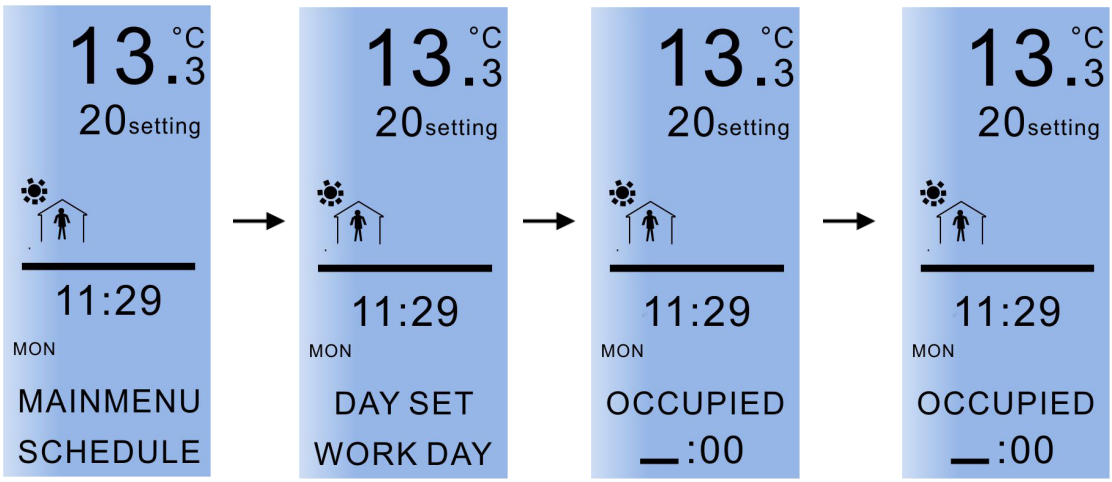


b. When press mode key, it will be switched between fan mode and heat\cool. When press up and down keys, it will go into the fan mode list or heat cool list.



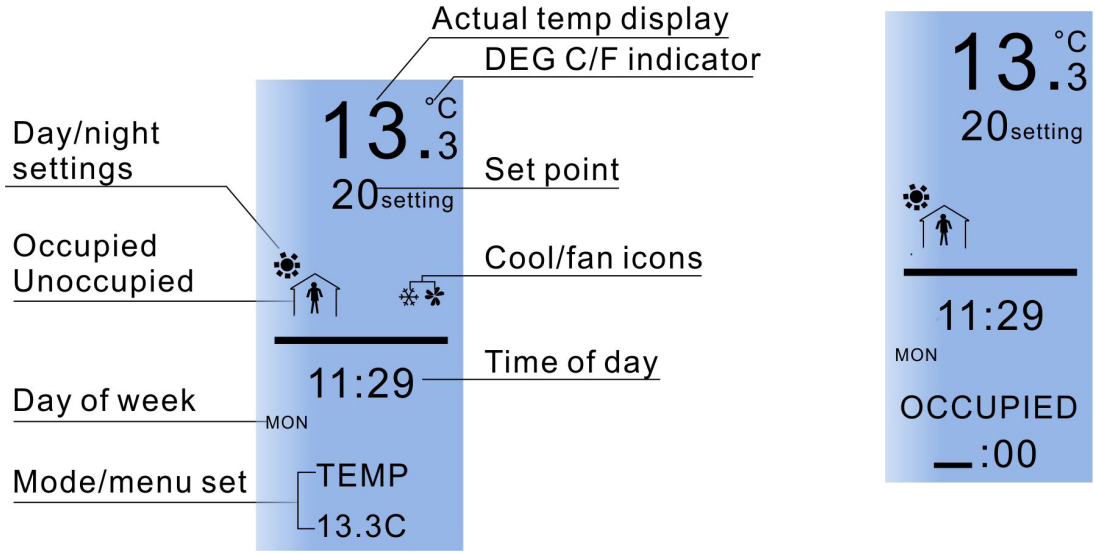


c. Now you are in the normal state, when press menu key, it will be switched between schedule, clock, advanced.
When it comes to schedule, press OK, go into the day set list.
Press menu key go into the occupied\unoccupied time set and press up\down arrow key, will increase or decrease the hour. Press menu key, it will switch to the minute list.



b. Now you are in the normal state, when the menu key is pressed, the unit will switch between schedule, clock and advanced screens. To change the unit's ID press menu and keep pressing menu until 'advanced' is displayed on the screen. Press 'ok' and it will display 'sensor internal'. Repeatedly press menu until you reach 'net ID'. To change the net ID press the up and down arrows to increase or decrease the value from 1 to 254. Upon choosing a desired value, leave the unit for six seconds and the value will be stored.

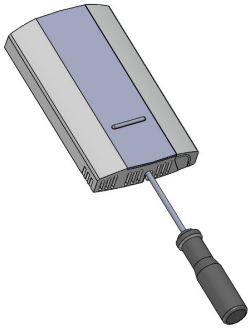
3) LCD Display Features



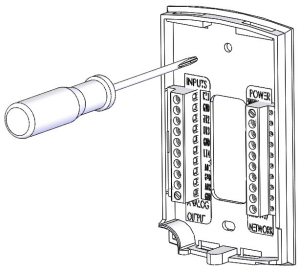
The LCD panel displays a wide variety of functions that Tstat7 thermostat can do to create a comfort level like no other. Be able to automatically adjust the heat, cool, and fan modes to which ever temperature you desire; day or night. You can also program the thermostat to operate at a lower level when the room or building is unoccupied, saving energy and costs on your electric bill, what's more, the earth will become more and more beautiful and ecological.

Installation Mounting

1)Unfasten the screw located at the base and lift off the front panel of the enclosure.

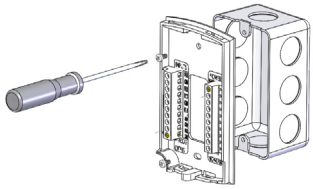


2)Wall mount: Fasten the screws on the back panel to the wall, and re-attach the front panel to the now mounted panel. Refasten the screw at the base connecting both panels.



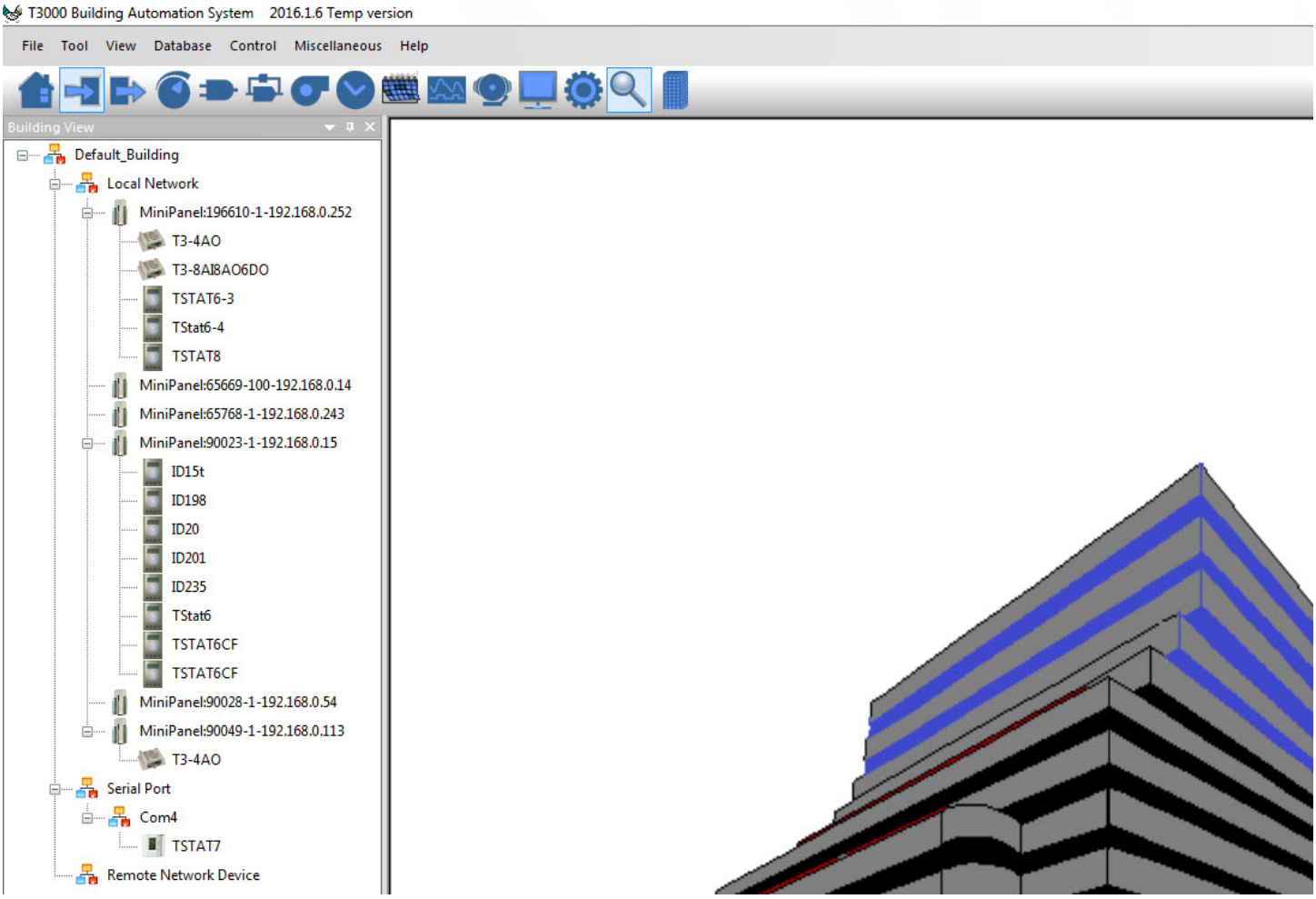
OR

3)Standard ‘11-10’ electrical box: Fasten the screws on the back panel to the electrical box, and re-attach the front panel to the now mounted panel. Refasten the screw at the base connecting both panels.

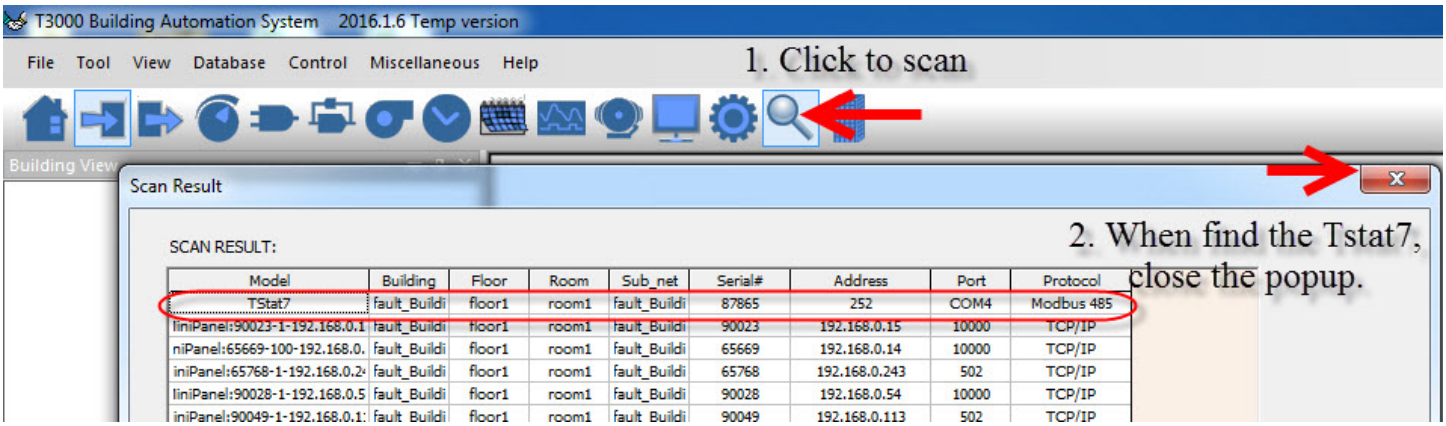


T3000 Software Instructions

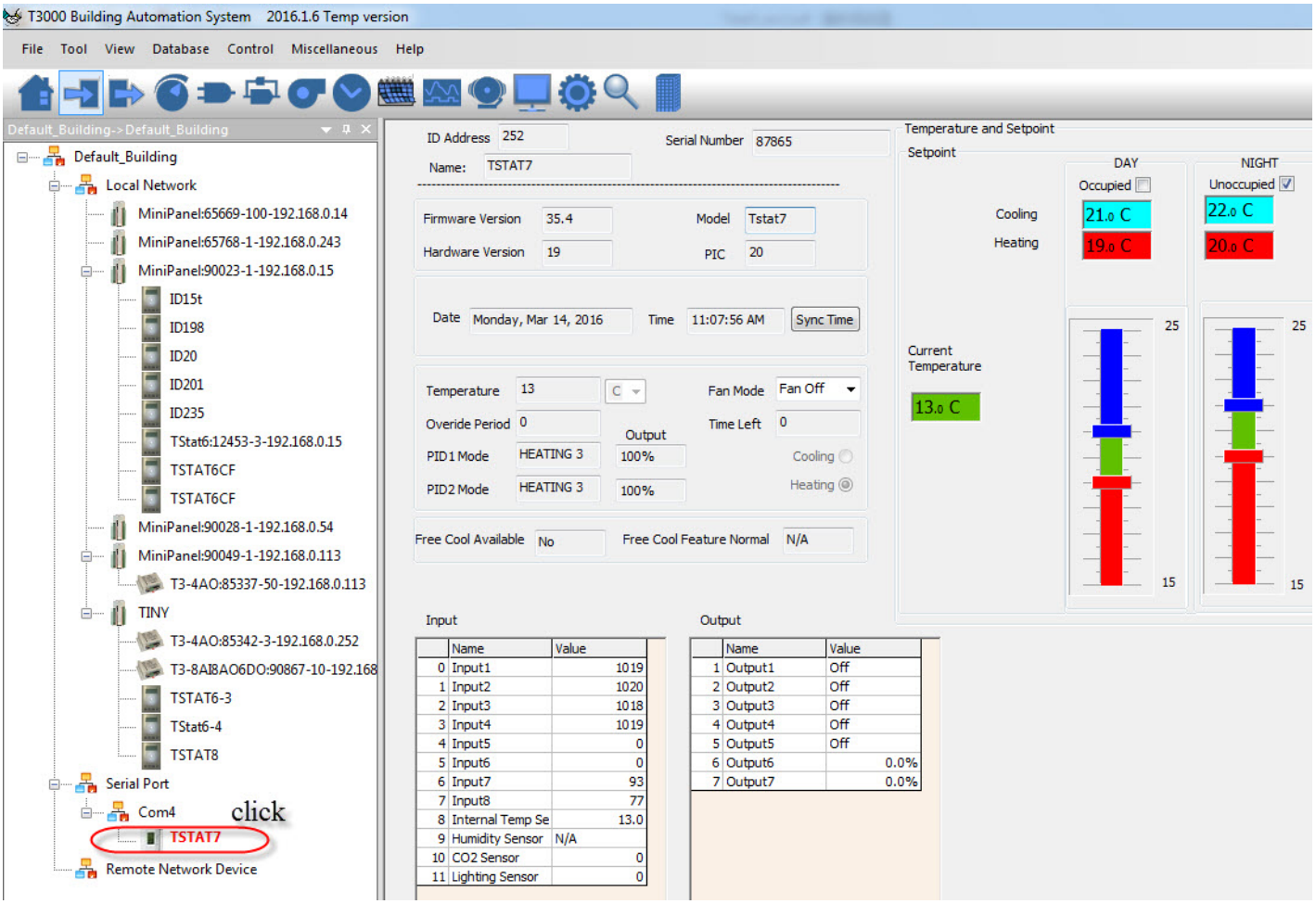
1. Visit *https://tinyurl.com/y7uyu9n3*, download T3000 software and install it;
2. Connect Tstat7 to PC via RS485 at pin 19 and 20. Start the software T3000, it will open below the view.



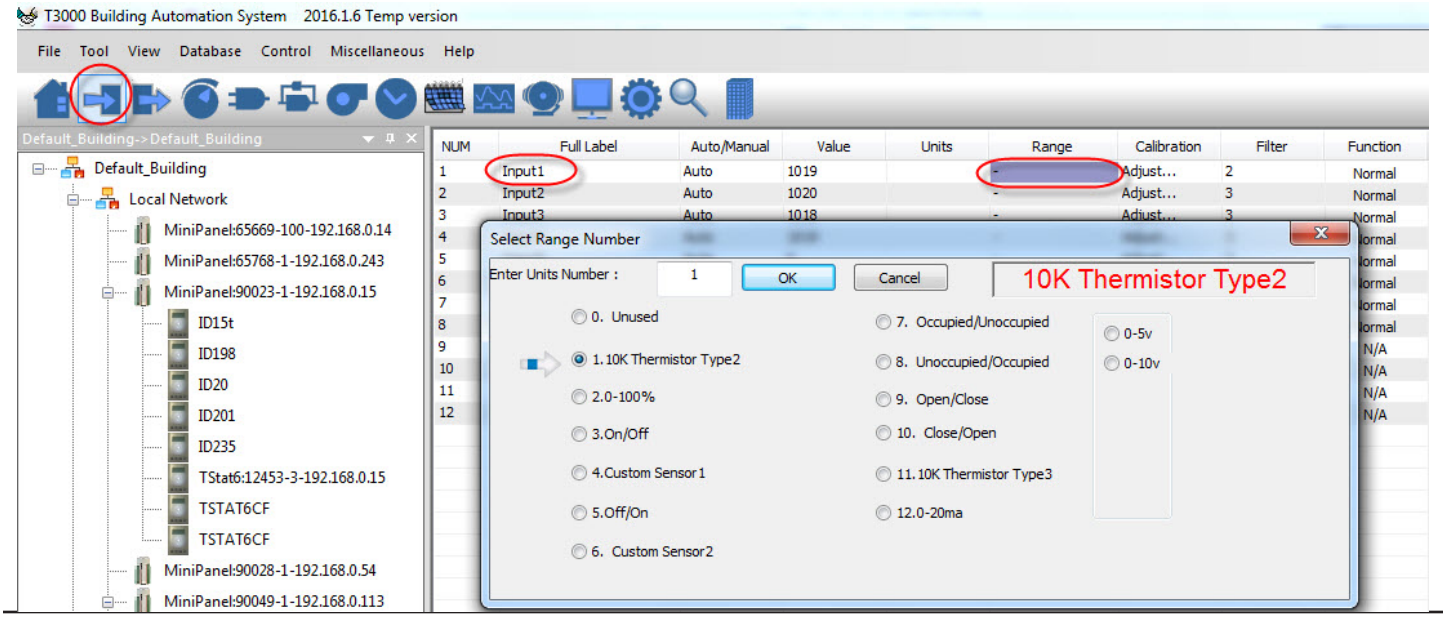
3. Click the button to scan, and the following view will appear then close the popup. It shows the tstat7 has been connnected.



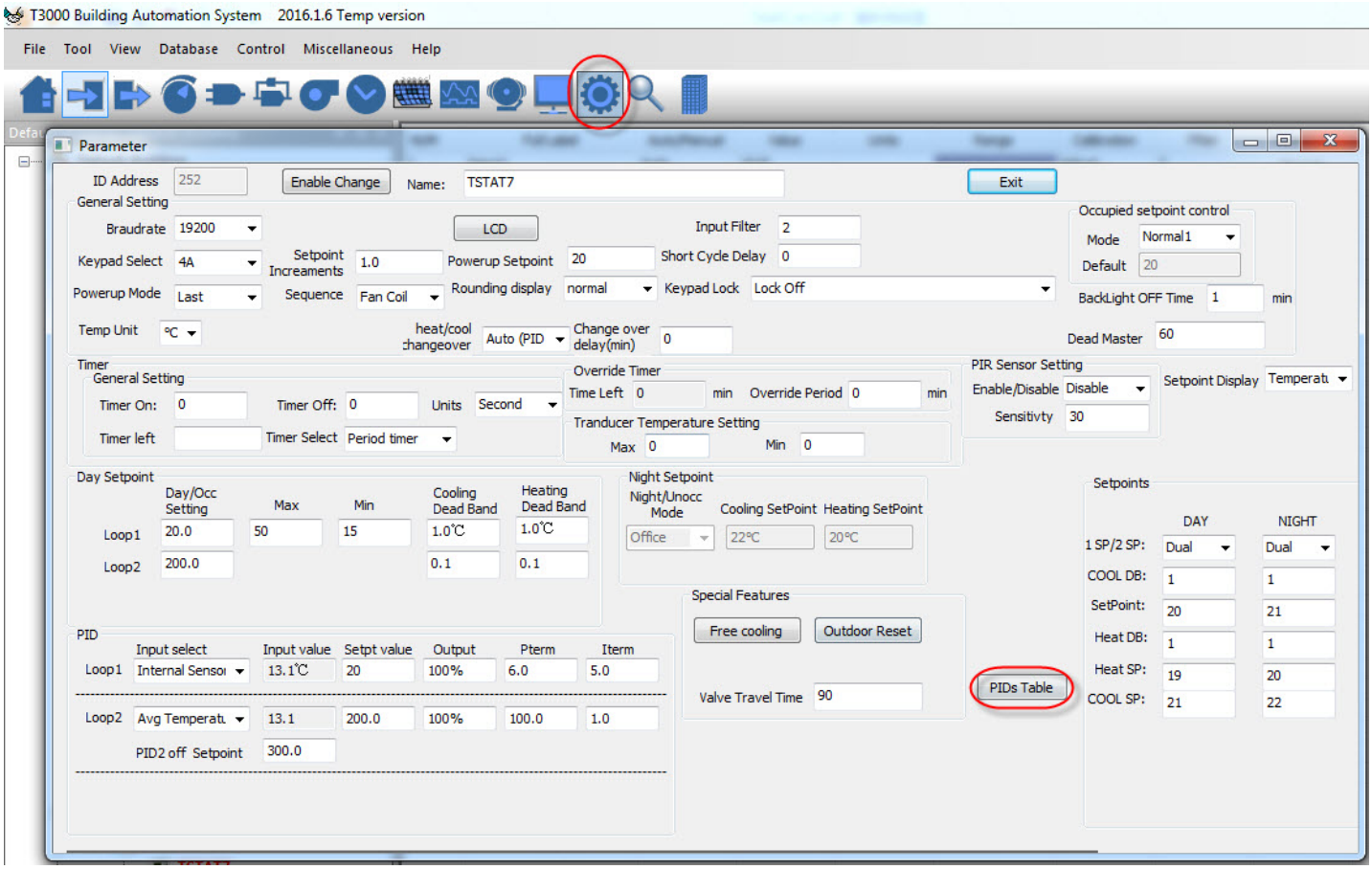
4. Click the Tstat7 log as below the red circle marks and right side will display the basic information of Tstat7.

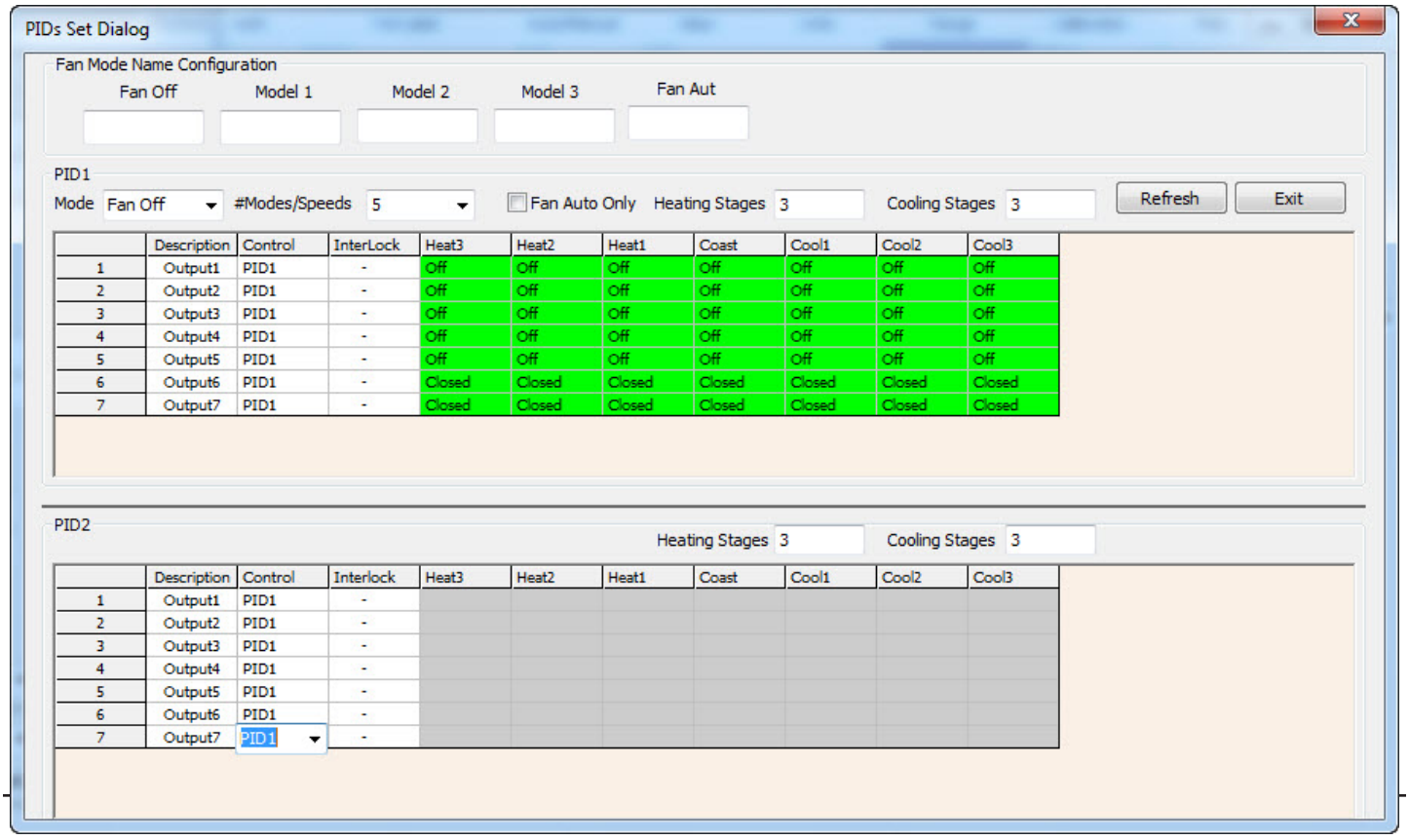


5. Click button input, it will show all the information of input, same as output.
When you press input1, you can change the name according to your demand.
When you press range, a pop up window will appear, there are different choices.



6. When press the setting button, it will show the parameter view. When click PIDs Table, it will open a PID popup.





Modbus Register List

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

PM-5E Temperature Controller

Descriptions

This full-featured CPU based thermostat with clock is designed for small cooling and heating air handling systems in residential and commercial facilities. The unit provides features which eclipse standard mechanical thermostats at a price that fits conventional HVAC projects.

The PM5 is very similar to the Tstat5 and Tstat6 series thermostats but note that there is no internal temperature sensor inside the PM5, you will need to connect an external sensor such as a temperature, humidity, or pressure sensor for feedback.

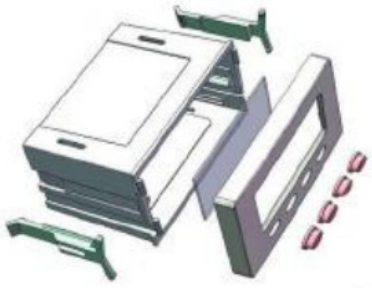


Highlights

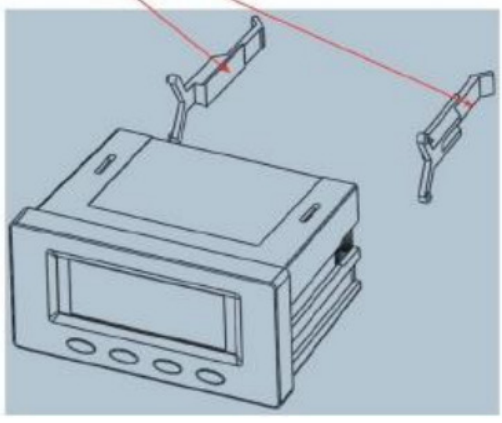
-Tight control of 0.5℃ provides comfortable indoor environment.
-High impact plastic enclosure provides durability in commercial environments.
-Customizable sequence of operation table (FCU with modulating or on/off valve, single or 3-speed fan, pressure independent VAV, stage sequencer…)

Thchnial Data

PM-5E	5 relays x 1amps @24VAC /110VAC / 220VAC, ±10% 8 universal inputs, 2 universal outputs (10V @100ma), with clock.
Operating temperature	-30~70℃ (-22~158℉)
Supply voltage	15~24VAC/DC ?10%, 50-60Hz
Power consumption	100mA at 12VDC
Relay contacts rating	max 6A
Ambient humidity	10-90 %Rh
Operating Environment	0 ~ 99% humidity non condensing
Plastic Housing	Flammability rating UL 94V0 file E194560
Enclosure rating	IP31
Temperature sensor	10K thermistor ?0.5℃
Colour	White/Off-white
Weight	200g

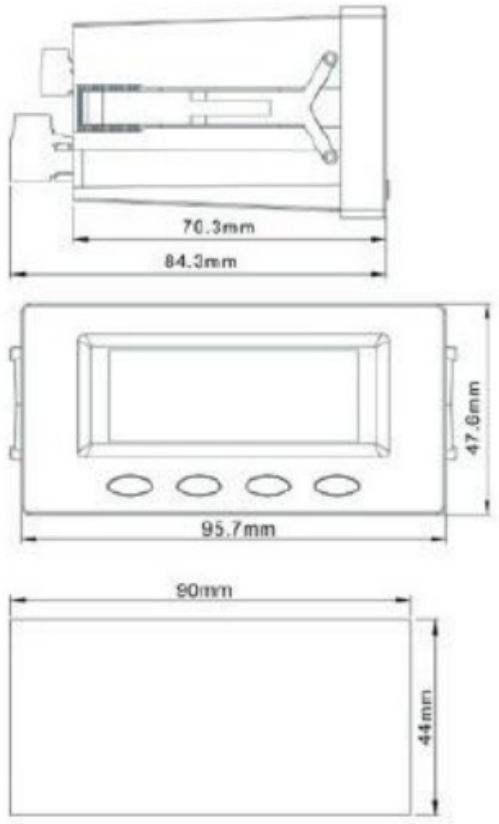


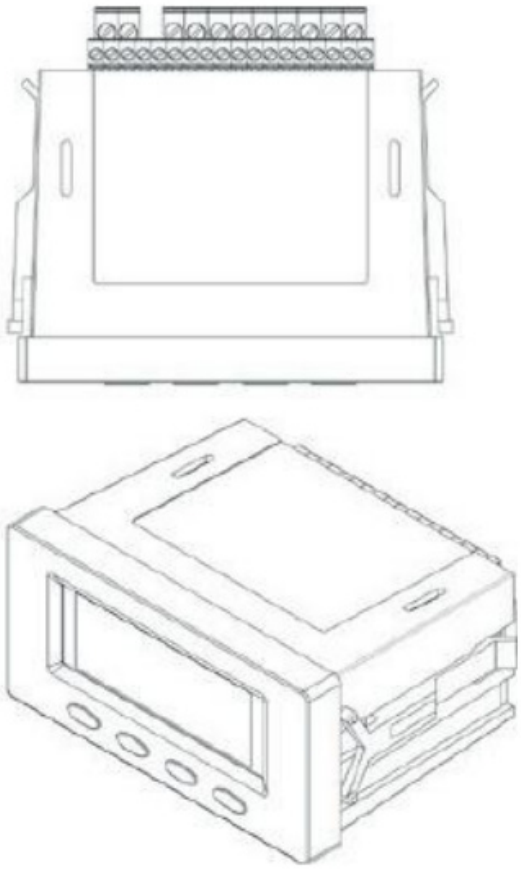
Snap Slider: Slide tab into slot to secure device in the panel.
No screws or other hardware required.



PM-5E Temperature Controller

Dimensions



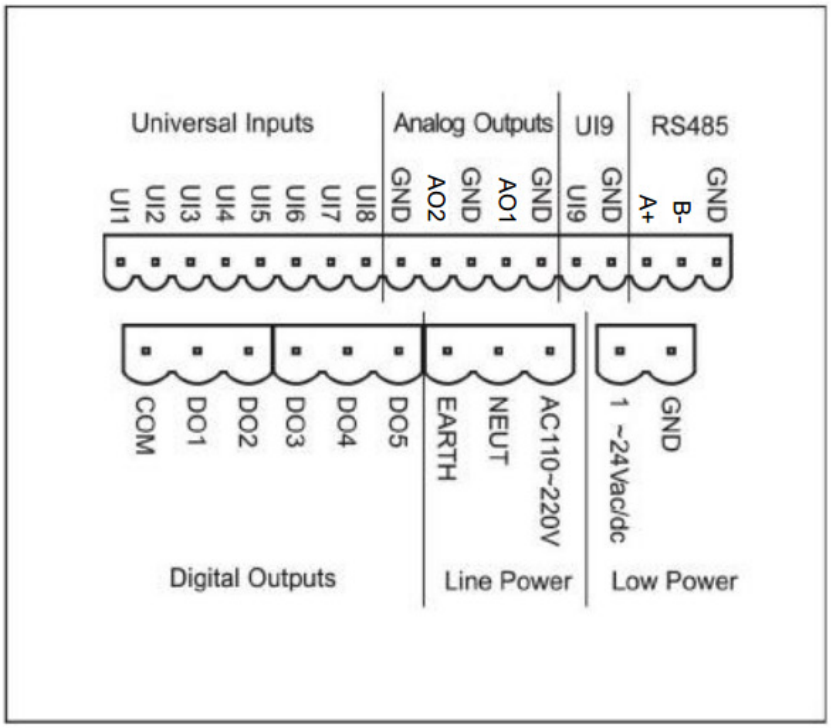


Terminal Block Diagrams:

The low power terminals can take anything from 15 to 24V AC/DC.

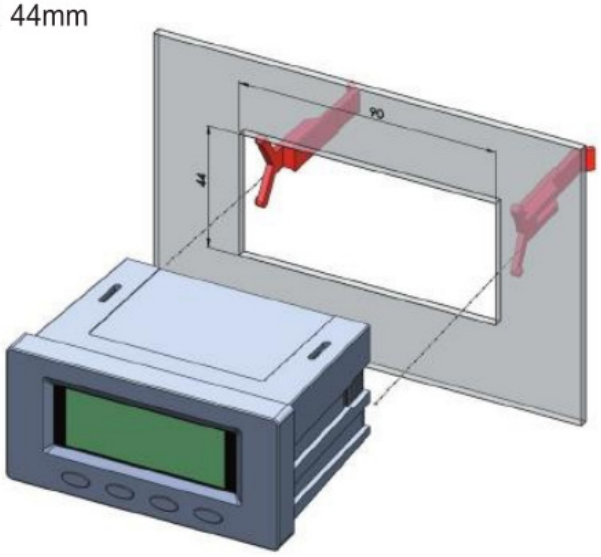
The high power terminals can take from 110 to 220V AC.

This two power supply cannot be used at the same time.

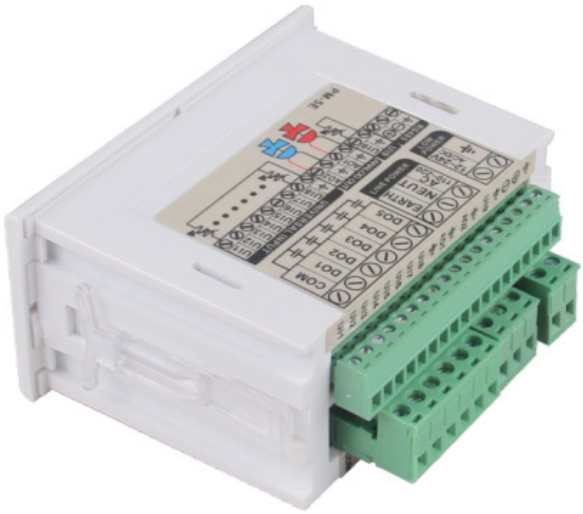


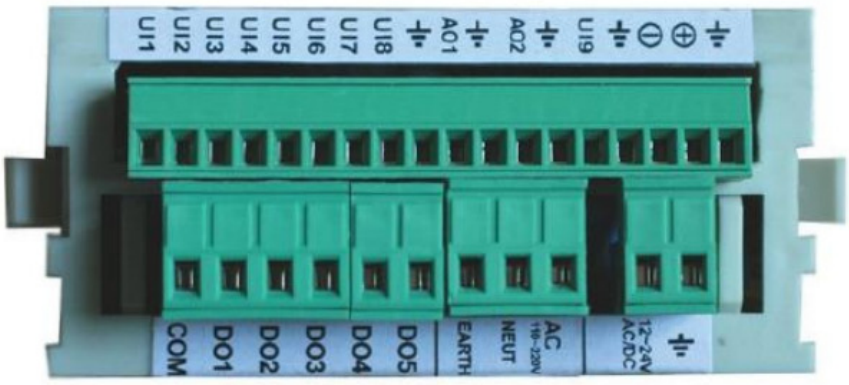
PM-5E Temperature Controller

Panel Cutout Size: 90 x 44mm



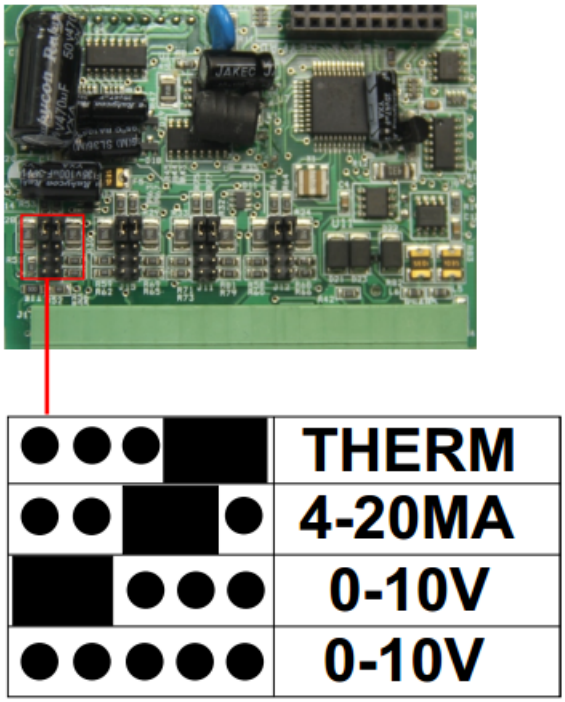






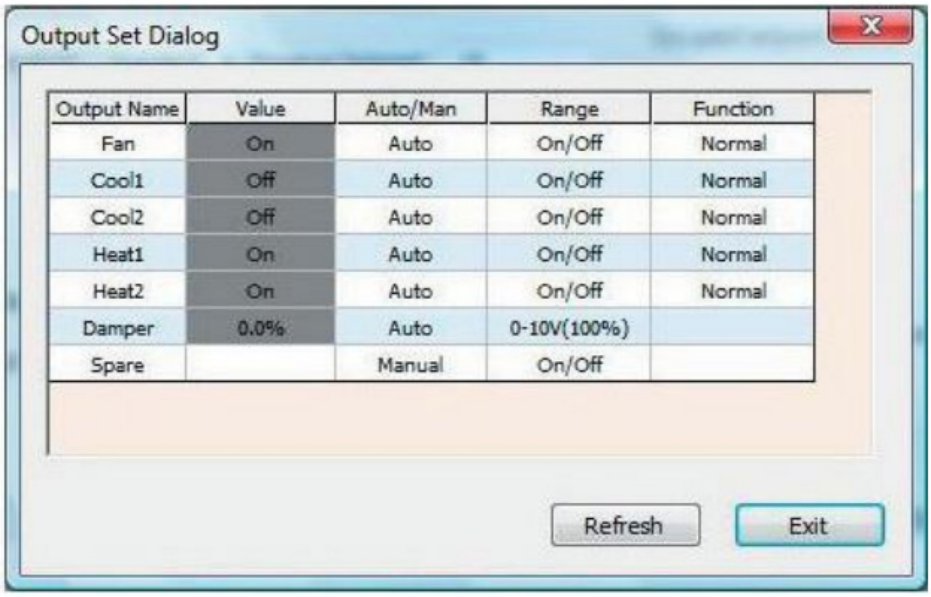
Jumper Settings

PM-5E jumper settings

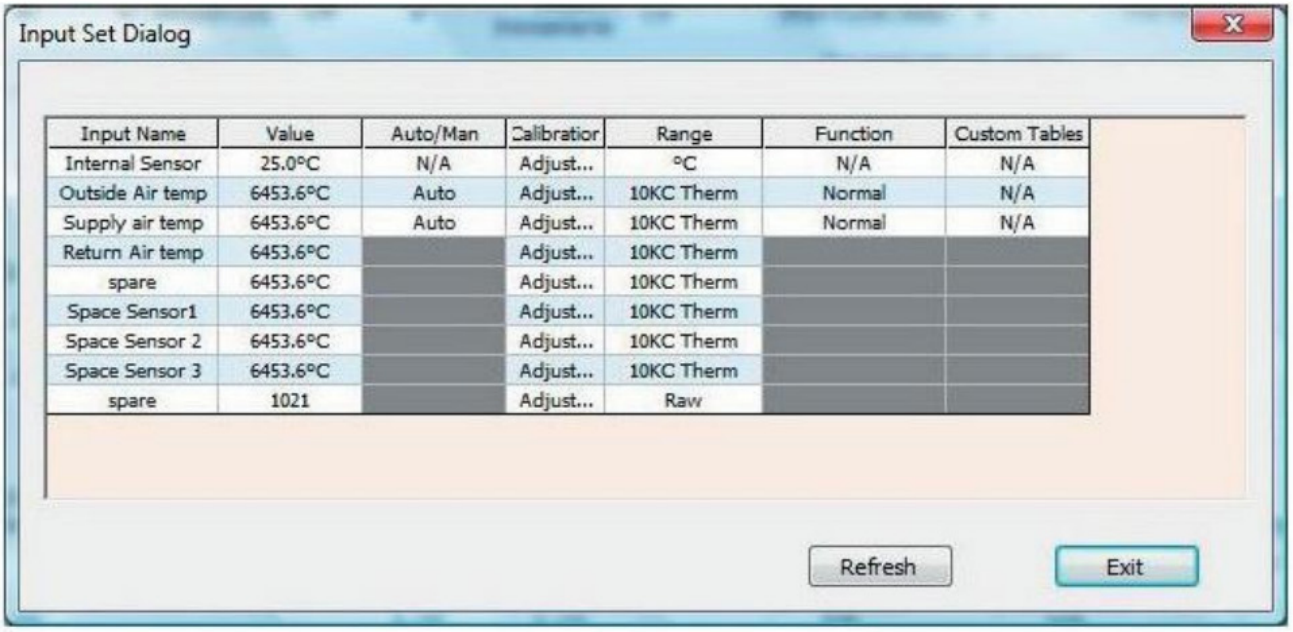


Two Heat Two Cool example

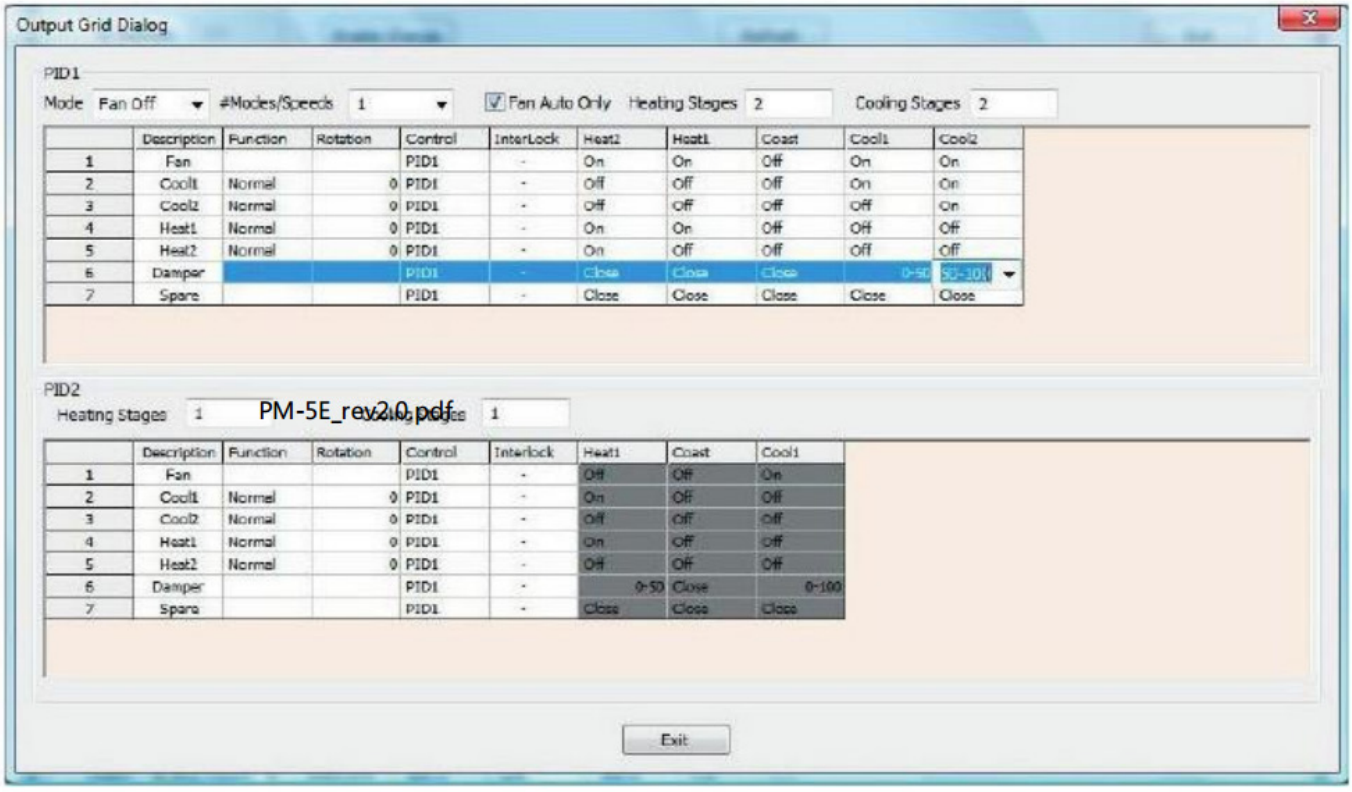
First go to the advanced -> outputs grid and type in the names of the outputs and configure as any output for any function.
Output 6 and 7 are the analog outputs, you can set the damper up on output6
Output 7 is spare.



Configure the inputs, the only thing to watch out for is inputs 1 and 2 are the only ones with special features attached to them, the 'Function' column.

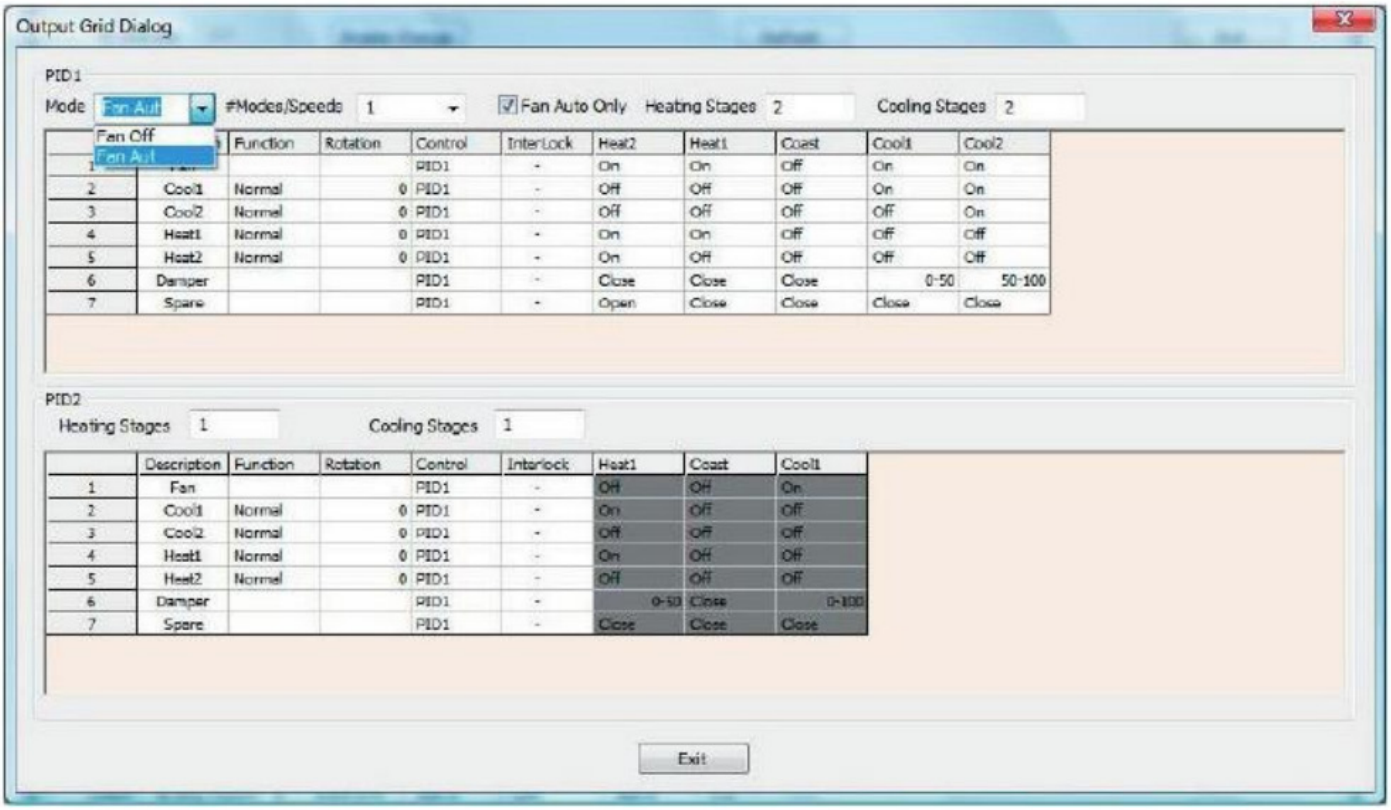


Here"s the outputs grid where you set up each output (row) for each stage of heating and cooling (the columns). Check auto only for now, skip the setup of the manual modes to keep thigns simple.The economizer is on output 6 and I"ve arbitrarily set it to open up 0-50 on stage 1 and 50 - 100% on stage 2 cool.

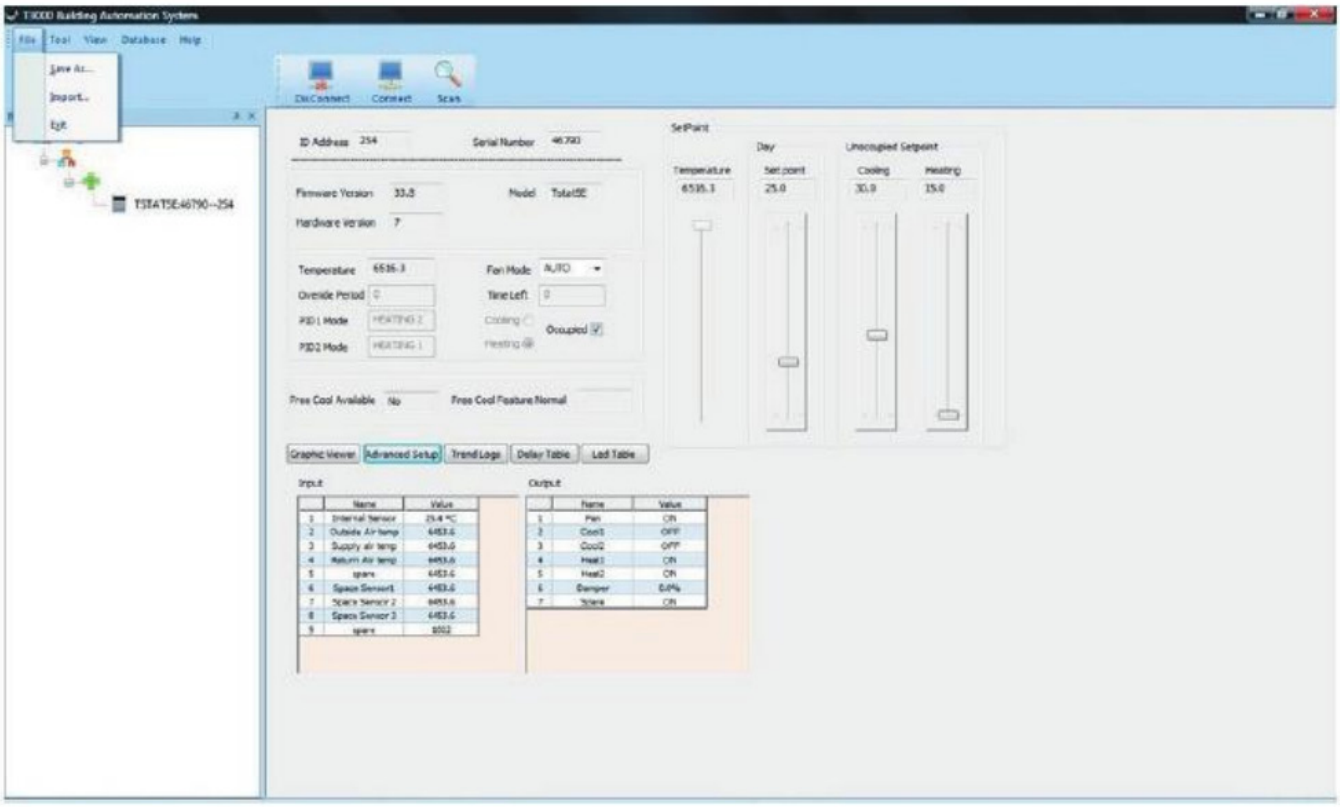


PM-5E_rev2.0.pdf

Next select the „mode"box at the top left and choose the Auto table, copy all the settings for the grid.
This feature lets you set up a particular output to be on or off in each of the various modes.
For example you could lock out the cooling completley at night by putting the Cool1 and Cool2 outputs (rows) to be off for all the columns (heat1,2,cool1,2 and so on).



Once you have the config all set up you can save it and quickly copy it to other stats using the File-Save and File ->Load commands in the menu system.



Register List

All of the registers of the tstat are accessible using the serial interface via the read and/or write commands.
is a detailed list of all of the tstat registers.

Note: When using the Modbus Poll software, addressing should be set to “Protocol Addresses (Base 0)” under the “Display” menu.

Address	Bytes	Range	Defaults		Register and Description
			癈	癈	
0 to 3	4	-	-	-	Serial Number - 4 byte value. Read-only
4 to 5	2	-	-	-	Software Version – 2 byte value. Read-only
6	1	0-255	254	254	ADDRESS. Modbus device address
7	1	0-255	-	-	Product Model. This is a read-only register that is used by the microcontroller to determine the product
8	1	0-255	-	-	Hardware Revision. This is a read-only register that is used by the microcontroller to determine the hardware rev
9	1	0-255	-	-	PIC firmware version
10	1	0-255	-	-	PLUG_N_PLAY_ADDRESS, „plug n play" address, used by the network master to resolve address conflicts. See VC code for algorithms
15	1	0-1	0	0	Base address selection. 0 = Protocol address, 1 = PLC address.
16	1	0-255	-	-	Update Register. Look below in ISP section
11 to 100					Blank, for future use
101	2	0-3000	-	-	ROOM TEMPERATURE reading in Deg from the sensor selected by TSS. Writing a temperature value to this register will calibrate the tstat by automatically adjusting the calibration register
102	2	0-1000	-	-	COOLING_VALVE, a number from 0-1000 representing 0% (closed) to 100% (open)
103	2	0-1000	-	-	HEATING_VALVE, a number from 0-1000 representing 0% (closed) to 100% (open)
104	2	0-100	-	-	PID, current PI calculation for cooling term
105					NOT USED FOR REV 25
106	1	0-3	-	-	COOL_HEAT_MODE, heating or cooling mode. 0=none, 1=cooling, 2=heating.
107	1	0-3	-	-	MODE_OPERATION, heating or cooling state: 0-7 = coasting, cooling 1,2,3, heating 1,2,3
108	1	0-255	-	-	DIGITAL_OUTPUT_STATE, bit 0 thru 4 = relay 1 thru 5.
109	2	0-1000	500	500	CALIBRATION, this is the calibration factor for the internal sensor, normally maintained by the tstat,
110	2	0-1000	500	500	CALIBRATION_EXTERNAL , this is the calibration factor for the external sensor, normally maintained by the tstat,
111	1	0-3	0	0	TEMP_SELECT, Sensor to be used for the PID calculations, 0 = internal sensor IC, 1= external sensor, 2 = internal thermistor, 3 = average the internal thermistor and external sensor
112	1	0-255	100	100	DAC_OFFSET , Calibration data for the 0-10VDC signal, internal variable maintained by tstat
113	1				NOT USED FOR REV 25
114	1	10-255	60	60	PTERM , proportional term for PI calculation
115	1	0-255	50	50	ITERM , integral term for PI calculation
116	1				NOT USED FOR REV 25
117	1				NOT USED FOR REV 25
118	1	0-2	1	1	SEQUENCE , control sequence ie fancoil, heatpump etc.
119	1	1-200	10	10	COOLING_DEADBAND , offset from setpoint for cooling to begin. Units of 0.1 deg.
120	1	1-200	10	10	HEATING_DEADBAND , offset from setpoint for heating to begin. Units of 0.1 deg
121	1	0-1	0	1	DEGC_OR_F , engineering units, Deg C = 0, DegF = 1
122	1	0-3	3	3	FAN , number of fan speeds. Single speed = 1 up to three speed fan = 3
123	1	0-35 (C) 0-95 (F)	10	10	NIGHT_HEATING_DEADBAND , heating deadband in the night time or OFF mode. Units of 1 deg.
124	1	0-99	10	10	NIGHT_COOLING_DEADBAND , cooling deadband for the night (OFF) mode. Units of 1 deg.
125	1	0-1	0	0	APPLICATION , application: 0 = office, 1 = Hotel or Residential
126	1	0-255	20	68	POWERUP_SETPOINT , setpoint on power up

Address	Bytes	Range	Defaults		Register and Description
			癈	癋	
127	1	0-3	2	2	POWERUP_MODE, mode of operation on power up. 0 = power off, 1 = power up in on mode, 2 = last value (default), 3 = auto mode.
128	1	0-5	1	1	KEYPAD_SELECT , variable to select various keypad arrangements. Refer to PAd description in Table 1: Advanced Menu ItemsNumber of buttons on the keypad The keypad can have up to six buttons. The setting is not normally adjusted in the field. Care should be taken to coordinate with the settings in register 106, the Heat / Cool changeover parameter128=0 , two buttons, for adjusting the setpoint.128=1 , 4 buttons, lower pair for the mode and upper pair for the setpoint. 128=2 , 6 button keypad, with heat cool manual selection. Lower pair for the mode, next pair for the setpoint and upper pair for the heat or cool mode. 128=3 , 6 button keypad, with separate heating and cooling setpoints. Lower pair for the mode, next pair for the cooling setpoint and uppermost pair for the heating setpoint.
129	1	0-2	0	0	AUTO_ONLY , enables or disables manual mode. 0 = Manual Fan Modes 1-x Allowed (depending on R122 value, 1 = Auto Mode Only, 2 = DDC mode, the user can not change setpoint and fan speed from keypad.
130	1				NOT USED FOR REV 25
131	1	0-255	50	99	MAX_SETPOINT, Setpoint high, the highest setpoint a user will be able to set from the keypad.
132	1	0-255	15	55	MIN_SETPOINT, Setpoint Low, the lowest setpoint a user will be able to set from the keypad.
133	1	0-3	0	0	SPECIAL_MENU_LOCK, Special menu lockout via keypad, serial port only, 0=Full Menu, 1=Menu Disabled, 2=User Menu, 3 = The user need adjust setpoint in menu mode
134	1	0-1	0	0	FACTORY_DEFAULTS, Reset all parameters to the factory settings
135	1	MIN-MAX	20	68	COOLING_SETPOINT , current cooling setpoint - limits are set by the max and min setpoints
136	1				NOT USED FOR REV26
137	1	0-4	0	0	FAN_SPEED, current operating fan speed
Relay Output Tables (bit0 = relay1, bit1 = relay2, bit2 = relay3, bit3 = relay4, bit4 = relay5)Fan0 table is for the off state. Fan1, Fan2, and Fan3 are for the manual states. Fan4 is for the Auto state. These states are controlled by the user.The mode of operation (coasting, cooling, heating) is determined by the PID parameter.					
138	1	0-255	0	0	FAN0_OPERATION_TABLE_COAST
139	1	0-255	65	65	FAN0_OPERATION_TABLE_COOL1
140	1	0-255	202	202	FAN0_OPERATION_TABLE_COOL2
141	1	0-255	204	204	FAN0_OPERATION_TABLE_COOL3
142	1	0-255	65	65	FAN0_OPERATION_TABLE_HEAT 1
143	1	0-255	210	210	FAN0_OPERATION_TABLE_HEAT2
144	1	0-255	212	212	FAN0_OPERATION_TABLE_HEAT3
145	1	0-255	1	1	FAN1_OPERATION_TABLE_COAST
146	1	0-255	65	65	FAN1_OPERATION_TABLE_COOL1
147	1	0-255	201	201	FAN1_OPERATION_TABLE_COOL2
148	1	0-255	201	201	FAN1_OPERATION_TABLE_COOL3
149	1	0-255	65	65	FAN1_OPERATION_TABLE_HEAT1
150	1	0-255	209	209	FAN1_OPERATION_TABLE_HEAT2
151	1	0-255	209	209	FAN1_OPERATION_TABLE_HEAT3
152	1	0-255	2	2	FAN2_OPERATION_TABLE_COAST
153	1	0-255	66	66	FAN2_OPERATION_TABLE_CO OL1
154	1	0-255	202	202	FAN2_OPERATION_TABLE_COOL2
155	1	0-255	202	202	FAN2_OPERATION_TABLE_COOL3
156	1	0-255	66	66	FAN2_OPERATION_TABLE_HEAT1
157	1	0-255	210	210	FAN2_OPERATION_TABLE_HEAT2
158	1	0-255	210	210	FAN2_OPERATION_TABLE_HEAT3
159	1	0-255	4	4	FAN3_OPERATION_TABLE_COAST
160	1	0-255	68	68	FAN3_OPERATION_TABLE_COOL1
161	1	0-255	204	204	FAN3_OPERATION_TABLE_COOL2

Address	Bytes	Range	Defaults		Register and Description
			[illegible]	[illegible]	
162	1	0-255	204	204	FAN3_OPERATION_TABLE_COOL3
163	1	0-255	68	68	FAN3_OPERATION_TABLE_HEAT1
164	1	0-255	212	212	FAN3_OPERATION_TABLE_HEAT2
165	1	0-255	212	212	FAN3_OPERATION_TABLE_HEAT3
166	1	0-255	0	0	FANAUT_OPERATION_TABLE_COAST
167	1	0-255	65	65	FANAUT_OPERATION_TABLE_COOL1
168	1	0-255	202	202	FANAUT_OPERATION_TABLE_COOL2
169	1	0-255	204	204	FANAUT_OPERATION_TABLE_COOL3
170	1	0-255	65	65	FANAUT_OPERATION_TABLE_HEAT1
171	1	0-255	210	210	FANAUT_OPERATION_TABLE_HEAT2
172	1	0-255	212	212	FANAUT_OPERATION_TABLE_HEAT3
Analog Output Tables (bit0,1 = analog out1, bit2, 3 = analog out2, 00 = 0%, 01 = 0-100%, 11 = 100%)					
173	1	0-255	0	0	VALVE_OPER_TABLE_COAST, Analog output state for each of the 8 modes of operation
174	1	0-255	1	1	VALVE_OPER_TABLE_COOLING1
175	1	0-255	3	3	VALVE_OPER_TABLE_COOLING2
176	1	0-255	3	3	VALVE_OPER_TABLE_COOLING3
177	1	0-255	4	4	VALVE_OPER_TABLE_HEATING1
178	1	0-255	4	4	VALVE_OPER_TABLE_HEATING2
179	1	0-255	12	12	VALVE_OPER_TABLE_HEATING3
180	2	0-65535	-	-	External Sensor 1 - Filtered, calibrated value for analog in 1
181	2	0-65535	-	-	External Sensor 2 - Filtered, calibrated value for analog in 2
182	1	0-255	15	65	Night heating setpoint
183	1	0-255	30	80	Night cooling setpoint
184	1	0-255	1	1	Bit 0 is read/write and shows the occupancy mode. Bit 0 = 0 means unoccupied. Bit 0 = 1 means occupied. Bit 1 is read only and shows the reset state. Bit 1 = 0 means hardware restart. Bit 1 = 1 means software restart. Bit 2 is read/write and is the reset prevention bit. Bit 2 = 0 means the tstat will automatically reset after certain registers are changed. Bit 2 = 1 prevents this reset. Changing this bit from 1 to 0 will trigger a reset. Bit 3 is the state of the digital input. Bit 3 = 1 means logic high. Bit 3 = 0 means logic low. Bit 4,5: Reserved, used for some non standard occupancy sensor logic. Bit6 0=no delay on modbus reply, 1= 10ms delay before send for slower PLC"s to switch from TX to RX. Bit7, RS485/wireless communications mode: The normal communications method is a bus topology using RS485 which uses a „transmit enable" or TX_EN line on the RS485 hardware whenever transmission from the thermostat to the bus takes place. For wireless devices this is typically taken care of by the radio module itself so it is not needed. Default = 0, When bit7 is 0, the RS485 chip, TX_EN line is used for normal RS485 bus communications. When bit7 is 1, the TX_EN line is not used, allowing the radio module to communicate one-to-one with the Tstat
185	1	0-1	1	1	BAu - Baudrate
186	1	0-4	0	0	Ou1 - Output1 Scale - 0=On\Off, 1=0-10V, 2=0-5V, 3=2-10V, 4= 10-0V
187	1	0-4	0	0	Ou2 - Output2 Scale - 0=On\Off, 1=0-10V, 2=0-5V, 3=2-10V, 4= 10-0V
188	1	0-4	1	1	AI1 – Analog input 1 range 0=10-bit raw data, 1=10K thermistor, 2=0-100%, 3 = on\off, 4= custom
189	1	0-4	0	0	AI2 – Analog input 2 range 0=10-bit raw data, 1=10K thermistor, 2=0-100%, 3 = on\off, 4= custom
190	1	0-0	0	0	dI1 – Digital input 1 range 0 = ON\OFF.
191	1	0-255	0	0	OUTPUT1_DELAY_OFF_TO_ON – delay time for output1 going from OFF to ON (sec)
192	1	0-255	0	0	OUTPUT2_DELAY_OFF_TO_ON – delay time for output2 going from OFF to ON (sec)
193	1	0-255	0	0	OUTPUT3_DELAY_OFF_TO_ON – delay time for output3 going from OFF to ON (sec)
194	1	0-255	0	0	OUTPUT4_DELAY_OFF_TO_ON – delay time for output4 going from OFF to ON (sec)
195	1	0-255	0	0	OUTPUT5_DELAY_OFF_TO_ON – delay time for output5 going from OFF to ON (sec)
196	1	0-255	0	0	OUTPUT1_DELAY_ON_TO_OFF – delay time for output1 going from OFF to ON (sec)
197	1	0-255	0	0	OUTPUT2_DELAY_ON_TO_OFF – delay time for output2 going from OFF to ON (sec)

198	1	0-255	0	0	
199	1	0-255	0	0	
200	1	0-255	0	0	
201	1	0-20	0	0	MODBUS_CYCLING_DELAY – delay time (in minutes) for switching out of heating or cooling and then back in.
202	1	0-200	0	0	MODBUS_CHANGOVER_DELAY – delay time (in minutes) for switching from cooling into heating or vice versa.
203	1	0-6	0	0	dIS – Display. This sets the display to either room temperature or setpoint. 0 = room temp, 1 = setpoint, 2 = Blank Display, 3 = PID2 value, 4 = PID2 setpoint, 5 = set segment code by manually, 6 = Display sleep
					LED TABLE Determines what activates the LEDs
204	1	0-24	3	3	LED1 (top left to bottom right)
205	1	0-24	2	2	LED2
206	1	0-24	1	1	LED3
207	1	0-24	15	15	LED4
208	1	0-24	13	13	LED5
209	1	0-24	14	14	LED6
210	1	0-24	19	19	LED7
					0 = NONE 1 = RELAY1 2 = RELAY2 3 = RELAY3 4 = RELAY4 5 = RELAY5 6 = COASTING STAGE 7 = COOLING1 STAGE 8 = COOLING2 STAGE 9 = COOLING3 STAGE 10 = HEATING1 STAGE 11 = HEATING2 STAGE 12 = HEATING3 STAGE 13 = COOLING MODE 14 = HEATING MODE 15 = FAN OFF 16 = FAN LOW 17 = FAN MED 18 = FAN HI 19 = FAN AUTO 20 = HEAT1 OR COOL1 21 = HEAT2 OR COOL2 22 = HEAT3 OR COOL3 23 = COOL1,2, OR 3 24 = HEAT1, 2, OR 3 25 = OCCUPANCY 26 = STAGE 1,2 OR 3 27 = STAGE 2 OR 3
211	1	0-255	0	0	Unoccupied Override Timer, Ort. 0=disabled, not 0=number of minutes manual override is allowed
212	1	0-255	-	-	OVERRIDE_TIMER_DOWN_COUNT - Number of minutes remaining on the timer when unoccupied override timer is in effect
213	1	0-100	20	20	Temperature sensor filter, FIL, weighted average of stored value to new raw value
214	1	0-5	0	0	Heating cooling mode configuration, HC, 0=PID, 1=Keypad, 2=Digital_in1, 3=!Digital_in1, 4=Analog_in1, 5=Analog_in2
215	2	0-3000	-	-	Internal Temperature Sensor IC - Shows the filtered, calibrated value of the internal temperature sensor IC
216	2	0-3000	-	-	Internal Thermistor Sensor - Shows the filtered, calibrated value of the internal thermistor sensor
217	2	0-1000	500	500	Calibration Internal Thermistor - Calibration value used on the internal thermistor
218	2	0-1000	500	500	Calibration Analog Input2 - Calibration value used on the analog input 2
219	2	0-65535	-	-	Lookup Table 1 - 0.0V value Sensor value that corresponds to 0.0V
220	2	0-65535	-	-	Lookup Table 1 - 0.5V value Sensor value that corresponds to 0.5V
221	2	0-65535	-	-	Lookup Table 1 - 1.0V value Sensor value that corresponds to 1.0V
222	2	0-65535	-	-	Lookup Table 1 - 1.5V value Sensor value that corresponds to 1.5V
223	2	0-65535	-	-	Lookup Table 1 - 2.0V value Sensor value that corresponds to 2.0V
224	2	0-65535	-	-	Lookup Table 1 - 2.5V value Sensor value that corresponds to 2.5V
225	2	0-65535	-	-	Lookup Table 1 - 3.0V value Sensor value that corresponds to 3.0V
226	2	0-65535	-	-	Lookup Table 1 - 3.5V value Sensor value that corresponds to 3.5V
227	2	0-65535	-	-	Lookup Table 1 - 4.0V value Sensor value that corresponds to 4.0V
228	2	0-65535	-	-	Lookup Table 1 - 4.5V value Sensor value that corresponds to 4.5V
229	2	0-65535	-	-	Lookup Table 1 - 5.0V value Sensor value that corresponds to 5.0V
230	2	0-65535	-	-	Lookup Table 2 - 0.0V value Sensor value that corresponds to 0.0V
231	2	0-65535	-	-	Lookup Table 2 - 0.5V value Sensor value that corresponds to 0.5V
232	2	0-65535	-	-	Lookup Table 2 - 1.0V value Sensor value that corresponds to 1.0V
233	2	0-65535	-	-	Lookup Table 2 - 1.5V value Sensor value that corresponds to 1.5V
234	2	0-65535	-	-	Lookup Table 2 - 2.0V value Sensor value that corresponds to 2.0V
235	2	0-65535	-	-	Lookup Table 2 - 2.5V value Sensor value that corresponds to 2.5V
236	2	0-65535	-	-	Lookup Table 2 - 3.0V value Sensor value that corresponds to 3.0V
237	2	0-65535	-	-	Lookup Table 2 - 3.5V value Sensor value that corresponds to 3.5V
238	2	0-65535	-	-	Lookup Table 2 - 4.0V value Sensor value that corresponds to 4.0V
239	2	0-65535	-	-	Lookup Table 2 - 4.5V value Sensor value that corresponds to 4.5V
240	2	0-65535	-	-	Lookup Table 2 - 5.0V value Sensor value that corresponds to 5.0V
241	2	0-2	-	-	Universal PID input select, 0=none, 1=analog_in1, 2=analog_in2
242	2	0-65535	-	-	Universal PID upper deadband
243	2	0-65535	-	-	Universal PID lower deadband
244	2	0-65535	-	-	Universal PID pterm
245	2	0-65535	-	-	Universal PID iterm
246	2	0-65535	-	-	Universal PID setpoint
247	1	0-3	-	-	Output 1 PID Control 0 = PID1
248	1	0-3	-	-	Output 2 PID Control 1 = PID2
249	1	0-3	-	-	Output 3 PID Control 2 = Maximum of PID1 and PID2

250	1	0-3	-	-	Output 4 PID Control 3 = Minimum of PID1 and PID2
251	1	0-3	-	-	Output 5 PID Control
252	1	0-3	-	-	Output 6 PID Control
253	1	0-3	-	-	Output 7 PID Control
254	1	0-255	-	-	Universal PID Output - Coasting
255	1	0-255	-	-	Universal PID Output - Cooling1
256	1	0-255	-	-	Universal PID Output - Cooling2
257	1	0-255	-	-	Universal PID Output - Cooling3
258	1	0-255	-	-	Universal PID Output - Heating1
259	1	0-255	-	-	Universal PID Output - Heating2
260	1	0-255	-	-	Universal PID Output - Heating3
Analog Output Tables (bit0, 1 = analog out1, bit2, 3 = analog out2, 00 = 0%, 01 = 0-100%, 11 = 100%)					
261	1	0-255	-	-	Universal PID Valve Output - Coasting
262	1	0-255	-	-	Universal PID Valve Output - Cooling1
263	1	0-255	-	-	Universal PID Valve Output - Cooling2
264	1	0-255	-	-	Universal PID Valve Output - Cooling3
265	1	0-255	-	-	Universal PID Valve Output - Heating1
266	1	0-255	-	-	Universal PID Valve Output - Heating2
267	1	0-255	-	-	Universal PID Valve Output - Heating3
268	1	0-6	3	3	Number of Heating Stages in Universal Table-(Maximum # of total heating and cooling states is 6)
269	1	0-6	3	3	Number of Cooling Stages in Universal Table-(Maximum) # of total heating and cooling states is 6)
270	1	0-100	-	-	Universal PID
271	2	0-65535	-	-	PID1 Units High byte - Upper 2 bytes of the PID1 units in ASCII
272	2	0-65535	-	-	PID1 Units Low byte - Lower 2 bytes of the PID1 units in ASCII
273	2	0-65535	-	-	PID2 Units High byte - Upper 2 bytes of the PID2 units in ASCII
274	2	0-65535	-	-	PID2 Units Low byte - Lower 2 bytes of the PID2 units in ASCII
275	2	0-65535	-	-	Universal Night Setpoint
276	1	0-6	3	3	Number of Heating Stages in Original Table - (Maximum # of total heating and cooling states is 6)
277	1	0-6	3	3	Number of Cooling Stages in Original Table - (Maximum # of total heating and cooling states is 6)
278	1	0-19	-	-	PID2 heating or cooling state. 0=coasting, 1=cooling1, 2=cooling2, 3=cooling3, 4=heating1, 5=heating2, 6=heating3, 14=cooling4, 15=cooling5, 16=cooling6, 17=heating4, 18=heating5, 19=heating6.
279	1	10-255	-	-	Valve travel time. The time of the valve travel from one end to another end. The units is second
280	1	0	0	0	Determine the output1 mode. Output1 always is ON/OFF mode
281	1	0	0	0	Determine the output2 mode. Output2 always is ON/OFF mode
282	1	0	0	0	Determine the output3 mode. Output3 always is ON/OFF mode
283	1	0-1	0	0	Determine the output4 mode. 0, ON/OFF mode; 1, floating valve for cooling; 2, lighting control; 3, PWM
284	1	0-1	0	0	Determine the output5 mode. 0, ON/OFF mode; 1, floating valve for heating; 2, lighting control; 3, PWM
285	1	0-100	-	-	Valve percent. Show the valve opened how much percent. READ ONLY
Interlock for each output, analog and digital output. 0, interlock always ON; 1, DI1 determine the interlock status; 2, AI1 determine the interlock status, the range of AI1 must be ON/OFF; 3, AI2 determine the interlock status, the range of AI2 must be ON/OFF; 4, TIMER OR, the output OR with the period timer; 5, TIMER AND, the output AND with the period timer					
286	1	0-5	0	0	Interlock for output1
287	1	0-5	0	0	Interlock for output2
288	1	0-5	0	0	Interlock for output3
289	1	0-5	0	0	Interlock for output4
290	1	0-5	0	0	Interlock for output5
291	1	0-5	0	0	Interlock for output6
292	1	0-5	0	0	Interlock for output7
293	1	1-10	10	10	Setpoint increment. The value is expanded 10 times, the increment is from 0.1 to 1.
294	2	0-65535	0	0	Last key pressed counter. Hong long time past since the last key pressed. Reset if any key is pressed. The units is minute.
295	1	0-255	5	40	Freeze protect setpoint. If the ambient temperature less than the setpoint, the heating valve will open some time the Delay to off register set
296	1	5-255	10	10	Delay to open. The heating valve will open if the ambient temp less than the Freeze temp setpoint last the time this register set. The units is second.
297	1	5-255	30	30	Delay to close. The duration the heating valve open. The units is minute.
298	1	0-5	0	0	Analog input1 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode. Refer to dI1 on page13.

299	1	0-5	0	0	Analog input2 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode. Refer to dI1 on page13.
300	1	0-5	0	0	dI1 – Digital input 1 function. Refer to dI1 description in Table 1: Advanced Menu Items
301	2	0-65535	0	0	Period timer ON time.
302	2	0-65535	0	0	Period timer OFF time.
303	1	0-2	1	1	Period timer units. 0, second; 1, minute; 2, hour.
304	1	0-255	-	-	Keypad encode value. The reverse value read from P0 port when some key is pressed. READ ONLY.
305	1	0-255	-	-	LED hundred"s segment code. Drive the LEDs by manually, the register 203 (display) must be set 5.
306	1	0-255	-	-	LED ten"s segment code. Drive the LEDs by manually, the register 203 (display) must be set 5.
307	1	0-255	-	-	LED digital"s segment code. Drive the LEDs by manually, the register 203 (display) must be set 5.
308	1	0-255	-	-	LED status"s segment code. Drive the LEDs by manually, the register 203 (display) must be set 5.
309	1	0-255	0	0	Input auto/ manual enable. Bit0 correspond to analog input1 (register 180); bit1 to analog input2 (register 181); bit2 to digital input1 (register 311). 0, auto mode, the corresponding input value from sensor; 1, manual mode, the corresponding value from serial port.
310	1	0-255	0	0	Output auto/manual enable. Bit 0 to 4 correspond to output1 to output5, bit 5 correspond to output6 (register 102), bit 6 correspond to output7 (register 103). 0, auto mode; 1, manual mode.
311	1	0-1	1	1	Digital manual input. Write the manual value for digital input when digital input in manual mode.
312	1	0-1	0	0	Output1 manual input.
313	1	0-1	0	0	Output2 manual input.
314	1	0-1	0	0	Output3 manual input.
315	1	0-1	0	0	Output4 manual input.
316	1	0-1	0	0	Output5 manual input.
317	1	0-255	0	0	Dead master. The Tstat will go to occupied mode automatically after the time set in the register no serial communication since power on. 0, disable the function. the units is minute.
318	1	0-5	1	1	Rouding display. 0, round the display to digit; 1, round the display to the nearest 1/10 unit; 5, round the display to the nearest 1/2 unit. 2, 3, 4 reserved.
319	1	0-1	0	0	Timer selection. 0. Period timer; 1, Rotation timer.
320	1	0-255	0	0	Rotation flag group. Put the corresponding output into rotation group by setting the corresponding bit. bit 0 correspond to output2; bit1 correspond to output3; bit2 correspond to output4; bit3 correspond to output5. 0, not put into rotation group; 1, put into rotation group. The rotation group at least has two items and they must be consecutive.
321	1	1-4	-	-	The output 2 is controlled by which output table in the rotation group. READ ONLY.
322	1	1-4	-	-	The output 3 is controlled by which output table in the rotation group. READ ONLY.
323	1	1-4	-	-	The output 4 is controlled by which output table in the rotation group. READ ONLY.
324	1	1-4	-	-	The output 5 is controlled by which output table in the rotation group. READ ONLY.
325	1	0-65535	-	-	Rotation time left. Hong long time left the rotation will happen. READ ONLY.
326	1	0-1	-	-	Show the size of E2 chip. 0 = 24c02, 1 = 24c08/24c16.
327	1	0-3	0	0	Assign the timer be used for which feature. 0 = period timer, 1 = rotation timer, 2 = interlock, 3 = PWM timer.
328	1	0-2	0	0	The output1 function, there are three functions for the output1. 0 = normal ON/OFF output, 1 = rotation , 2 = lighting control.
329	1	2-5	-	-	Show which output table is using for this output when this output function be set rotation
330	1	2-5	-	-	Show which output table is using for this output when this output function be set rotation
331	1	2-5	-	-	Show which output table is using for this output when this output function be set rotation
332	1	2-5	-	-	Show which output table is using for this output when this output function be set rotation
333	2	0-65535	-	-	How much time left before rotation action.
334	1	0-2	0	0	The output2 function, there are three functions for the output2 .0 = normal ON/OFF output, 1 = rotation , 2 = lighting control.
335	1	0-2	0	0	The output3 function, there are three functions for the output3. 0 = normal ON/OFF output, 1 = rotation , 2 = lighting control.
336	1	0-2	0	0	The output4 function, there are three functions for the output4. 0 = normal ON/OFF output, 1 = rotation , 2 = lighting control.
337	1	0-2	0	0	The output5 function, there are three functions for the output5. 0 = normal ON/OFF output, 1 = rotation , 2 = lighting control.
338	1	0-255	20	68	Default occupied setpoint. Works in concert with the "occupied setpoint control register", register 339.
339	1	0-2	0	0	Occupied Setpoint Control Register: 0 = normal, setpoint is managed by the serial port and keypad, the stat will remember the last occupied setpoint and use that during the next occupied period. 1 = Default mode, the last occupied setpoint if forgotten and the occupied setpoint gets reset to the default. 2 = trigger an event, when a master controller writes 2 to this register, the default setpoint will be copied to the occupied setpoint after which the Tstat will set the value back to 1 to show the event has been serviced.

340	1	0-1	0	0	Enable/disable PIR correspond 1/0 respectively.
341	1	0-255	0	0	PWM output range in COAST mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%,3 = 50-100%,4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5
342	1	0-255	64	64	PWM output range in COOLING2 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%,3 = 50-100% 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5
343	1	0-255	38	38	PWM output range in COOLING3 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%,3 = 50-100% 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5
344	1	0-255	16	16	PWM output range in COOLING1 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%,3 = 50-100% 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5
345	1	0-255	4	4	PWM output range in HEATING1 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%,3 = 50-100% 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5
346	1	0-255	3	3	PWM output range in HEATING2 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%,3 = 50-100% 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5
347	1	0-255	1	1	PWM output range in HEATING3 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%,3 = 50-100% 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5
348	1	0-100	-	-	The ON period take how many percentage for output4
349	1	0-100	-	-	The ON period take how many percentage for output5
350	1	0-255	0	0	Free cooling configuration. bit0, free cool enable/disable, 0 = disable, 1= enable. bit1, free cool available decided by local or external master. 0 = local, 1 = NC. bit2, free cool available status, 0 = npt available, 1= available. bit4, show the status if NC is OK when the free cool decided by NC
					Analog Output Tables (bit0, 1 =analog out1, bit2, 3=analog out2, 00=0%, 01=0-100%, 11=100%)
351	1	0-255	0	0	Analog output OFF table, coasting mode
352	1	0-255	0	0	Analog output OFF table, cooling1 mode
353	1	0-255	0	0	Analog output OFF table, cooling2 mode
354	1	0-255	0	0	Analog output OFF table, cooling3 mode
355	1	0-255	0	0	Analog output OFF table, heating1 mode
356	1	0-255	0	0	Analog output OFF table, heating2 mode
357	1	0-255	0	0	Analog output OFF table, heating3 mode
358	1	0-255	0	0	Register lock.All registers except fan speed and manual inputs/outputs register are not writable. 0 = lock 1 = no lock
359	1	0-255	0	0	Outside temperature for free cooling from external sensor or NC.
360	2	0-255	0	0	If outside temp be set from NC.The communication with NC must be set in this time otherwise will set error status and use external sensor.
361	1	0-255	0	0	If the outside air temp is lower than the room temeprature by this amount, then the free cooling is worthwhile, 350 bit2 = 1.If the OAT is greater than the room temp, then free cooling mode is not worhtwhile , 350 bit2 = 0
					Output table in free cooling mode,0 = 0%, 1 = 100%,2 = MIN->100%,3 = MIN|100%,4 = MIN.Bit7 through 4 correspond to OFF table bit 3 through 0 correspond to ON table.
362	1	0-255	0	0	Free cooling output configuration.Coasting mode
363	1	0-255	0	0	Free cooling output configuration.Cooling1 mode

DM-8-MOD-24VDC Specifications



DM-8-MOD-24VDC is based on DM-8-MOD, we add a Bracket.So the actuator can be mounted on the ball valve in any of four 90° positions.It cantains damper actuator and Vavle body and so on.

Materials

Bracket	Stainless steel 304
Valve	Brass
Spindle	Chromed Brass
Screws	Stainless steel 304

Advantages

-Easy to install
-Low sound power level
-Leakage rate: tight sealing
-Long life cycles

1.Damper Actuator



Description

Continuously modulating type damper actuator is controlled by DC 0~10V or 4~20mA signal, and can provide 0~10VDC position feedback signal. It is specially designed for damper control in HVAC system. There are 4, 6, 8Nm models for optional.

Characteristics

● Various Signals Control

Standard type: 0~10Vdc control; the setting position of J3 is at point V, If you want 0~10Vdc or 4~20mA control type, please inform about it in your order. We will adjust the PCB in factory. You can use J3 setting to switch the control signals between 2~10VDC and 4~20mA: point “V” is for 2~10VDC control; point A is for 4~20mA control.

●Simple Installation

Fix with square damper shaft. Damper shaft dimensions see below Dimension Diagram. The rotating angle of the actuator can be set by internal potentiometer (PT1). The match between working range and feedback signal is automatically done by the actuator.

● Manuel Operation

It can be operated manually if needed: push the manual button on the actuator, the gearings inside the actuator will break away. The damper can be operated manually when keep pushing the manual button. PLEASE DO NOT OPERATE WHEN POWER ON!

● High Dependable Performance

Modulating type damper actuator uses bi-directional magnetic clutch synchronous motor. It has overload protection and overtime protection, and no need limitator needed, the actuator will stop automatically when it runs to the end. And the damper actuator has a precision of 15° adjustable mechanical limitator.

Specifications and Technical Data

Model	DM-8-MOD-24VDC
Torque	≥8Nm
Operation Time (50Hz/90º)	≈156s
Rated Voltage	24VDC/AC±10% (50/60Hz)
Cable	0.5~1.5mm2
Power Consumption	4VA when operating
Control Signal	DC0~10V or 4~20mA
Factory Setting	Working condition: DA (J1) Axle rotates to 0º(J4) when signal is lost
Position Precision	±5%
Rotate Angel	90º<limitation≤ 95º
Noise Level	Maximum 45dB(A)
Position Indicator	Mechanical indication
Protection Class	IP 40
Ambient Temperature	-5 ° C~+50° C
Storage Temperature	-30° C~+70° C
Usage Life	>60000 times

* The accessories include 2 limitative baffles, 2 baffle setscrews (M3×6), 1 actuator body setscrews (ST4.8×12.5), and 1 aluminum gasket.

2.VALVE BODY

DESCRIPTION

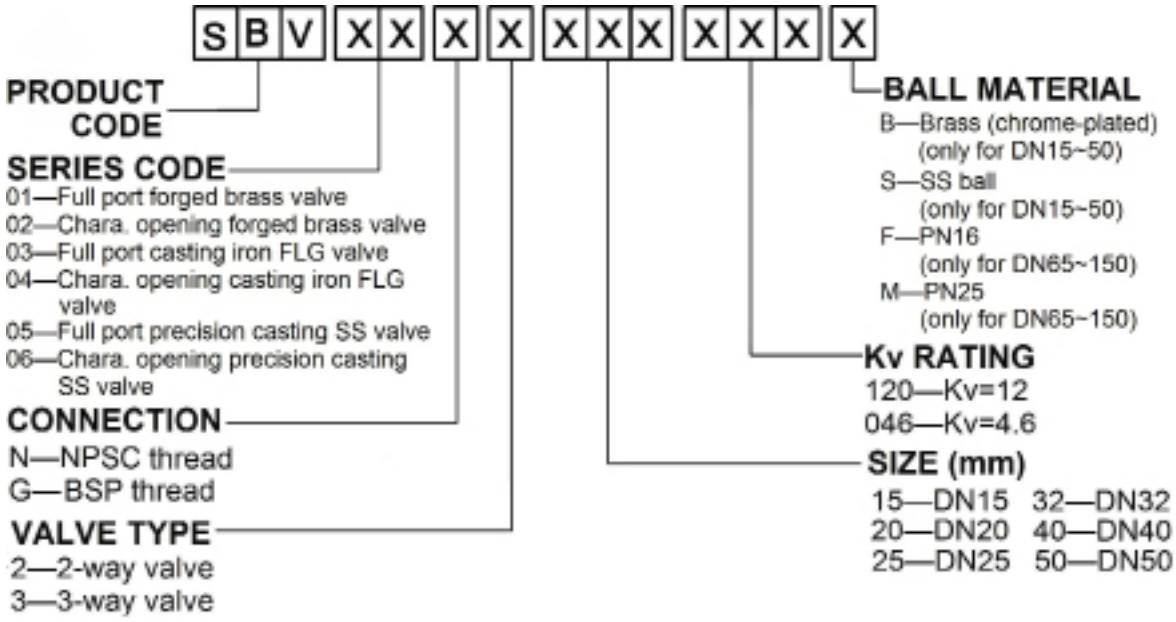
SBV series ball valve bodies are widely used to control water flow in central air-conditioning, heating system. Controlled by standard floating signal or 3-point signal from angle rotation actuators, the valve ball can be rotated to different angle. There two flow control type: SBV01 full port ball valve body and SBV02 characterized ball valve body. The valves are 3-piece structure, and have six sizes: DN15, DN20, DN25, DN32, DN40 and DN50. The ball sealing inside the valve is made of PTFE material of high lubricating ability and wearability. It makes the valve has high closing-off pressure and great hermetization. The valves can be matched with SBA01,SBA03 and SBA04 series actuators.

ACTUATOR APPLICATION	VALVE SIZE	ACTUATOR CONNECTION
SBA01	DN15, DN 20, DN 25	Press button
SBA03	DN15, DN 20, DN 25	Bolt
SBA04	DN32, DN 40, DN 50	Bolt



Modulating Valve

MODEL SELECTION



TECHNICAL DATA

MODEL		TYPE	Kv	Cv	THREAD	CLOSE OFF PRES. (Mpa)	RATED BODY PRES. (MPa)
SBV01G215120	SBV05G215120	2-way	12	14	G1/2	0.6	2.5
SBV02G215040	SBV06G215040		4	4.7			
SBV01G220150	SBV05G220150		15	17.5	G3/4		
SBV02G220063	SBV06G220063		6.3	7.4			
SBV01G225220	SBV05G225220		22	25	G1		
SBV02G225100	SBV06G225100		10	11.7			
SBV01G232310	SBV05G232310		31	36.3	G11/4		
SBV02G232160	SBV06G232160		16	18.7			
SBV01G240330	SBV05G240330		33	38.6	G11/2		
SBV02G240250	SBV06G240250		25	29.3			
SBV01G250500	SBV05G250500		50	58.5	G2		
SBV02G250400	SBV06G250400		40	46.8			

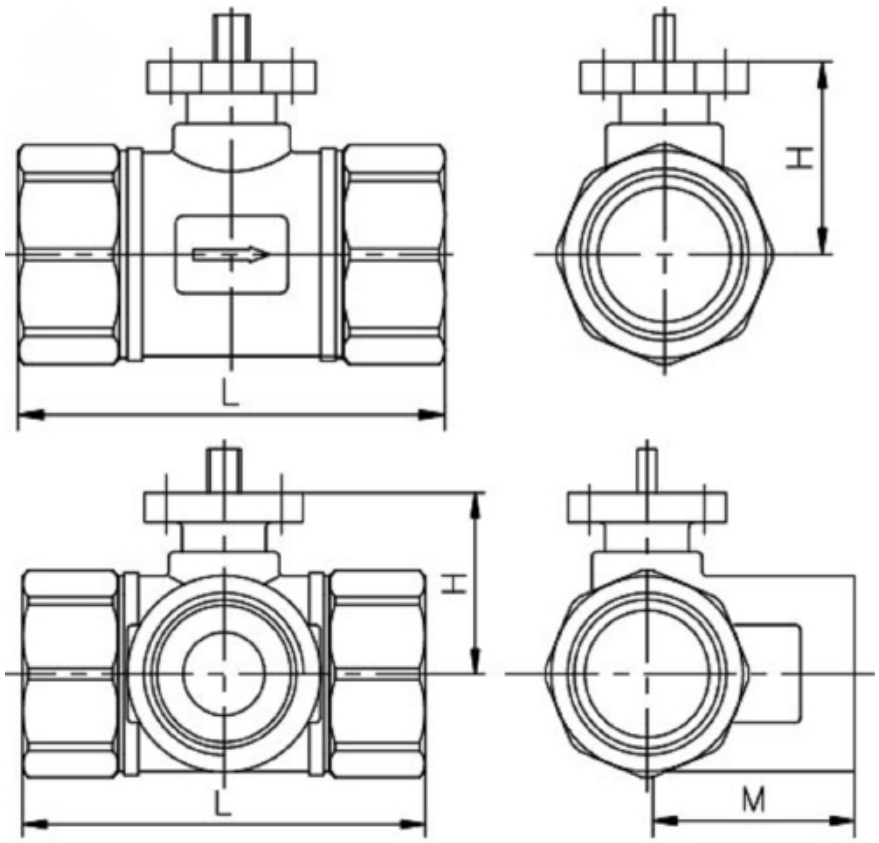
Modulating Valve

MATERIAL

MATERIAL	BODY	Forged brass / Precision casting stainless steel
	BALL	Casting brass (chrome-plate) / stainless steel
	SEAT	PTFE (Poly tetrae fluoro ethylene)
	STEM	Stainless steel / brass
	O-RING	NBR
WORKING MEDIA		Chilled/hot water or 50% glycol
MEDIA TEMPERATURE		2 ° C~94 ° C

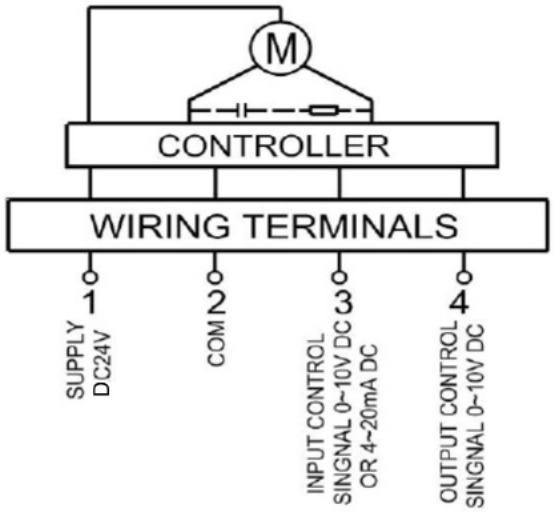
DIMENSIONS (MM)

SIZE (mm)	DIMENSION (mm)				THREAD (G)	MAX. PIPE THREAD SIZE (mm)
	L		H	M		
	2-way	3-way				
15	68	68	32	33	G1/2	13
20	68	68	32	35	G3/4	13
25	84	84	37	44	G1	17
32	98	98	48	50	G11/4	19
40	98	105	48	50	G11/2	19
50	122	123	52	62	G2	29



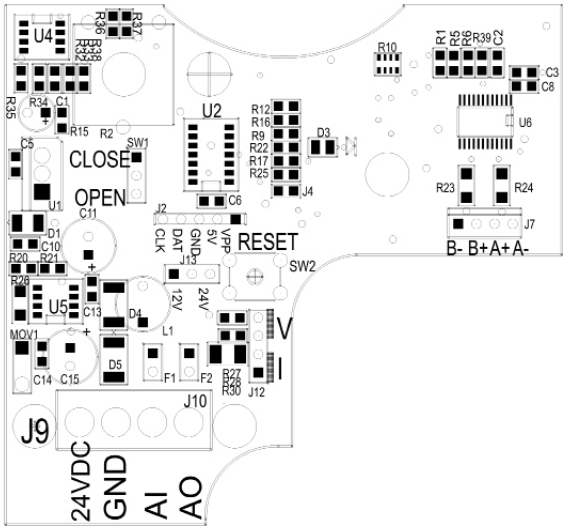
Modulating Valve

Wiring Diagram

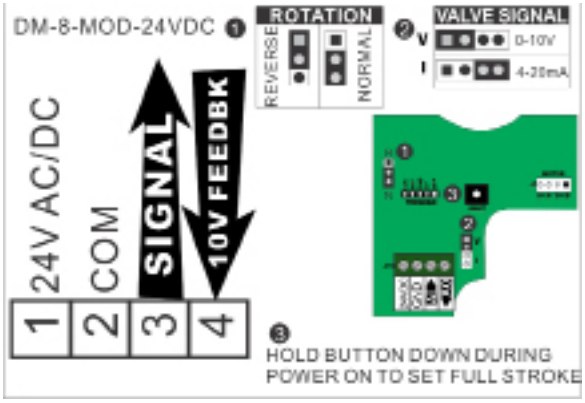


INPUT CONTROL SIGNAL		ROTATE DIRECTION
DA	RA	
INCREASING	DECREASING	↷
DECREASING	INCREASING	↶

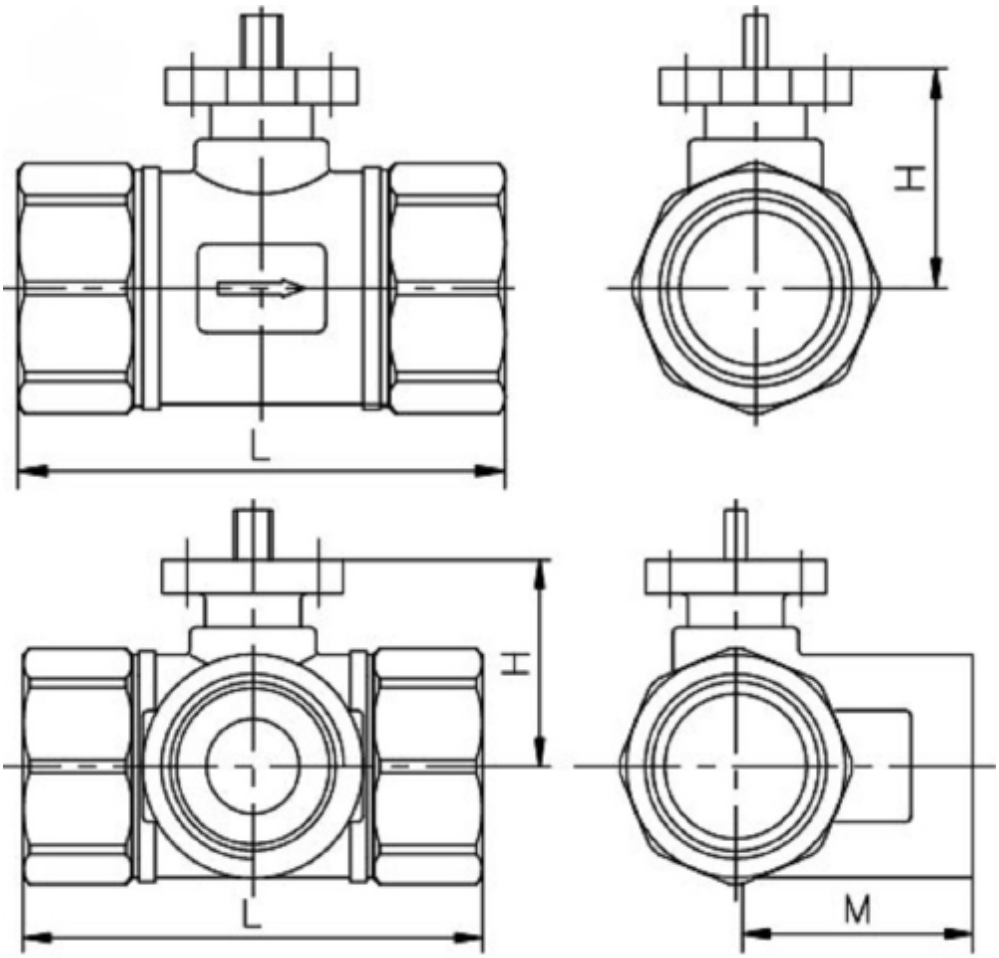
PCB Setting Diagram



Jumper for DM-8-MOD-24VDC



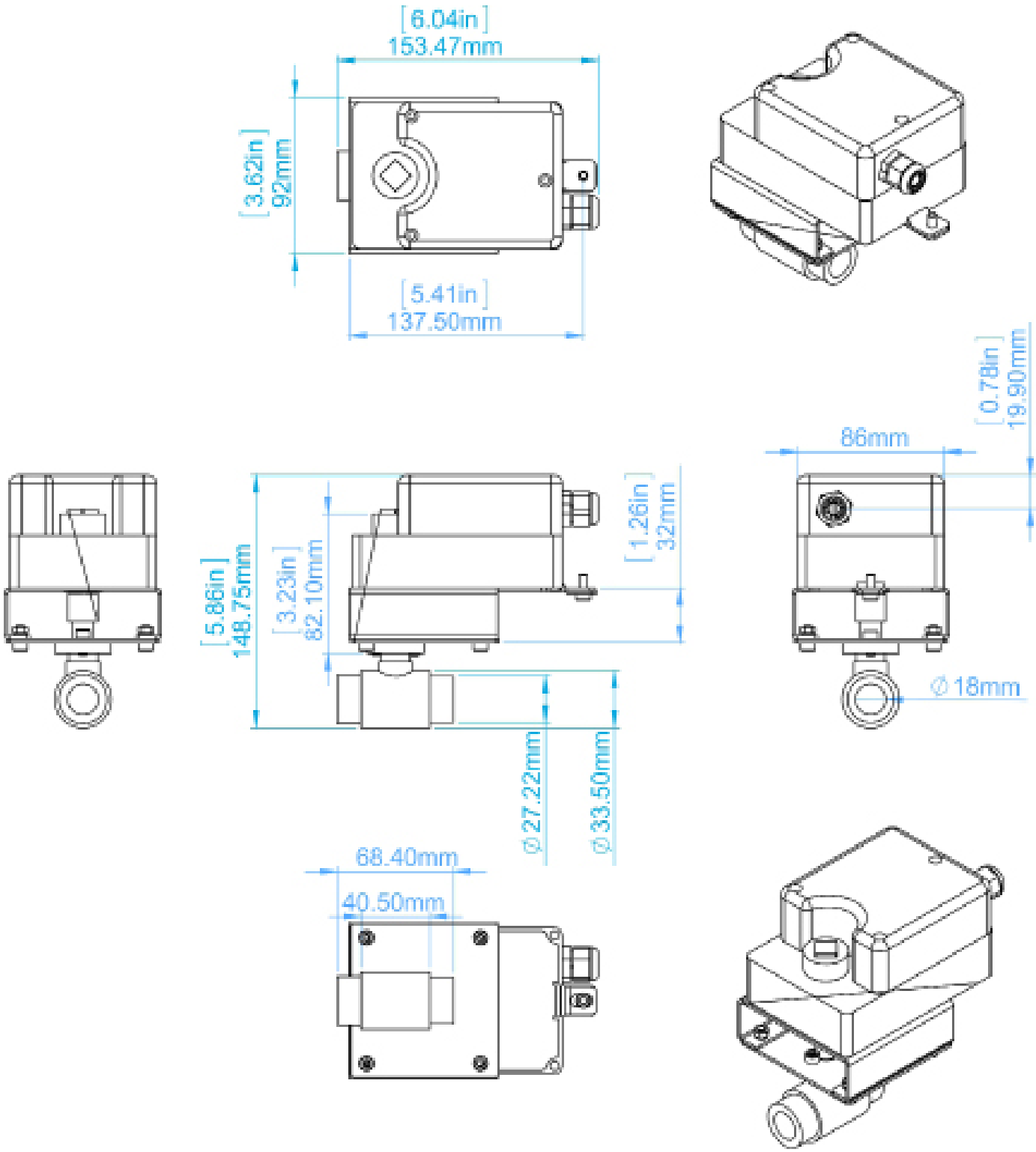
Dimensions (mm)



Note: Only suitable for 13×13mm or 10×10mm foursquare damper shaft. Other sizes of aluminum gaskets can be made when the Damper Shaft dimension “a” is smaller than 10mm.

Modulating Valve

Drawing



Ball Valves

DN12~DN50, 2 way / 3 way Motorized Ball Valve

Motorized ball valve is using bi-directional motor, and mainly used in central air-conditioning system, heating system, water treatment, and production industry to control the flow of chilled/ hot medium.



DN12~DN25



DN32~DN50

Actuator Specification

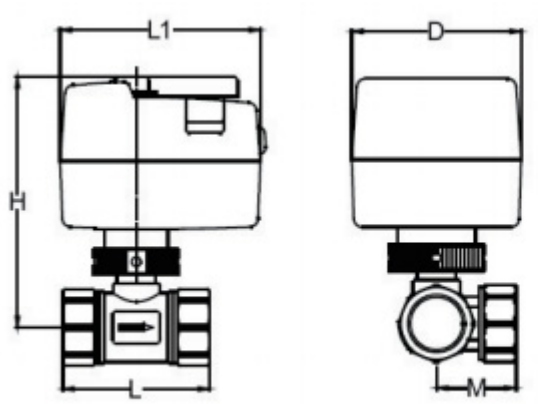
Power Supply	24VAC	220VAC	24VAC
Frequency	50/60Hz		
Power	3VA on load	5VA on load	4VA on load
Control Signal	3-point floating / electric on/off		DC0(2) ~ 10V DC4(0) ~ 20mA
Default Setting	-------		Input 0 ~ 10V DC Feedback 0 ~ 10V DC Running Status DA
Torque	DN12 ~ DN25		>= 4Nm
	DN32 ~ DN50		>= 6Nm
Stroke Time(0~90⁰)	DN12 ~ DN25	about 45s (50Hz/90⁰) / 90s for optional	
	DN32 ~ DN50	about 60s (50Hz/90⁰) / 120s for optional	
Rotation Angle	90⁰ <= Mechanical Limitation < 95⁰		
Cable	0.5 ~ 1mm²		
Material	Cover	Fire-retardent ABS engineering plastic	
	Chassis	Fire-retardent Reinforced nylon PA6 - 110	
	Gear	POM, Fire-retardent Reinforced nylon PA6-230, Brass HPb59-1	
Temperature	Operating: -5 ~ +50⁰C; Storage: -30 ~ +70⁰C		
Protection Class	IP54		

Valeve Description

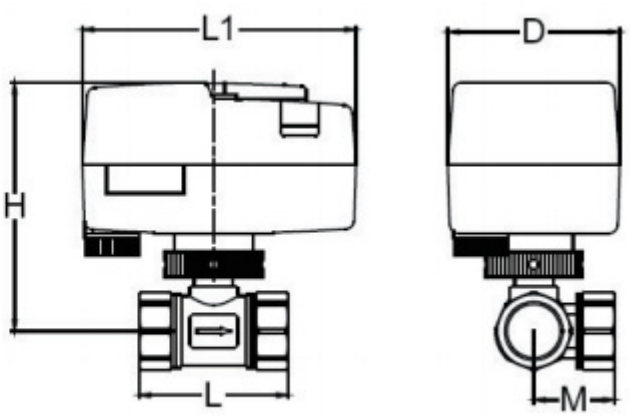
Working Media	Chilled / hot water or <= 50% glycot
Media Temperature	2 ~ 94⁰C
Rated Body Pressure	PN25
Flow Characteristic	Equal Percentage
Leakage	A.B port 0~0.01% Kv AB port 0.5% Kv
Connection Type	Thread
Closing-off Pressure	600kPa
Rotation Angle	90⁰
Installation Level	Horizontal / Vertical

Material	
Valve Body	Forged Brass
Valve Ball	Stainless Steel / Casting Brass (chrome-plate)
Valve Seat	PTFE
Valve Shaft	Stainless Steel / Forged Brass
Seal	NBR

Dimension



DN12~DN25



DN32~DN50

Size	Rated Body Pressure	Kv	Dimension(mm)					
			L		H	M	L1	D
			2 way	3 way				
DN12	PN25	4.0	68	68	115	33	92	77
DN18		6.3	68	68	115	34		
DN25		10	82	84	120	43		
DN32		16	98	104	131	50	123	78
DN40		25	105	111	131	50		
DN50		40	122	143	135	61		

Ball Valves

DN 65 ~ DN150, 2 way Motorized Ball Valve

Motorized ball valve is using bi-directional motor, and mainly used in central air-conditioning system, heating system, water treatment, and production industry to control the flow of chilled/ hot medium.



DN65~DN100



DN125~DN150

Actuator Specification

Power Supply (50/60Hz)		24VAC	220VAC	24VAC
Power	DN65 ~ DN100	4.5VA on load	8.5VA on load	5.5VA on load
	DN125 ~ DN150	10VA on load		11VA on load
Control Signal		3-point floating / electric on/off		DC0(2) ~ 10V DC4(0) ~ 20mA
Default Setting		--------		Input 0 ~ 10V DC Feedback 0 ~ 10V DC Running Status DA
Torque		DN65 ~ DN100		>= 25 Nm
		DN125 ~ DN150		>= 65 Nm
Stroke Time(0~90^0)		120s (50Hz)		
Rotation Angle		90^0 <= Mechanical Limitation < 95^0		
Cable		0.5 ~ 1mm^2		
Material	Cover	Fire-retardent ABS engineering plastic		
	Chassis	Casting Aluminum Alloy		
	Gear	DN65 ~ DN100	POM, Steel	
		DN125 ~ DN150	Brass, HPb59-1, Steel (40Cr, 45)	
Temperature		Operating: -5 ~ +50^{0}C; Storage: -30 ~ +70^{0}C		
Protection Class		IP54		

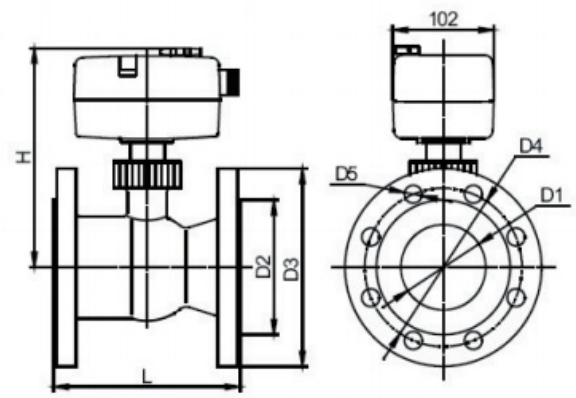
Ball Valves

Valve Specification

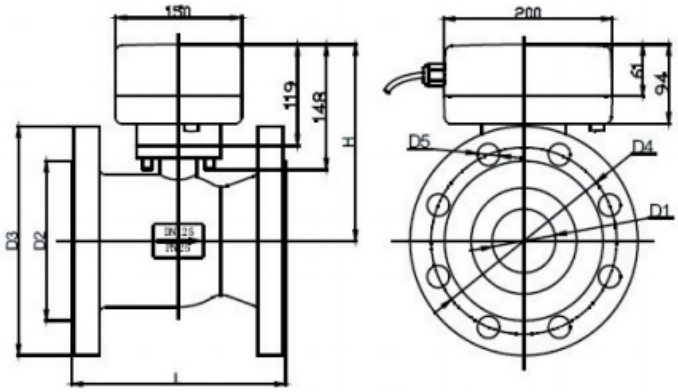
Working Media	Chilled / hot water or <= 50% glycol
Media Temperature	2 ~ 94°C
Rated Body Pressure	PN16 / PN25
Flow Characteristic	Equal Percentage
Leakage	Less than 0~0.01% Kv
Connection Type	Flanged
Closing-off Pressure	600kPa
Rotation Angle	90°
Installation Level	Horizontal / Vertical

Material	
Valve Body	Casting Iron
Valve Ball	Stainless Steel
Valve Seat	PTFE
Valve Shaft	Stainless Steel
Seal	NBR

Dimension



DN65~DN100

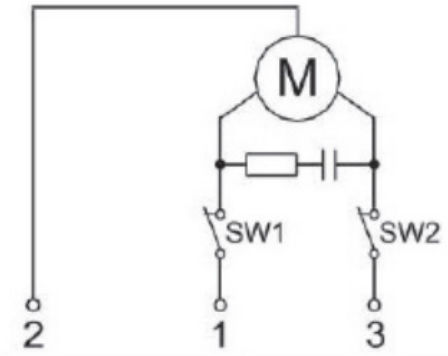


DN125~DN150

Size	Rated Body Pressure	Kv	Dimmension (mm)						
			L	H	D1	D2	D3	D4	D5
DN65	PN16 (PN25)	64	190 (190)	216 (216)	82 (82)	120 (120)	185 (185)	145 (145)	18 (18)
DN80		102	190 (190)	216 (216)	82 (82)	136 (136)	200 (200)	160 (160)	18 (18)
DN100		163	230 (230)	226 (226)	102 (102)	156 (162)	220 (236)	180 (190)	18 (23)
DN125		260	254 (254)	232 (232)	125 (125)	188 (188)	250 (270)	210 (220)	18 (26)
DN150		416	267 (267)	250 (250)	154 (154)	210 (215)	285 (300)	240 (250)	22 (26)

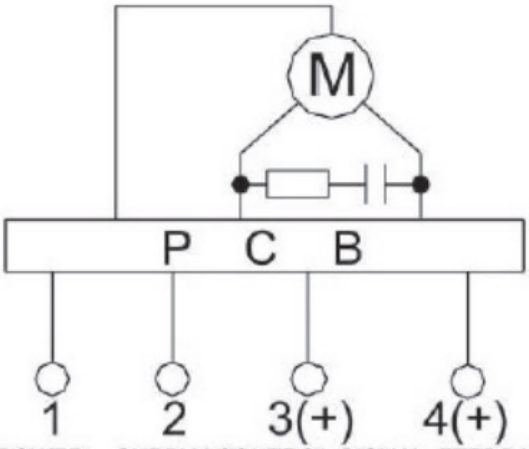
Wiring Diagram

WIRING



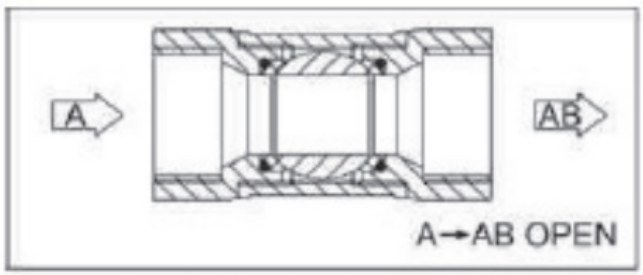
POWER	ROTATING DIRE.
1-2	0°
2-3	90°

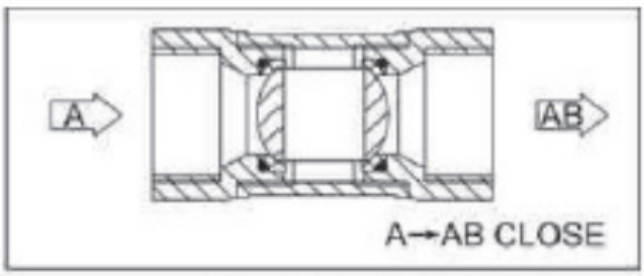
PCB SETTING

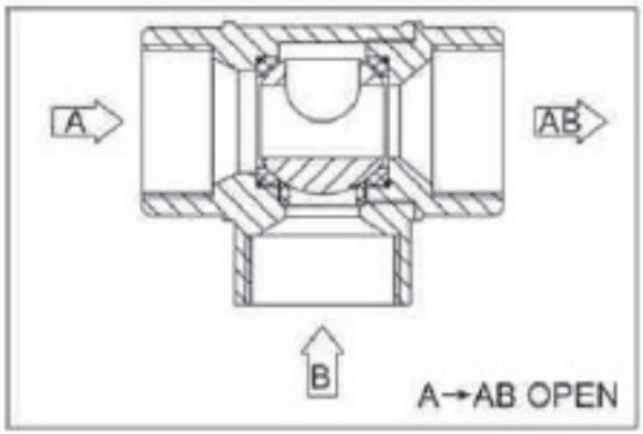


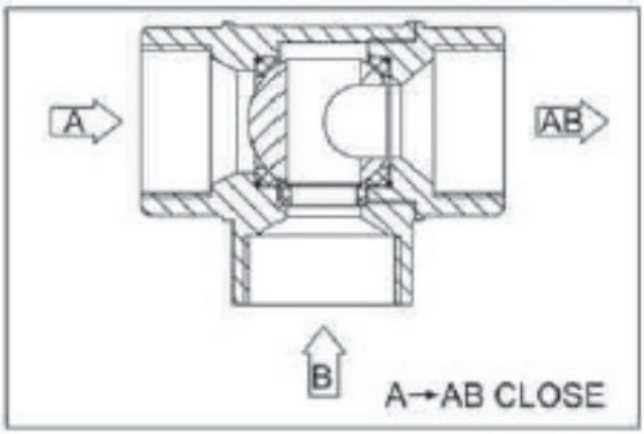
1 POWER SUPPLY 24VAC
2 SUPPLY SIGNAL COM
3(+) CONTROL SIGNAL (0)2~10VDC OR (0)4~20mA DC
4(+) FEEDBACK SIGNAL 0~10VDC

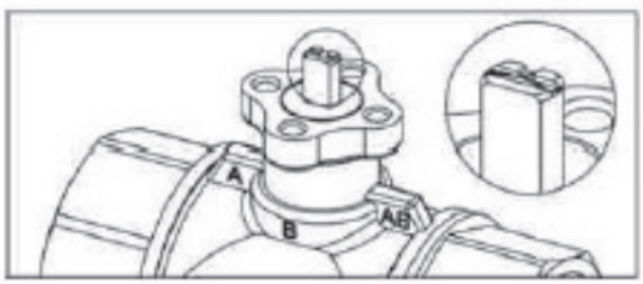
INPUT CONTROL SIGNAL		ACTUATOR ROD
DA	RA	
INCREASE	DECREASE	0°
DECREASE	INCREASE	90°

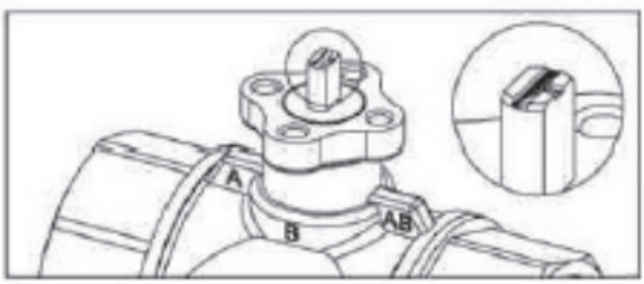






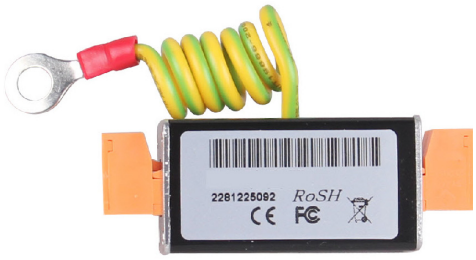






RS485 Lightning Protector

Description



RS485 Lightning Protector is used for lightning protection of data communication system, which can protect the four signal lines or two twisted pair line information, to provide high energy and low energy level to protect the coarse fine for the protection of the data line. It also provides fine differential mode protection and ground to common mode protection for 1, 2 and 3, 4 lines,and thus effectively absorb and transfer the energy impact caused by lightning and surge, and introduce the energy into the earth through the grounding cable, and ultimately protect the sensitive electronic equipment from being infringed.
It is used for all RS485 data or composite video signal transmission system over-voltage protection (such as monitoring system 485 PTZ, camera protection)

Highlights

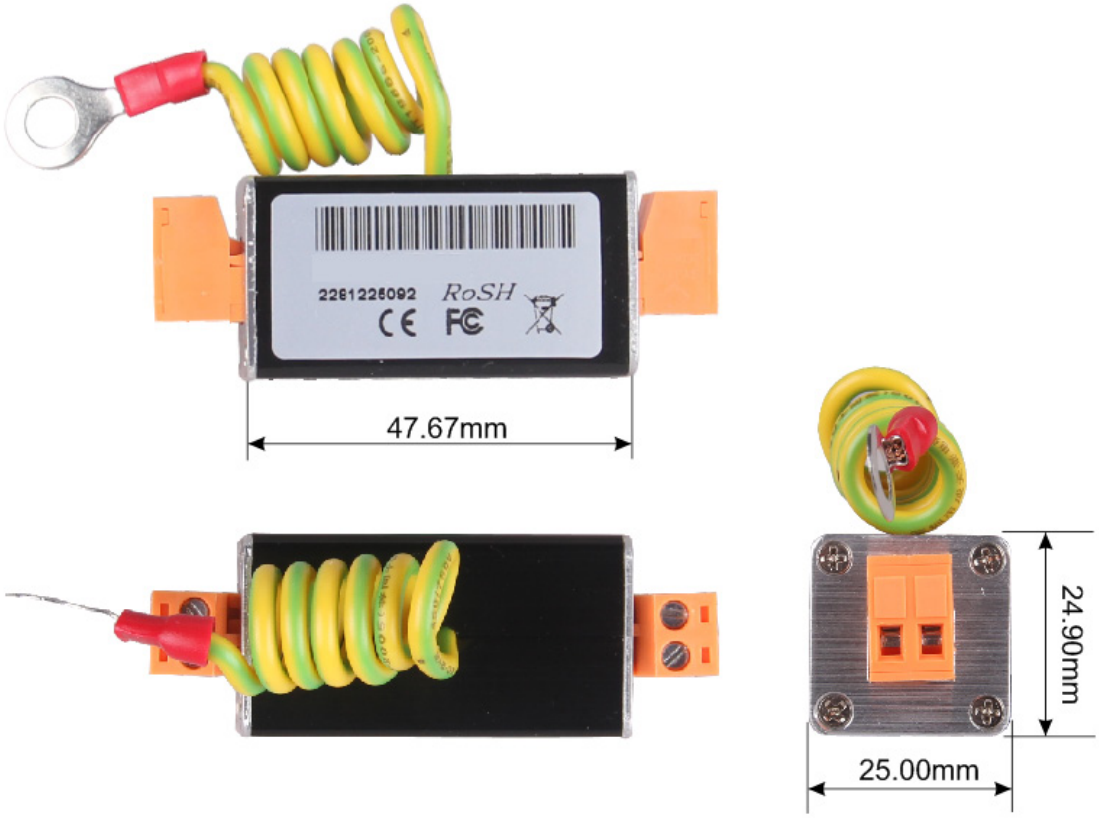
- Large flow capacity
- Multi-level protection
- High response speed
- Low insert loss

Specifications

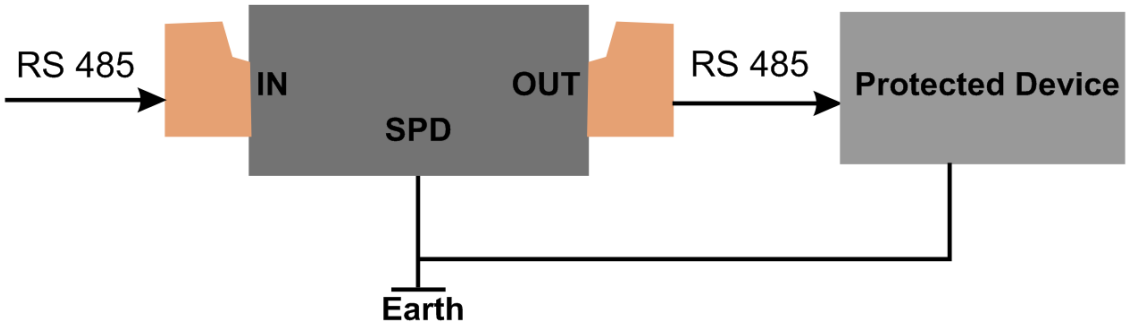
Interface	2*2-bit Rs485 industrial terminal
Discharge voltage	7.8V
MCOV	5.5V
Response time	<0.5ns
Bandwidth	0-10M
Insert Loss	<0.2dB
Operating temperature	-60~+190°C
Size	65*25*25mm

RS485 Lightning Protector

Dimension



Wiring Diagram



Note:
IN is the input port ,which is connected to the transmission line, OUT is the output port,which is connected to the device to be protected. A protector is connected to signal output source device port and the input port of the protected device. The ground conductor and the ground bus of lightning protection system should be reliably connected.

Power Adapter-PA-12V

Power Adaptor

Description

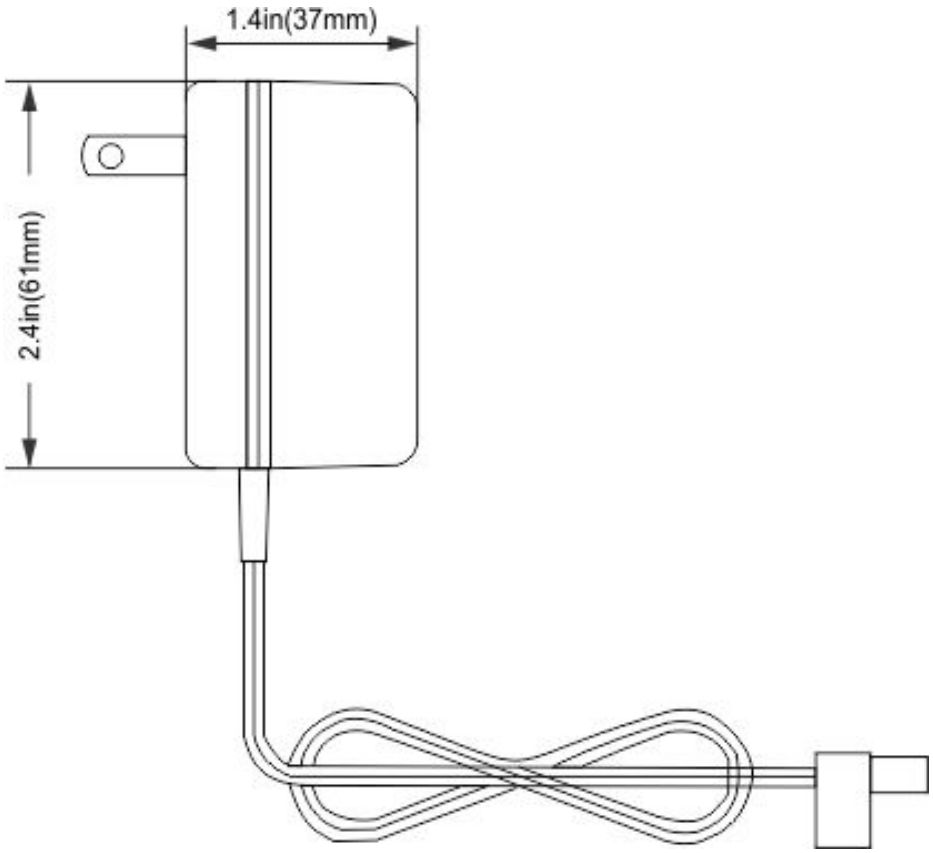
The product is a kind of AC to DC switching power transfer device,which can provide 120VAC input, 12VDC&150mA output. It's a wall plug power adaptor.



Specifications

Power Adaptor	AC-DC
Input	120VAC, 60Hz
Output	12VDC, 150mA
Color	White
Weight	0.18kg

Dimension



Terminal Shorting Bar

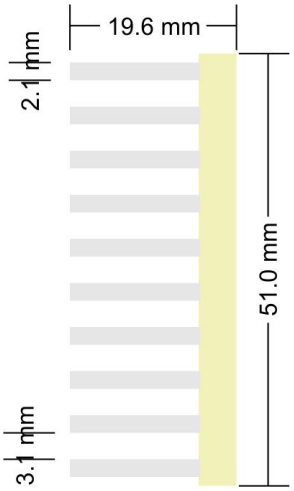
Description

Use these strips to run a common conductor through multiple terminals on any of the Temco T3 series controllers and I/O modules. This terminal strip speeds up wiring and improves the reliability of your terminations. Each of the pins on the strip screws into the terminal block. The outer bar is covered in high temperature ABS. They're available in 10 pin only version for now, you can cut them down for shorter runs or gang them up for longer runs.



Specifications

Specs	10 pin shorting strip
Spacing	3.1mm
Material	Galvanized steel, 0.8mm
Insulation	UL listed ABS
Maximum Current	10 amps
Maximum Voltage	110VAC







HPB5 Series Push button

Product Overview

HPB5 series are suitable to industrial
control circuit with AC 50Hz or 60HZ, 0~380V rated voltage and 0~220V D C operating voltage,used for the control of magnetic starter, contactor, relay and other electric circuit.

Specs

The product has two types: normal type
and economical type,containing pilot lamp,
pushbuttons, illuminated pushbuttons, mushroom push button, emergency pushbuttons, selector switches, key-lock switches, mushroom key-lock switches, double head switchs, The installation hole isΦ22mm . It used in wide area.

Performance

Using high quality inflaming retarding materials. Switch unit is separated independently, the insulating per formance and antivibration is very well. The product meets standards of IEC60947-5-1,GB14048.5 etc.

Structure

The switch unit is slow-breal and self -cleaning. It uses modular combination mode and you can combine fromone to eight switch units optional, so can make the product meet there quirement of many special control
circuits.It can be connected more safely and installed firmly.Economical plastic type can be used in acid environment.

Protective Degree

The standard is IP40 and some types can reach IP67 with the seal cover.

Specifications

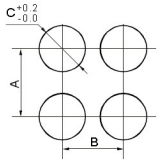
Operating Temperature		- 25 ° C~+55° C(no freezing)
Operating Humidity		45 Operating Humidity ~ 85%RH(no condensation)
Operating Altitude		Installati on site can't be over 2000m above see level.
Contact Material		-silver -silver alloy -gold-clad silver, cladding thickness is 3μm
Contact Resistance		≤50m
Insulation Resistance		≥100M
Dielectric Strength		3000V,Alternating Current50Hz
Vibration Resistance		50Hz,Amplitude 1.0mmp-p
Shock Resistance		≥10g
Life	Mechanical	Momentary :≥1,000,000 times; alternate,selector :≥500,000 times;key-lock,emergency :≥200,000 times
	Electrical	50000times≥
Terminal		Screw terminal, connecting abili ty: Min : 1×0.5mm , 2 Max: :2×1.5mm or 1×2.5mm 2 2 (with or without connecting link)
Operation		Operation strength:800gf~2200gf,according to the quantity of switch units Operation travel :About 5.5mm(For push button type)
Pollution Degree		3 degrees

Switch Ratings

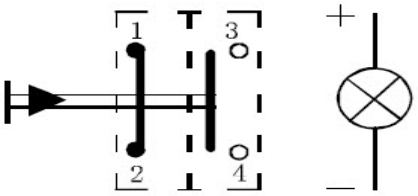
Rated Insulation Voltage	Ui: 660V					
Thermal Current	Ith: 10A					
Rated Voltage	24V	48V	110V	220V	380V	500V
Direct Current	10A	5A	2.2A	1.1A		
Alternating Current P.F=0.7			10A	6A	4A	2A

Installation Dimensions

Panel thickness is 0.5~5mm



Switch Ratings



Switchcode:11
1,2arenormalclosed;
3,4arenormalopened.

Momentary Push Button

Type	A	B	C	Remarks
Normal,Key-lock	≥50mm	≥40mm	Φ22	1.Canbeusedin25mminstallationhole-withadiameterchangingcircle. 2.AandBareboththeminimumdimensions..
Lever	≥55mm	≥40mm		
Mushroom	≥50mm	≥50mm		
BigMushroom	≥70mm	≥70mm		

LampRatings

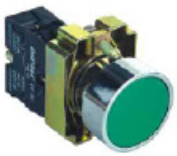
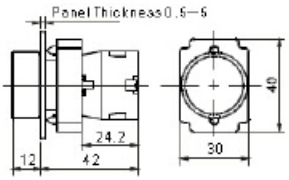
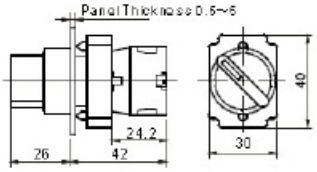
LampType	ACLEDLamp		
Rated Voltage	AC/DC6V	AC/DC12V	AC/DC24V
	AC110V	AC220V	AC380V
LampLife	40,000hours		
LampColor	R G Y O B W		

Note:1.Thelampcontainscurrent-limitingresistorinsideanddoesn'tneedconnectoutside..
2.ThestandardisusingAC/DCLEDlamp,DCLEDlamp,dual-colorLEDlampandothervoltagescanbecustomized. customizedifyouneed.

Implication of Type

HPB5 ☆	★	— □	■	/ ◇◆	/ △	/ ▲	/ ◎
Code of series	Structure type: E plastic type E1 simple type No letter means metal head.	The front shape: J double head type: flat head with flat head. S double head type: flat head with big head. No letter means round	Contact Structure: 01 1NC 10 1NO 11 1NO1NC 22 2NO2NC Can be freely combined according to your needs.	Operating type: D pilot lamp Z alternate type X selector type XB lever type Y key-lock type M mushroom type TS emergency type No letter means momentary	◇ expresses selector and key-lock operating position: 2 two position 3 three position ◆ expresses operating type: 1 maintain 2 half return 3 self return	Color: R red G green Y yellow O orange B blue W white N black	Lamp Voltage (Please check the lamp rating)	Protective Degree: P IP65 FP IP67 No letter means IP40

Cutline of Normal Type

Shape	Operating Type	Type Number	Dimensions	Remarks
Flat Head 	latching style	HPB5-□/△/◎		R G Y O B W N Can't be used with lamp. Protective Degree: IP40 IP65, IP67 IP67 should be installed with seal cover.
Selector Switch 	90° position maintain	HPB5-□X/21/◎		N Can't be used with lamp. Protective Degree: IP40,IP65
	90°2 position return	HPB5-□X/23/◎		
	45°3 position maintain	HPB5-□X/31/◎		
	45°3position half return	HPB5-□X/32/◎		
	45°3 position self return	HPB5-□X/33/◎		

Plastic Switch Box

Description

The Switch BOX series sealed box is widely used in industries such as machinery and machine tool, electric equipment, power, communication, automation, etc., as well as in marine, metallurgy, chemical, aerospace, rail transportation, sewage treatment, architecture and so on. Depending on the requirements, it can be used as sealed box, instrument case, field control cabinet, or illumination box. It also can be used as terminal box or button box.

1. The materials used for Switch BOX series sealed box can be divided into enhanced flame retardent ABS ;
2. IP65 protection
3. Sealed boxes with or without knockdown holes available;
4. Mounting holes inside the box for installation of boards or fixing of guide rails;
5.Superior corrosion resistance of the box, pollution free;



PSB-1

Specifications

waterproof push button station boxes
1.Protection level IP65
2.Cert:CCC,CE,TUV,RoHS
3.Flame retardant: V0
4.Material: ABS &
5.External Size:80x110x70mm
6.Fit Round Switch Head Diameter:22mm
7.Screwthread Diameter:5mm
8.Color:white
9.One or two holes



PSB-2

Flashing Strobe Annunciator

1. Descriptions

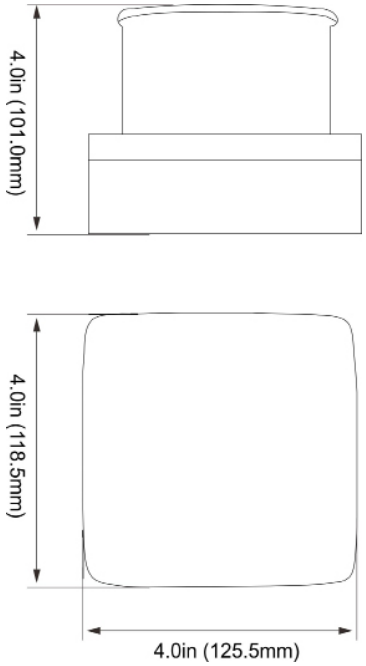
The strobe sounder is an ideal alternative to fire bells and for external use. It is housed in an attractive horn comprises of flame retardant ABS. Eight selectable tones and a volume control are featured to meet most requirements.

The strobe is also available with transparent poly-carbonate front which will provide both visual and audible alarm.



2. Specifications

Color	Red/Yellow
Operating voltage	24V AC/DC
Alarm current	≤40mA
Operating temperature	-20°C~+60°C
Waterproof rating	IP65
Flash	60±3 times/min
Sound	8 different tones
Operating humidity	≤95% RH
Sound	100db(within 1m)
Size	124*130*100mm
Weight/pcs	0.36kg



3. Part Number Scheme

FSA - R

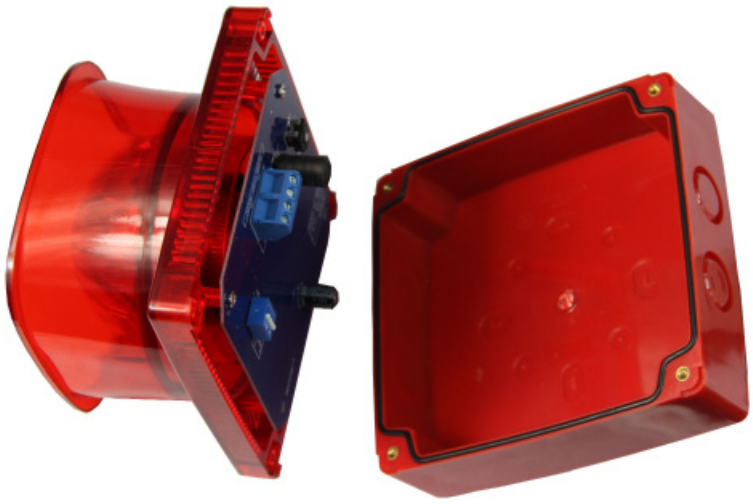
Code	Description
FSA	Strobe Annunciator

Code	Option
R	Red
Y	Yellow

Flashing Strobe Annunciator

4. Features

- 8 adjustable tones
- Adjustable volume



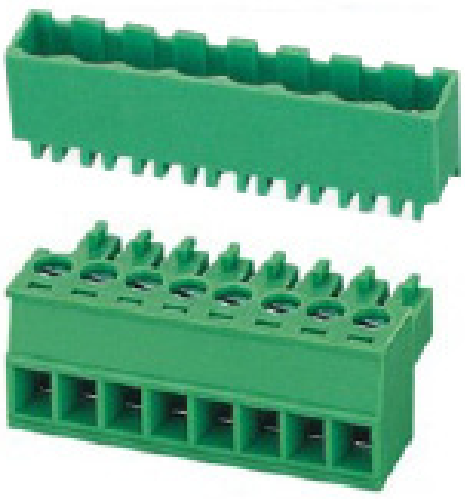
Model		
Part No.	FSA-Y	FSA-R
Color	Yellow	Red
Sound Output	See current consumption table	
Operation Voltage	24V AC/DC	
Quiescent Current	0mA	
Alarm Current@24V	See current consumption table	
Operating Temperature	-20°C to 60°C	
Minimum Continuous Temperature	0°C	
Maximum Humidity	95%RH non condensing	
IP Rating	IP65	
Size	124*130*100mm	

DIL SWITCH SETTINGS (SW4 N/A)					
1	2	3	Tone Description	dB Level	Current (mA)
Off	Off	Off	Sweep Negative 1200-500 Hz In 1 Second	101 (+/- 2dB)	27
On	Off	Off	Alternating 554 and 440Hz 0.5s Each	98 (+/- 2dB)	20
Off	On	Off	Continuous 660Hz	101 (+/- 2dB)	27
On	On	Off	Alternating 554Hz @ 0.1s/440Hz @ 0.4s	98 (+/- 2dB)	19
Off	Off	On	Intermittent 970Hz @ 0.5s On/Off	98 (+/- 2dB)	20
On	Off	On	Continuous 970Hz	103 (+/- 2dB)	29.3
Off	On	On	Sweep Positive 800-970Hz	103 (+/- 2dB)	38
On	On	On	Alternating 800 and 970Hz @ 0.25s Each	102 (+/- 2dB)	35

Connectors

Descriptions

The connectors,also called plug-in terminal blocks, provide the wire size from 0.08mm2 to 16mm2.
It is available with different pitches from 2.5mm to 10.16mm.You can choose insert direction, contact direction, plug-in direction according to requests.

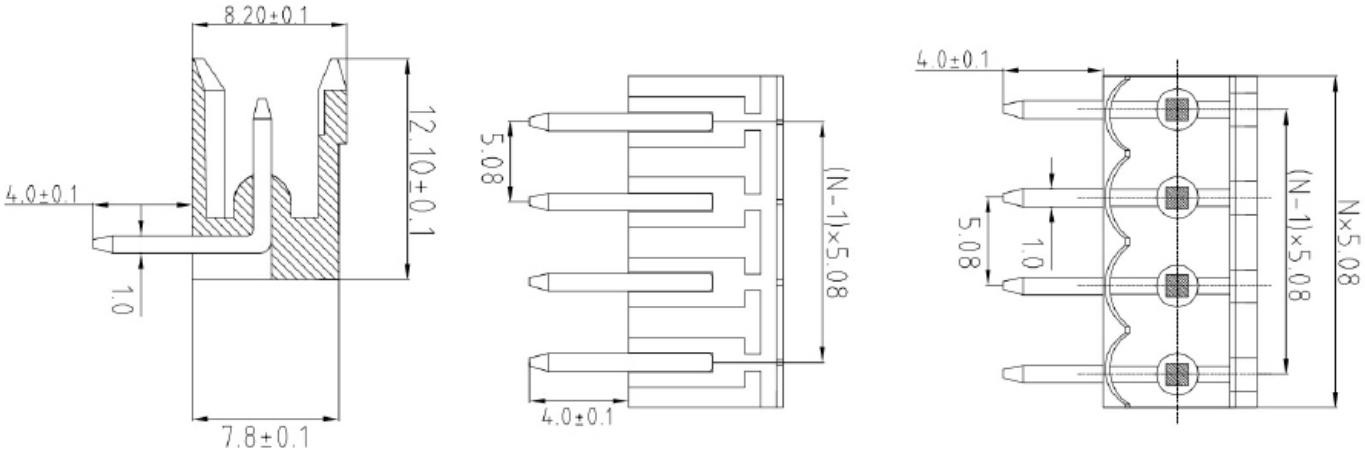


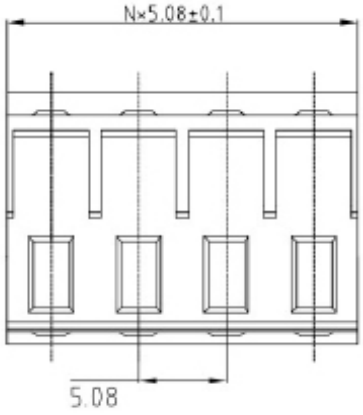
Specifications

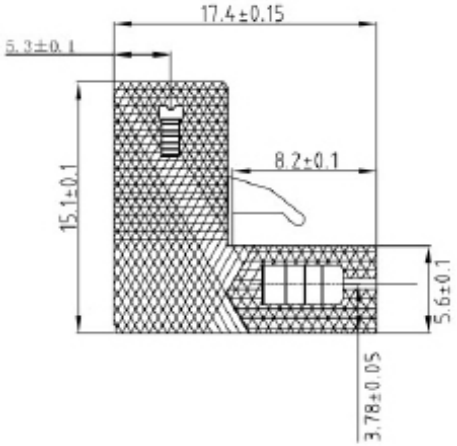
Voltage :300V
Current:10A
Voltage resistance:AC2500V/1Min
Conductive wire diameter:28-14AWG
Temperature Range:-40 °C ~-105 °C
Plastic Enclosure:PA66,UL94V-0
Screw:M2.5,steel

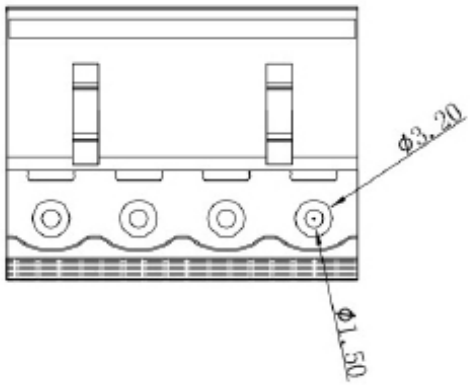
Dimensions

Unit:mm




N×5.08±0.1
5.08


17.4±0.15
5.3±0.1
8.2±0.1
15.1±0.1
5.6±0.1
3.78±0.05


φ3.20
φ1.50

Floor Heating Manifold&Electro-thermal Actuator

Descriptions

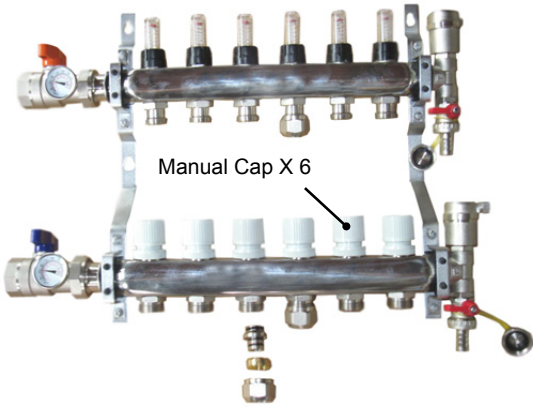
Manifold is used for heat regulation in floor heating systems.

Manifold is for flow and return, with the option of connecting up to twelve floor heating circuits. Components can be connected in series via unions.

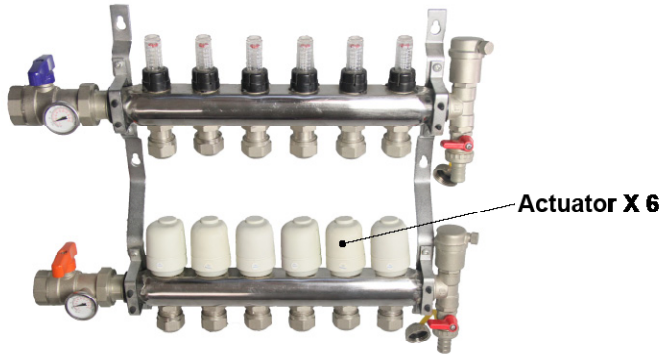
The flow is set individually for each floor heating circuit. Thermostatic valve inserts are integrated in the return manifold, which can be controlled electronically by means of thermal actuators or act as a self-acting unit by means of remote temperature adjusters.

Versions available from 2–12 Ports to serve up to 12 circuits per manifold.

The manifold comes in your choice of 3/4” Outlets rated for 21 PSI or 1/2” Outlets rated for 36 PSI.



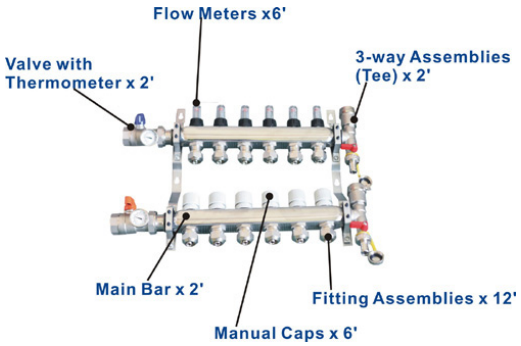
Manual adjustable caps can be replaced by actuators shown in the following picture.



Main Material & Components

The manifold is made of 304 stainless steel.

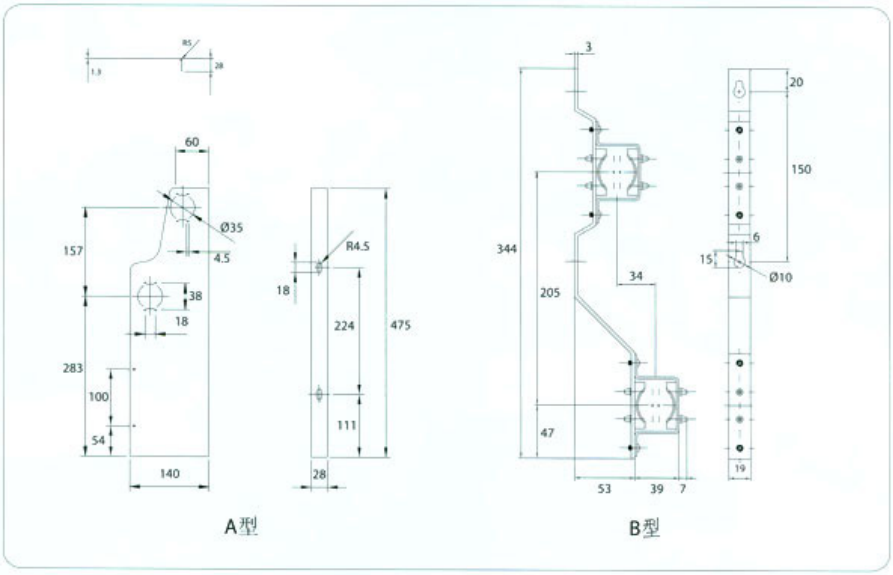
Components Include:
2-12 loops optional,
1” main bars and 3/4”or 1/2” outlets;
viewable and adjustable flow meters;
automatic drain tap, end cap and drainage valve ;
a pair of brackets;
straight/angle valves with thermometer;
loop fitting assemblies: 1216 & 1620;
loop cap.



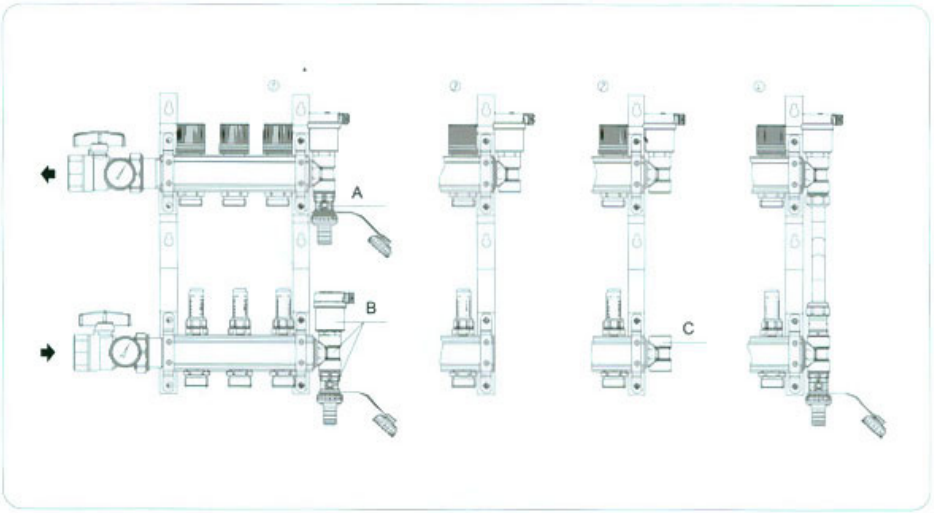
Loop Cap:	Loop Fitting Assembly 1216:	Loop Fitting Assembly 1620:
		

Floor Heating Manifold&Electro-thermal Actuator

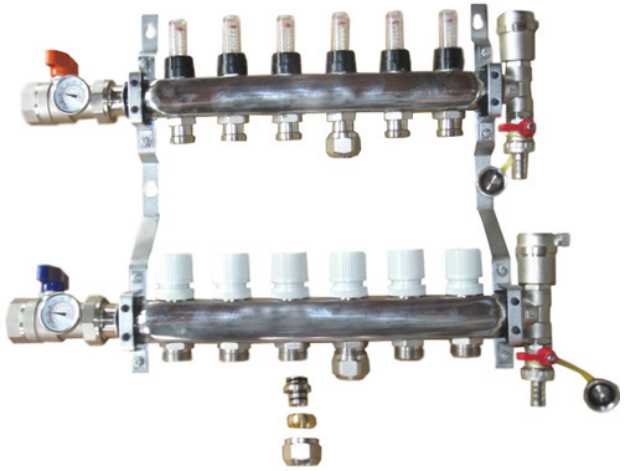
Dimensions



Circulations



Installation



Humidity / Temp Transmitter & Modbus

Humidity Sensor uses MODBUS protocol to communicate with others. Following is a table of MODBUS Registers.

Address	Register and Description
424	temperature output current calibration offset value adjust value(30% - 40%)
425	temperature output current calibration offset value adjust value(40% - 50%)
426	temperature output current calibration offset value adjust value(50% - 60%)
427	temperature output current calibration offset value adjust value(60% - 70%)
428	temperature output current calibration offset value adjust value(70%- 80%)
429	temperature output current calibration offset value adjust value(80% - 90%)
430	temperature output current calibration offset value adjust value(90% - 100%)
431	humidity output current calibration offset value adjust value(0 - 10%)
432	humidity output current calibration offset value adjust value(10% - 20%)
433	humidity output current calibration offset value adjust value(20% - 30%)
434	humidity output current calibration offset value adjust value(30% - 40%)
435	humidity output current calibration offset value adjust value(40% - 50%)
436	humidity output current calibration offset value adjust value(50% - 60%)
437	humidity output current calibration offset value adjust value(60% - 70%)
438	humidity output current calibration offset value adjust value(70% - 80%)
439	humidity output current calibration offset value adjust value(80%- 90%)
440	humidity output current calibration offset value adjust value(90% - 100%)
441	spare for futher function
442	spare for futher function
443	temperature output offset, depending on sensor range
450	Temperature Calibration Offset for sensor
451	Humidity Calibration Offset for sensor
452	the filter of temperature
453	the filter of humidity
454	calibrate table select,default tabel =0 or customer table = 1
455	user calibrate points number
456 ~ 475	user calibrate points
476	K line
477	B line
478	humidity sensor serial number
479	spare for futher function
480	spare for futher function
481	spare for futher function
482	dew point
483	heat control

Strobe Annunciator

1. Descriptions

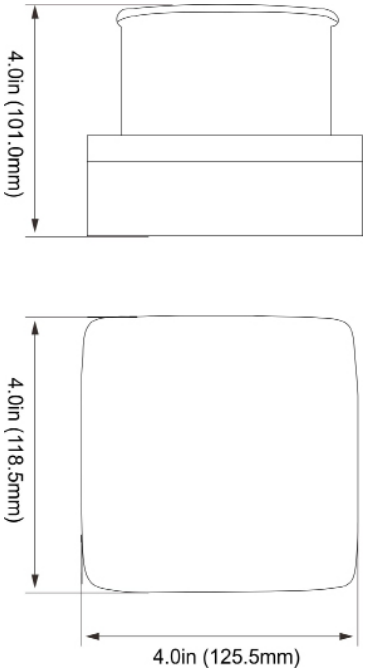
The strobe sounder is an ideal alternative to fire bells and for external use. It is housed in an attractive horn comprises of flame retardant ABS. Eight selectable tones and a volume control are featured to meet most requirements.

The strobe is also available with transparent poly-carbonate front which will provide both visual and audible alarm.



2. Specifications

Color	Red/Yellow
Operating voltage	24V AC/DC
Alarm current	≤40mA
Operating temperature	-20°C~+60°C
Waterproof rating	IP65
Flash	60±3 times/min
Sound	8 different tones
Operating humidity	≤95% RH
Sound	100db(within 1m)
Size	124*130*100mm
Weight/pcs	0.36kg



3. Part Number Scheme

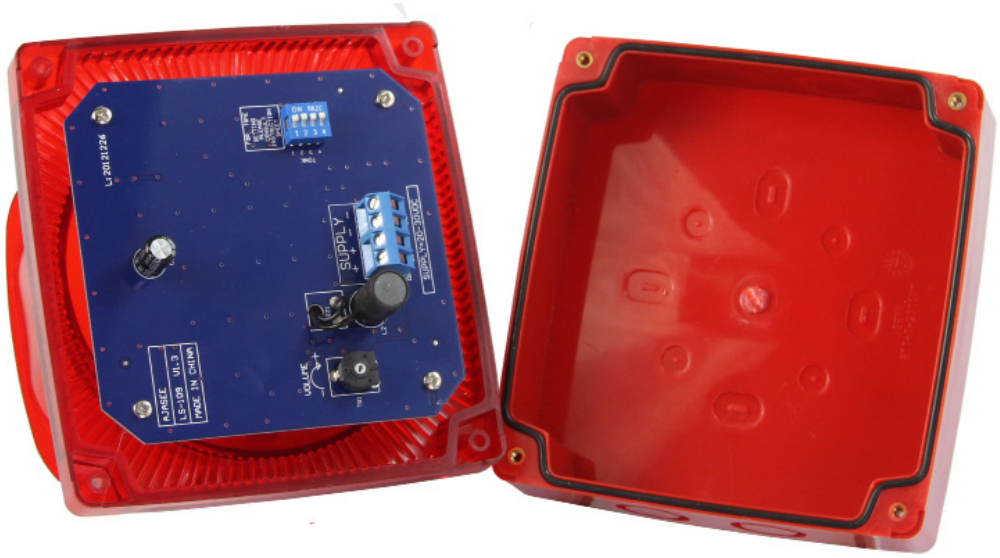
FSA - R

Code	Description
FSA	Strobe Annunciator

Code	Option
R	Red
Y	Yellow

4. Features

- 8 adjustable tones
- Adjustable volume



Model		
Part No.	FSA-Y	FSA-R
Color	Yellow	Red
Sound Output	See current consumption table	
Operation Voltage	24V AC/DC	
Quiescent Current	0mA	
Alarm Current@24V	See current consumption table	
Operating Temperature	-20°C to 60°C	
Minimum Continuous Temperature	0°C	
Maximum Humidity	95%RH non condensing	
IP Rating	IP65	
Size	124*130*100mm	

DIL SWITCH SETTINGS (SW4 N/A)					
1	2	3	Tone Description	dB Level	Current (mA)
Off	Off	Off	Sweep Negative 1200-500 Hz In 1 Second	101 (+/- 2dB)	27
On	Off	Off	Alternating 554 and 440Hz 0.5s Each	98 (+/- 2dB)	20
Off	On	Off	Continuous 660Hz	101 (+/- 2dB)	27
On	On	Off	Alternating 554Hz @ 0.1s/440Hz @ 0.4s	98 (+/- 2dB)	19
Off	Off	On	Intermittent 970Hz @ 0.5s On/Off	98 (+/- 2dB)	20
On	Off	On	Continuous 970Hz	103 (+/- 2dB)	29.3
Off	On	On	Sweep Positive 800-970Hz	103 (+/- 2dB)	38
On	On	On	Alternating 800 and 970Hz @ 0.25s Each	102 (+/- 2dB)	35

Tstat5i

Description

This full-featured CPU based thermostat is designed for small cooling and heating air handling systems in residential and commercial facilities. The unit provides features which eclipse standard mechanical thermostats at a price that fits conventional HVAC projects. Use for heat pumps, air handlers, fan coils, baseboard control, simple zone control, freezers, heaters.... Various configurations of i/o for low and line voltage applications, up to 5 relay outputs & 2 analog outputs.



Highlights:

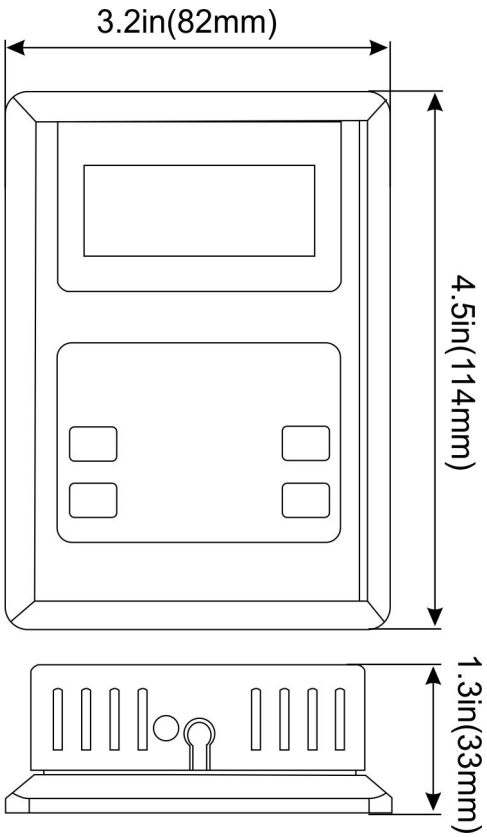
-Tight control of 0.5°C provides comfortable indoor environment.

-High impact plastic enclosure provides durability in commercial environments.

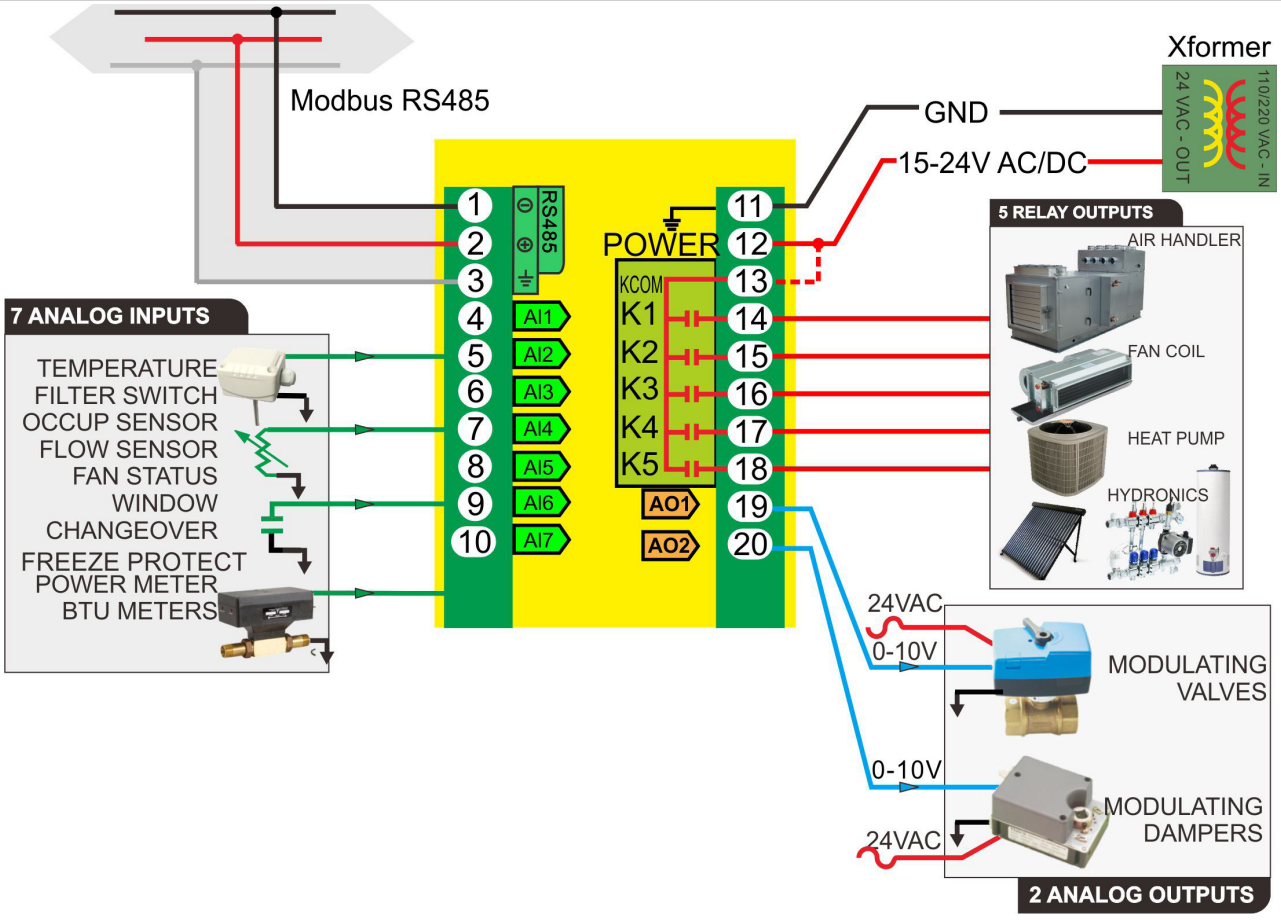
-Customizable sequence of operation table (FCU with modulating or on/off valve, single or 3-speed fan, pressure independent VAV, stage sequencer…)

Specification

TSTAT5I	7 analog inputs, 5 relays, 2 analog outputs (10V @100ma)
Operating temperature	-30-70°C(-22~158°F)
Supply voltage	15~24VAC/DC ±20%, 50-60Hz
Power consumption	100mA at 12VDC
Relay contacts rating	2A@30VDC, 0.5A/125VAC UL File No.: E43149 CSA File No.: LR26550
Ambient humidity	10-90 %Rh
Operating environment	0 ~ 99% humidity non condensing
Plastic housing	Flammability rating UL 94HB
Enclosure rating	IP31
Internal Temperature sensor	10K thermistor ±0.5°C
Color	White
Weight	200g

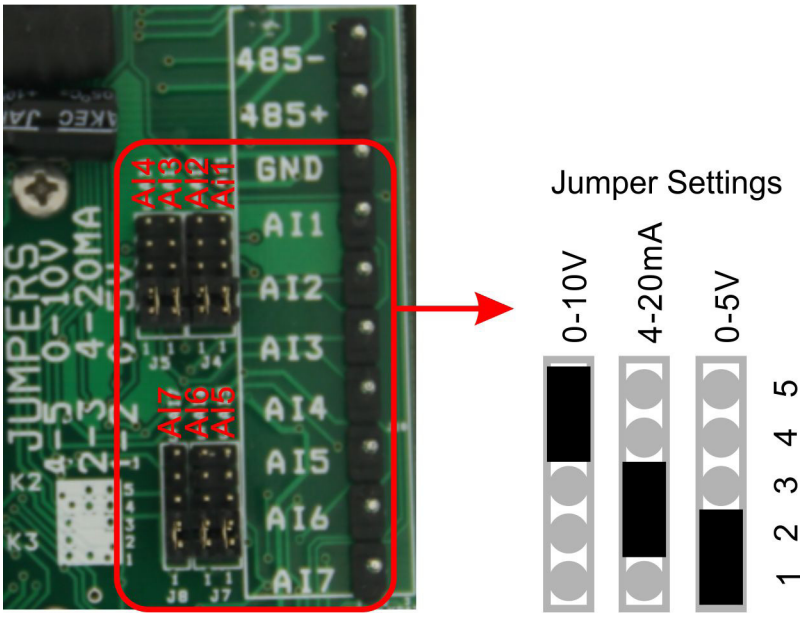


Wiring Diagram



Jumper Settings

There are 7 universal inputs, each analog input has its own jumper setting, and all you need to do is to set the single jumper to the appropriate signal type: 0-5V, 0-10V, or 4-20mA.





There are four advanced menu items which can be adjusted to suit the application and tune the operation of the thermostat, generally speaking, all the parameters are set up at the factory and will give satisfactory results out of the box. Below is the instructions.

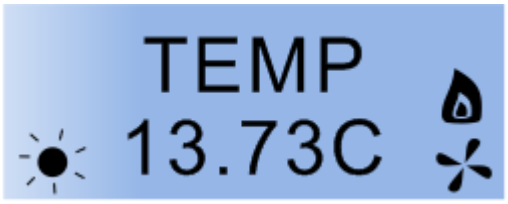
Decrease value

Increase value

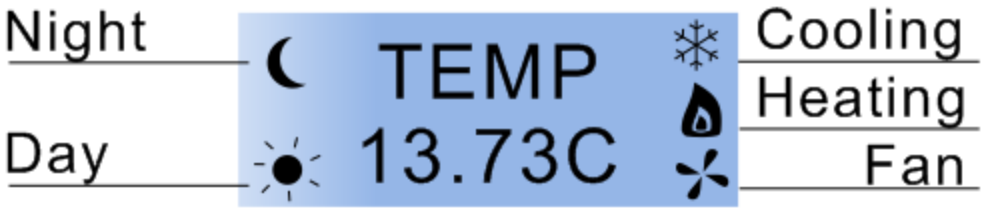
Previous Item

Next Item

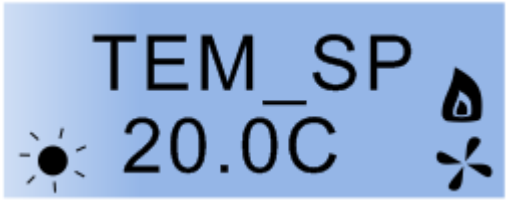
1. Normal state



2. LCD display



3. Now you are in the normal state, when you press ▲ or ▼, it will show the set point screen. Press ▲ or ▼, to increase or decrease the set point value. Waiting three seconds, it will confirm the setting automatically. It will be heating or cooling mode as you set.



4. Now you are in the normal state, when you press ◀ or ▶, it will switch to system on, off or auto mode. When it comes to system on mode, the day LCD screen displayed. When turning to system off mode, the night LCD screen displayed.



5. Now you are in the normal state, press ◀ and ▶ together, keep it for several seconds, it will switch into the menu item. Below the table show the specific information of the advanced menu items.

Advanced Menu Items

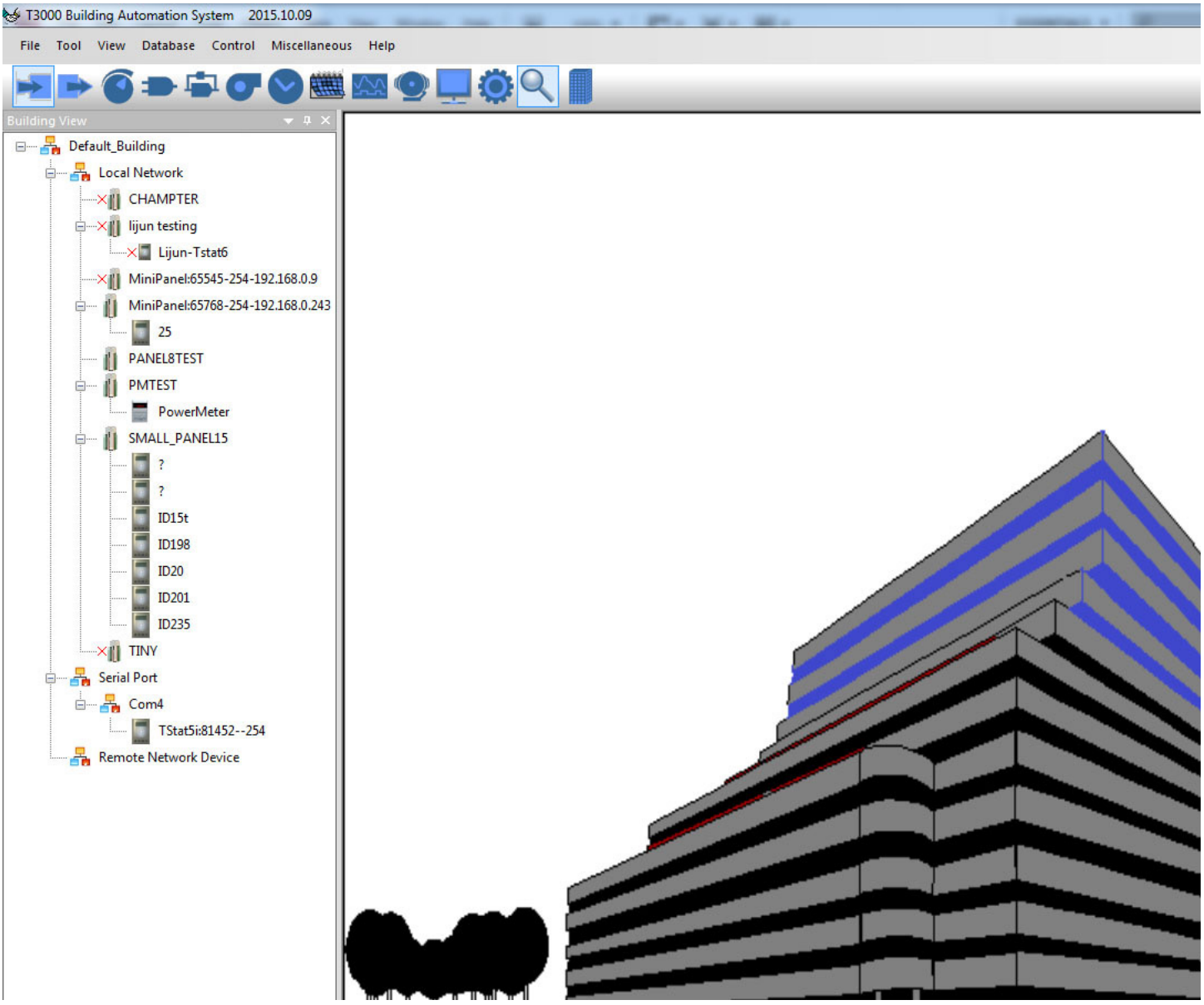
Code	Description (Range, Default)
Add	**Modbus Device Address (1-254, 254)** This is the modbus address of the tstat. It is the address to which the stat will respond when receiving serial communication.
CAL	**Calibration of the Selected Temperature Sensor (0-1000, 500)** To calibrate the temperature shown on the tstat display you will need a handheld mercury thermometer or digital thermometer. Hold the meter close to the thermostat and allow it to come to equilibrium. Use the keypad to get into the menu mode until CAL is shown on the display. Now you can adjust the display using the up and down buttons till the temperature shown matches the handheld meter. When you are done, just let the display time out to normal operation, the display will stop flashing and will show the current room temperature. You can repeat this sequence if necessary till the readings on the thermostat and meter agree. The thermostat will store the calibration figures even through extended power outages and should not need to be adjusted for many years. The main point to keep in mind when calibrating is to let everything come to equilibrium. The thermostat should be powered up for 5 minutes prior to any calibration and the thermometer should be left near the thermostat for about the same amount of time. The 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 resolving down to 0.06°C so the weak link in calibrating is usually the procedure used rather than the tstat accuracy. • Make sure the tstat is mounted in a location free of drafts. .
tSS	**Temperature Sensor Select (0-3, 0)** The tstat has an extra input for use with an external temp sensor. tSS = 0: The tstat will use the internal temperature sensor IC 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 internal thermistor and external thermistor which is shown on the display and used for PID calculations.
FIL	**Temperature Sensor Filter (0-10, 5)** Filter used for the raw temperature being read by the sensor. 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 readings more but make them respond more slowly.
CAL DAC	
BAUDRATE	**Baud Rate (0-1, 1)** This is the rate of serial communication. It can be set to either 9.6 kb/s or 19.2 kb/s.
dSC	**Short Cycle Delay (0-20, 0)** This parameter adjusts the delay between cycling of the mode of operation. It is the number of minutes after entering 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, dSC minutes, until it can re-enter into Cooling1 mode. This value is in increments of 1 min.
dCH	**Changover Delay (0-200, 0)** This parameter adjusts the delay between switching from a heating mode of operation 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 min.
PPr	**Proportional Term (10-255, 20)** The proportional term is the 'P' term of the familiar PID control strategy and determines 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 valve respond 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 lazy 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° (C or 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 described next. The P value is in increments of 0.1° (i.e. 20 means 2.0°) and is in the same units (C or F) as the tstat.

Code	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 I term will gradually open the valve to make up the final small deviation from set-point. The default value of 5.0 (%/Deg minute) is fine for most applications and will cause the valve to open 5% for one degree (C or F) of error per minute. For example, when the PIn term set to the default of 5.0 (%/Deg 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 I term 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 I term as the opposite of the P term, -"a bigger I means faster valve, smaller I means lazier valve". -The default value of 5% will work fine for most applications. -If the valve is short cycling, make the I term lazier (smaller). The I value is in increments of 0.1 %/°min (i.e. 50 means 5.0%/°min) and is in the same units (C or 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: 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, 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, Coasting, Cool1, Cool2 and Cool3. So the table is a 5 outputs x 7 steps spreadsheet 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 "Tstat Factory" software utility on our website (http://www.temcocontrols.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: Setting SOP to 2, puts the Tstat into transducer mode. In this mode, the cooling analog 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: A special sequence of operations is embedded in the tstat that assists in commissioning of the installation and testing of the tstats. When SOP is set to '0' this is the testing sequence and the unit will cycle the relay outputs on and off in a slow rotation. The analog outputs are also cycled in a slow ramp, the cooling goes from 0-10V while the heating goes in reverse from 10 to 0V. 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.
HC	**Heating Cooling Mode Configuration (0-5, 0)** This item configures the method by which the tstat determines the heating or cooling mode. HC = 0: mode is controlled automatically by the PID. PID > 52 is heating mode, PID < 48 is cooling mode. HC = 1: mode is controlled by the keypad or serial communication. This is for keypad configurations in which the user or serial com can manually set heating or cooling. 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 in1 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. HC = 5: same as mode 4, but using the analog in2 sensor instead of analog in1.
Hdb **Cdb**	**Heating & Cooling Deadbands (1-200, 10)** If there is one setpoint, the heating setpoint follows the cooling setpoint and is calculated by: Heating Setpoint = Setpoint - Heating Deadband. Cooling Setpoint = Setpoint + Cooling Deadband If there are two setpoints, heating and cooling are separately adjusted. The setpoints are calculated as follows: Heating Setpoint = Max(Cooling Setpoint + Cooling Deadband , Heating Setpoint) Cooling Setpoint = Min(Cooling Setpoint, Heating Setpoint - Cooling Deadband) The min value for Cdb 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.

Code	Description (Range, Default)
UNITS C_F	**Degrees C/Degrees F (0-1, -)** The display can be switched to show Degrees C or Degrees F. 0 = C, 1 = F.
FAn	**Number of Fan Speeds to show on the display (0-3, 3)** The number of fan speeds allowed. Fan = 3, user will see “Off, -1-, -2-, -3-, Aut” Fan = 2, user will see “Off, -1-, -2-, Aut” Fan = 1, user will see “Off, -1- , Aut” , Fan = 0, user will see “Off, On”
nHd **nCd**	**Night Heating Deadband (0-35, 10) for deg C, (0-95, 10) for deg F** **Night Cooling Deadband (0-99, 10) for deg C and F** When the tstat is in unoccupied mode, and APP is set to 0, the heating setpoint is adjusted downwards by the amount of the nHd. The cooling setpoint is adjusted upwareds 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.
nSp	
APP	**Application (0-1, 0)** 0 - OFFICE applications 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 setpoints Night Heating Setpoint = Cooling Setpoint - nHd value. Night Cooling Setpoint = Cooling Setpoint + nCd value.
POS	**Power on setpoint (0-255, 20) for deg C, (0-255, 68) for deg F** 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 every day. 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.
POn	**Power on Mode (0-3, 3)** 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 to power up in whatever state it was in before the power outage.
PAd	**Number of buttons on the keypad (0-5, 1)** The keypad has up to six buttons. The setting is not normally adjusted in the field, but it does offer some flexibility to adjust the configuration to accommodate changes in the project specifications or possibly to use a tstat from one project on another in an emergency. BUT=2a(0) sets the keypad to only one pair of buttons which are used for adjustng the setpoint. BUT=2b(5) similiar to 2, except that in the 2b configuration, cooling and heating mode can only be changed via the serial interface. BUT=4a(1) sets two buttons for fan spe+ ed, and 2 for the setpoint. BUT=4b(4) sets the lower left button for cool/heat mode, the lower right button for fan speed, and the 2 middle buttons for setpoint. BUT=6A(2) sets 2 buttons for fan speed, 2 for setpoint and 2 for heating/cooling mode. BUT=6b(3) sets 2 buttons for fan speed, 2 for cooling setpoint and 2 for heating setpoint.
Aut	**Auto mode only (0-2, 0)** This setting allows the manual modes to be locked out to duplicate the operation of an auto only thermostat. Set this to “0” and the fan will be allowed to go into manual speeds. The user will see “Off, -1-, -2-, -3-, Aut”. Set this to ‘1’ to force the tstat into auto mode when switched on. The user will see “Off, On” The default setting is “0” to allow manual modes for the fan. Set this to ‘2’ to force the tstat into DDC mode,The user can not adjust setpoint and fan speed from keypad,but can adjust them from serial port.

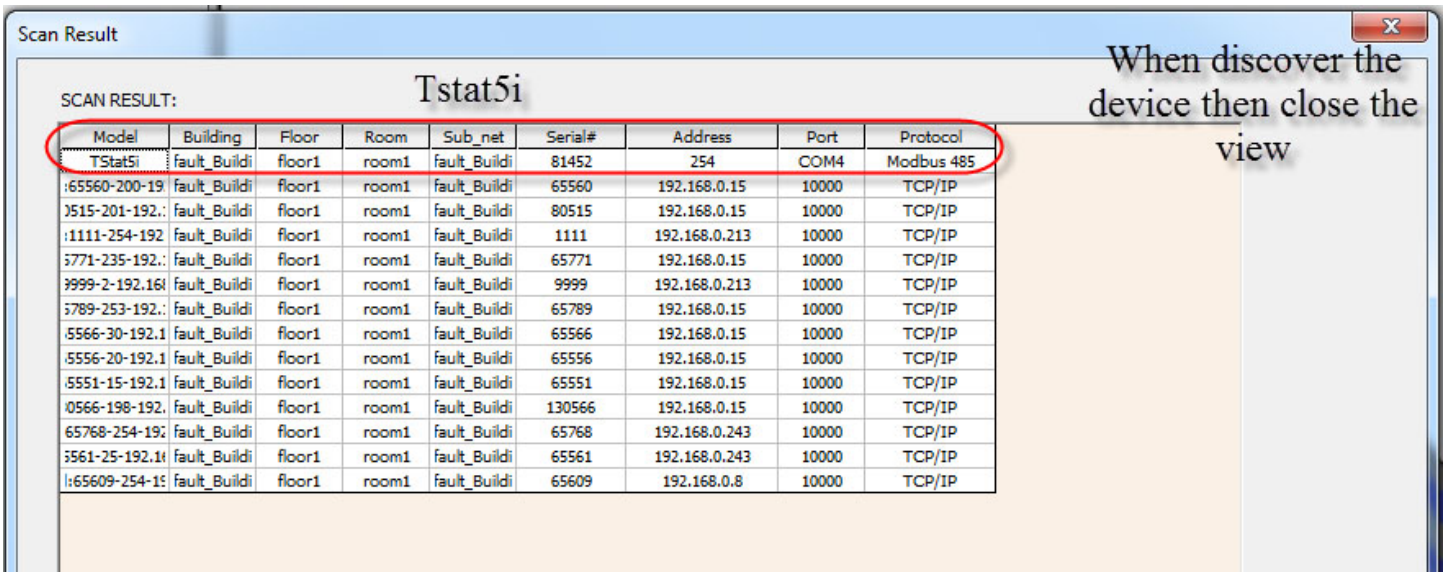
Code	Description (Range, Default)
Ou1 **Ou2**	**Output settings (0-4, 0)** Sets the full-scale voltage of the analog outputs. Ou1 sets analog out 1 (Cooling). Ou2 sets analog out 2 (Heating). This setting is used to match the analog outputs to various types of actuators, transducers or other controllers. For example, by setting the output range to act over a 5VDC scale you can set the tstat up as a transducer to interface into a master DDC controller. Or perhaps you have a valve that operates over the 2-10VDC range, this 'output' type setting lets you tailor the tstat to the particular application. OuX = 0, the output will 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 permanently 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 only if you happen to have a Tstat5A or 5CM and need a couple of extra on/off outputs 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 tying in a 250 ohm resistor in series with the output and making sure the grounds of the actuator and tstat are common.
SLO **SHI**	**Setpoint Minimum (0-255, 15) for deg C, (0-255, 55) for deg F** **Setpoint Maximum (0-255, 50) for deg C, (0-255, 99) for deg F** Rev24: The maximum and minimum allowable user setpoint settings. The occupants cannot 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.
LOC	**Keypad lockout (0-3, 0)** Rev25 only: This setting is useful to keep the building occupants from experimenting 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 can not do anything from keypad except enter menu mode.In menu mode,the user can set 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
dIS	**Display Setting (0-6, 0)** This allows the display to be configured in a few different modes. 0 = display the room temperature. 1 = display the setpoint. 2 = blank display. 3 = display pid2 value. 4 = display pid2 setpoint. 5 = display by manually. 6 = dispaly nothing except keypad pressed.
VTT	**Valve Transient Time (10-255, 0)** This setting allows the user to adjust the valve transient time from fully open to fully closed. Value ranges from 10 (10s) to 255 (255s)

1. Connect Tstat5i to PC by RS485 and start T3000 program.

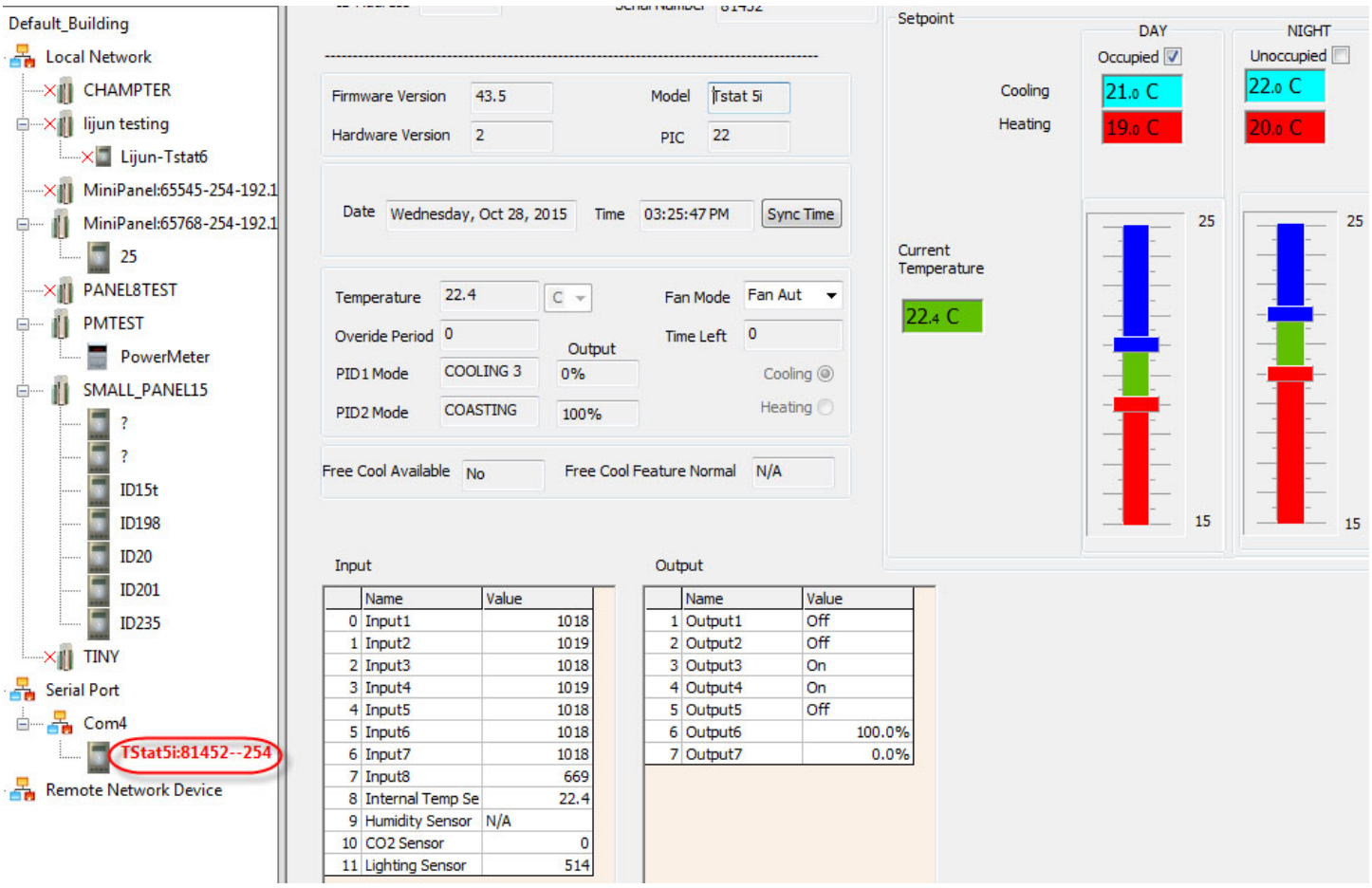


2. Click scan button, it will open a view and discover new devices.

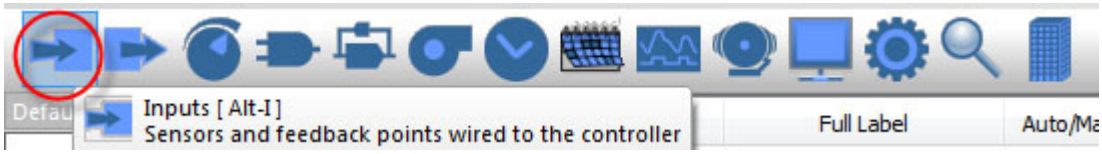




3. Click Tstat5i log and it will show all the information of Tstat5i, including ID address, serial number, firmware version, hardware version, PIC, date, time, temperature, and so on.

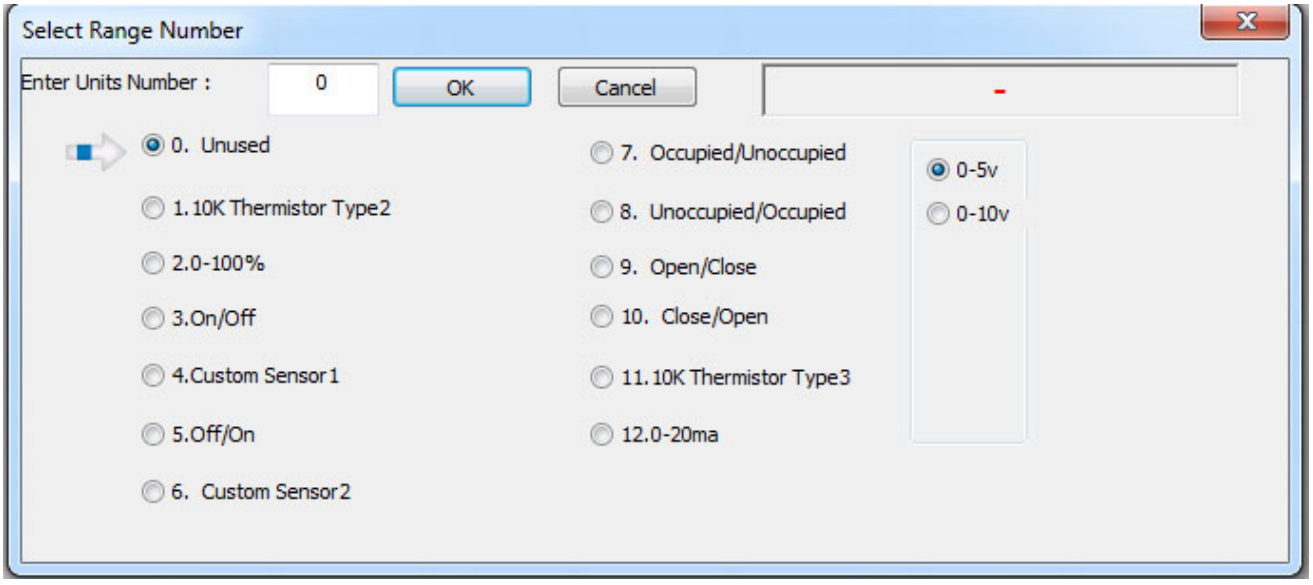


4. Now we need to set up our external devices in the inputs menu. Click the icon that is circled in the picture below, and it will show inputs view.



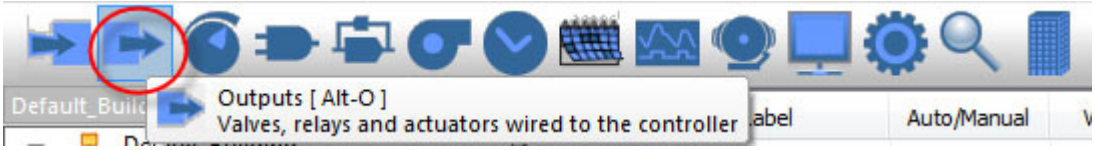
5. For input, it has auto and manual mode. When choose auto, you need to pick the appropriate ranges according to our devices, so that the values being displayed will be meaningful for that par-tiuclar input. For input 1, click range as the arrow point in the photo displayed below, a pop up window will appear.

NUM	Full Label	Auto/Manual	Value	Units	Range	Calibration	Filter	Function
1	Input1	Auto	1018		-	Adjust...	2	Normal
2	Input2	Auto	1019		-	Adjust...	3	Normal
3	Input3	Auto	1018		-	Adjust...	3	Normal
4	Input4	Auto	1019		-	Adjust...	3	Normal
5	Input5	Auto	1018		-	Adjust...	3	Normal
6	Input6	Auto	1018		-	Adjust...	3	Normal
7	Input7	Auto	1018		-	Adjust...	3	Normal
8	Input8	Auto	672		-	Adjust...	3	Normal
9	Internal Temp Sensor	Auto	22.3	℃	℃	Adjust...	2	N/A
10	Humidity Sensor	N/A	N/A	N/A	N/A	Adjust...	N/A	N/A
11	CO2 Sensor	Auto	0	ppm	N/A	Adjust...	3	N/A
12	Lighting Sensor	N/A	511	LUX	LUX	Adjust...	N/A	N/A



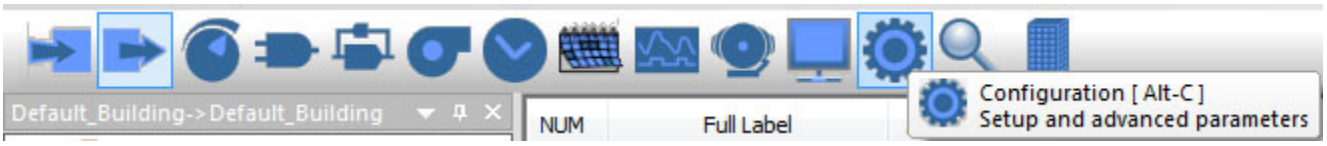
When you choose manual, no need to click range column, you can directly write one fixed value.

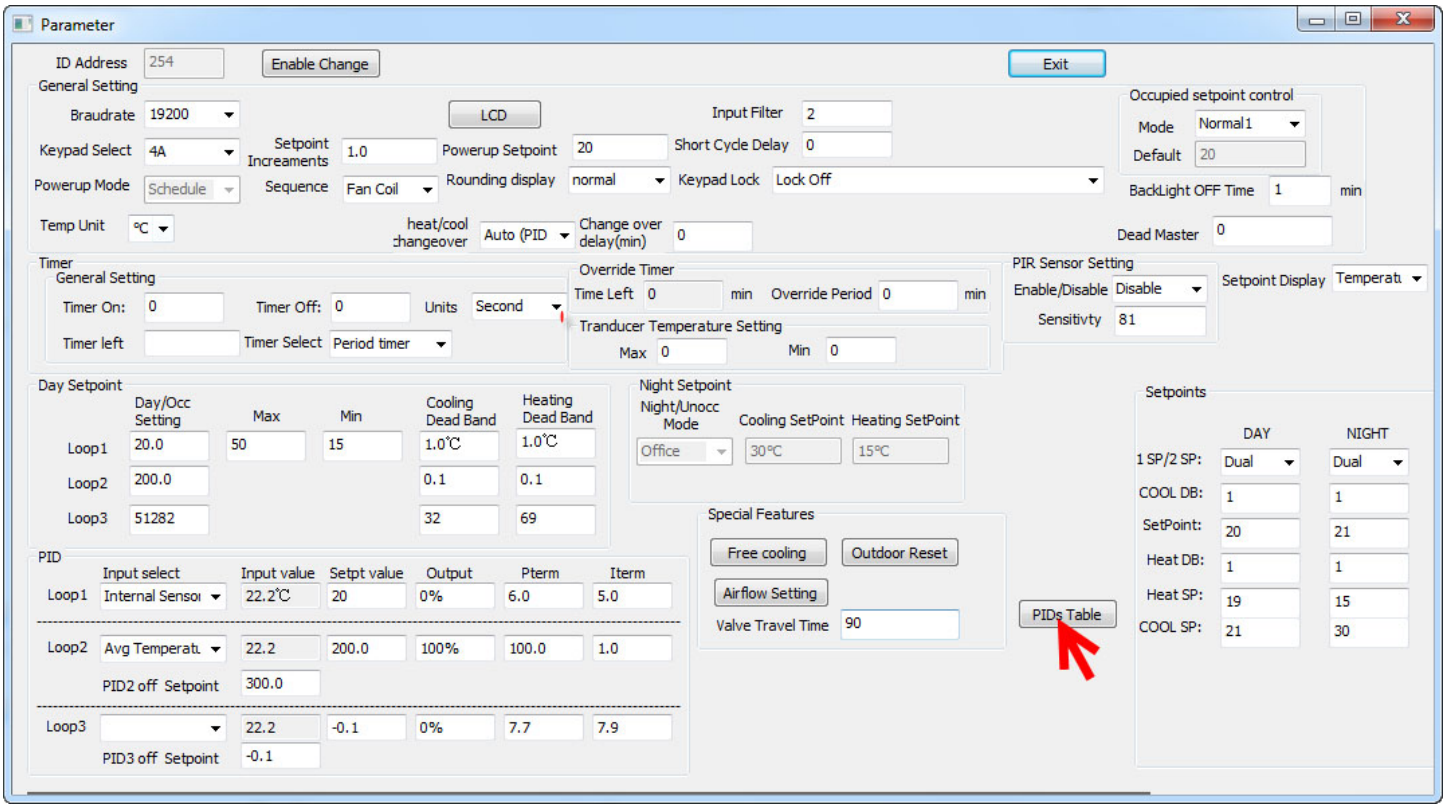
6. Click output button, it will show all the information of outputs.

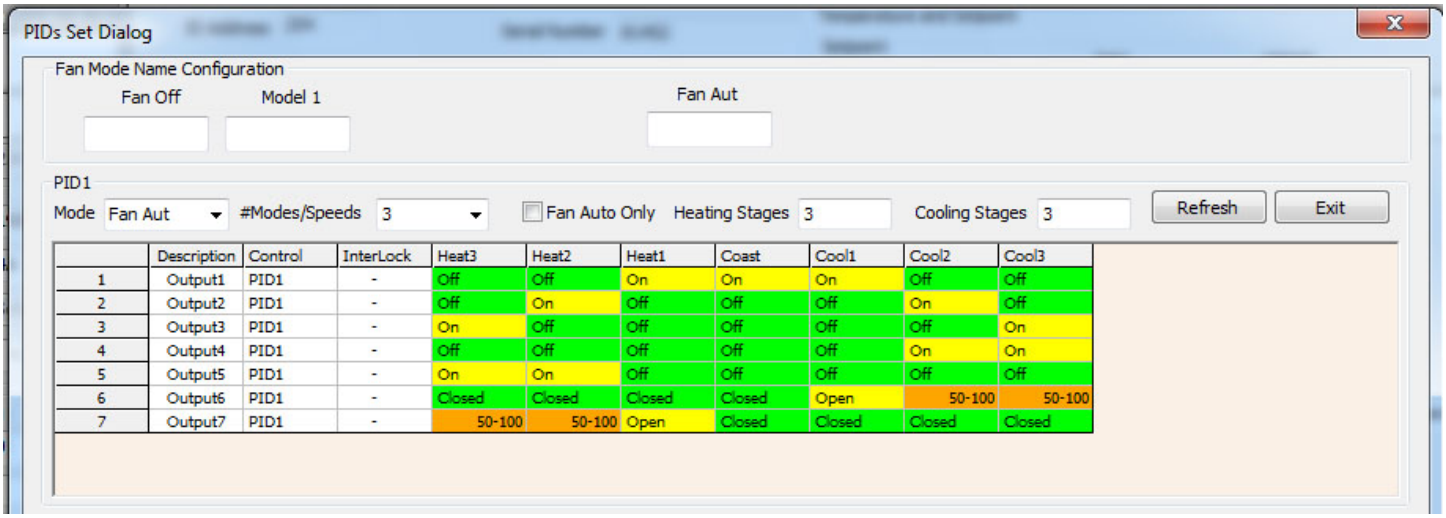


NUM	Full Label	Auto/Manual	Value	Units	Range	Function	Interlock	OFF->ON Delay	ON->OFF Delay	Signal Type
1	Output1	Auto	Off	N/A	On/Off	Normal	ON	0	0	N/A
2	Output2	Auto	Off	N/A	On/Off	Normal	ON	0	0	N/A
3	Output3	Auto	On	N/A	On/Off	Normal	ON	0	0	N/A
4	Output4	Auto	On	N/A	On/Off	Normal	ON	0	0	N/A
5	Output5	Auto	Off	N/A	On/Off	Normal	ON	0	0	N/A
6	Output6	Auto	100.0%	%	0-10V(100%)	Normal	ON	0	0	N/A
7	Output7	Auto	0.0%	%	0-10V(100%)	Normal	ON	0	0	N/A

6. Click Configuration, it will show a window of all parameter information. Click PID to select an appropriate mode for the PID table.







Humidity / Temp Transmitter & Modbus

Tstat6 / 5i Register list

Address	Bytes	Register and Description
0-3	4	Serial Number - 4 byte value. Read-only
4-5	2	Software Version – 2 byte value. Read-only
6	1	ADDRESS. Modbus device address
7	1	Product Model. This is a read-only register that is used by the microcontroller to determine the product
8	1	Hardware Revision. This is a read-only register that is used by the microcontroller to determine the hardware rev
9	1	PIC firmware version
10	1	PIC version of Humidity module
11	1	PLUG_N_PLAY_ADDRESS, 'plug n play' address, used by the network master to resolve address conflicts. See VC code for algorithms
14		Spare
15	1	Base address selection.0 = Protocol address,1 = PLC address.
16	1	Firmware 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.
17,18,19		Spare
20	2	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
21-100		Blank, for future use
101	1	COOL_HEAT_MODE, heating or cooling mode. 0=none, 1=cooling, 2=heating.
102	1	MODE_OPERATION, heating or cooling state: 0-7 = coasting, cooling 1,2,3, heating 1,2,3
103	1	SEQUENCE , 0 = internal test sequence, outputs slowly cycle on/off or ramp up & down. 1 = normal, operation according to the output tables.
104	1	DEGC_OR_F, engineering units, Deg C = 0, Deg F = 1
105	1	FAN MODE, number of fan speeds. Single speed = 1 up to three speed fan = 3
106	1	POWER UP_MODE, mode of operation on power up. 0 = power off, 1 = power up in on mode, 2 = last value (default), 3 = auto mode.
107	1	AUTO_ONLY , enables or disables manual mode. 0 = Manual Fan Modes 1-x Allowed (depending on R122 value, 1 = Auto Mode Only, 2 = DDC mode,the user can not change setpoint and fan speed from keypad.
108	1	Write 1 to register 108 - resets the unit to latest factory defaults. (same as writing Writing 143 to register 16)
109	1	Info Byte, this register contains info about the state of the tstat.
109_0	1	Bit 0 is read/write and shows the occupancy mode. Bit 0 = 0 means unoccupied. Bit 0 = 1 means occupied.
109_1	1	Bit 1 is read only and shows the reset state. Bit 1 = 0 means hardware restart. Bit 1 = 1 means software restart.
109_2	1	Bit 2 is read/write and is the reset prevention bit. Bit 2 = 0 means the tstat will automatically reset after certain registers are changed. Bit 2 = 1 prevents this reset. Changing this bit from 1 to 0 will trigger a reset.
109_3	1	Bit 3 is the state of the digital input. Bit 3 = 1 means logic high. Bit 3 = 0 means logic low.
109_4	1	Bit 4: Reserved, used for some non standard occupancy sensor logic
109_5	1	Bit5 0=no delay on modbus reply, 1= 10ms delay before send for slower PLC's to switch from TX to RX
109_7	1	Bit7, RS485/wireless communications mode: The normal communications method is a bus topology using RS485 which uses a 'transmit enable' or TX_EN line on the RS485 hardware whenever transmission from the thermostat to the bus takes place. For wireless devices this is typically taken care of by the radio module itself so it is not needed. Default = 0, When bit7 is 0, the RS485 chip, TX_EN line is used for normal RS485 bus communications. When bit7 is 1, the TX_EN line is not used, allowing the radio module to communicate one-to-one with the Tstat
110	1	Bau - Baudrate, 0=9600, 1=19.2kbaud
111	1	Unoccupied Override Timer, Ort. 0=disabled, >0=number of minutes manual override is allowed
112	1	OVERRIDE_TIMER_DOWN_COUNT - Number of minutes remaining on the timer when unoccupied override timer is in effect.
113	1	Heating cooling mode configuration, HC, 0=PID, 1=Keypad, 2=Digital_in1(not used), 3=Digital_in1,(not used) 4=Analog_in1, 5=Analog_in2
114	2	Period timer ON time.
115	2	Period timer OFF time.
116	1	Period timer units. 0, second; 1, minute; 2, hour.
117	1	Dead master. The Tstat will go to occupied mode automatically if there is no serial communications for a user defined period of time, for example if the register is set to 10 the thermostat will go to ocupied mode if there are no communications for a period of 10 minutes. Set the register to 0 to disable the feature
118	1	Time format. 0 = 12hours,1 = 24hours, in TSTAT6, it always 24h
119	1	free cool cobfigure byte
120	1	Spare
121	2	TEMPERATURE reading in DegC or F from the sensor used in the control loop PI1 which is configured in register 111. This can be the internal sensor, external, or an average of the two. Writing a temperature value to this register will calibrate the currently selected sensor by adjusting the associated calibration register. If average is selected then you cannot write to this register.
122	1	ANALOG INPUT1 RANGE. 0 = raw data, 1 = thermistor, 2 = %, 3 = ON/OFF, 4 = N/A, 5 = OFF/ON
123	1	ANALOG INPUT2 RANGE. 0 = raw data, 1 = thermistor, 2 = %, 3 = ON/OFF, 4 = N/A, 5 = OFF/ON
124	1	ANALOG INPUT3 RANGE. 0 = raw data, 1 = thermistor, 2 = %, 3 = ON/OFF, 4 = N/A, 5 = OFF/ON

Humidity / Temp Transmitter & Modbus

Address	Bytes	Register and Description
125	1	ANALOG INPUT4 RANGE. 0 = raw data, 1 = thermistor, 2 = %, 3 = ON/OFF, 4 = N/A, 5 = OFF/ON
126	1	ANALOG INPUT5 RANGE. 0 = raw data, 1 = thermistor, 2 = %, 3 = ON/OFF, 4 = N/A, 5 = OFF/ON
127	1	ANALOG INPUT6 RANGE. 0 = raw data, 1 = thermistor, 2 = %, 3 = ON/OFF, 4 = N/A, 5 = OFF/ON
128	1	ANALOG INPUT7 RANGE. 0 = raw data, 1 = thermistor, 2 = %, 3 = ON/OFF, 4 = N/A, 5 = OFF/ON
129	1	ANALOG INPUT8 RANGE. 0 = raw data, 1 = thermistor, 2 = %, 3 = ON/OFF, 4 = N/A, 5 = OFF/ON
130	2	Internal Thermistor Sensor - Shows the filtered, calibrated value of the internal thermistor sensor
131	2	Analog input1 value
132	2	Analog input2 value
133	2	Analog input3 value
134	2	Analog input4 value
135	2	Analog input5 value
136	2	Analog input6 value
137	2	Analog input7 value
138	2	Analog input8 value
139	2	co2 ppm(optional)
140	2	humidity % (optional)
141	2	Input auto/ manual enable.
142	1	Temperature sensor filter, FIL, weighted average of stored value to new raw value
143	1	(future)Analog input1 filer
144	1	(future)Analog input2 filer
145	1	(future)Analog input3 filer
146	1	(future)Analog input4 filer
147	1	(future)Analog input5 filer
148	1	(future)Analog input6 filer
149	1	(future)Analog input7 filer
150	1	(future)Analog input8 filer
151	1	(future)co2 filer
152	1	(future)hum filer
153	2	CALIBRATION, this is the calibration factor for the internal sensor, normally maintained by the tstat.
154	2	Calibration for the internal thermistor - internally managed offset for the internal temp sensor value
155	2	Calibration for analog input1
156	2	Calibration for analog input2
157	2	Calibration for analog input3
158	2	Calibration for analog input4
159	2	Calibration for analog input5
160	2	Calibration for analog input6
161	2	Calibration for analog input7
162	2	Calibration for analog input8
163	2	hum 1st calibration capacitance value
164	2	hum 1st calibration humidity value
165	2	hum 2nd calibration capacitance value
166	2	hum 2nd calibration humidity value
167	1	Analog input1 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode.
168	1	Analog input2 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode.

Address	Bytes	Register and Description
169	1	(future)Analog input3 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode.
170	1	(future)Analog input4 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode.
171	1	(future)Analog input5 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode.
172	1	(future)Analog input6 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode.
173	1	(future)Analog input7 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode.
174	1	(future)Analog input8 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode.
175	2	Lookup Table 1 - 0.0V value Sensor value that corresponds to 0.0V
176	2	Lookup Table 1 - 0.5V value Sensor value that corresponds to 0.5V
177	2	Lookup Table 1 - 1.0V value Sensor value that corresponds to 1.0V
178	2	Lookup Table 1 - 1.5V value Sensor value that corresponds to 1.5V
179	2	Lookup Table 1 - 2.0V value Sensor value that corresponds to 2.0V
180	2	Lookup Table 1 - 2.5V value Sensor value that corresponds to 2.5V
181	2	Lookup Table 1 - 3.0V value Sensor value that corresponds to 3.0V
182	2	Lookup Table 1 - 3.5V value Sensor value that corresponds to 3.5V
183	2	Lookup Table 1 - 4.0V value Sensor value that corresponds to 4.0V
184	2	Lookup Table 1 - 4.5V value Sensor value that corresponds to 4.5V
185	2	Lookup Table 1 - 5.0V value Sensor value that corresponds to 5.0V
186	2	Lookup Table 2 - 0.0V value Sensor value that corresponds to 0.0V
187	2	Lookup Table 2 - 0.5V value Sensor value that corresponds to 0.5V
188	2	Lookup Table 2 - 1.0V value Sensor value that corresponds to 1.0V
189	2	Lookup Table 2 - 1.5V value Sensor value that corresponds to 1.5V
190	2	Lookup Table 2 - 2.0V value Sensor value that corresponds to 2.0V
191	2	Lookup Table 2 - 2.5V value Sensor value that corresponds to 2.5V
192	2	Lookup Table 2 - 3.0V value Sensor value that corresponds to 3.0V
193	2	Lookup Table 2 - 3.5V value Sensor value that corresponds to 3.5V
194	2	Lookup Table 2 - 4.0V value Sensor value that corresponds to 4.0V
195	2	Lookup Table 2 - 4.5V value Sensor value that corresponds to 4.5V
196	2	Lookup Table 2 - 5.0V value Sensor value that corresponds to 5.0V
197	1	Humidity Control Register, 0 = defautl, write 1 here to set to fac calib
198	1	Current humidity sensor value
199	1	Update calibration data, when set to 1, tstat will update the calibration data to PIC
200	1	Calibration points number, value can be single or two point calibration for the Tstat6
201	1	Decide which calibration table will be used. 0 = default table 1 = customer table
202	1	Determine the output1 mode. 0, ON/OFF mode; 1, floating valve for cooling
203	1	Determine the output2 mode. 0, ON/OFF mode; 1, floating valve for cooling
204	1	Determine the output3 mode
205	1	Determine the output4 mode. 0, ON/OFF mode; 1, floating valve for cooling; 2, lighting control; 3, PWM
206	1	Determine the output5 mode. 0, ON/OFF mode; 1, floating valve for heating; 2, lighting control; 3, PWM
207	1	Analog Output1 range - 0=On/Off, 1=0-10V, 2=0-5V, 3=2-10V, 4= 10-0V
208	1	Analog Output2 range - 0=On/Off, 1=0-10V, 2=0-5V, 3=2-10V, 4= 10-0V
209	1	Output1 tot 5, bit 0 thru 4 = relay 1 thru 5.
210	2	Output6 ,Analog output1, a number from 0-1000 representing 0% (closed) to 100% (open). When Range = On/Off mode, On=1000, Off=0.

Address	Bytes	Register and Description
211	2	~~Output7 Analog output2, a number from 0-1000 representing 0% (closed) to 100% (open). When Range = On/Off mode,~~ On=1000, Off=0.
212	1	DAC_OFFSET , Calibration data for the 0-10VDC signal, internal variable maintained by tstat
213	1	Output1 Relay1_delay_OFF_TO_ON – delay time for output1 going from OFF to ON (sec)
214	1	Output2 Relay2_delay_OFF_TO_ON – delay time for output2 going from OFF to ON (sec)
215	1	Output3 Relay3_delay_OFF_TO_ON – delay time for output3 going from OFF to ON (sec)
216	1	Output4 Relay4_delay_OFF_TO_ON – delay time for output4 going from OFF to ON (sec)
217	1	Output5 Relay5_delay_OFF_TO_ON – delay time for output5 going from OFF to ON (sec)
218	1	(future)Output6 delay_OFF_TO_ON – delay time for output4 going from OFF to ON (sec)
219	1	(future)Output7 delay_OFF_TO_ON – delay time for output5 going from OFF to ON (sec)
220	1	output 1 current time left from OFF to ON
221	1	output 2 current time left from OFF to ON
222	1	output 3 current time left from OFF to ON
223	1	output 4 current time left from OFF to ON
224	1	output 5 current time left from OFF to ON
225	1	(reserved)output 6 current time left from OFF to ON
226	1	(reserved)output 7 current time left from OFF to ON
227	1	Output1 Relay1_delay_ON_TO_OFF – delay time for output1 going from ON to OFF (sec)
228	1	Output2 Relay2_delay_ON_TO_OFF – delay time for output2 going from ON to OFF (sec)
229	1	Output3 Relay3_delay_ON_TO_OFF – delay time for output3 going from ON to OFF (sec)
230	1	Output4 Relay4_delay_ON_TO_OFF – delay time for output4 going from ON to OFF(sec)
231	1	Output5 Relay5_delay_ON_TO_OFF – delay time for output5 going from ON to OFF(sec)
232	1	(future)Output6_delay_ON_TO_OFF – delay time for output4 going from ON to OFF(sec)
233	1	(future)Output7_delay_ON_TO_OFF – delay time for output5 going from ON to OFF (sec)
234	1	output 1 current time left from ON to OFF
235	1	output 2 current time left from ON to OFF
236	1	output 3 current time left from ON to OFF
237	1	output 4 current time left from ON to OFF
238	1	output 5 current time left from ON to OFF
239	1	(reserved)output 6 current time left from ON to OFF
240	1	(reserved)output 7 current time left from ON to OFF
241	1	MODBUS_CYCLING_DELAY – delay time (in minutes) for switching out of heating or cooling and then back in.
242	1	MODBUS_CHANGOVER_DELAY – delay time (in minutes) for switching from cooling into heating or vice versa.
243	1	Valve travel time. The time of the valve travel from one end to another end. The units is second
244	1	Valve percent. Show the valve opened how much percent. READ ONLY
		Interlock for each output, analog and digital output. 0, interlock always ON; 1, DI1 determine the interlock status(not used any more) ; 2, AI1 determine the interlock status, the range of AI1 must be ON/OFF; 3, AI2 determine the interlock status, the range of AI2 must be ON/OFF; 4, TIMER OR, the output OR with the period timer; 5, TIMER AND, the output AND with the period timer.
245	1	Interlock for output1
246	1	Interlock for output2
247	1	Interlock for output3
248	1	Interlock for output4
249	1	Interlock for output5
250	1	Interlock for output6
251	1	Interlock for output7
252	1	Delay to open. The heating valve will open if the ambient temp less than the Freeze temp setpoint last the time this register set. The units is second.

Humidity / Temp Transmitter & Modbus

Address	Bytes	Register and Description
253	1	Delay to close. The duration the heating valve open. The units is minute.
254	1	Output auto/manual enable. Bit 0 to 4 correspond to output1 to output5, bit 5 correspond to output6, bit 6 correspond to output7. 0, auto mode; 1, manual mode.
255	1	Relay1 manual output value
256	1	Relay2 manual output value
257	1	Relay3 manual output value
258	1	Relay4 manual output value
259	1	Relay5 manual output value
260	2	(future) Analog1 manual output value
261	2	(future) Analog2 manual output value
262	1	DEADMASTER_MODE = 0, the default, outputs will not change when deadmaster is triggered DEADMASTER_MODE = 1, the output will be trigger to “AUTO” mode if they were previously in manual DEADMASTER_MODE = 2, the outputs will go to manual on or off as defined in the following registers.
263	1	Define output states when DEADMASTER_MODE = 2 (active) Bit0 is for relay 1, bit1 for relay 2 and so on up to output 5
264	2	Analog Output1 goes to this value when DEADMASTER_MODE = 2 (active), 0-1000
265	2	Analog Output2 goes to this value when DEADMASTER_MODE = 2 (active), 0-1000
266	1	Output1 Function setting: 0=normal, default. 1 = rotation (old disabled feature) 2 = lighting control, one keypad button can be assigned to toggle a relay on & off
267	1	Output2 function setting (see above)
268	1	Output3 function setting (see above)
269	1	Output4 function setting (see above)
270	1	Output5 function setting (see above)
271	1	(future)Output6 function setting (see above)
272	1	(future)Output7 function setting (see above)
273	1	FAN_SPEED, current operating fan speed Relay Output Tables (bit0 = relay1, bit1 = relay2, bit2 = relay3, bit3 = relay4, bit4 = relay5) Fan0 table is for the off state. Fan1, Fan2, and Fan3 are for the manual states. Fan4 is for the Auto state. These states are controlled by the user.
274	1	Output 1 PID Interlock 0 = PID1, can assign each output to either PID1 or 2, the max or the min of the two PIDS
275	1	Output 2 PID Interlock 1 = PID2
276	1	Output 3 PID Interlock 2 = Maximum of PID1 and PID2
277	1	Output 4 PID Interlock 3 = Minimum of PID1 and PID2
278	1	Output 5 PID Interlock
279	1	Output 6 PID Interlock
280	1	Output 7 PID Interlock
281	1	PID2 Output table- Coasting
282	1	UPID2 Output table- Cooling1
283	1	PID2 Output table- Cooling2
284	1	PID2 Output table- Cooling3
285	1	PID2 Output - Heating1
286	1	PID2 Output - Heating2
287	1	PPID2 Output - Heating3
288	1	FAN0_OPERATION_TABLE_COAST
289	1	FAN0_OPERATION_TABLE_COOL1
290	1	FAN0_OPERATION_TABLE_COOL2
291	1	FAN0_OPERATION_TABLE_COOL3
292	1	FAN0_OPERATION_TABLE_HEAT1

Address	Bytes	Register and Description
293	1	FAN0_OPERATION_TABLE_HEAT2
294	1	FAN0_OPERATION_TABLE_HEAT3
295	1	FAN1_OPERATION_TABLE_COAST
296	1	FAN1_OPERATION_TABLE_COOL1
297	1	FAN1_OPERATION_TABLE_COOL2
298	1	FAN1_OPERATION_TABLE_COOL3
299	1	FAN1_OPERATION_TABLE_HEAT1
300	1	FAN1_OPERATION_TABLE_HEAT2
301	1	FAN1_OPERATION_TABLE_HEAT3
302	1	FAN2_OPERATION_TABLE_COAST
303	1	FAN2_OPERATION_TABLE_COOL1
304	1	FAN2_OPERATION_TABLE_COOL2
305	1	FAN2_OPERATION_TABLE_COOL3
306	1	FAN2_OPERATION_TABLE_HEAT1
307	1	FAN2_OPERATION_TABLE_HEAT2
308	1	FAN2_OPERATION_TABLE_HEAT3
309	1	FAN3_OPERATION_TABLE_COAST
310	1	FAN3_OPERATION_TABLE_COOL1
311	1	FAN3_OPERATION_TABLE_COOL2
312	1	FAN3_OPERATION_TABLE_COOL3
313	1	FAN3_OPERATION_TABLE_HEAT1
314	1	FAN3_OPERATION_TABLE_HEAT2
315	1	FAN3_OPERATION_TABLE_HEAT3
316	1	FANAUT_OPERATION_TABLE_COAST
317	1	FANAUT_OPERATION_TABLE_COOL1
318	1	FANAUT_OPERATION_TABLE_COOL2
319	1	FANAUT_OPERATION_TABLE_COOL3
320	1	FANAUT_OPERATION_TABLE_HEAT1
321	1	FANAUT_OPERATION_TABLE_HEAT2
322	1	FANAUT_OPERATION_TABLE_HEAT3
323	1	ALVE_OPER_TABLE_COAST, Analog output state for each of the 7 modes of operation
324	1	VALVE_OPER_TABLE_COOLING1
325	1	VALVE_OPER_TABLE_COOLING2
326	1	VALVE_OPER_TABLE_COOLING3
327	1	ALVE_OPER_TABLE_HEATING1
328	1	ALVE_OPER_TABLE_HEATING2
329	1	ALVE_OPER_TABLE_HEATING3
330	1	Number of Heating Stages (Max heat+cool = 6)
331	1	Number of Cooling Stages (Max heat + Cool = 6)
332	1	Number of Heating Stages in Original Table - (Maximum # of total heating and cooling states is 6)
333	1	Number of Cooling Stages in Original Table - (Maximum # of total heating and cooling states is 6)
334	1	analog output in OFF table, coating mode,bit1 means AO1 : 1 = on, 0 = off bit3 means AO2 : 1 = on, 0 = off
335	1	analog output in OFF table, cooling1 mode,bit1 means AO1 : 1 = on, 0 = off bit3 means AO2 : 1 = on, 0 = off
336	1	analog output in OFF table, cooling2 mode,bit1 means AO1 : 1 = on, 0 = off bit3 means AO2 : 1 = on, 0 = off
337	1	analog output in OFF table, cooling3 mode,bit1 means AO1 : 1 = on, 0 = off bit3 means AO2 : 1 = on, 0 = off
338	1	analog output in OFF table, heating1 mode,bit1 means AO1 : 1 = on, 0 = off bit3 means AO2 : 1 = on, 0 = off
339	1	analog output in OFF table, heating2 mode,bit1 means AO1 : 1 = on, 0 = off bit3 means AO2 : 1 = on, 0 = off
340	1	analog output in OFF table, heating3 mode,bit1 means AO1 : 1 = on, 0 = off bit3 means AO2 : 1 = on, 0 = off
341	1	Default occupied setpoint. Works in concert with the “occupied setpoint control register”, register 339
342	1	Occupied Setpoint Control Register: 0 = normal, setpoint is managed by the serial port and keypad, the stat will remember the last occupied setpoint and use that during the next occupied period. 1 = Default mode, the last occupied setpoint if forgotten and the occupied setpoint gets reset to the default. 2 = trigger an event, when a master controller writes 2 to this register, the default setpoint will be copied to the occupied setpoint after which the Tstat will set the value back to 1 to show the event has been serviced.

Address	Bytes	Register and Description
344	1	spare
345	1	(Day)Occupied setpoint
346	1	(Day)Occupied cooling setpoint dead band , offset from setpoint for cooling to begin. Units are 0.1 deg.
347	1	(Day)Occupied heating setpoint dead band , offset from setpoint for heating to begin. Units are 0.1 deg.
348	2	(Day)Occupied cooling setpoint (day cooling setpoint)
349	2	(Day)Occupied heating setpoint (day heating setpoint)
350	1	(Night)Unoccupied setpoin.
351	1	spare
352	1	(Night)Unoccupied heating setpoint dead band , heating deadband for the night (OFF) mode. Units of 1 deg.
353	1	(Night)Unoccupied cooling setpoint dead band , cooling deadband for the night (OFF) mode. Units of 1 deg.
354	2	(Night)Unoccupied heating setpoint
355	2	(Night)Unoccupied cooling setpoint
356	2	(TBD)Window interlock cooling setpoint
357	2	(TBD)Window interlock heating setpoint
358	2	PID2 Unoccupied (OFF) Setpoint
359	2	PID2 Occupied Setpoint
360	2	PID2 Cooling Deadband TBD: can write to either deadband or to setpoint
361	2	PID2 Heating Deadband, TBD: can write to either deadband or to setpoint
362	2	economy mode cooling setpoint
363	2	economy mode heating setpoint
364	1	POWERUP_SETPOINT , setpoint on power up
365	1	MAX_SETPOINT, Setpoint high, the highest setpoint a user will be able to set from the keypad.
366	1	MIN_SETPOINT, Setpoint Low, the lowest setpoint a user will be able to set from the keypad.
367		reserved,MAX_SETPOINT2
368		reserved,MIN_SETPOINT2
369		reserved,MAX_SETPOINT3
370		reserved,MIN_SETPOINT3
371		reserved,MAX_SETPOINT4
372		reserved,MIN_SETPOINT4
373	1	Setpoint increment on the display each time the user hits the up/down buttons. Units are 0.1Deg, 10 = 1Deg and so on.
374	1	Freeze protect setpoint. If the ambient temperature less than the setpoint, the heating valve will open some time the Delay to off register set .
375		reserved, wall setpoint
376		reserved,ceiling setpoint
377		reserved,average setpoint
378		reserved,unoccupied heating
379		reserved,unoccupied cooling
380		reserved,humidity setpoint
381		reserved,cuurent1 setpoint
382	1	Sensor to be used for the PID calculations, 1= external sensor analog input 1 , 2 = internal thermistor, 3 = average the internal thermistor and analog input1
383	1	Universal PID input select, 0=none, 1=analog_in1, 2=analog_in2, 3= humidity 4= co2
384	1	PID1, current PI calculation for PID number 1 (PID2 is in register 240)
385	1	COOLING PTERM , proportional term for PI calculation
386	1	COOLING ITEM
387	2	PID2 P term
388	2	PID2 I term
389	1	PID2, the current value of PID number 2
390	2	PID1 Units High byte - Upper 2 bytes of the PID1 units in ASCII
391	2	PID1 Units Low byte - Lower 2 bytes of the PID1 units in ASCII

Address	Bytes	Register and Description
392	2	PID2 Units High byte - Upper 2 bytes of the PID2 units in ASCII
393	2	PID2 Units Low byte - Lower 2 bytes of the PID2 units in ASCII
394	1	PID2 heating or cooling state derived from PID2 register 240, 0=coasting, 1=cooling1, 2=cooling2, 3=cooling3, 4=heating1, 5=heating2, 6=heating3, 14=cooling4, 15=cooling5, 16=cooling6, 17=heating4, 18=heating5, 19=heating6.
395	1	KEYPAD_SELECT , variable to select various keypad arrangements. Refer to PAd description in Table 1: Advanced Menu Items
396	1	SPECIAL_MENU_LOCK, Special menu lockout via keypad, serial port only, 0=Full Menu, 1=Menu Disabled, 2=Typical small menu system, 3 = The user can adjust the setpoint in menu mode, 4 = Partial menu enabled
397	1	dIS – Display. This sets the display to either room temperature or setpoint. 0 = room temp, 1 = setpoint, 2 = Blank Display,3 = PID2 value,4 = PID2 setpoint, 5 = set segment code by manually, 6 = Display sleep
398	2	ICON TABLE Set when certain icons are on/off ICON1 : TBD list the icons here, one for Tstat6 and one for Ttsat7
398_0		(TBD)day icon
398_1		(TBD)night icon
398_2		(TBD)heating icon
398_3	1	(TBD)cooling icon
398_4	1	(TBD)fan icon
400	1	Keypad encoded value. Last keypress, READ ONLY
401	1	LED hundred's digit, , can drive the LEDs manually when the display register 381 is set to manual (5)
402	1	LED ten's digit, , can drive the LEDs manually when the display register 381 is set to manual (5)
403	1	LED one's digit code, can drive the LEDs manually when the display register 381 is set to manual (5)
404	1	LED discrete status symbols, can drive the LEDs manually when the display register 381 is set to manual (5)
405	1	Rouding display. 0 = round the display to the nearest digit; 1 = round the display to the nearest 1/10 unit; 5 = round the display to the nearest 1/2 unit. 2,3,4 reserved.
406	1	The minimum address which the device can accept, use this to limit addresses to a certain defined band.
407	1	The maximum device address can be set. The device address should between min and max address, default is 254
408	1	Show the size of E2 chip. 0 = 24c02, 1 = 24c08/24c16.
409	1	Assign the timer to be used for which feature. 0 = period timer, 1 = rotation timer, 2 = interlock, 3 = PWM timer.
410	1	Clock, year
411	1	Clock,month
412	1	Clock,week
413	1	Clock,day
414	1	clock, hours
415	1	clock,minutes
416	1	clock,seconds
417	1	alarm,not used now
418	1	work day,wake time hour
419	1	work day,wake time minutes
420	1	work day,away time,hour
421	1	work day,away time,minute
422	1	work day,home time,hour
423	1	work day,home time,minute
424	1	work day,sleep time,hour
425	1	work day,sleep time,minute
426	1	weekend day,wake time hour
399	2	The second two character on LCD for input2 sensor user name,
400	2	The third two character on LCD for input2 sensor user name,
401	2	The fourth two character on LCD for input2 sensor user name,
402	2	The first two character on LCD for input3 sensor user name,
403	2	The second two character on LCD for input3 sensor user name,
404	2	The third two character on LCD for input3 sensor user name,

Address	Bytes	Register and Description
427	1	weekend day,wake time minutes
428	1	weekend,away time,hour
429	1	weekend,away time,minute
430	1	weekend,home time,hour
431	1	weekend,home time,minute
432	1	weekend,sleep time,hour
433	1	weekend,sleep time,minute
434	1	LCD turn off, 0 = turn off, 1 = normal
435	2	User name. line 1:characters 1 & 2
436	2	User name. line 1:characters 3 & 4
437	2	User name. line 1:characters 5 & 6
438	2	User name. line 1:characters 7 & 8
439	2	User name. line 2:characters 1 & 2
440	2	User name. line 2:characters 3 & 4
441	2	User name. line 2:characters 5 & 6
442	2	User name. line 2:characters 7 & 8
443	2	Internal sensor name. line 1:characters 1 & 2
444	2	Internal sensor name. line 1:characters 3 & 4
445	2	Internal sensor name. line 1:characters 5 & 6
446	2	Internal sensor name. line 1:characters 7 & 8
447	2	Input 1 user name. line 1:characters 1 & 2
448	2	Input 1 user name. line 1:characters 3 & 4
449	2	Input 1 user name. line 1:characters 5 & 6
450	2	Input 1 user name. line 1:characters 7 & 8
451	2	Input 2 user name. line 1:characters 1 & 2
452	2	Input 2 user name. line 1:characters 3 & 4
453	2	Input 2 user name. line 1:characters 5 & 6
454	2	Input 2 user name. line 1:characters 7 & 8
455	2	Input 3 user name. line 1:characters 1 & 2
456	2	Input 3 user name. line 1:characters 3 & 4
457	2	Input 3 user name. line 1:characters 5 & 6
458	2	Input 3 user name. line 1:characters 7 & 8
459	2	Input 4 user name. line 1:characters 1 & 2
460	2	Input 4 user name. line 1:characters 3 & 4
461	2	Input 4 user name. line 1:characters 5 & 6
462	2	Input 4 user name. line 1:characters 7 & 8
463	2	Input 5 user name. line 1:characters 1 & 2
464	2	Input 5 user name. line 1:characters 3 & 4
465	2	Input 5 user name. line 1:characters 5 & 6
466	2	Input 5 user name. line 1:characters 7 & 8
467	2	Input 6 user name. line 1:characters 1 & 2
468	2	Input 6 user name. line 1:characters 3 & 4
469	2	Input 6 user name. line 1:characters 5 & 6
470	2	Input 6 user name. line 1:characters 7 & 8
471	2	Input 7 user name. line 1:characters 1 & 2
472	2	Input 7 user name. line 1:characters 3 & 4

Address	Bytes	Register and Description
473	2	Input 7 user name. line 1:characters 5 & 6
474	2	Input 7 user name. line 1:characters 7 & 8
475	2	Input 8 user name. line 1:characters 1 & 2
476	2	Input 8 user name. line 1:characters 3 & 4
477	2	Input 8 user name. line 1:characters 5 & 6
478	2	Input 8 user name. line 1:characters 7 & 8
479	2	Output 1 user name. line 1:characters 1 & 2
480	2	Output 1 user name. line 1:characters 3 & 4
481	2	Output 1 user name. line 1:characters 5 & 6
482	2	Output 1 user name. line 1:characters 7 & 8
483	2	Output 2 user name. line 1:characters 1 & 2
484	2	Output 2 user name. line 1:characters 3 & 4
485	2	Output 2 user name. line 1:characters 5 & 6
486	2	Output 2 user name. line 1:characters 7 & 8
487	2	Output 3 user name. line 1:characters 1 & 2
488	2	Output 3 user name. line 1:characters 3 & 4
489	2	Output 3 user name. line 1:characters 5 & 6
490	2	Output 3 user name. line 1:characters 7 & 8
491	2	Output 4 user name. line 1:characters 1 & 2
492	2	Output 4 user name. line 1:characters 3 & 4
493	2	Output 4 user name. line 1:characters 5 & 6
494	2	Output 4 user name. line 1:characters 7 & 8
495	2	Output 5 user name. line 1:characters 1 & 2
496	2	Output 5 user name. line 1:characters 3 & 4
497	2	Output 5 user name. line 1:characters 5 & 6
498	2	Output 5 user name. line 1:characters 7 & 8
499	2	Output 6 user name. line 1:characters 1 & 2
500	2	Output 6 user name. line 1:characters 3 & 4
501	2	Output 6 user name. line 1:characters 5 & 6
502	2	Output 6 user name. line 1:characters 7 & 8
503	2	Output 7 user name. line 1:characters 1 & 2
504	2	Output 7 user name. line 1:characters 3 & 4
505	2	Output 7 user name. line 1:characters 5 & 6
506	2	Output 7 user name. line 1:characters 7 & 8
507	2	Output 8 user name. line 1:characters 1 & 2
508	2	Output 8 user name. line 1:characters 3 & 4
509	2	Output 8 user name. line 1:characters 5 & 6
510	2	Output 8 user name. line 1:characters 7 & 8
511	2	Schedule_B character 1
512	2	Schedule_B character 2
513	2	Schedule_B character 3
514	2	Schedule_B character 4
515	2	Schedule_C character 1
516	2	Schedule_C character 2
517	2	Schedule_C character 3
518	2	Schedule_C character 4

Address	Bytes	Register and Description
519	2	Schedule_D character 1
520	2	Schedule_D character 2
521	2	Schedule_D character 3
522	2	Schedule_D character 4
523	2	Wall character 1
524	2	Wall character 2
525	2	Wall character 3
526	2	Wall character 4
527	2	Ceiling character 1
528	2	Ceiling character 2
529	2	Ceiling character 3
530	2	Ceiling character 4
531	2	Outdoor character 1
532	2	Outdoor character 2
533	2	Outdoor character 3
534	2	Outdoor character 4
535	2	Average character 1
536	2	Average character 2
537	2	Average character 3
538	2	Average character 4
539	1	LCD screen1,select which information will display on LCD,range0 to 12
540	1	LCD screen2,select which information will display on LCD,range0 to 12
541	1	Demand response flag 0: disable 1:yes 2:no
542	1	(reserved)All registers except fan speed and manual input are not writable.0 = lock,1 = no lock
543	1	Enable/disable PIR correspond 1/0 respectively.
544		Reserve for factory test
545		Reserve for factory test
546		Reserve for 3rd calibration capacitance value (future)
547		Reserve for 3rd calibration humidity value (future)
548		Reserve for 4th calibration capacitance value (future)
549		Reserve for 4th calibration humidity value (future)
550		Reserve for 5th calibration capacitance value (future)
551		Reserve for 5th calibration humidity value (future)
552		Reserve for 6th calibration capacitance value (future)
553		Reserve for 6th calibration humidity value (future)
554		Reserve for 7th calibration capacitance value (future)
555		Reserve for 7th calibration humidity value (future)
556		Reserve for 8th calibration capacitance value (future)
557		Reserve for 8th calibration humidity value (future)
558		Reserve for 9th calibration capacitance value (future)
559		Reserve for 9th calibration humidity value (future)
560		Reserve for 10th calibration capacitance value (future)
561		Reserve for 10th calibration humidity value (future)
562	1	(TBD)humdity sensor factory calibration data write lockA(only when A = 12 and B = 34, can write factory data)
563	1	(TBD)humdity sensor factory calibration data write lockB(prevent user do wrong operation to change calibration data)
564	1	lcd rotate enable, decide how many items will be shown on rotate mode,range0 to 12

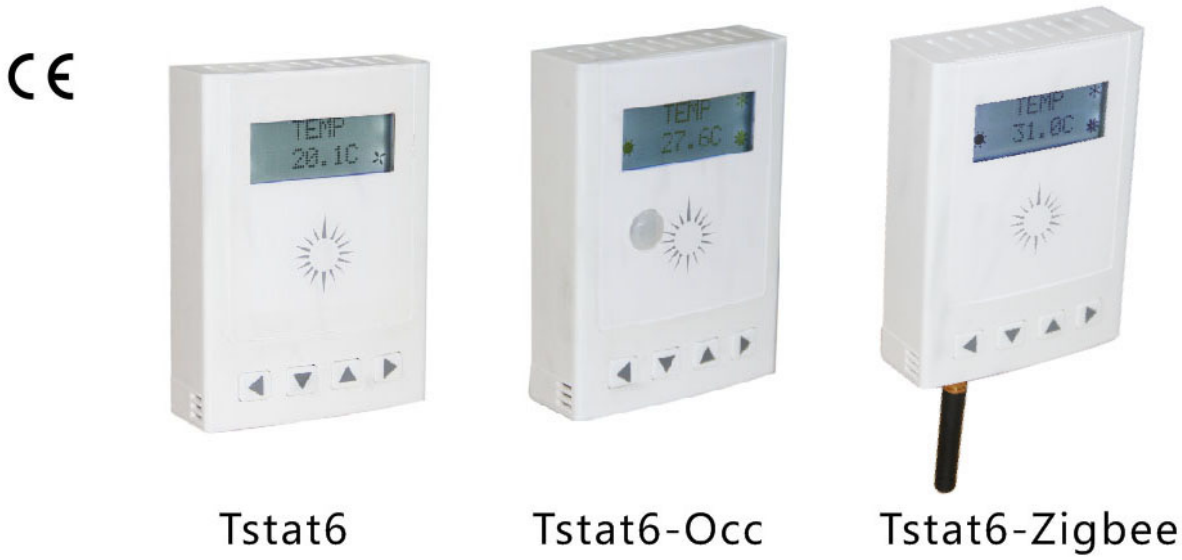
Address	Bytes	Register and Description
565	1	schedule enable/disable control bit. 0 = disable 1 = enable, default: enable
566-579	14	decide which item will be shown in the display sequency.see up note
580-586	7	decide which item will be shown as the output item
587	1	PWM output range in COAST mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5
588	1	PWM output range in COOLING2 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5
589	1	PWM output range in COOLING3 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5
590	1	PWM output range in COOLING1 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5
591	1	PWM output range in HEATING1 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5
592	1	PWM output range in HEATING2 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5
593	1	PWM output range in HEATING3 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5
594	1	"PWM output range in COOLING3 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5"
595	1	"PWM output range in HEATING1 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5"
596	1	"PWM output range in HEATING2 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5"
597	1	"PWM output range in HEATING3 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5"
598	1	spare
599	1	spare
600	1	spare
601	1	spare
602	2	calibration data of thermistor which on external humidity sensor
603 - 606	4	Keypad define : default value:128,64,8,4.
607	1	humidity sensor heater control 0=not heat, 1=heating.
608	1	humidity sensor manual input enable 0=disble 1=enable.
609	2	humidity sensor manual input value, raneg: 0 to 1000
610	1	CO2 sensor manual input enable 0=disble 1=enable.
611	2	CO2 sensor manual input value, raneg: 0 to 3000
612	2	CO2 sensor calibration data
613	1	PID2 OFF TABLE COASTING
614	1	PID2 OFF TABLE COOLING1
615	1	PID2 OFF TABLE COOLING2
616	1	PID2 OFF TABLE COOLING3
617	1	PID2 OFF TABLE HEATING1
618	1	PID2 OFF TABLE HEATING2
619	1	PID2 OFF TABLE HEATING3
620	1	PID2 VALVE OFF TABLE COASTING
621	1	PID2 VALVE OFF TABLE COOLING1
622	1	PID2 VALVE OFF TABLE COOLING2
623	1	PID2 VALVE OFF TABLE COOLING3
624	1	PID2 VALVE OFF TABLE HEATING1

Address	Bytes	Register and Description
625	1	PID2 VALVE OFF TABLE HEATING2
626	1	PID2 VALVE OFF TABLE HEATING3
627	1	spare
628	1	value of light sensor
629	1	PIR sensor select 1=PIR sensor enable 0=PIR sensor disable
630	1	PIR sensor real value
631	1	PIR sensor range 0:unocupied 1: occupied
632	1	PID2 VALVE TABLE COASTING
633	1	PID2 VALVE TABLE COOLING1
634	1	PID2 VALVE TABLE COOLING2
635	1	PID2 VALVE TABLE COOLING3
636	1	PID2 VALVE TABLE HEATING1
637	1	PID2 VALVE TABLE HEATING2
638	1	PID2 VALVE TABLE HEATING3
639	1	ID write protect. 0:enable ID write 1: disable ID write
641	1	PIR TIMER.
642	2	(VAV function) supply setpoint
643	2	(VAV function) Maximum supply setpoint
644	2	(VAV function) Minimal supply setpoint
645	2	(VAV function) Maximum airflow for cooling
646	2	(VAV function) Maximum airflow for heating
647	2	(VAV function) Minimal airflow
648	2	(VAV function) airflow setpoint
649	1	(VAV function) VAV function control bit0:VAV function enable/disable 0:(default)disable 1:enable bit1:airflow sensor present 0:NO 1:YES bit2: engineering units setting 0:in aireflow unit 1:in %
650		(VAV function) spare
651	1	(VAV function) PID3_VALVE_OPERATION_TABLE_BEGIN
652	1	(VAV function) PID3_VALVE_OPER_TABLE_COOL1
653	1	(VAV function) PID3_VALVE_OPER_TABLE_COOL2
654	1	(VAV function) PID3_VALVE_OPER_TABLE_COOL3
655	1	(VAV function) PID3_VALVE_OPER_TABLE_HEAT1
656	1	(VAV function) PID3_VALVE_OPER_TABLE_HEAT2
657	1	(VAV function) PID3_VALVE_OPER_TABLE_HEAT3
658	1	(VAV function) PID3 cooling deadband
659	1	(VAV function) PID3 heating deadband
660	1	(VAV function) PID3 Pterm
661	1	(VAV function) PID3 Iterm
662	1	(VAV function) PID3 heat stage(max 6 stages)
663	1	(VAV function) PID3 cool stage(max 6 stages)
664	1	(VAV function) PID3 output
665	1	(VAV function) PID3_DIGITAL_OUTPUT_BEGIN
666	1	(VAV function) PID3_DIGITAL_OUTPUT_COOL1
667	1	(VAV function) PID3_DIGITAL_OUTPUT_COOL2
668	1	(VAV function) PID3_DIGITAL_OUTPUT_COOL3
669	1	(VAV function) PID3_DIGITAL_OUTPUT_HEAT1
670	1	(VAV function) PID3_DIGITAL_OUTPUT_HEAT2

Address	Bytes	Register and Description
671	1	(VAV function) PID3_DIGITAL_OUTPUT_HEAT3
672	1	(VAV function) PID3_VALVE_OFF_TABLE_BEGIN
673	1	(VAV function) PID3_VALVE_OFF_TABLE_COOL1
674	1	(VAV function) PID3_VALVE_OFF_TABLE_COOL2
675	1	(VAV function) PID3_VALVE_OFF_TABLE_COOL3
676	1	(VAV function) PID3_VALVE_OFF_TABLE_HEAT1
677	1	(VAV function) PID3_VALVE_OFF_TABLE_HEAT2
678	1	(VAV function) PID3_VALVE_OFF_TABLE_HEAT3
679	1	(VAV function) PID3_DIGITAL_OFF_OUTPUT_BEGIN
680	1	(VAV function) PID3_DIGITAL_OFF_OUTPUT_COOL1
681	1	(VAV function) PID3_DIGITAL_OFF_OUTPUT_COOL2
682	1	(VAV function) PID3_DIGITAL_OFF_OUTPUT_COOL3
683	1	(VAV function) PID3_DIGITAL_OFF_OUTPUT_HEAT1
684	1	(VAV function) PID3_DIGITAL_OFF_OUTPUT_HEAT2
685	1	(VAV function) PID3_DIGITAL_OFF_OUTPUT_HEAT3

Tstat6 Series

Descriptions



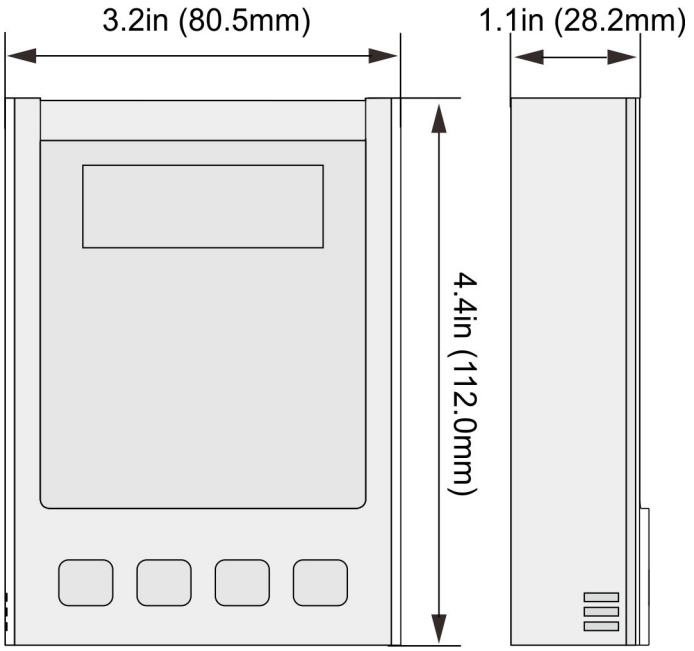
This full-featured CPU based thermostat is designed for small cooling and heating air handling systems in residential and commercial facilities. The unit provides features which eclipse standard mechanical thermostats at a price that fits conventional HVAC projects.

Highlights:
-Tight control of 0.5°C provides comfortable indoor environment.
-High impact plastic enclosure provides durability in commercial environments.
-Customizable sequence of operation table (FCU with modulating or on/off valve,single or 3-speed fan, pressure independent VAV, stage sequencer)
-Available in Clock, Clock & Humidity, CO2 ,OCC and Zigbee options

	Sales Price	Discount Price	OEM>50k/yr
Tstat6	39	37	36
Tstat6-CH	44	42	41
TSTAT6-CO2	90	75	60
TSTAT6-ZIGB	55	53	51
TSTAT6-OCC	41	39	38

Tstat6 Technical Data

TSTAT6	5 relays x 2amps @24V, 7 analog inputs, 2 analog outputs (10V @100ma)
Operating temperature	-30-70°C(-22~158°F)
Supply voltage	12~24VAC/DC ±20%, 50-60Hz
Power consumption	100mA at 12VDC
Relay contacts rating	2A @ 24VDC, 0.5A @ 125VAC UL File No.: E43149 CSA File No.: LR26550
Ambient humidity	10-90 %Rh
Operating Environment	0 ~ 99% humidity non condensing
Plastic Housing	Flammability rating UL 94HB
Enclosure rating	IP31
Temperature sensor	10K thermistor ±0.5°C
Colour	White/Off-white
Weight	200g



Tstat6-CO2 Technical Data

- Tstat6 with C02 sensor now available. All the powerful features of Tstat6 zone controller plus a C02 sensor in one compact package.
- Can be used as a stand alone zone controller for 'demand based' total solution.
- Or use the analog outputs as a regular C02 transmitter as inputs to a central controller.
- Modbus RS485 network connection for easy integration with automation systems.
- Tight control of 0.5°C provides comfortable indoor environment.
- High impact plastic enclosure provides durability in commercial environments.
- Customizable sequence of operation table (FCU with modulating or on/off valve, single or 3-speed fan, pressure independent VAV, stage sequencer…)
- An affordable CO2 sensing solution for HVAC/DCV

CO2 Performance:
Measurement Range.....0-3,000 ppm display
(2000ppm, 5000ppm, 10,000ppm are optional)
Accuracy.....±70 ppm or ±5% of reading
Repeatability.....±20 ppm
Temperature Dependence .....Typ.±0.2% of reading per °C or ±2 ppm per °C, whichever is greater, referenced to 25°C

Tstat6-Zigbee Technical Data

- 2.4-GHz IEEE 802.15.4 Compliant RF Transducer
- Programmable Output Power Up to 4.5dBm

Tstat6-C or Tstat-CH Technical Data

A genuine Tstat6 with Clock or Humidity options, they added some new features.

1. Temperature range: indoor & outdoor -30 °C ~ + 70 °C (-22 ~ +158 °F)
   Humidity range : indoor 10% ~ 90%RH
   Power - supply : 100mA at 12VDC
2. Functions :
   Indoor & outdoor temperature display , indoor humidity display.
   Temperature unit °C /°F changeable.
   Clock & date display function , automatic exchanging in 5 seconds between clock & date
   Pointing function each hour.
   Display the current temperature , humidity , time, and automatic exchanging working according to the schedule.
   Calender display function.
   Week display function.
   Clock ,date , lunar calendar, Gregorian calendar automatic exchanging function (only for typical models).
3. Attention :
   *Press button for one time when the meter is first used or the battery is replaced .
   *Press button for one time if any abnormal display appears .

Tstat6-OCC Technical Data

Tstat6-OCC is an energy conservation device designed to detect the presence of human occupants in a given area.

Many commercial, industrial and government facilities require a significant number of lighting fixtures for adequate illumination, and therefore use a significant amount of power to operate the lighting fixtures. A number of facilities use lighting control systems to control when the lighting fixtures are energized and thereby reduce the amount of power that is consumed to light these facilities.

Tstat6-OCC can be provided with an ambient light sensor and control input therefore. The ambient light sensor and control input can be used to select a minimum level of light above which a lighting fixture is prevented from being switched and powered on following detected motion.

Tstat6-OCC typically sense the presence of one or more persons within a designated area and generate occupancy signals indicative of that presence. These signals activate or deactivate one or more electrical appliances, such as, for example, a lighting unit or a heating, ventilating, and air conditioning system. When occupancy is sensed, the various electrically-powered loads in that area controlled by the sensor are energized. When that same area has been unoccupied for a predetermined period of time, the sensor de-energizes the electrical loads that it controls. Thus, the lighting control system operates in a daylight inhibit mode when the ambient light level is sufficient to render the switching of the lamp unnecessary. The two most prevalent types of occupancy sensors are passive infrared and active ultrasonic devices. A passive infrared (PIR) sensor will turn on the load whenever it detects a moving or newly apparent heat source. we only have passive infrared (PIR) sensor.

Light Sensor Module Technical Data

The light Sensor module is a standard item now. It just provides an illuminance value. It is designed with TPS851. This device enables low power consumption to be achieved.

- Little fluctuation in light current and high level of sensitivity
  : IL = 37 μA to 74 μA @EV = 100 lx using fluorescent light
  : Light current variation width: ×1.67
  (When light current classification is specified.)
  : Little temperature fluctuation
- Built-in luminous-efficiency correction function, reduced sensitivity variations due to various light sources
  : IL (using incandescent light)/IL (using fluorescent light) = 1.2 (typ.)
- Low supply voltage, making device suitable for battery-powered equipment: VCC = 2.7 V to 5.5 V

Operating Temperature: -30°C ~ 85°C

Maximum Ratings (25°C)

Characteristics	Symbol	Rating	Unit
Supply voltage	VCC	-0.5 to 7	V
Output voltage	VOUT	≤ VCC	V
Light current	IL	5	mA
Permissible power dissipation	P	35	mW
Operating temperature range	Topr	-30 to 85	°C
Storage temperature range	Tstg	-40 to 100	°C
Soldering temperature range (Note 1)	Tsol	260	°C

Note 1: The reflow time and the recommended temperature profile are shown in the section entitled Handling Precautions.

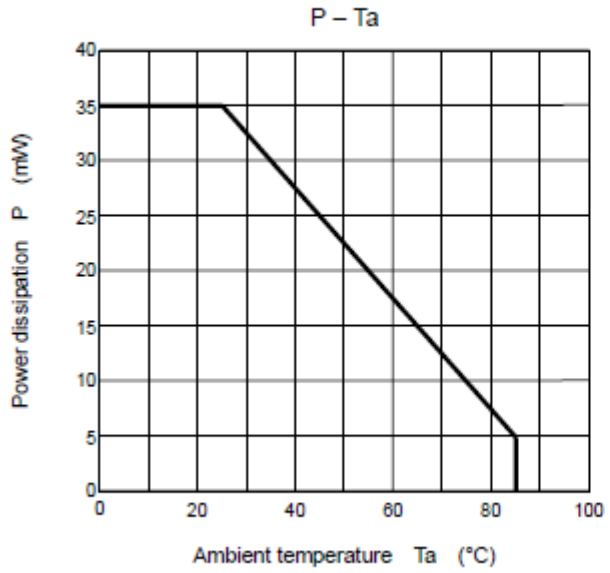
Recommended Operating Conditions

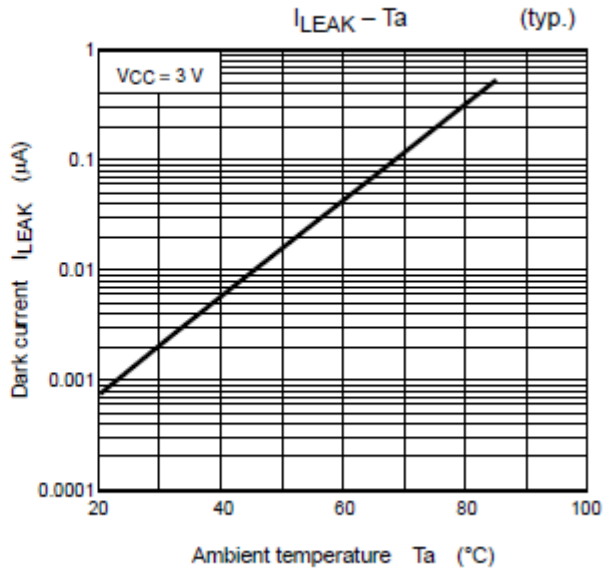
Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage	VCC	2.2	——	5.5	V

Electrical and Optical Characteristics (Ta 25°C)

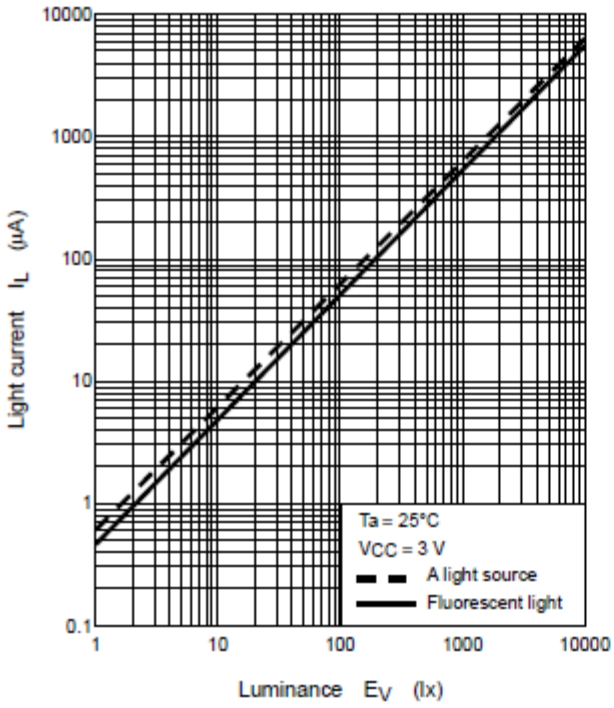
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Supply current	ICC	VCC =3 V, EV=1000 lx RL =1 k Ω (Note 2)	—	620	—	μ A
Light current (1)	IL (1)	VCC =3 V, EV=1000 lx (Note 2) , (Note 4)	—	62	—	μ A
Light current (2)	IL (2)	VCC =3 V, EV=10 lx (Note 3) , (Note 4)	3.7	—	7.4	μ A
Light current (3)	IL (3)	VCC =3 V, EV=100 lx (Note 3) , (Note 4)	37	—	74	μ A
Light current ratio	IL (1) / IL (3)	——	—	1.2	1.7	
Dark current	ILEAK	VCC=3.3 V, EV = 0	—	—	0.17	μ A

Note 2: CIE standard A light source is used (color temperature 2856K, approximated incandescence light).
Note 3: Fluorescence light is used as light source. However, white LED is substituted in a mass-production process.
IL classification IL (3) A: - > 37 μ A to 62 μ A, B: 44 μ A to 74 μ A
Note 4: Light current measurement circuit

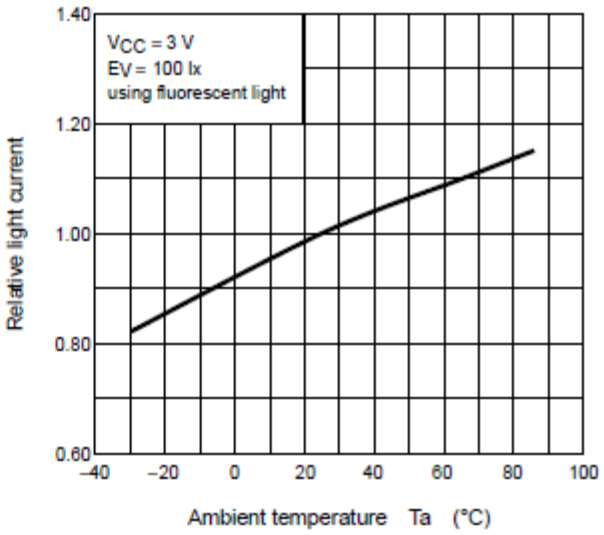




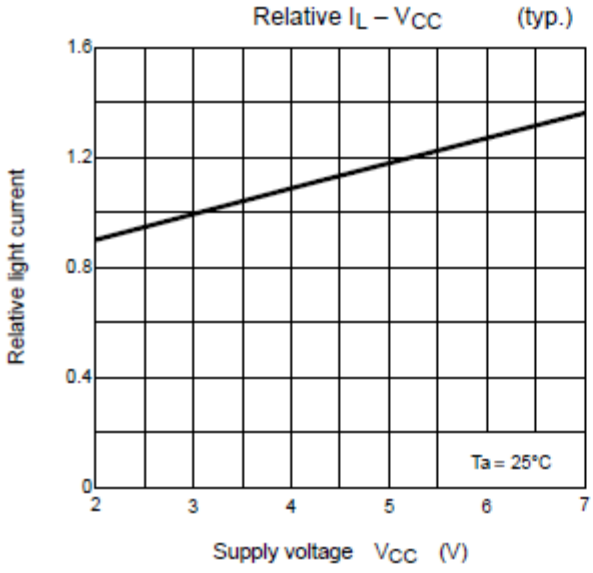
$I_L - E_V$ (typ.)



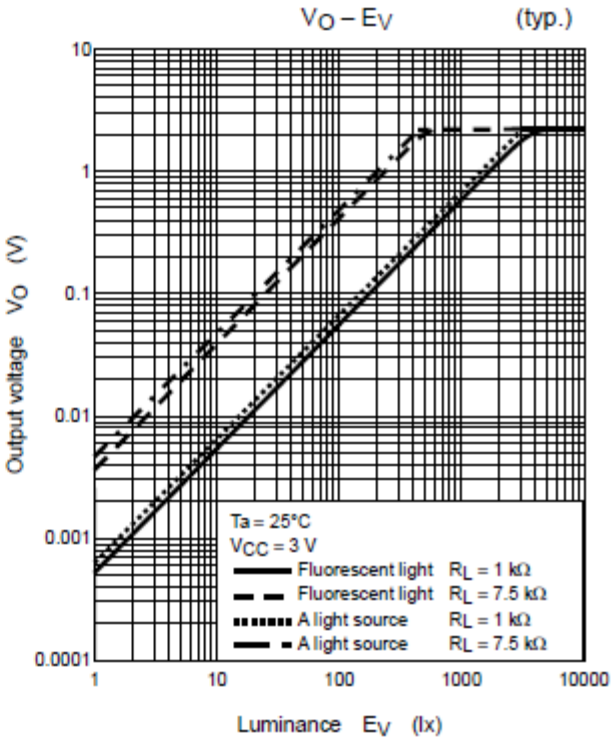
Relative I_L – Ta (typ.)



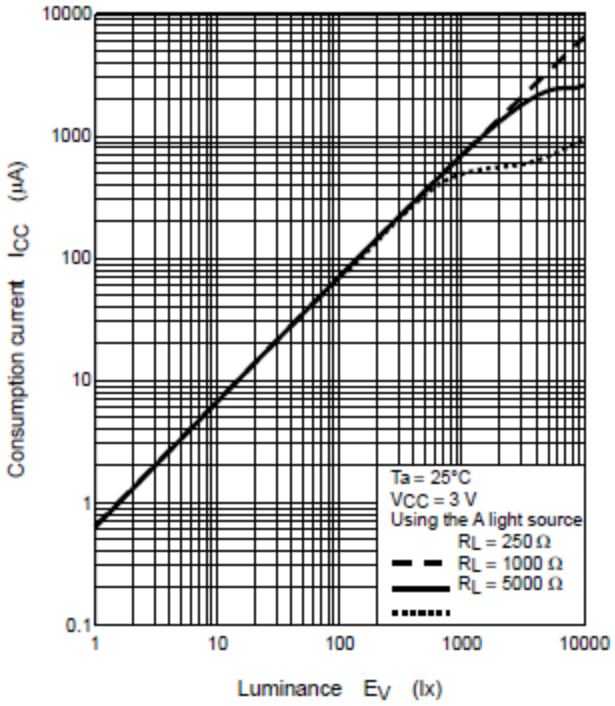
Relative I_L – V_{CC} (typ.)



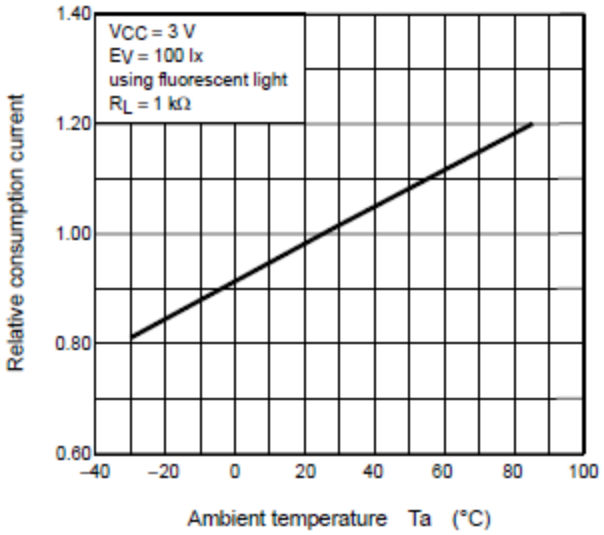
$V_O - E_V$ (typ.)



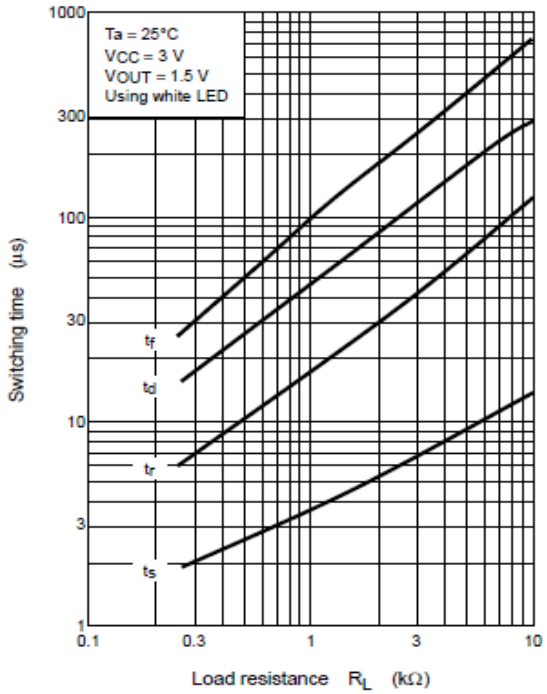
$I_{CC} - E_V$ (typ.)



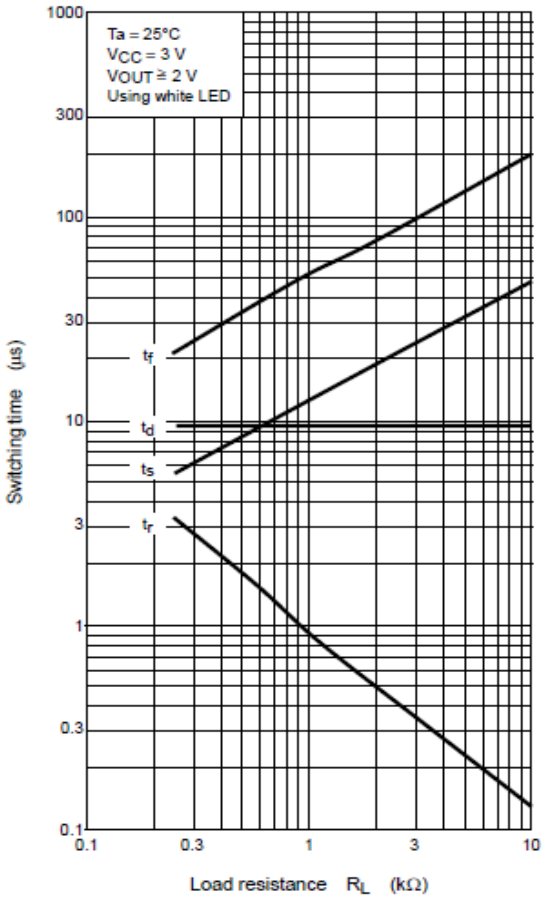
Relative I_{CC} – Ta (typ.)



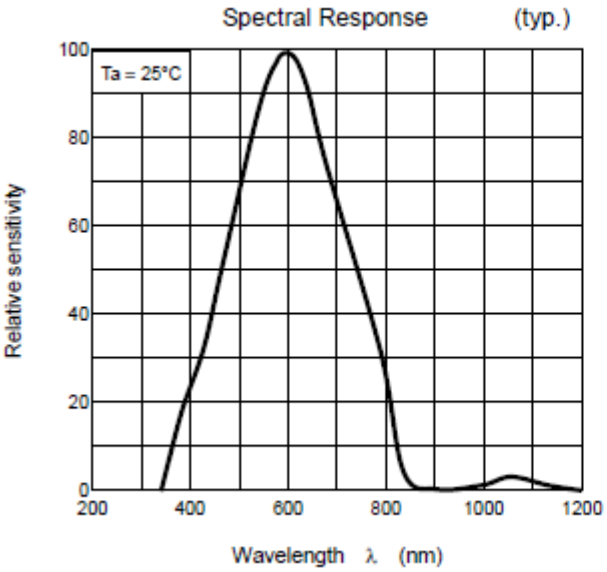
Switching Characteristics
(non-saturating operation) (typ.)

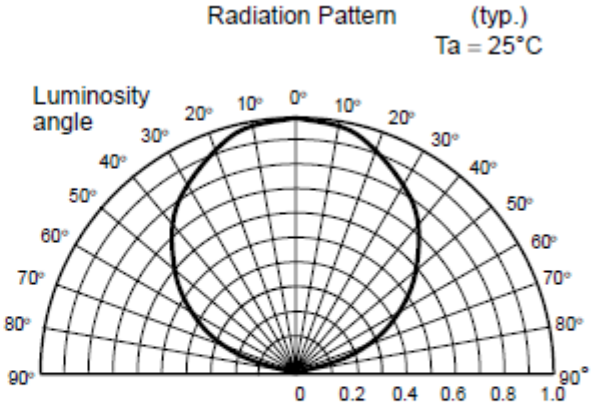


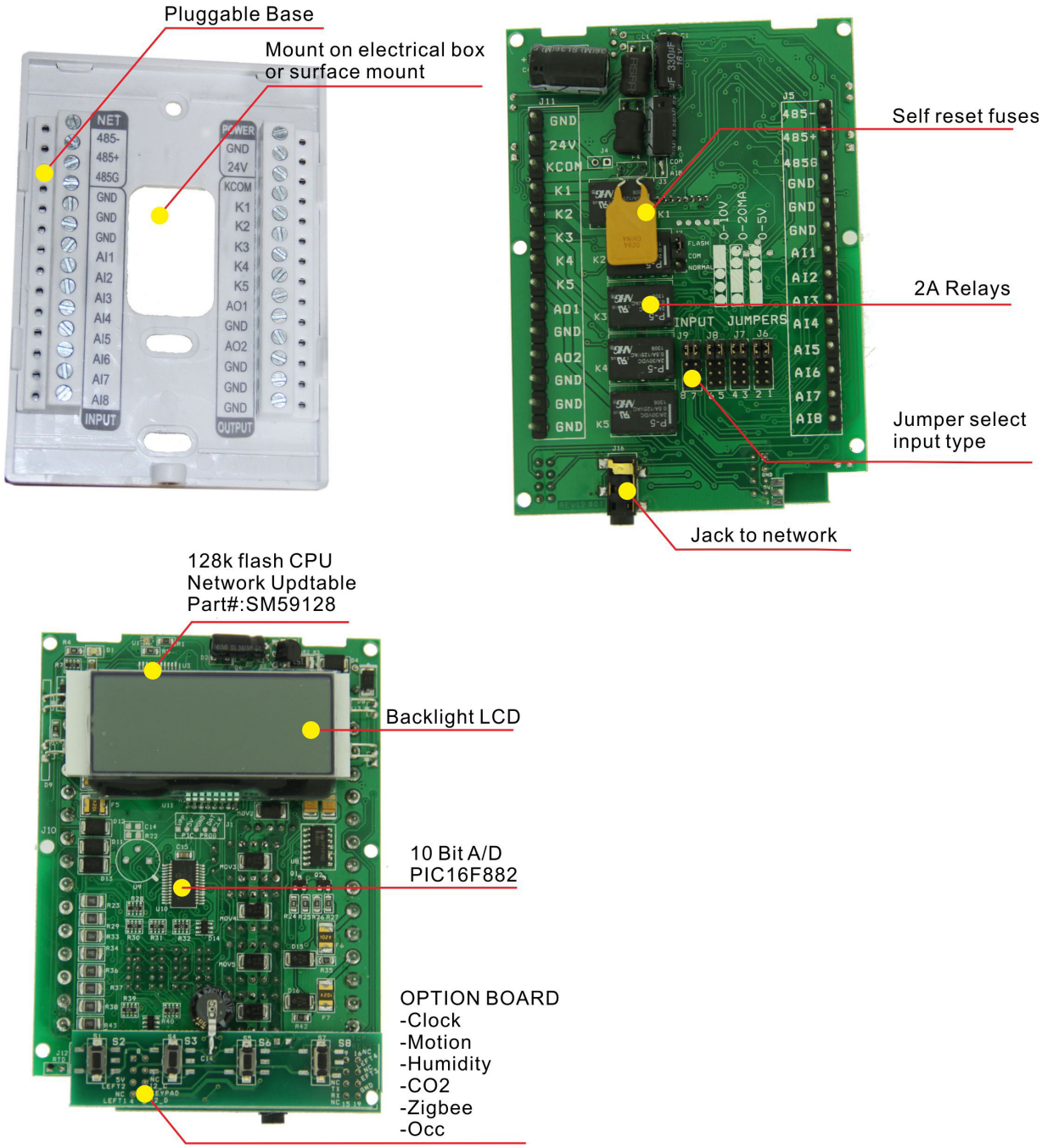
Switching Characteristics
(saturating operation) (typ.)



Switching Time Measurement Circuit and Waveforms

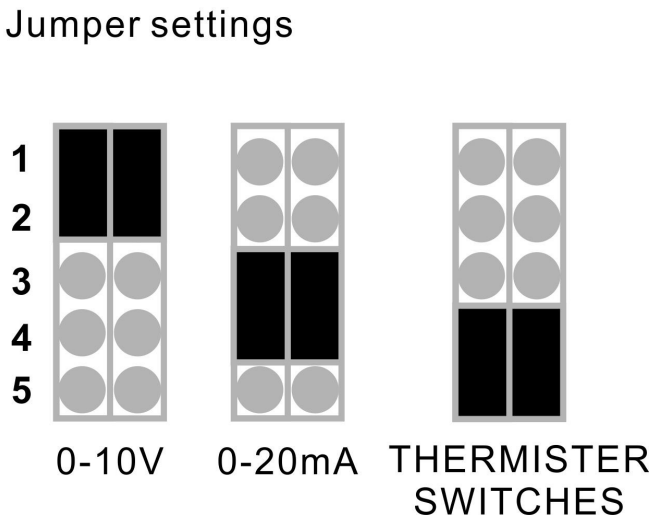




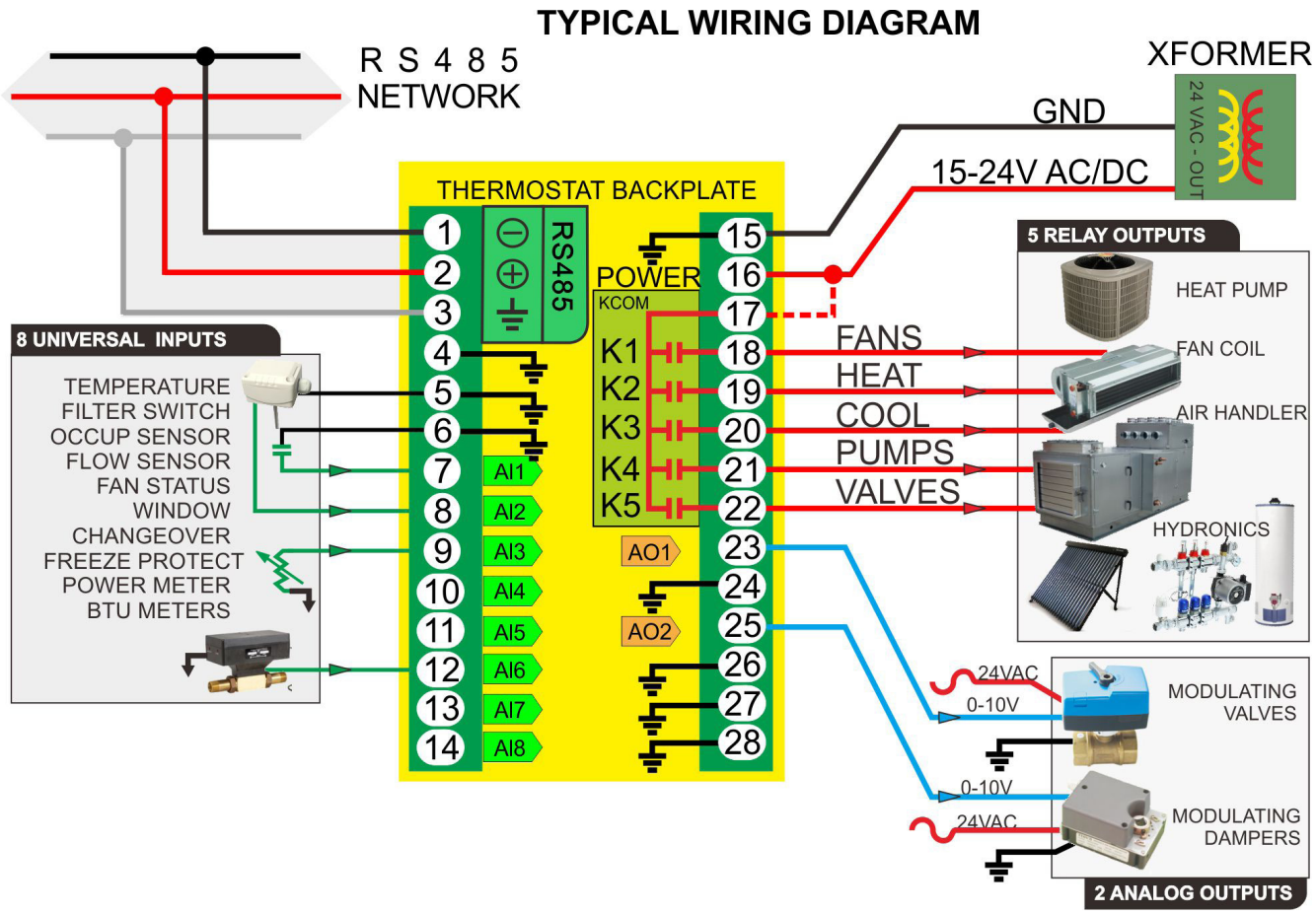

Pluggable Base
Mount on electrical box
or surface mount
Self reset fuses
2A Relays
Jumper select
input type
Jack to network
128k flash CPU
Network Updtable
Part#:SM59128
Backlight LCD
10 Bit A/D
PIC16F882
OPTION BOARD
-Clock
-Motion
-Humidity
-CO2
-Zigbee
-Occ

Tstat6 Jumper Settings

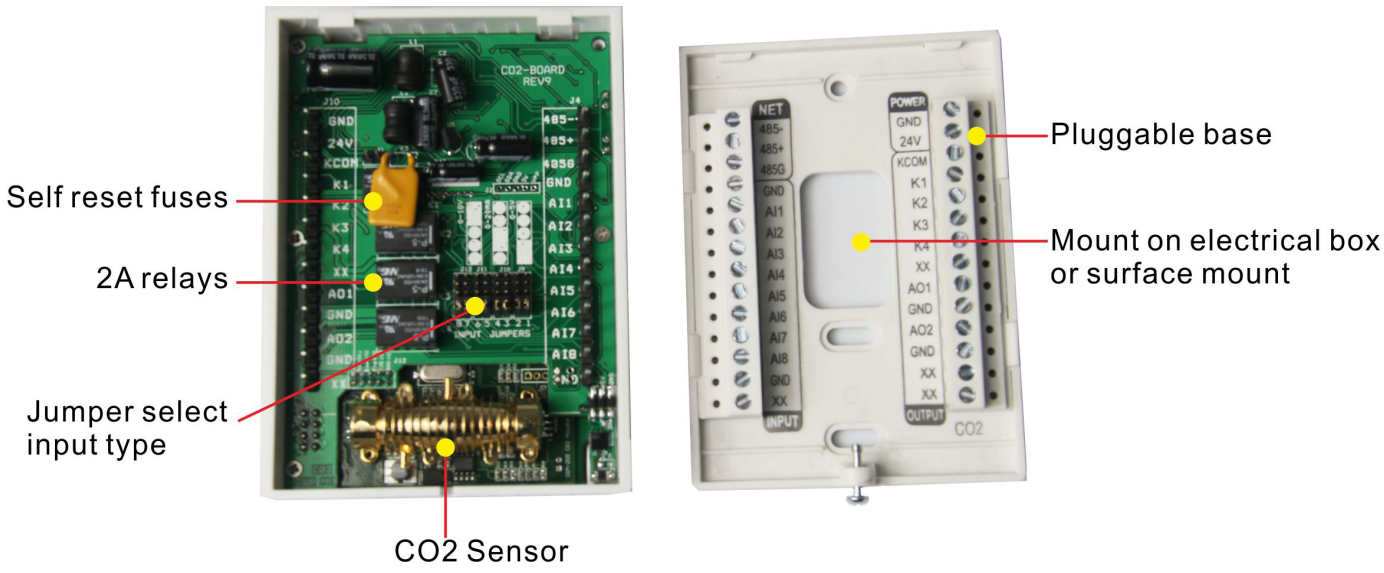




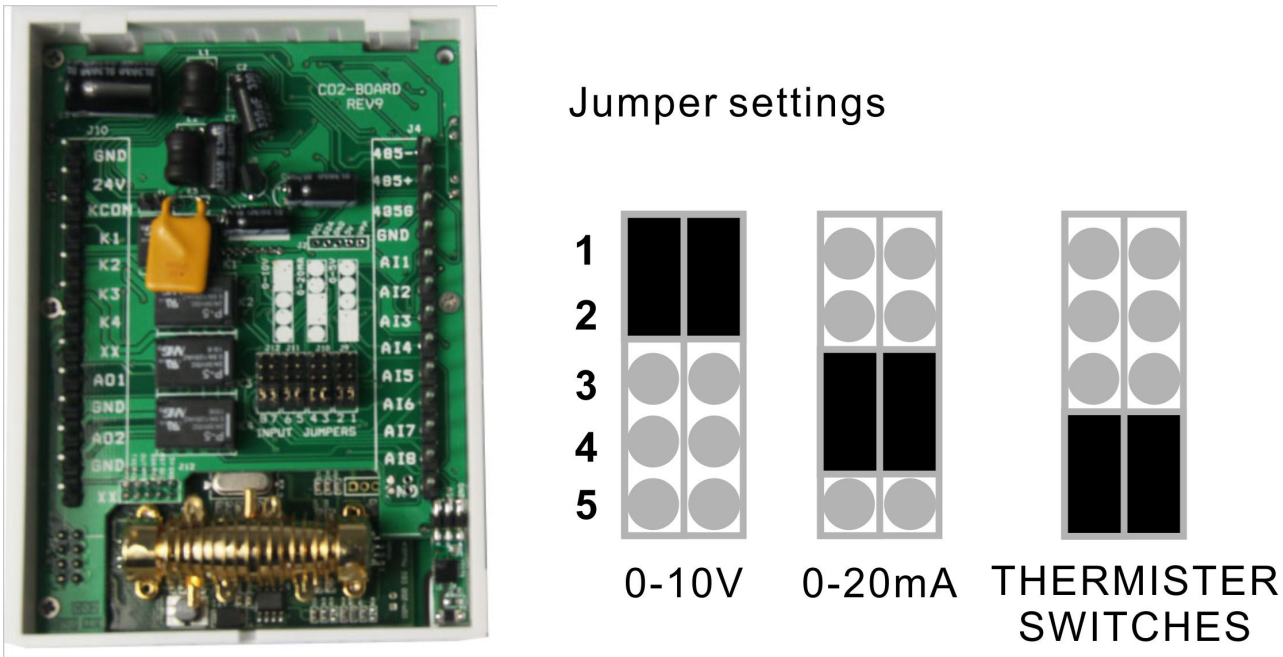
Tstat6 Wiring Diagram



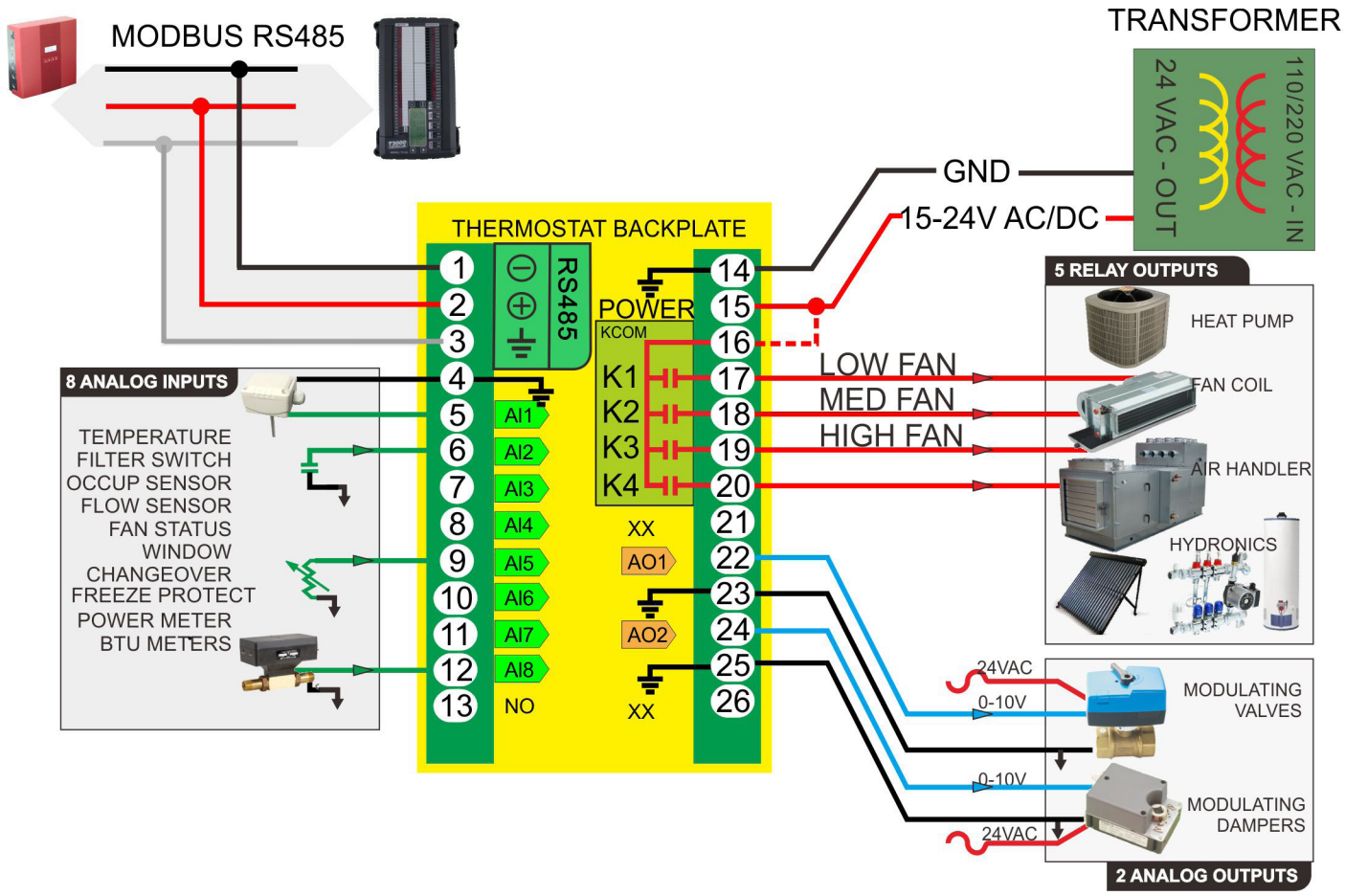
Tstat6-CO2 Highlights



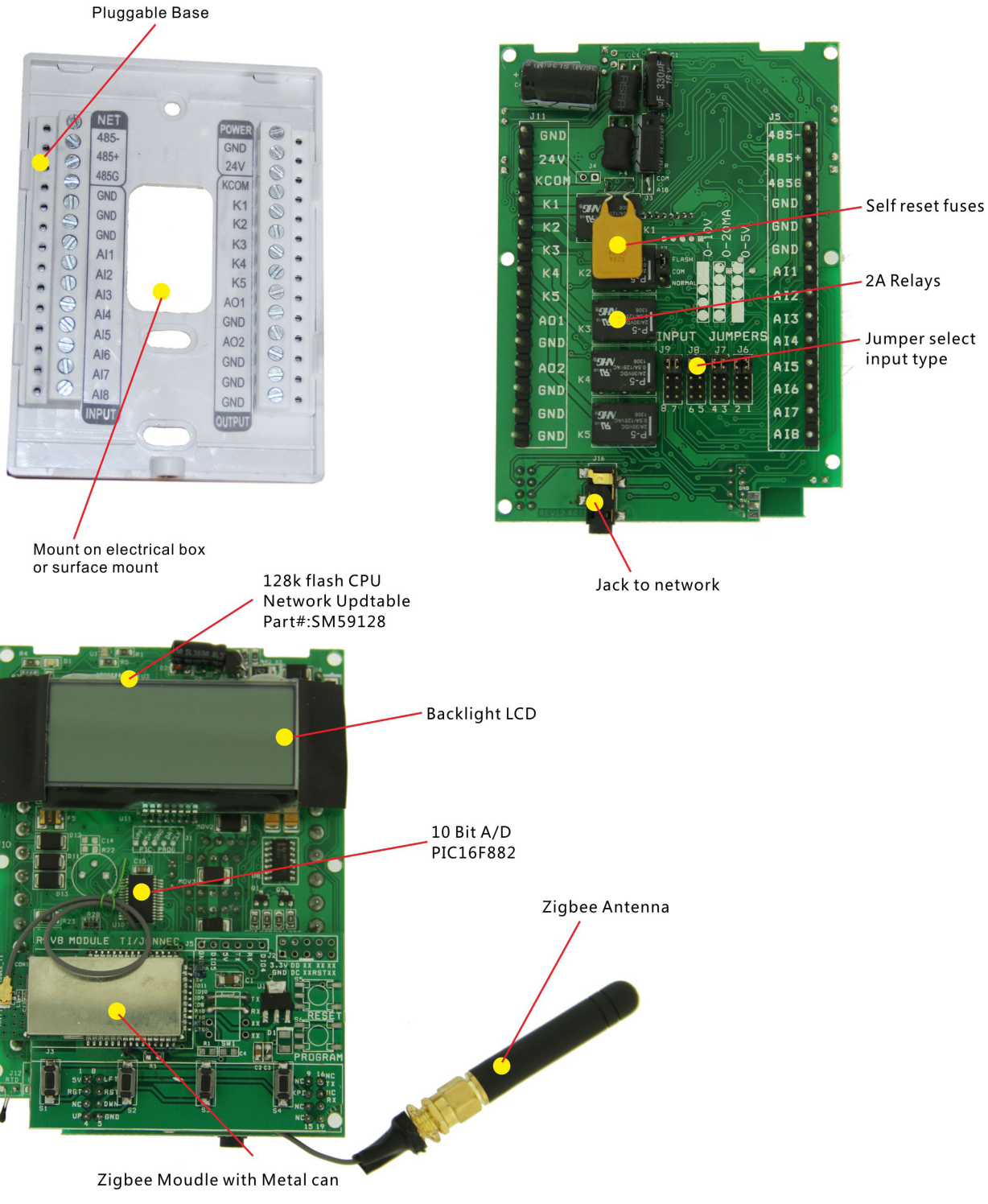
Tstat6-CO2 Jumper Settings



Tstat6-CO2 Wiring Diagram

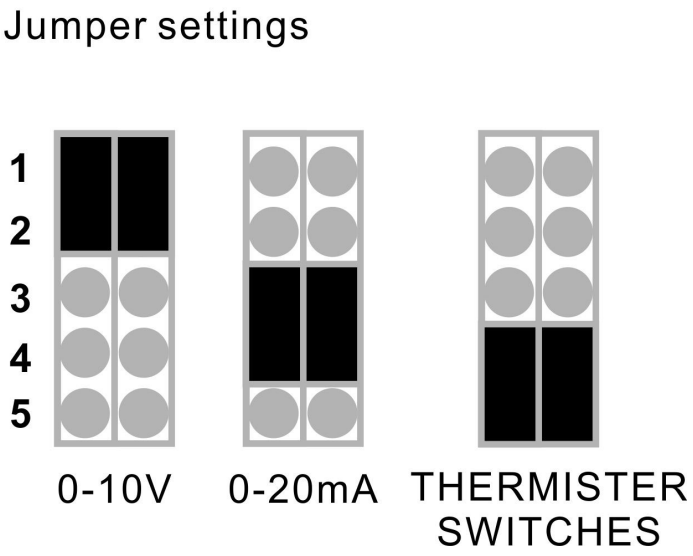


Tstat6-Zigbee Highlights

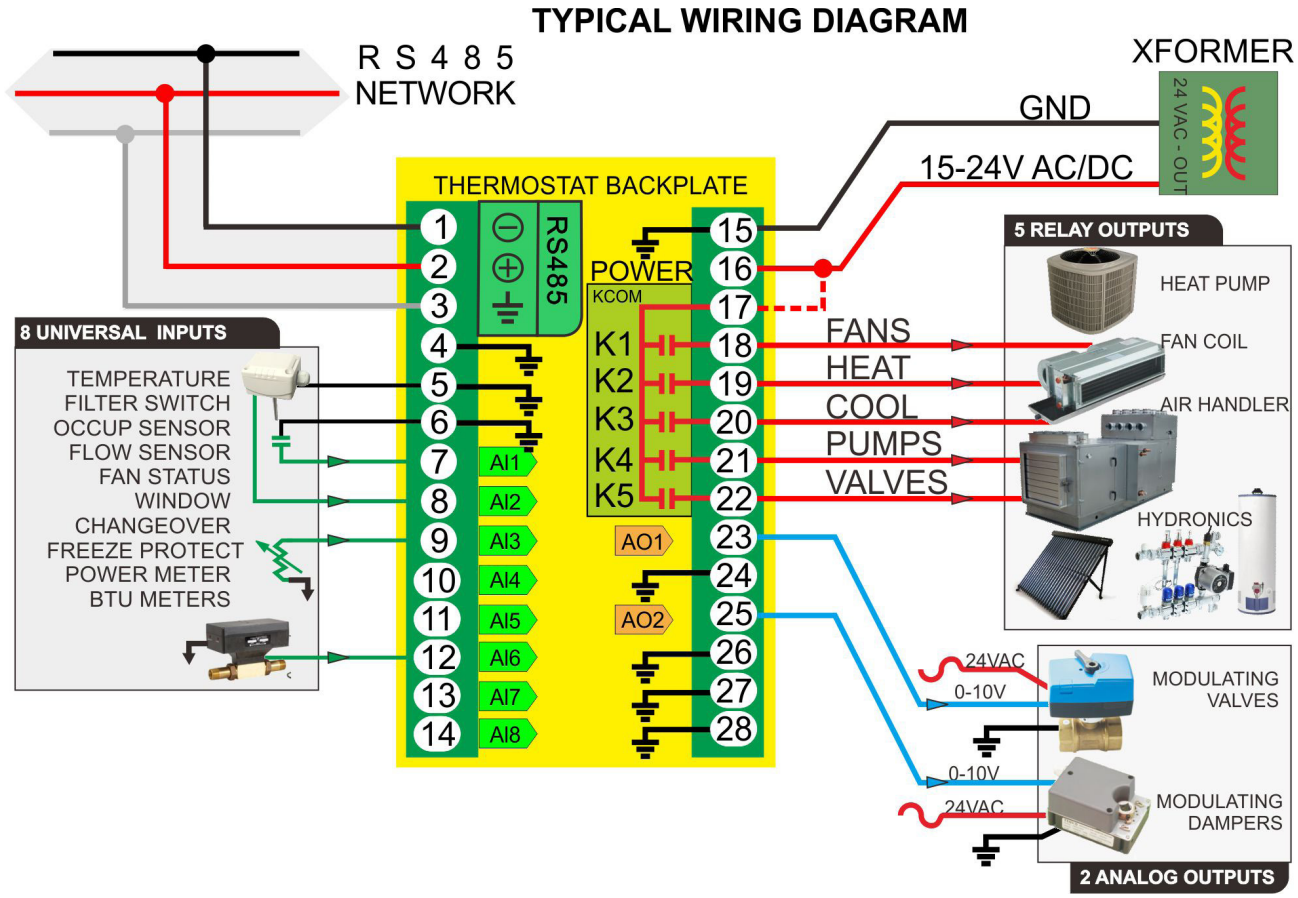


Tstat6-Zigbee Jumper Settings

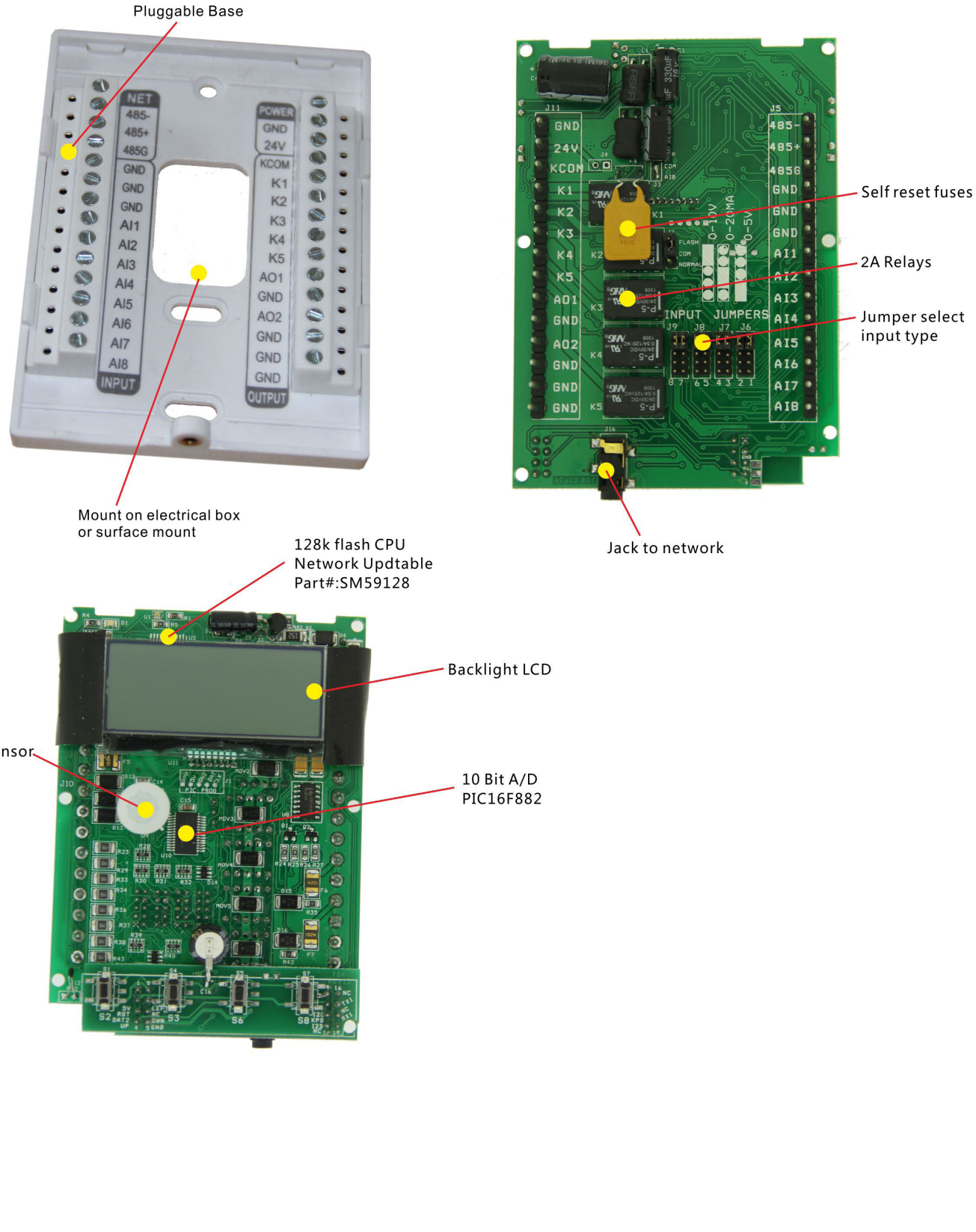




Tstat6-Zigbee Wiring Diagram

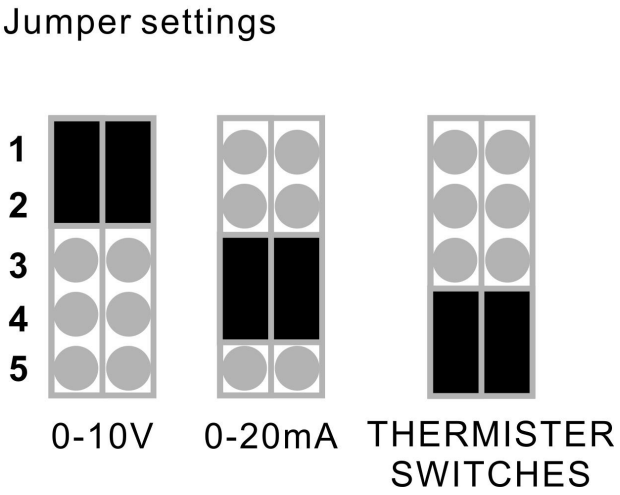


Tstat6-OCC Highlights

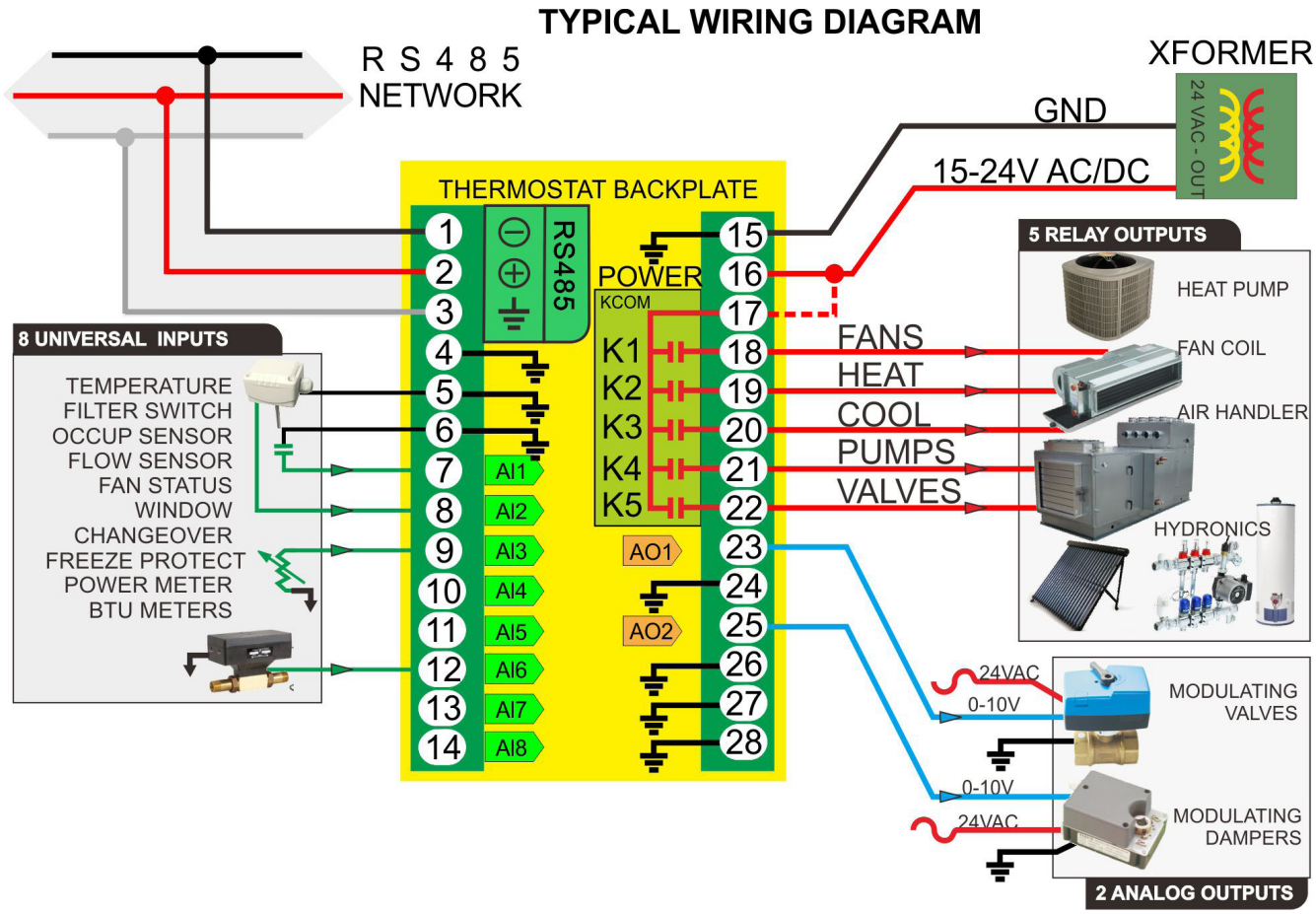


Tstat6-OCC Jumper Settings





Tstat6-OCC Wiring Diagram



Advanced Menu Item Details

The Tstat6 series thermostats have several advanced menu items which can be adjusted in the field to suit the application and tune the operation of the thermostat. Generally speaking, all the parameters are set up at the factory on an order-by-order basis and will give satisfactory results out of the box. There are four keys, here show the instructions.

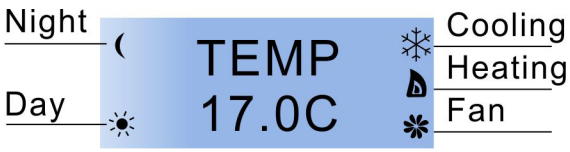


- Last menu item
- Next menu item
- Increase value
- Decrease value

1. Normal State.



2. LCD screen display.



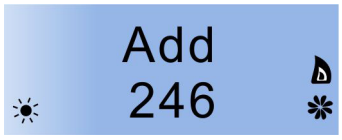
1. Now you are in the normal state, when you press ▲ or ▼ , it will show the set point screen. Press ▲ or , to increase or decrease the set point value. Waiting three seconds will confirm the setting. When the current temp value is under the set point, it will show the heating symbol. When the current temp value is above the set point value, it will show the cooling symbol.



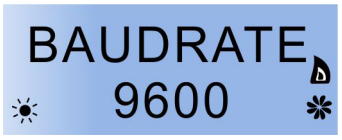


3. Now you are in the normal mode, press both ◀ and ▶ at the same time and hold for several seconds. It will switch into the menu mode. Press ◀ or ▶ to scroll through the menu options such as 'Add', 'CAL', 'BAUDRATE', 'UNITS' and many others. To change the values at a particular menu, press ▲ or ▼ . The chosen value will be stored automatically.

To change the unit's address scroll through the menu until you reach 'Add'. Press ▲ or ▼ to increase or decrease the unit's address from 1 to 254.
To change the baudrate, locate 'baudrate' within the menu and use ▲ and ▼ to choose 19200 or 9600.









Code	Description (Range, Default)
Add	**Modbus Device Address (1-254, 254)** This is the modbus address of the tstat. It is the address to which the stat will respond when receiving serial communication.
CAL	**Calibration of the Selected Temperature Sensor (0-1000, 500)** To calibrate the temperature shown on the tstat display you will need a handheld mercury thermometer or digital thermometer. Hold the meter close to the thermostat and allow it to come to equilibrium. Use the keypad to get into the menu mode until CAL is shown on the display. Now you can adjust the display using the up and down buttons till the temperature shown matches the handheld meter. When you are done, just let the display time out to normal operation, the display will stop flashing and will show the current room temperature. You can repeat this sequence if necessary till the readings on the thermostat and meter agree. The thermostat will store the calibration figures even through extended power outages and should not need to be adjusted for many years. The main point to keep in mind when calibrating is to let everything come to equilibrium. The thermostat should be powered up for 5 minutes prior to any calibration and the thermometer should be left near the thermostat for about the same amount of time. The 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 resolving down to 0.06°C so the weak link in calibrating is usually the procedure used rather than the tstat accuracy. • Make sure the tstat is mounted in a location free of drafts.
tSS	**Temperature Sensor Select (0-3, 0)** The tstat has an extra input for use with an external temp sensor. tSS = 0: The tstat will use the internal temperature sensor IC 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 internal thermistor and external thermistor which is shown on the display and used for PID calculations.
FIL	**Temperature Sensor Filter (0-10, 5)** Filter used for the raw temperature being read by the sensor. 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 readings more but make them respond more slowly.
BAUDRATE	19200, 9600
dSC	**Short Cycle Delay (0-20, 0)** This parameter adjusts the delay between cycling of the mode of operation. It is the number of minutes after entering 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, dSC minutes, until it can re-enter into Cooling1 mode. This value is in increments of 1 min.
dCH	**Changover Delay (0-200, 0)** This parameter adjusts the delay between switching from a heating mode of operation 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 min.

Humidity / Temp Transmitter & Modbus

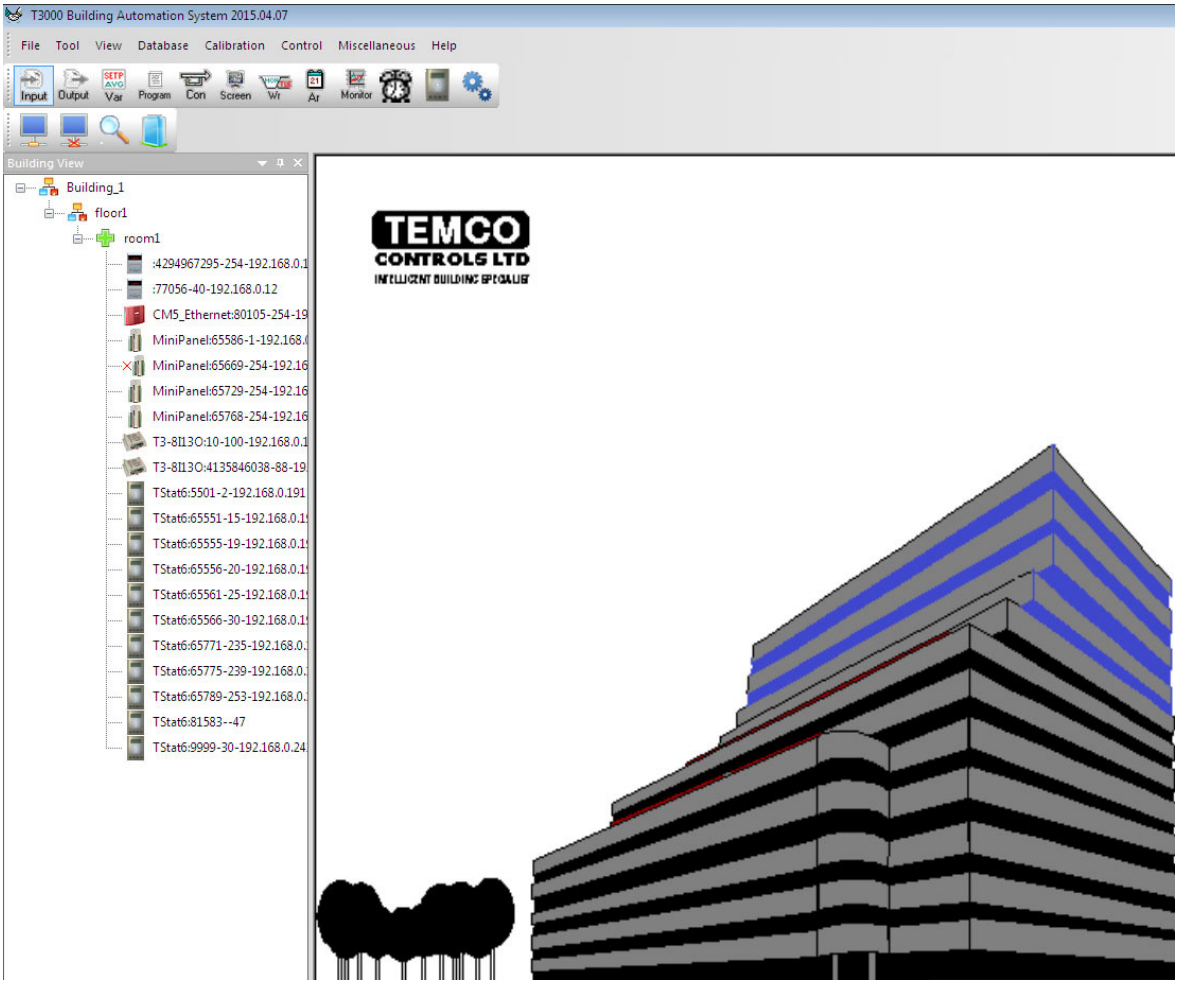
Code	Description (Range, Default)
PPr	**Proportional Term (10-255, 20)** The proportional term is the 'P' term of the familiar PID control strategy and determines how fast a valve will react to a deviation from setpoint at a particular instant in time. The default value of 2.0° (C or F) is fine for most applications, where a 2.0° deviation is required to make the valve respond 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 lazy 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° (C or 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 described next. The P value is in increments of 0.1° (i.e. 20 means 2.0°) and is in the same units (C or F) as the tstat.
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 I term will gradually open the valve to make up the final small deviation from setpoint. The default value of 5.0 (%/Deg minute) is fine for most applications and will cause the valve to open 5% for one degree (C or F) of error per minute. For example, when the PIn term set to the default of 5.0 (%/Deg 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 I term 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 I term as the opposite of the P term, -"a bigger I means faster valve, smaller I means lazier valve". -The default value of 5% will work fine for most applications. -If the valve is short cycling, make the I term lazier (smaller). The I value is in increments of 0.1 %/°min (i.e. 50 means 5.0%/°min) and is in the same units (C or 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: 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, 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, Coasting, Cool1, Cool2 and Cool3. So the table is a 5 outputs x 7 steps spreadsheet 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 "Tstat Factory" software utility on our website (http://www.temcocontrols.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: Setting SOP to 2, puts the Tstat into transducer mode. In this mode, the cooling analog 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: A special sequence of operations is embedded in the tstat that assists in commissioning of the installation and testing of the tstats. When SOP is set to '0' this is the testing sequence and the unit will cycle the relay outputs on and off in a slow rotation. The analog outputs are also cycled in a slow ramp, the cooling goes from 0-10V while the heating goes in reverse from 10 to 0V. 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.
HC	**Heating Cooling Mode Configuration (0-5, 0)** This item configures the method by which the tstat determines the heating or cooling mode. HC = 0: mode is controlled automatically by the PID. PID > 52 is heating mode, PID < 48 is cooling mode. HC = 1: mode is controlled by the keypad or serial communication. This is for keypad configurations in which the user or serial com can manually set heating or cooling. 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 in1 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. HC = 5: same as mode 4, but using the analog in2 sensor instead of analog in1.

Code	Description (Range, Default)
Hdb **Cdb**	**Heating & Cooling Deadbands (1-200, 10)** If there is one setpoint, the heating setpoint follows the cooling setpoint and is calculated by: Heating Setpoint = Setpoint - Heating Deadband. Cooling Setpoint = Setpoint + Cooling Deadband If there are two setpoints, heating and cooling are separately adjusted. The setpoints are calculated as follows: Heating Setpoint = Max(Cooling Setpoint + Cooling Deadband , Heating Setpoint) Cooling Setpoint = Min(Cooling Setpoint, Heating Setpoint - Cooling Deadband) The min value for Cdb 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.
UNITS	**Degrees C/Degrees F (0-1, -)** The display can be switched to show Degrees C or Degrees F. 0 = C, 1 = F.
FAn	**Number of Fan Speeds to show on the display (0-3, 3)** The number of fan speeds allowed. Fan = 3, user will see “Off, -1-, -2-, -3-, Aut” Fan = 2, user will see “Off, -1-, -2-, Aut” Fan = 1, user will see “Off, -1- , Aut” , Fan = 0, user will see “Off, On”
nHd	**Night Heating Deadband (0-35, 10) for deg C, (0-95, 10) for deg F**
nCd	**Night Cooling Deadband (0-99, 10) for deg C and F** When the tstat is in unoccupied mode, and APP is set to 0, the heating setpoint is adjusted downwards by the amount of the nHd. The cooling setpoint is adjusted upwareds 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.
nSp	
APP	**Application (0-1, 0)** 0 - OFFICE applications 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 setpoints Night Heating Setpoint = Cooling Setpoint - nHd value. Night Cooling Setpoint = Cooling Setpoint + nCd value.
POS	**Power on setpoint (0-255, 20) for deg C, (0-255, 68) for deg F** 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 every day. 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.
POn	**Power on Mode (0-3, 3)** 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 to power up in whatever state it was in before the power outage.

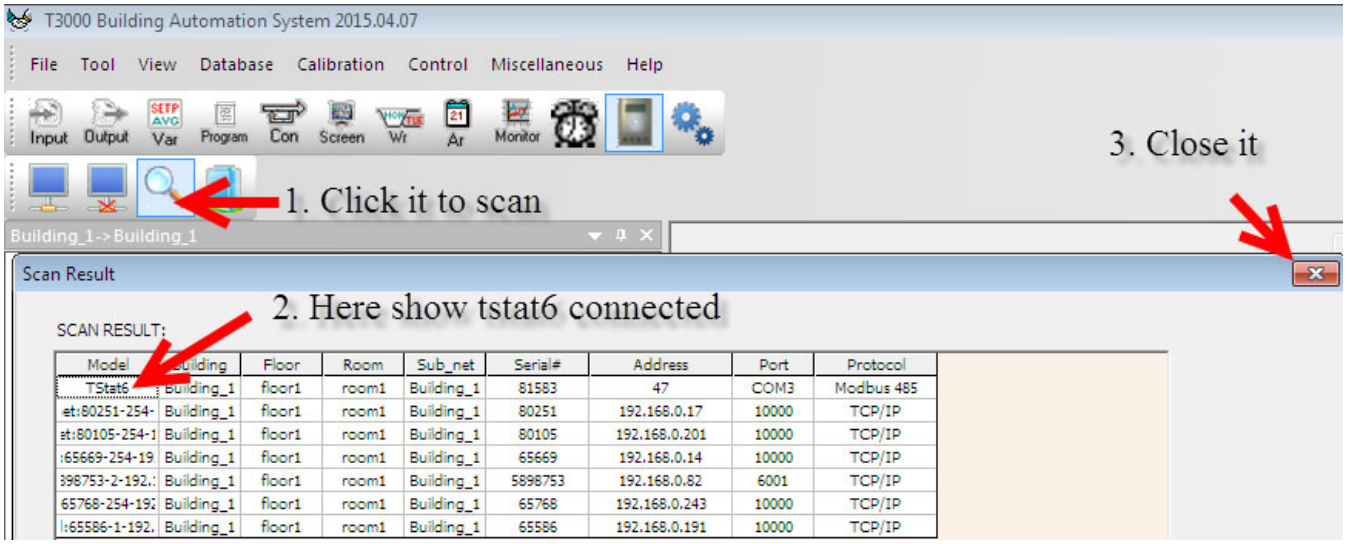
Code	Description (Range, Default)
Ou1 **Ou2**	**Output settings (0-4, 0)** Sets the full-scale voltage of the analog outputs. Ou1 sets analog out 1 (Cooling). Ou2 sets analog out 2 (Heating). This setting is used to match the analog outputs to various types of actuators, transducers or other controllers. For example, by setting the output range to act over a 5VDC scale you can set the tstat up as a transducer to interface into a master DDC controller. Or perhaps you have a valve that operates over the 2-10VDC range, this 'output' type setting lets you tailor the tstat to the particular application. OuX = 0, the output will 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 permanently 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 only if you happen to have a Tstat5A or 5CM and need a couple of extra on/off outputs 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 tying in a 250 ohm resistor in series with the output and making sure the grounds of the actuator and tstat are common.
SLO **SHI**	**Setpoint Minimum (0-255, 15) for deg C, (0-255, 55) for deg F** **Setpoint Maximum (0-255, 50) for deg C, (0-255, 99) for deg F** Rev24: The maximum and minimum allowable user setpoint settings. The occupants cannot 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.
LOC	**Keypad lockout (0-3, 0)** Rev25 only: This setting is useful to keep the building occupants from experimenting 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 can not do anything from keypad except enter menu mode.In menu mode,the user can set 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
dIS	**Display Setting (0-6, 0)** This allows the display to be configured in a few different modes. 0 = display the room temperature. 1 = display the setpoint. 2 = blank display. 3 = display pid2 value. 4 = display pid2 setpoint. 5 = display by manually. 6 = dispaly nothing except keypad pressed.
Vtt	**Valve Transient Time (10-255, 0)** This setting allows the user to adjust the valve transient time from fully open to fully closed. Value ranges from 10 (10s) to 255 (255s)
DEF	**Accept Default Setting (0-1, 0)** This allows the user to define the current Tstat configuration as the new FACtory default. Look below in Factory Default for greater details.
	Year, month, date
	Sun-Fri, time
	Workday, Night and Day, Time
	Weekend, Night and Day, Time

TSTAT6-CO2 calibration

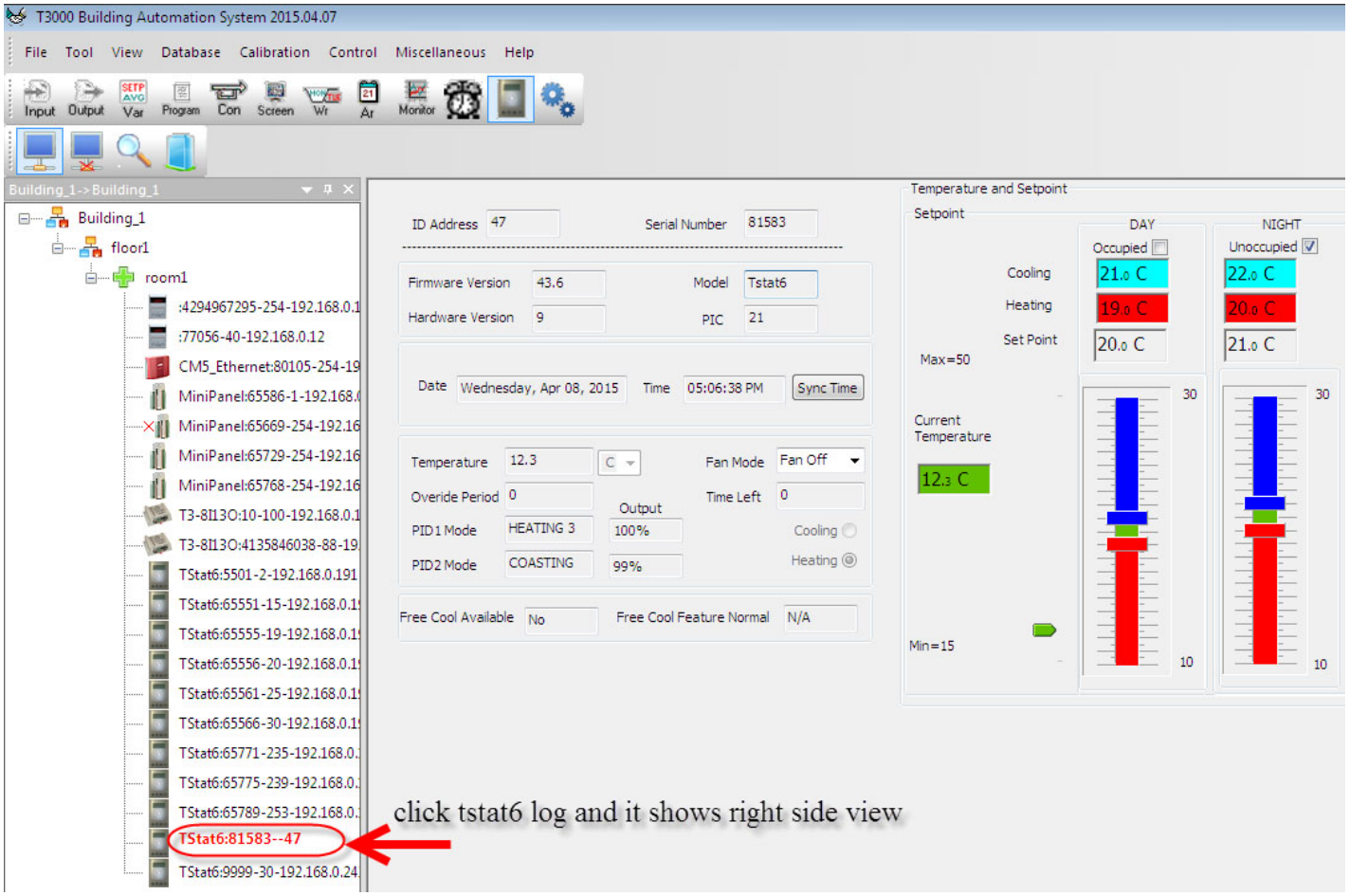
1. Connect TSTAT6-CO2 to PC by RS485.
2. Open T3000 and it show the following view.



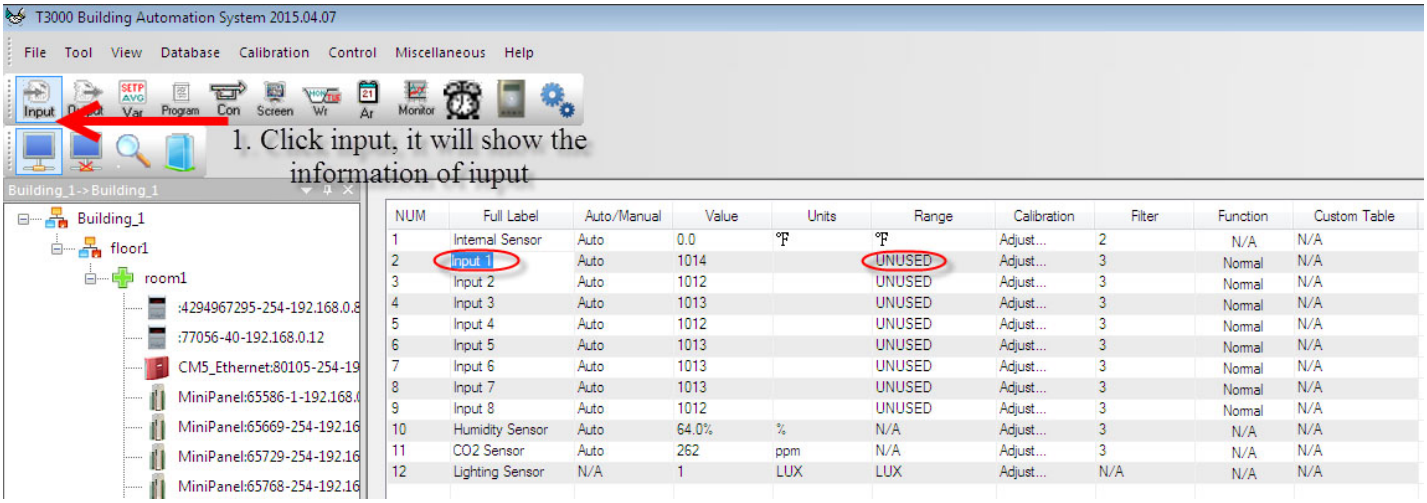
3. Click the button to scan, the following view will appear and close it as the picture shows.

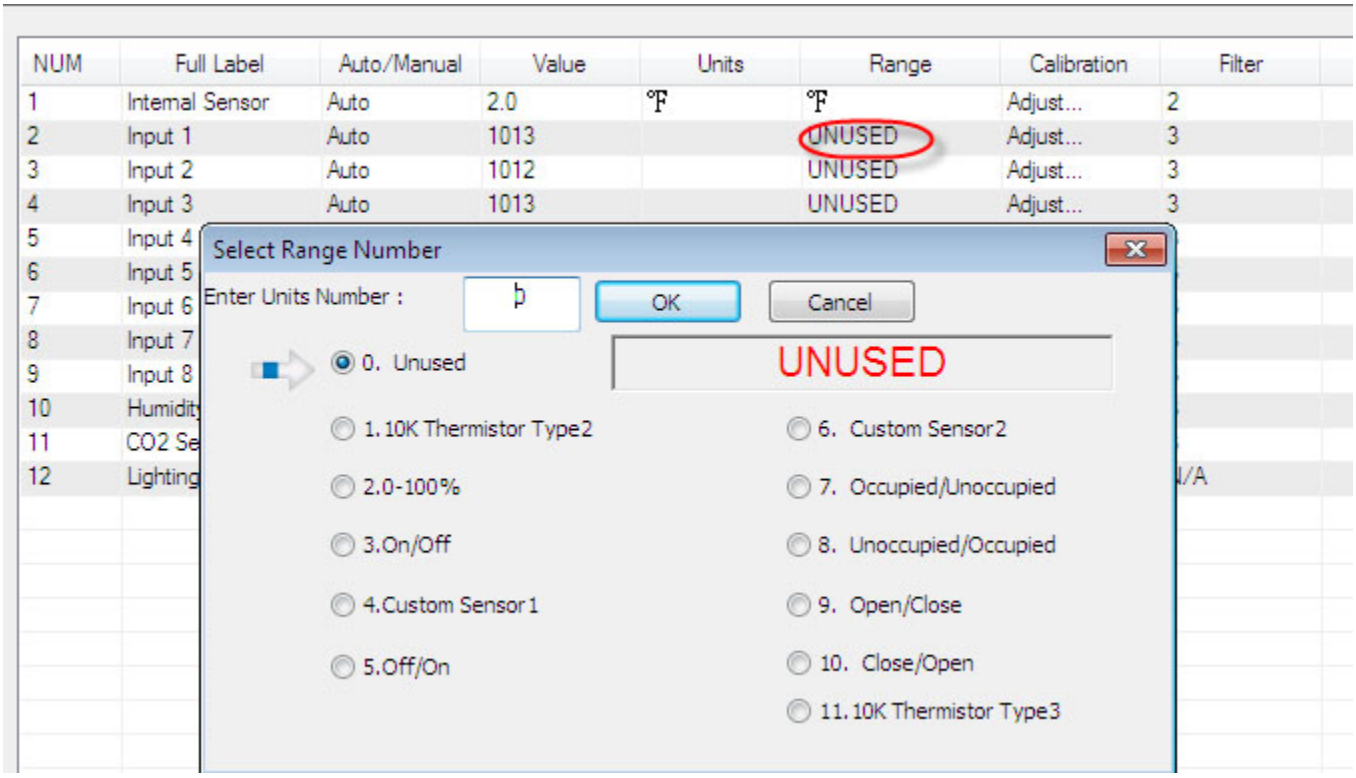


4. Click the TSTAT6 log and it will show all the information of TSTAT6.

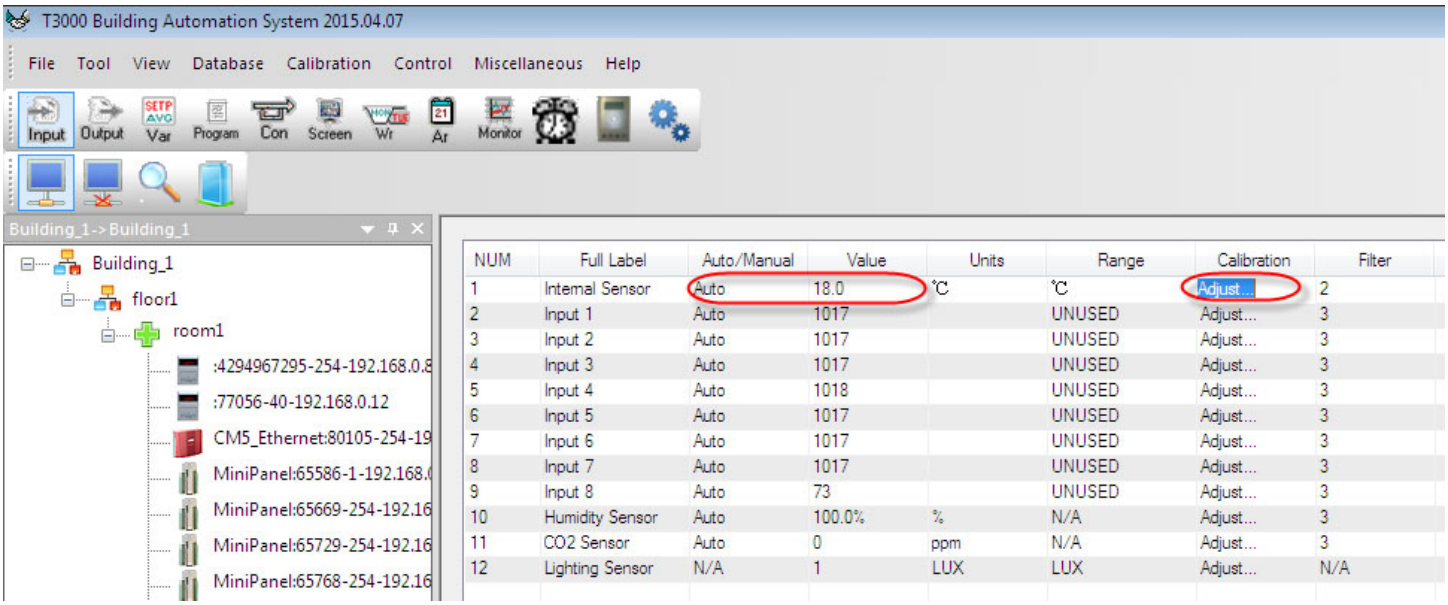


5. Click button input  , it will show all the information of input, same as output.
When you press input1, you can change the name according to your demand.
When you press range, it will show a view of range, there are different choices.

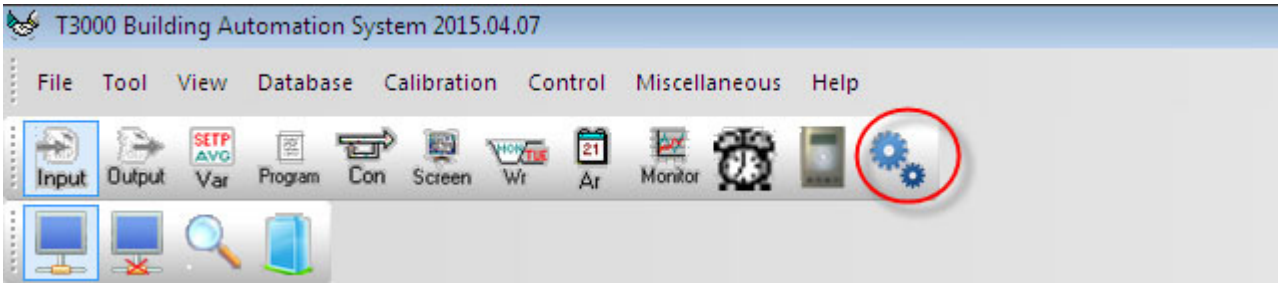


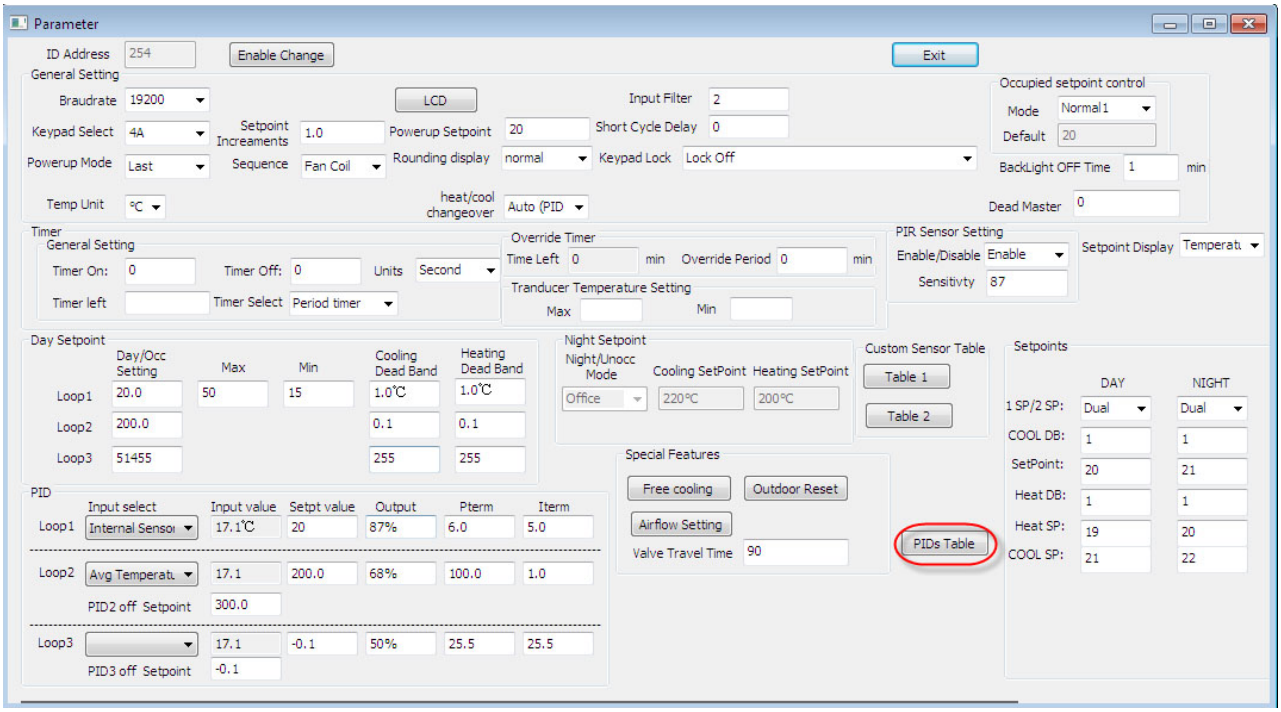


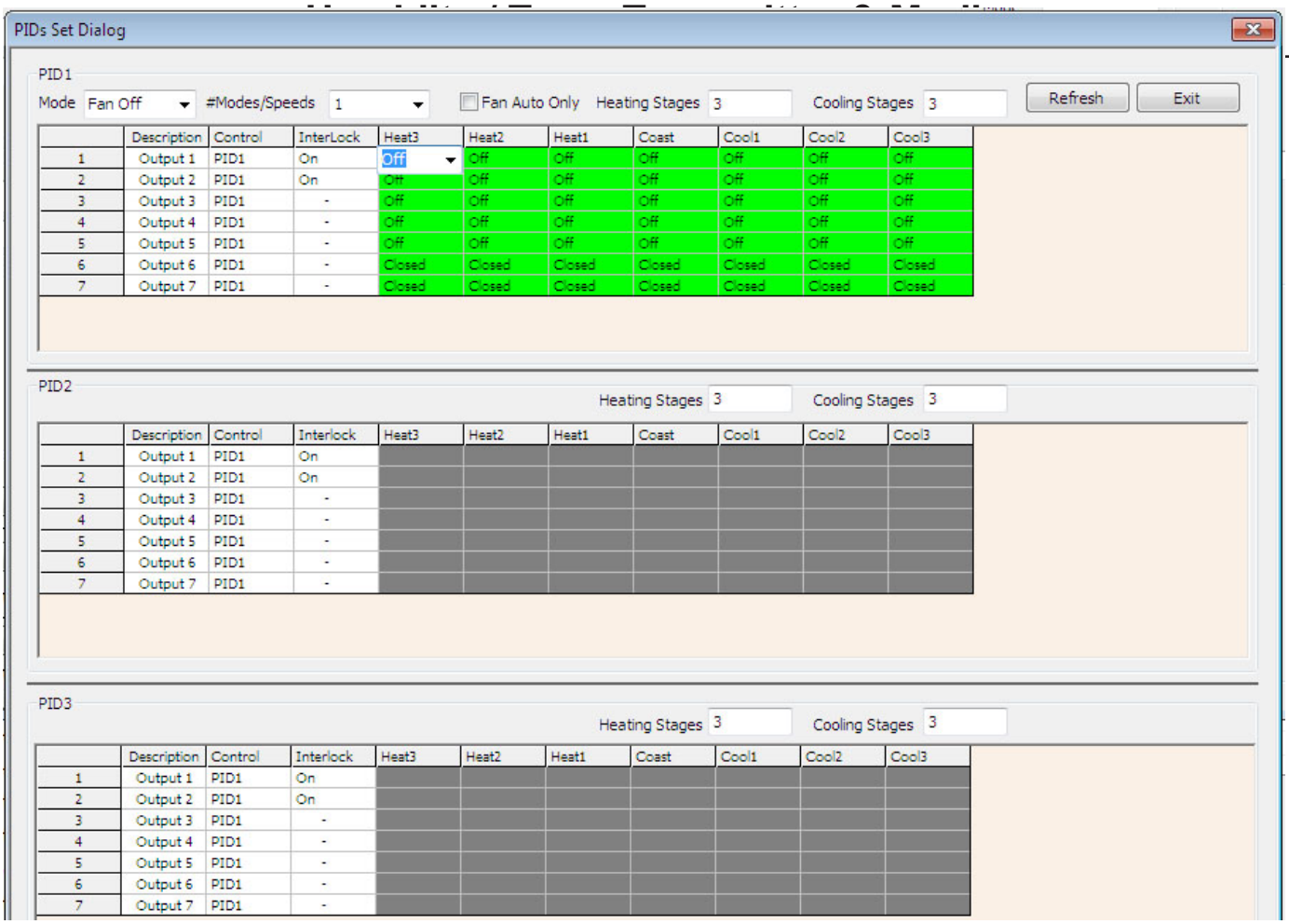
6. There is one list of Auto/Manual, when press manual, the value can be set by the customer. When you press auto, it will change automatically according to the temperature, and when you press calibration, you can adjust the value.



6. When press the setting button, it will show the parameter view. When press PIDs Table, it will open 3 PID view.






PIDs Set Dialog
PID1
Mode Fan Off
#Modes/Speeds 1
Fan Auto Only
Heating Stages 3
Cooling Stages 3
Refresh
Exit
Description Control InterLock Heat3 Heat2 Heat1 Coast Cool1 Cool2 Cool3
1 Output 1 PID1 On Off Off Off Off Off Off Off
2 Output 2 PID1 On Off Off Off Off Off Off Off
3 Output 3 PID1 - Off Off Off Off Off Off Off
4 Output 4 PID1 - Off Off Off Off Off Off Off
5 Output 5 PID1 - Off Off Off Off Off Off Off
6 Output 6 PID1 - Closed Closed Closed Closed Closed Closed Closed
7 Output 7 PID1 - Closed Closed Closed Closed Closed Closed Closed
PID2
Heating Stages 3
Cooling Stages 3
Description Control Interlock Heat3 Heat2 Heat1 Coast Cool1 Cool2 Cool3
1 Output 1 PID1 On
2 Output 2 PID1 On
3 Output 3 PID1 -
4 Output 4 PID1 -
5 Output 5 PID1 -
6 Output 6 PID1 -
7 Output 7 PID1 -
PID3
Heating Stages 3
Cooling Stages 3
Description Control Interlock Heat3 Heat2 Heat1 Coast Cool1 Cool2 Cool3
1 Output 1 PID1 On
2 Output 2 PID1 On
3 Output 3 PID1 -
4 Output 4 PID1 -
5 Output 5 PID1 -
6 Output 6 PID1 -
7 Output 7 PID1 -

Tstat7 Series

Descriptions



Tstat7
keypad closed



Tstat7
keypad open



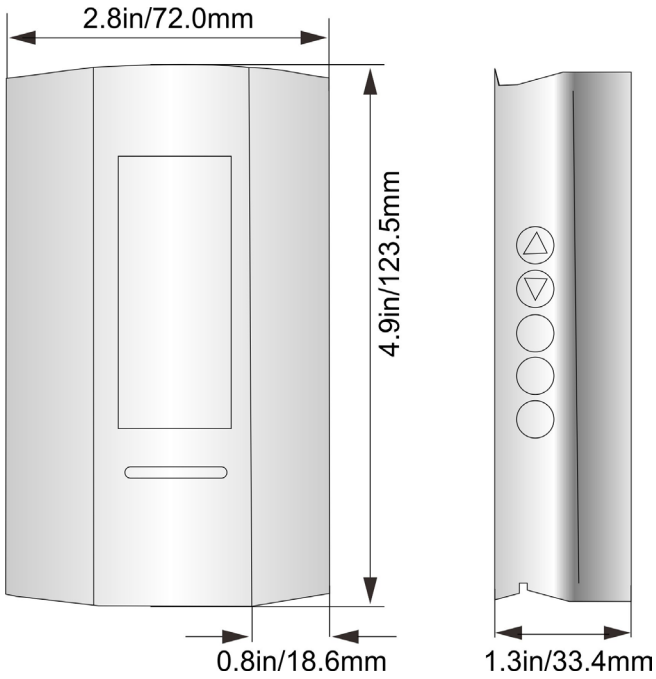
Tstat7
w/ occ sensor

Excellent thermostat with high accuracy temperature sensor and PI algorithm provide a comfortable indoor environment with its built in sensor, which is located in the controller and it will not be affected by the temperature off the wall on which it is mounted on. It is possible to connect an external sensor for monitoring the temperature of different locations.

This full-featured CPU based thermostat is designed for small cooling and heating air handling systems in residential and commercial facilities. The unit provides features which eclipse standard mechanical thermostats at a price that fits conventional HVAC projects.

Specifications

Relays x 1amps @24V	8 analog inputs
2 analog outputs	(10V @100ma)
Temperature range	40~100°C (-40~212°F)
Supply voltage	24VAC ±20%, 50-60Hz
Power consumption	100mA at 12VDC
Relay contacts rating	Max 6A
Operation	0~70°C (32~158°F)
Controlling	40~100°C (-40~212°F)
Storage	2~50°C (35~120°F)
Ambient humidity	10-90 % Rh
Operating Environment	0 ~ 99% humidity (non condensing)
Material enclosure	Flame proof plastic
Enclosure rating	IP31
Temperature sensor	10K thermistor ±0.5°C
Weight	200 grams
Color	White and off-white



Part Number Scheme

TSTAT7 - CH

Code	Description
TSTAT7	Thermostat

Code	Option
	Temperature & Clock
CH	Clock & Humidity
OCC	Clock & Occupancy sensor

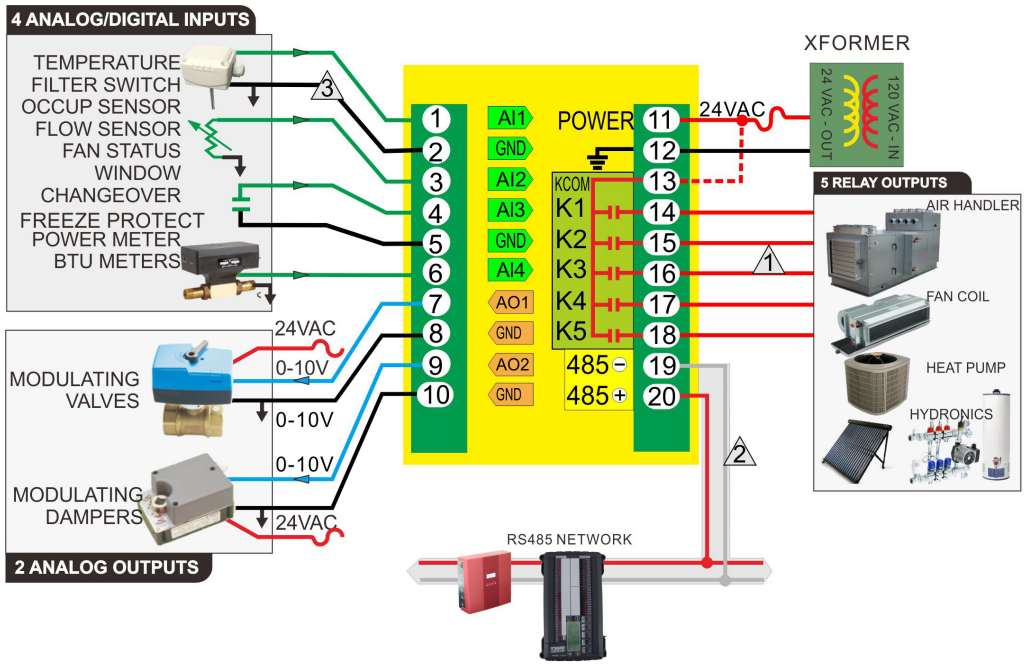
Typical Wire Routing

For proper safety all wiring and controllers should be installed separately to avoid accidently contact with one another. Make sure to keep wiring and equipment/controllers six feet from power distribution, motors, etc. If these conditions are not satisfied; irregularities can occur with the system.

With this easy to install and manage product, building developers/managers can deliver a system that exceeds expectations. Comfort control is made possible at a cost savings like no other.



Wiring Diagram



1 Relay outputs: 24VAC@1amp max, 3 amp combined max for all 5 outputs

2 RS485 network, 2 conductor with optional shield, 1200 meters and 64 devices max

3 Sensors, valves, dampers and equipment all share one common ground

The wiring diagram above outlines the basic functions the TSTAT7 thermostat can do for you. With four analog/digital inputs you can plug in occupancy sensors, flow sensors, fan status, freeze protection, power meters and BTU meters just to name a few. There are 2 analog outputs that can be used for modulating valves and modulating dampers. It comes equipped with a RS485 network that can be connected to a controller like a boiler as illustrated above.

On the other side we have five relay output capabilities which can be used for air handler units, fan coil units, heat pumps and many other different types of hydronic applications.

The TSTAT7 thermostat is compatible with any desire you need and the perfect fit for your next installation.

6. Operational Functions

1) Adjustable set-points

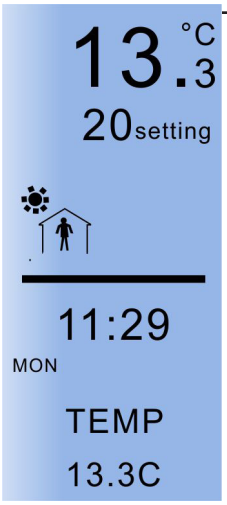
The buttons both the up arrow and down arrow allow the consumer to increase or decrease the desired set-point they wish to have. To adjust the set-point on the room sensor can only be done when the occupied symbol is being displayed on the LCD display. To increase the set-point temperature by a degree simply hit the up arrow button. To decrease the set-point temperature by a degree simply hit the down arrow button and continue either step until desired set-point is achieved. After the set-point is increased or decreased the LCD screen will display the current set-point, until the temperature in the room reaches the desired set-point (warmer/cooler) of the occupant.



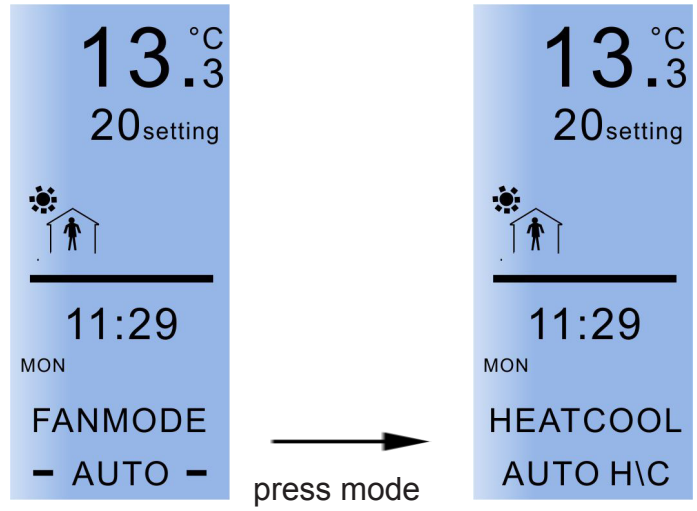
2) There are six buttons that operate the Tstat7:

Buttons		Functions
△	Top button (right side)	Increases setpoint
▽	Second button from top (right side)	Decreases setpoint
MODE	FAN Mode: Middle button (right side)	Adjusts manually/automatically the fan speed to satisfy cool air temperature
MENU	Main MENU: Second button from bottom (right side)	Optimizes the settings of heating/cooling, clock, schedule, etc
OK	Ok: First button from bottom (right side)	To save or enter a setting in the main menu
	Override switch unmarked (center of front cover)	For new occupancy adjustments

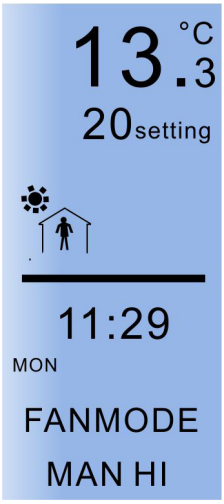
a. Normal state



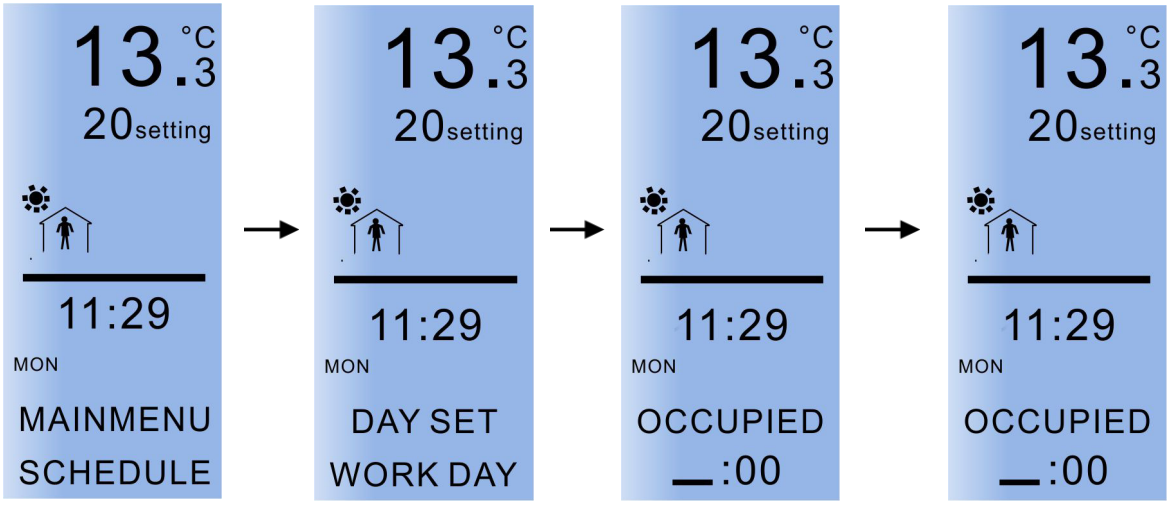
b. When press mode key, it will be switched between fan mode and heat\cool. When press up and down keys, it will go into the fan mode list or heat cool list.



press down

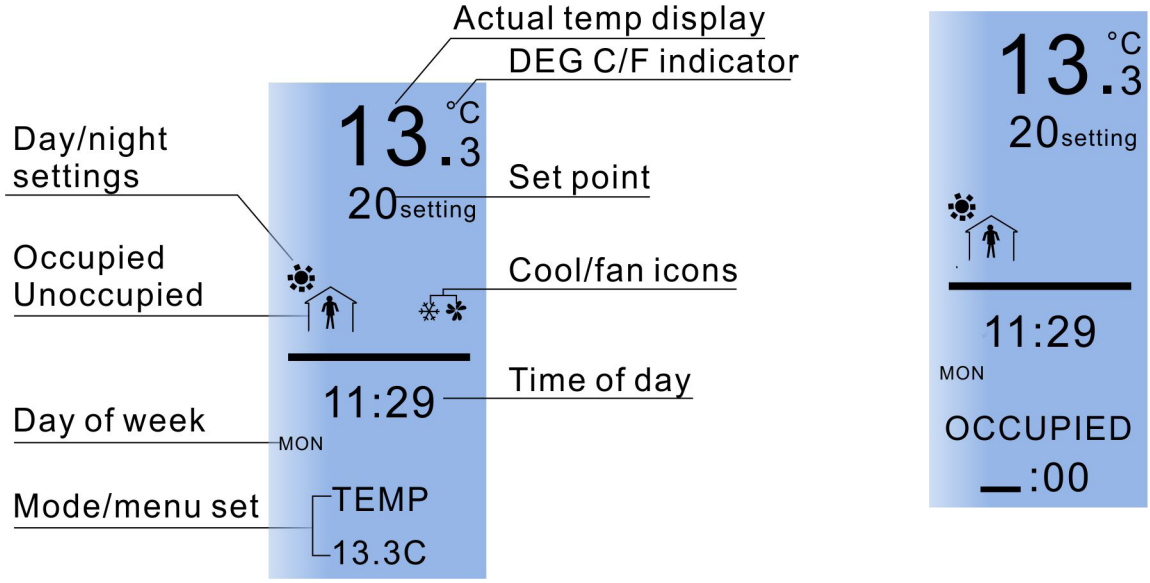


c. Now you are in the normal state, when press menu key, it will be switched between schedule, clock, advanced.
When it comes to schedule, press OK, go into the day set list.
Press menu key go into the occupied\unoccupied time set and press up\down arrow key, will increase or decrease the hour. Press menu key, it will switch to the minute list.



b. Now you are in the normal state, when the menu key is pressed, the unit will switch between schedule, clock and advanced screens. To change the unit's ID press menu and keep pressing menu until 'advanced' is displayed on the screen. Press 'ok' and it will display 'sensor internal'. Repeatedly press menu until you reach 'net ID'. To change the net ID press the up and down arrows to increase or decrease the value from 1 to 254. Upon choosing a desired value, leave the unit for six seconds and the value will be stored.

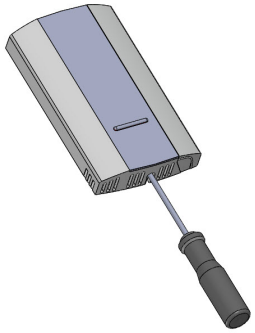
3) LCD Display Features



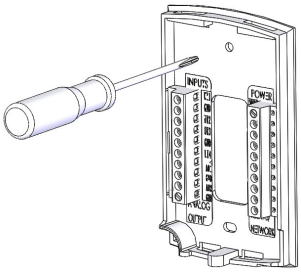
The LCD panel displays a wide variety of functions that Tstat7 thermostat can do to create a comfort level like no other. Be able to automatically adjust the heat, cool, and fan modes to which ever temperature you desire; day or night. You can also program the thermostat to operate at a lower level when the room or building is unoccupied, saving energy and costs on your electric bill, what's more, the earth will become more and more beautiful and ecological.

7. Installation Mounting

1)Unfasten the screw located at the base and lift off the front panel of the enclosure.

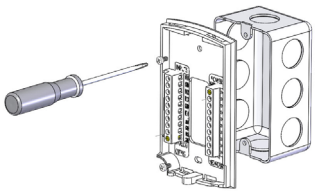


2)Wall mount: Fasten the screws on the back panel to the wall, and re-attach the front panel to the now mounted panel. Refasten the screw at the base connecting both panels.



OR

3)Standard ‘11-10’ electrical box: Fasten the screws on the back panel to the electrical box, and re-attach the front panel to the now mounted panel. Refasten the screw at the base connecting both panels.



Tstat8

Description

This full-featured CPU based thermostat is designed for small cooling and heating air handling systems in residential and commercial facilities. The unit provides features which eclipse standard mechanical thermostats at a price that fits conventional HVAC projects.

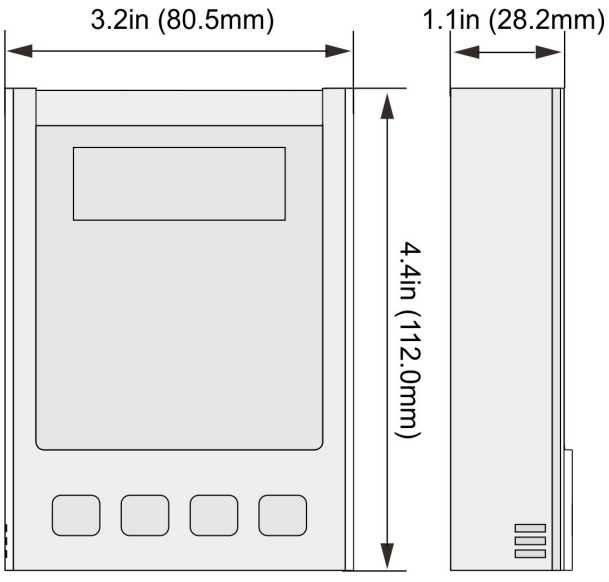


Highlights:

-Tight control of 0.5°C provides comfortable indoor environment.
-High impact plastic enclosure provides durability in commercial environments.
-LCD display
-Customizable sequence of operation table (FCU with modulating or on/off valve,single or 3-speed fan, pressure independent VAV, stage sequencer)
-Build in time and clock, temp, humidity, available in OCC.
-Support Bacnet over MSTP as well as Modbus.

Specifications

Tstat8	5 relays x 2amps @24V, 8 analog inputs, 2 analog outputs (10V @100ma)
Operating temperature	-30-70°C(-22~158°F)
Supply voltage	12~24VAC/DC ±20%, 50-60Hz
Power consumption	100mA at 12VDC
Relay contacts rating	2A @ 24VDC, 0.5A @ 125VAC UL File No.: E43149 CSA File No.: LR26550
Ambient humidity	10-90 %Rh
Operating Environment	0 ~ 99% humidity non condensing
Plastic Housing	Flammability rating UL 94HB
Enclosure rating	IP31
Temperature sensor	10K thermistor ±0.5°C
Colour	White
Weight	200g



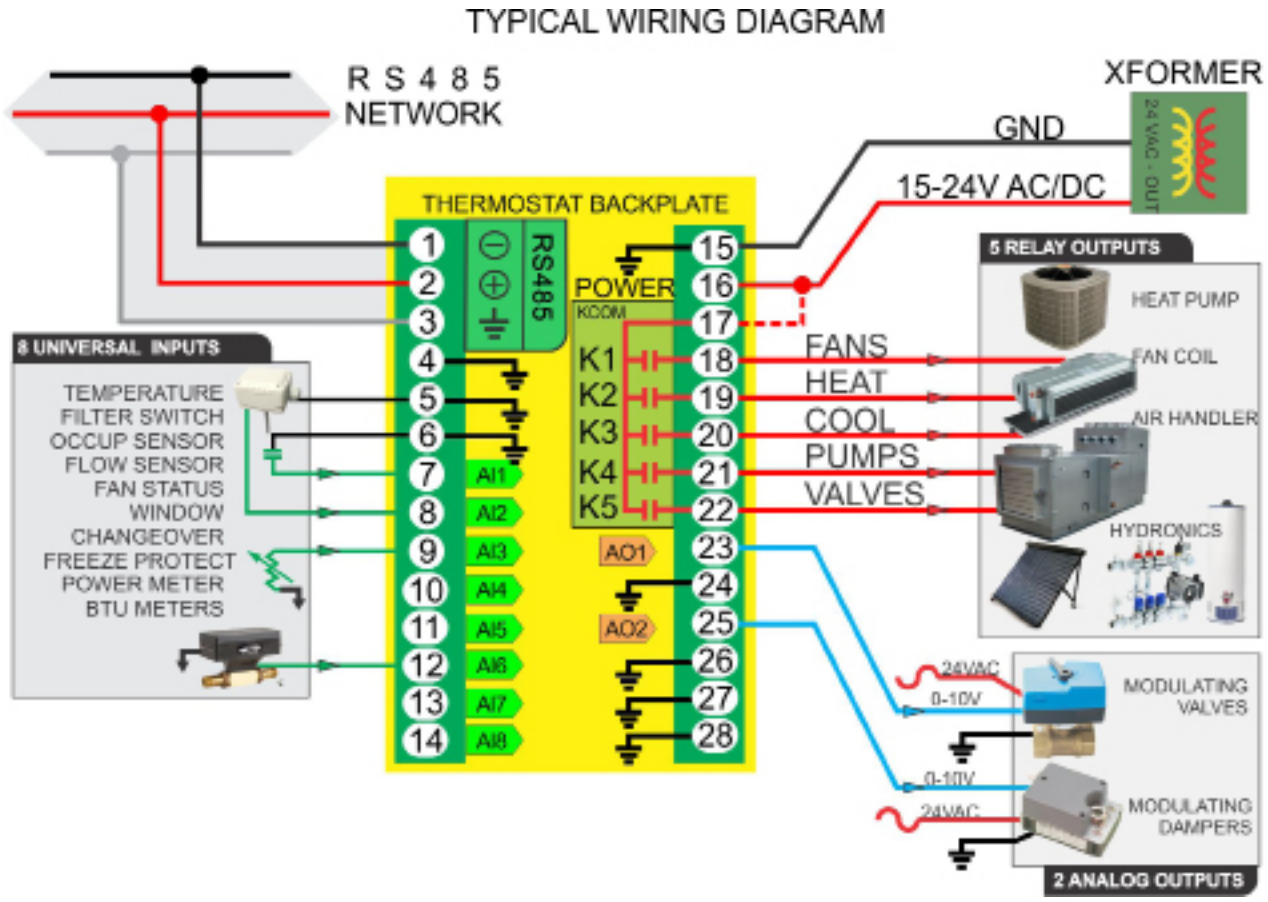
Part Number Scheme

Tstat8 – OCC

Code	Description
Tstat8	Thermostat

Code	Description
	Basic model temperature and clock
H	Humidity
OCC	Occupancy sensor

Wiring Diagram



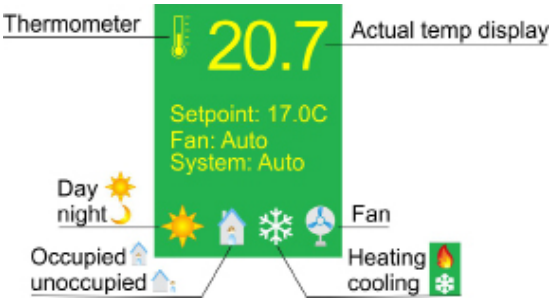
Advanced Menu Item Details



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

- Last menu item
- Next menu item
- Increase value
- Decrease value

1. LCD screen display/normal state



2. Now you are in the normal state, when you press ▲ or ▼ , it will increase or decrease the set point value. The value will flashing two times, then it will confirm the setting automaticlly. When the current temp value is under the set point, it will show the heating symbol. When the current temp value is above the set point value, it will show the cooling symbol.

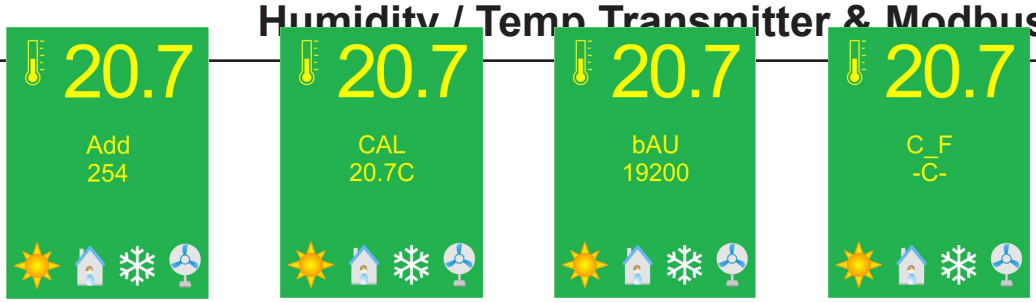




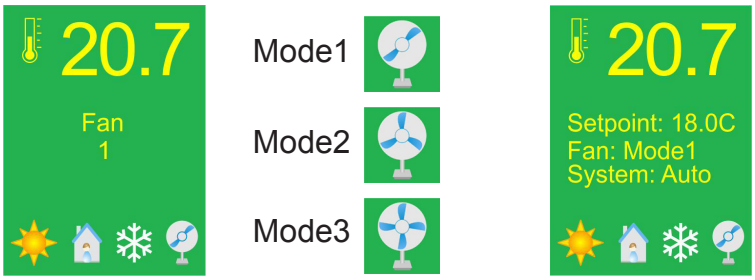


3. Now you are in the normal mode, press both ◀ and ▶ at the same time and hold for several seconds. It will switch into the menu mode. Press ◀ or ▶ to scroll through the menu options such as ‘Add’, ‘CAL’, ‘bAU’, ‘UNITS’ and many others. To change the values at a particular menu, press ▲ or ▼ . The chosen value will be stored automatically.

To change the unit’s address scroll through the menu until you reach ‘Add’. Press ▲ or ▼ to increase or decrease the unit’s address from 1 to 254.
To change the baudrate, locate ‘bAU’ within the menu and use ▲ and ▼ to choose 19200 or 9600.



4. To change the Fan number, locate ‘Fan’ within the menu and use ▲ and ▼ to choose 0, 1, 2, 3. Number of Fan speed to show on the display
Fan=1, user will see “Off, Mode1, Auto”
Fan=2, user will see “Off, Mode1, Mode2, Auto”
Fan=3, user will see “Off, Mode1, Mode2, Mode3, Auto”



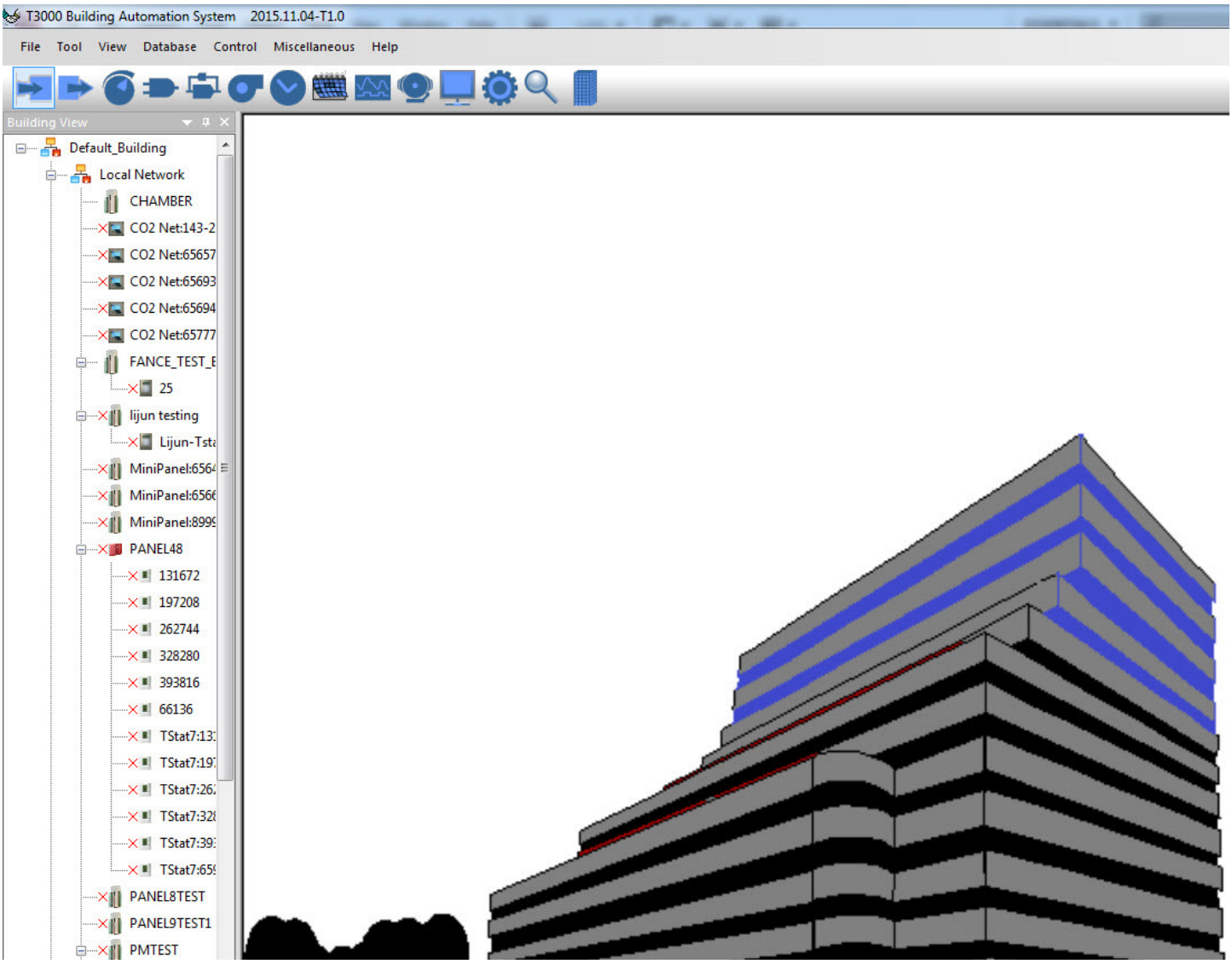
Code	Description (Range, Default)
Add	**Modbus Device Address (1-254, 254)** This is the modbus address of the tstat. It is the address to which the stat will respond when receiving serial communication.
CAL	**Calibration of the Selected Temperature Sensor (0-1000, 500)** To calibrate the temperature shown on the tstat display you will need a handheld mercury thermometer or digital thermometer. Hold the meter close to the thermostat and allow it to come to equilibrium. Use the keypad to get into the menu mode until CAL is shown on the display. Now you can adjust the display using the up and down buttons till the temperature shown matches the handheld meter. When you are done, just let the display time out to normal operation, the display will stop flashing and will show the current room temperature. You can repeat this sequence if necessary till the readings on the thermostat and meter agree. The thermostat will store the calibration figures even through extended power outages and should not need to be adjusted for many years. The main point to keep in mind when calibrating is to let everything come to equilibrium. The thermostat should be powered up for 5 minutes prior to any calibration and the thermometer should be left near the thermostat for about the same amount of time. The 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 resolving down to 0.06°C so the weak link in calibrating is usually the procedure used rather than the tstat accuracy. • Make sure the tstat is mounted in a location free of drafts.
tSS	**Temperature Sensor Select (0-3, 0)** The tstat has an extra input for use with an external temp sensor. tSS = 0: The tstat will use the internal temperature sensor IC 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 internal thermistor and external thermistor which is shown on the display and used for PID calculations.
FIL	**Temperature Sensor Filter (0-10, 5)** Filter used for the raw temperature being read by the sensor. 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 readings more but make them respond more slowly.
BAUDRATE	19200, 9600
dSC	**Short Cycle Delay (0-20, 0)** This parameter adjusts the delay between cycling of the mode of operation. It is the number of minutes after entering 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, dSC minutes, until it can re-enter into Cooling1 mode. This value is in increments of 1 min.
dCH	**Changover Delay (0-200, 0)** This parameter adjusts the delay between switching from a heating mode of operation 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 min.

Code	Description (Range, Default)
PPr	**Proportional Term (10-255, 20)** The proportional term is the 'P' term of the familiar PID control strategy and determines 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 valve respond 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 lazy 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° (C or 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 described next. The P value is in increments of 0.1° (i.e. 20 means 2.0°) and is in the same units (C or F) as the tstat.
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 I term will gradually open the valve to make up the final small deviation from set-point. The default value of 5.0 (%/Deg minute) is fine for most applications and will cause the valve to open 5% for one degree (C or F) of error per minute. For example, when the PIn term set to the default of 5.0 (%/Deg 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 I term 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 I term as the opposite of the P term, -"a bigger I means faster valve, smaller I means lazier valve". -The default value of 5% will work fine for most applications. -If the valve is short cycling, make the I term lazier (smaller). The I value is in increments of 0.1 %/°min (i.e. 50 means 5.0%/°min) and is in the same units (C or 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: 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, 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, Coasting, Cool1, Cool2 and Cool3. So the table is a 5 outputs x 7 steps spreadsheet 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 "Tstat Factory" software utility on our website (http://www.temcocontrols.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: Setting SOP to 2, puts the Tstat into transducer mode. In this mode, the cooling analog 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: A special sequence of operations is embedded in the tstat that assists in commissioning of the installation and testing of the tstats. When SOP is set to '0' this is the testing sequence and the unit will cycle the relay outputs on and off in a slow rotation. The analog outputs are also cycled in a slow ramp, the cooling goes from 0-10V while the heating goes in reverse from 10 to 0V. 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.
HC	**Heating Cooling Mode Configuration (0-5, 0)** This item configures the method by which the tstat determines the heating or cooling mode. HC = 0: mode is controlled automatically by the PID. PID > 52 is heating mode, PID < 48 is cooling mode. HC = 1: mode is controlled by the keypad or serial communication. This is for keypad configurations in which the user or serial com can manually set heating or cooling. 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 in1 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. HC = 5: same as mode 4, but using the analog in2 sensor instead of analog in1.

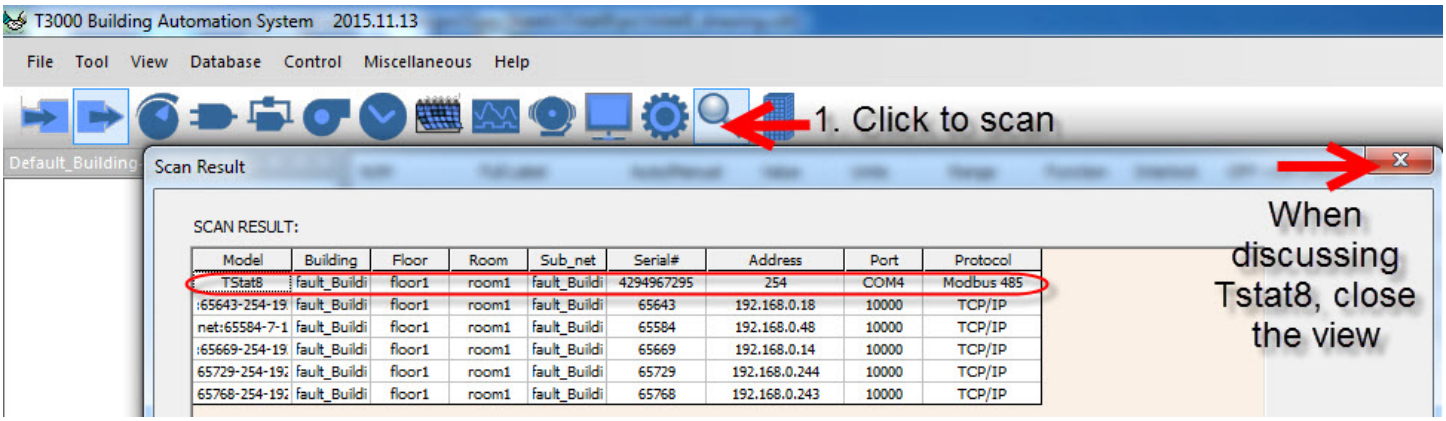
Code	Description (Range, Default)
Hdb **Cdb**	**Heating & Cooling Deadbands (1-200, 10)** If there is one setpoint, the heating setpoint follows the cooling setpoint and is calculated by: Heating Setpoint = Setpoint - Heating Deadband. Cooling Setpoint = Setpoint + Cooling Deadband If there are two setpoints, heating and cooling are separately adjusted. The setpoints are calculated as follows: Heating Setpoint = Max(Cooling Setpoint + Cooling Deadband , Heating Setpoint) Cooling Setpoint = Min(Cooling Setpoint, Heating Setpoint - Cooling Deadband) The min value for Cdb 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.
UNITS	**Degrees C/Degrees F (0-1, -)** The display can be switched to show Degrees C or Degrees F. 0 = C, 1 = F.
FAn	**Number of Fan Speeds to show on the display (0-3, 3)** The number of fan speeds allowed. Fan = 3, user will see “Off, -1-, -2-, -3-, Aut” Fan = 2, user will see “Off, -1-, -2-, Aut” Fan = 1, user will see “Off, -1- , Aut” , Fan = 0, user will see “Off, On”
nHd	**Night Heating Deadband (0-35, 10) for deg C, (0-95, 10) for deg F**
nCd	**Night Cooling Deadband (0-99, 10) for deg C and F** When the tstat is in unoccupied mode, and APP is set to 0, the heating setpoint is adjusted downwards by the amount of the nHd. The cooling setpoint is adjusted upwareds 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.
nSp	
APP	**Application (0-1, 0)** 0 - OFFICE applications 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 setpoints Night Heating Setpoint = Cooling Setpoint - nHd value. Night Cooling Setpoint = Cooling Setpoint + nCd value.
POS	**Power on setpoint (0-255, 20) for deg C, (0-255, 68) for deg F** 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 every day. 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.
POn	**Power on Mode (0-3, 3)** 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 to power up in whatever state it was in before the power outage.

Code	Description (Range, Default)
Ou1 **Ou2**	**Output settings (0-4, 0)** Sets the full-scale voltage of the analog outputs. Ou1 sets analog out 1 (Cooling). Ou2 sets analog out 2 (Heating). This setting is used to match the analog outputs to various types of actuators, transducers or other controllers. For example, by setting the output range to act over a 5VDC scale you can set the tstat up as a transducer to interface into a master DDC controller. Or perhaps you have a valve that operates over the 2-10VDC range, this 'output' type setting lets you tailor the tstat to the particular application. OuX = 0, the output will 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 permanently 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 only if you happen to have a Tstat5A or 5CM and need a couple of extra on/off outputs 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 tying in a 250 ohm resistor in series with the output and making sure the grounds of the actuator and tstat are common.
SLO **SHI**	**Setpoint Minimum (0-255, 15) for deg C, (0-255, 55) for deg F** **Setpoint Maximum (0-255, 50) for deg C, (0-255, 99) for deg F** Rev24: The maximum and minimum allowable user setpoint settings. The occupants cannot 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.
LOC	**Keypad lockout (0-3, 0)** Rev25 only: This setting is useful to keep the building occupants from experimenting 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 can not do anything from keypad except enter menu mode.In menu mode,the user can set 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
dIS	**Display Setting (0-6, 0)** This allows the display to be configured in a few different modes. 0 = display the room temperature. 1 = display the setpoint. 2 = blank display. 3 = display pid2 value. 4 = display pid2 setpoint. 5 = display by manually. 6 = dispaly nothing except keypad pressed.
Vtt	**Valve Transient Time (10-255, 0)** This setting allows the user to adjust the valve transient time from fully open to fully closed. Value ranges from 10 (10s) to 255 (255s)
DEF	**Accept Default Setting (0-1, 0)** This allows the user to define the current Tstat configuration as the new FACtory default. Look below in Factory Default for greater details.
	Year, month, date
	Sun-Fri, time
	Workday, Night and Day, Time
	Weekend, Night and Day, Time

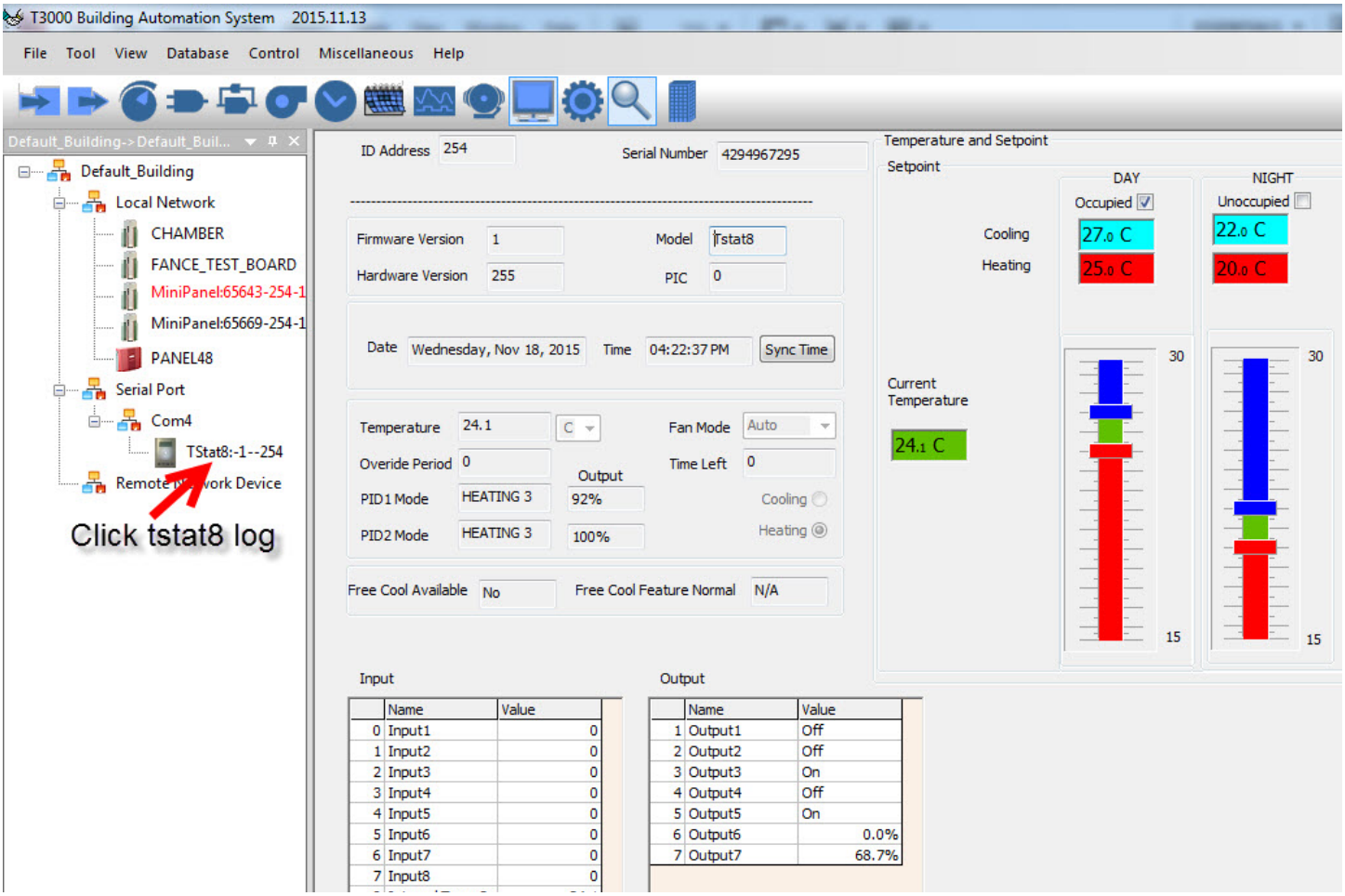
1. Connect Tstat8 to PC by RS485, and then start T3000 software.



2. Click the button to scan, the following view will appear and close it as the picture shows.



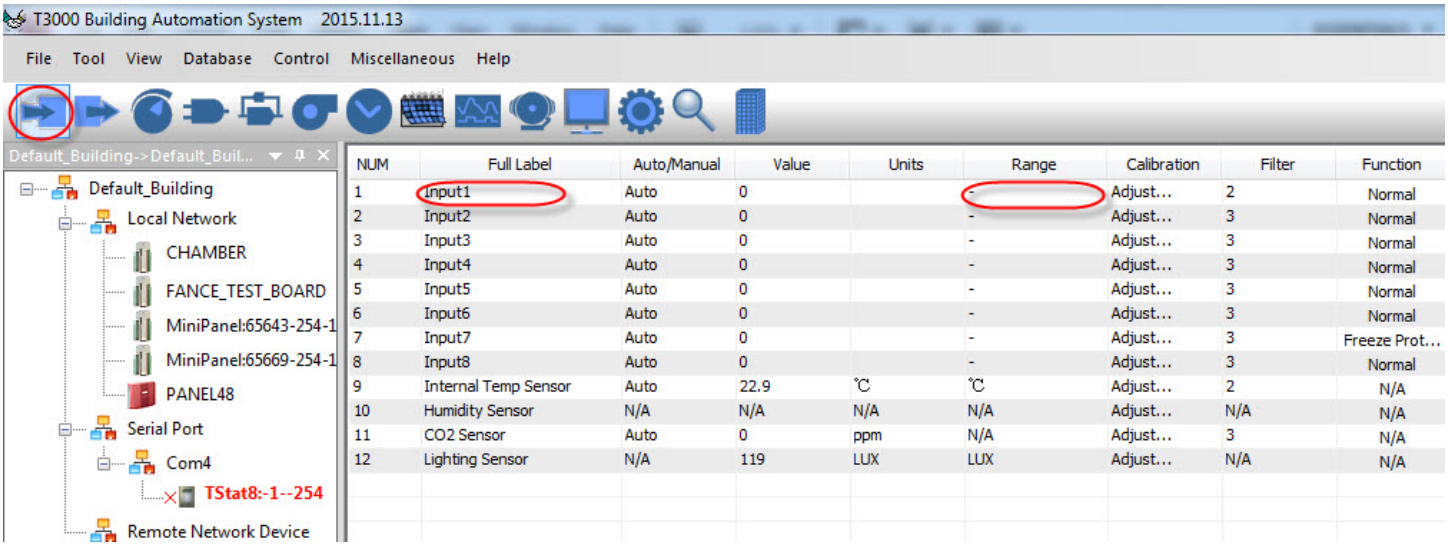
3. Click the Tstat8 log and it will show all the information of Tstat8.



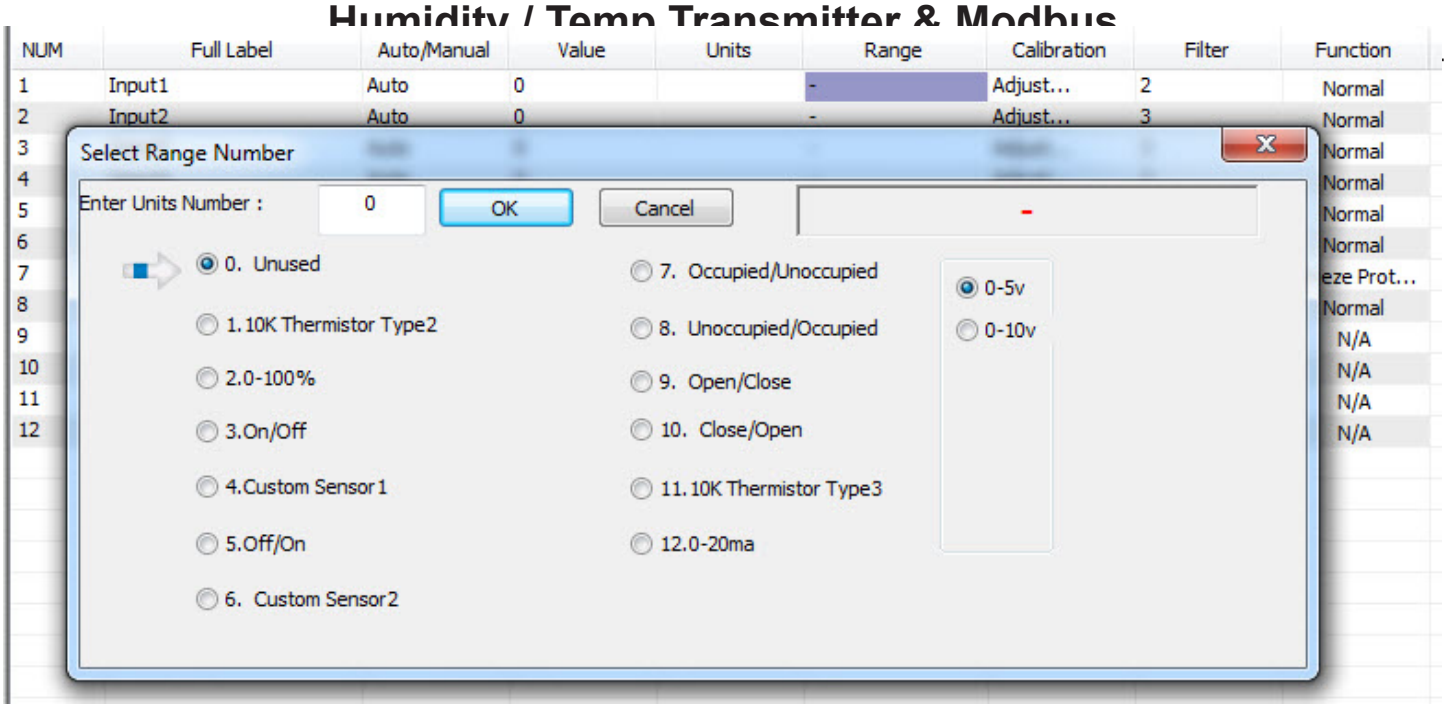
	Name	Value
0	Input1	0
1	Input2	0
2	Input3	0
3	Input4	0
4	Input5	0
5	Input6	0
6	Input7	0
7	Input8	0

	Name	Value
1	Output1	Off
2	Output2	Off
3	Output3	On
4	Output4	Off
5	Output5	On
6	Output6	0.0%
7	Output7	68.7%

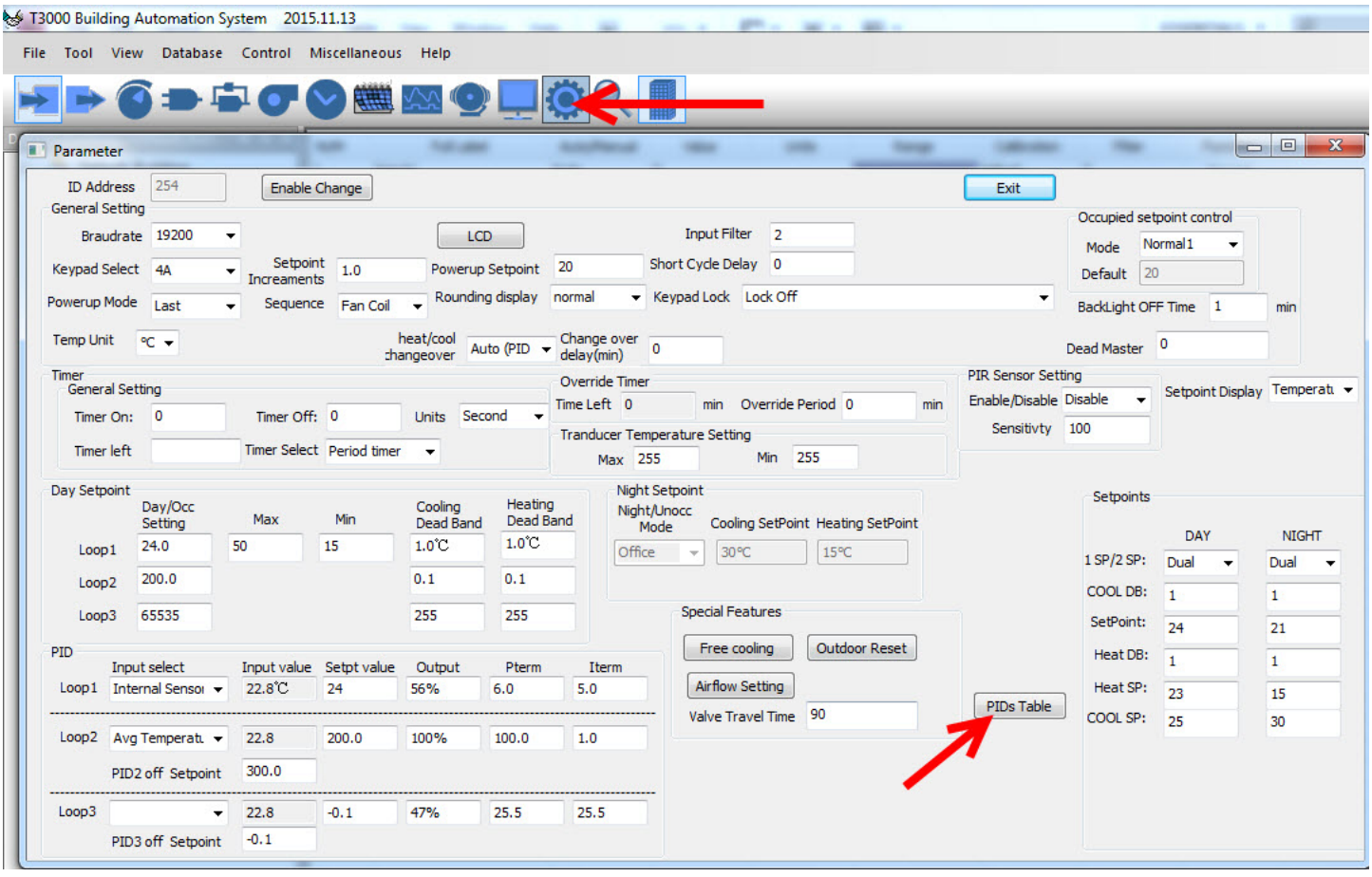
5. Click button input, it will show all the information of input, same as output.
When you press input1, you can change the name according to your demand.
When you press range, a pop up window will appear, there are different choices.

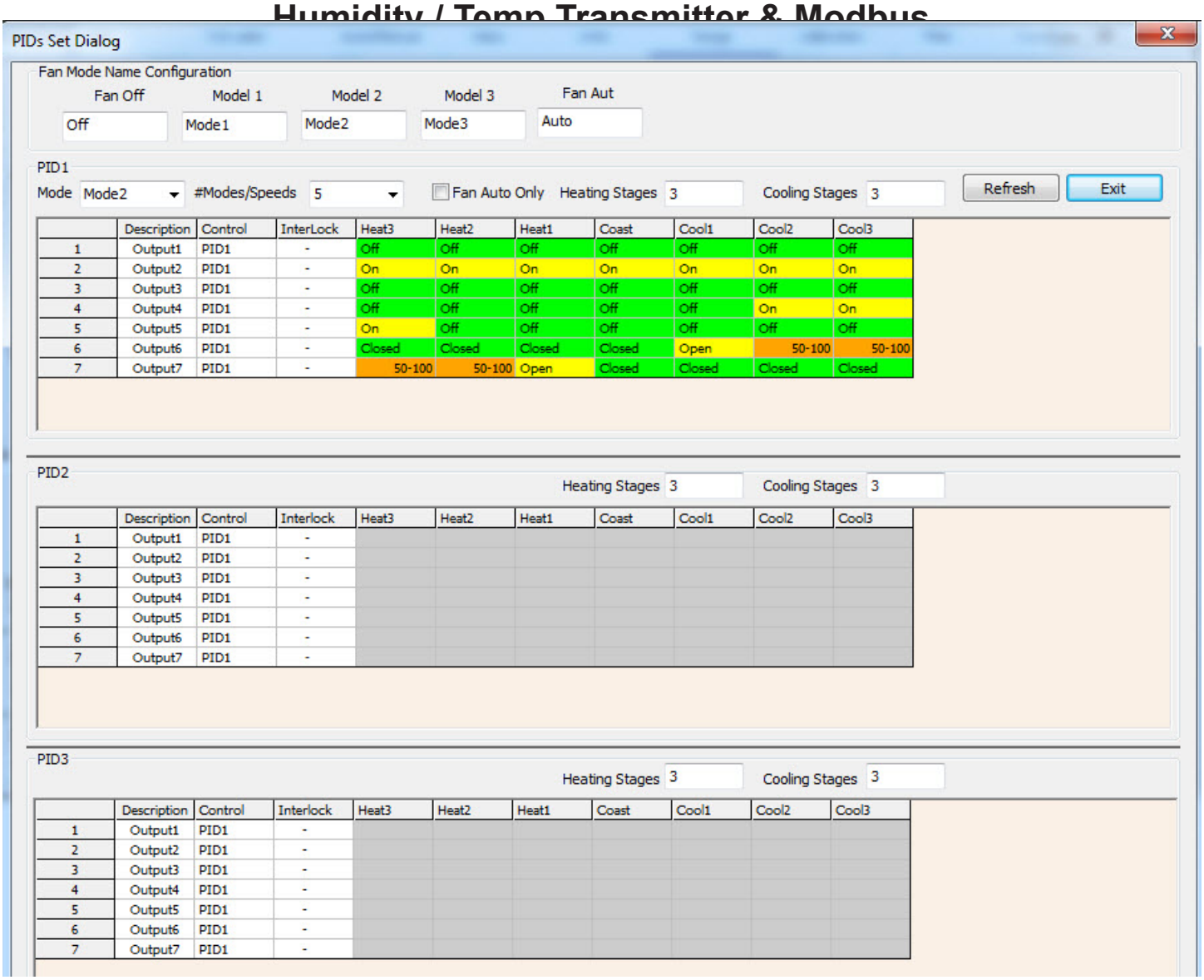


NUM	Full Label	Auto/Manual	Value	Units	Range	Calibration	Filter	Function
1	Input1	Auto	0		-	Adjust...	2	Normal
2	Input2	Auto	0		-	Adjust...	3	Normal
3	Input3	Auto	0		-	Adjust...	3	Normal
4	Input4	Auto	0		-	Adjust...	3	Normal
5	Input5	Auto	0		-	Adjust...	3	Normal
6	Input6	Auto	0		-	Adjust...	3	Normal
7	Input7	Auto	0		-	Adjust...	3	Freeze Prot...
8	Input8	Auto	0		-	Adjust...	3	Normal
9	Internal Temp Sensor	Auto	22.9	℃	℃	Adjust...	2	N/A
10	Humidity Sensor	N/A	N/A	N/A	N/A	Adjust...	N/A	N/A
11	CO2 Sensor	Auto	0	ppm	N/A	Adjust...	3	N/A
12	Lighting Sensor	N/A	119	LUX	LUX	Adjust...	N/A	N/A



6. When press the setting button, it will show the parameter view. When press PIDs Table, it will open 3 PID view.




PIDs Set Dialog
Fan Mode Name Configuration
Fan Off
Model 1
Model 2
Model 3
Fan Aut
Off
Mode1
Mode2
Mode3
Auto
PID1
Mode Mode2
#Modes/Speeds 5
Fan Auto Only
Heating Stages 3
Cooling Stages 3
Refresh
Exit
Description Control InterLock Heat3 Heat2 Heat1 Coast Cool1 Cool2 Cool3
1 Output1 PID1 - Off Off Off Off Off Off Off
2 Output2 PID1 - On On On On On On On
3 Output3 PID1 - Off Off Off Off Off Off Off
4 Output4 PID1 - Off Off Off Off Off On On
5 Output5 PID1 - On Off Off Off Off Off Off
6 Output6 PID1 - Closed Closed Closed Closed Open 50-100 50-100
7 Output7 PID1 - 50-100 50-100 Open Closed Closed Closed Closed
PID2
Heating Stages 3
Cooling Stages 3
Description Control Interlock Heat3 Heat2 Heat1 Coast Cool1 Cool2 Cool3
1 Output1 PID1 -
2 Output2 PID1 -
3 Output3 PID1 -
4 Output4 PID1 -
5 Output5 PID1 -
6 Output6 PID1 -
7 Output7 PID1 -
PID3
Heating Stages 3
Cooling Stages 3
Description Control Interlock Heat3 Heat2 Heat1 Coast Cool1 Cool2 Cool3
1 Output1 PID1 -
2 Output2 PID1 -
3 Output3 PID1 -
4 Output4 PID1 -
5 Output5 PID1 -
6 Output6 PID1 -
7 Output7 PID1 -

Tstat8	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 microcontroller to determine the product
8	"Hardware Revision. This is a read-only register that is used by the microcontroller to determine the hardware rev"
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"
14	Spare
15	Base address selection.0 = Protocol address,1 = PLC address.
16	Firmware 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.
17,18,19	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 to 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	Seurity key
51	The number of tstats around
51-x	Tstat's modbus ID
x-99	Tstat's signal strength
22to100	Blank, for future use
101	COOL_HEAT_MODE, heating or cooling mode. 0=none, 1=cooling, 2=heating.
102	MODE_OPERATION, heating or cooling state: 0-7 = coasting, cooling 1,2,3, heating 1,2,3
103	SEQUENCE , 0 = internal test sequence, outputs slowly cycle on/off or ramp up & down. 1 = normal, operation according to the output tables.
104	DEGC_OR_F, engineering units, Deg C = 0, Deg F = 1

Humidity / Temp Transmitter & Modbus

Tstat8	Register and Description
105	numer of fan speeds or system modes,.. Single speed = 1 up to three speed fan = 3
106	"POWER UP_MODE, mode of operation on power up. 0 = power off, 1 = power up in on mode, 2 = last value (default), 3 = auto mode."
107	"AUTO_ONLY , enables or disables manual mode. 0 = Manual Fan Modes 1-x Allowed (depending on R122 value, 1 = Auto Mode Only, 2 = DDC mode,the user can not change setpoint and fan speed from keypad."
108	Write 1 to register 108 - resets the unit to latest factory defaults. (same as writing Writing 143 to register 16)
109	Info Byte, this register contains info about the state of the tstat.
109_0	"Bit 0 is read/write and shows the occupancy mode. Bit 0 = 0 means unoccupied. Bit 0 = 1 means occupied. "
109_1	"Bit 1 is read only and shows the reset state. Bit 1 = 0 means hardware restart. Bit 1 = 1 means software restart. "
109_2	"Bit 2 is read/write and is the reset prevention bit. Bit 2 = 0 means the tstat will automatically reset after certain registers are changed. Bit 2 = 1 prevents this reset. Changing this bit from 1 to 0 will trigger a reset."
109_3	Bit 3 is the state of the digital input. Bit 3 = 1 means logic high. Bit 3 = 0 means logic low.
109_4	Bit 4: Reserved, used for some non standard occupancy sensor logic
109_5	Bit5 0=no delay on modbus reply, 1= 10ms delay before send for slower PLC's to switch from TX to RX
109_6	Bit6 modbus address write protect 1: ID write disable 0: ID write enable
109_7	"Bit7, RS485/wireless communications mode: The normal communications method is a bus topology using RS485 which uses a 'transmit enable' or TX_EN line on the RS485 hardware whenever transmission from the thermostat to the bus takes place. For wireless devices this is typically taken care of by the radio module itself so it is not needed. Default = 0, When bit7 is 0, the RS485 chip, TX_EN line is used for normal RS485 bus communications. When bit7 is 1, the TX_EN line is not used, allowing the radio module to communicate one-to-one with the Tstat"
110	Bau - Baudrate, 0=9600, 1=19.2kbaud
111	Unoccupied Override Timer, Ort. 0=disabled, >0=number of minutes manual override is allowed

Humidity / Temp Transmitter & Modbus

Tstat8	Register and Description
112	"OVERRIDE_TIMER_DOWN_COUNT - Number of minutes remaining on the timer when unoccupied override timer is in effect."
113	"Heating cooling mode configuration, HC, 0=PID, 1=Keypad, 2=Digital_in1(not used), 3=Digital_in1,(not used) 4=Analog_in1, 5=Analog_in2"
114	Period timer ON time.
115	Period timer OFF time.
116	Period timer units. 0, second; 1, minute; 2, hour.
117	Dead master. The Tstat will go to occupied mode automatically if there is no serial communications for a user defined period of time, for example if the register is set to 10 the thermostat will go to ocupied mode if there are no communications for a period of 10 minutes. Set the register to 0 to disable the feature
118	Time format. 0 = 12hours,1 = 24hours, in TSTAT6, it always 24h
119	free cool cobfigure byte
120	RS485 mode/wireless selection, user can not change this register. Factory set only.
121	TEMPERATURE reading in DegC or F from the sensor used in the control loop PI1 which is configured in register 111. This can be the internal sensor, external, or an average of the two. Writing a temperature value to this register will calibrate the currently selected sensor by adjusting the associated calibration register. If average is selected then you cannot write to this register.
122	ANALOG INPUT1 RANGE. 0 = raw data, 1 = thermistor, 2 = %, 3 = ON/OFF, 4 = N/A, 5 = OFF/ON
123	ANALOG INPUT2 RANGE. 0 = raw data, 1 = thermistor, 2 = %, 3 = ON/OFF, 4 = N/A, 5 = OFF/ON
124	ANALOG INPUT3 RANGE. 0 = raw data, 1 = thermistor, 2 = %, 3 = ON/OFF, 4 = N/A, 5 = OFF/ON
125	ANALOG INPUT4 RANGE. 0 = raw data, 1 = thermistor, 2 = %, 3 = ON/OFF, 4 = N/A, 5 = OFF/ON
126	ANALOG INPUT5 RANGE. 0 = raw data, 1 = thermistor, 2 = %, 3 = ON/OFF, 4 = N/A, 5 = OFF/ON
127	ANALOG INPUT6 RANGE. 0 = raw data, 1 = thermistor, 2 = %, 3 = ON/OFF, 4 = N/A, 5 = OFF/ON
128	ANALOG INPUT7 RANGE. 0 = raw data, 1 = thermistor, 2 = %, 3 = ON/OFF, 4 = N/A, 5 = OFF/ON
129	ANALOG INPUT8 RANGE. 0 = raw data, 1 = thermistor, 2 = %, 3 = ON/OFF, 4 = N/A, 5 = OFF/ON

Humidity / Temp Transmitter & Modbus

Tstat8	Register and Description
130	Internal Thermistor Sensor - Shows the filtered, calibrated value of the internal thermistor sensor
131	Analog input1 value
132	Analog input2 value
133	Analog input3 value
134	Analog input4 value
135	Analog input5 value
136	Analog input6 value
137	Analog input7 value
138	Analog input8 value
139	co2 ppm(optional)
140	humidity % (optional)
141	Auto Manual mode for inputs, bit 0 = input1, bit1 = input2 and so on. In manual mode you can write to the input registers 311 & 312 for debugging & commissioning.
142	Temperature sensor filter, FIL, weighted average of stored value to new raw value
143	Analog input1 filer
144	Analog input2 filer
145	Analog input3 filer
146	Analog input4 filer
147	Analog input5 filer
148	Analog input6 filer
149	Analog input7 filer
150	Analog input8 filer
151	co2 filer
152	hum filer
153	CALIBRATION, this is the calibration factor for the internal sensor, normally maintained by the tstat.
154	Calibration for the internal thermistor - internally managed offset for the internal temp sensor value
155	Calibration for analog input1
156	Calibration for analog input2
157	Calibration for analog input3
158	Calibration for analog input4
159	Calibration for analog input5
160	Calibration for analog input6
161	Calibration for analog input7
162	Calibration for analog input8

Humidity / Temp Transmitter & Modbus

Tstat8	Register and Description
163	hum 1st calibration capacitance value
164	hum 1st calibration humidity value
165	hum 2nd calibration capacitance value
166	hum 2nd calibration humidity value
167	Analog input1 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode.
168	Analog input2 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode.
169	(future)Analog input3 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode.
170	(future)Analog input4 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode.
171	(future)Analog input5 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode.
172	(future)Analog input6 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode.
173	(future)Analog input7 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode.
174	(future)Analog input8 function selection. 0, normal; 1, freeze protect sensor input; 2, occupancy sensor input; 3, sweep off mode; 4, clock mode; 5, change over mode.
175	Lookup Table 1 - 0.0V value Sensor value that corresponds to 0.0V
176	Lookup Table 1 - 0.5V value Sensor value that corresponds to 0.5V
177	Lookup Table 1 - 1.0V value Sensor value that corresponds to 1.0V
178	Lookup Table 1 - 1.5V value Sensor value that corresponds to 1.5V
179	Lookup Table 1 - 2.0V value Sensor value that corresponds to 2.0V
180	Lookup Table 1 - 2.5V value Sensor value that corresponds to 2.5V
181	Lookup Table 1 - 3.0V value Sensor value that corresponds to 3.0V
182	Lookup Table 1 - 3.5V value Sensor value that corresponds to 3.5V
183	Lookup Table 1 - 4.0V value Sensor value that corresponds to 4.0V
184	Lookup Table 1 - 4.5V value Sensor value that corresponds to 4.5V
185	Lookup Table 1 - 5.0V value Sensor value that corresponds to 5.0V
186	Lookup Table 2 - 0.0V value Sensor value that corresponds to 0.0V
187	Lookup Table 2 - 0.5V value Sensor value that corresponds to 0.5V
188	Lookup Table 2 - 1.0V value Sensor value that corresponds to 1.0V
189	Lookup Table 2 - 1.5V value Sensor value that corresponds to 1.5V
190	Lookup Table 2 - 2.0V value Sensor value that corresponds to 2.0V
191	Lookup Table 2 - 2.5V value Sensor value that corresponds to 2.5V
192	Lookup Table 2 - 3.0V value Sensor value that corresponds to 3.0V

Humidity / Temp Transmitter & Modbus

Tstat8	Register and Description
193	Lookup Table 2 - 3.5V value Sensor value that corresponds to 3.5V
194	Lookup Table 2 - 4.0V value Sensor value that corresponds to 4.0V
195	Lookup Table 2 - 4.5V value Sensor value that corresponds to 4.5V
196	Lookup Table 2 - 5.0V value Sensor value that corresponds to 5.0V
197	Humidity Control Register, 0 = defautl, write 1 here to set to fac calib,
198	Current humidity sensor value
199	Update calibration data, when set to 1, tstat will update the calibration data to PIC
200	Calibration points number, value can be single or two point calibration for the Tstat6
201	Decide which calibration table will be used. 0 = default table 1 = customer table
202	Determine the output1 mode. 0, ON/OFF mode; 1, floating valve for cooling; 2, floating valve for heating 3, PWM
203	Determine the output2 mode. 0, ON/OFF mode; 1, floating valve for cooling; 2, floating valve for heating 3, PWM
204	Determine the output3 mode. 0, ON/OFF mode; 1, floating valve for cooling; 2, floating valve for heating 3, PWM
205	Determine the output4 mode. 0, ON/OFF mode; 1, floating valve for cooling; 2, floating valve for heating 3, PWM
206	Determine the output5 mode. 0, ON/OFF mode; 1, floating valve for cooling; 2, floating valve for heating 3, PWM
207	Analog Output1 range - 0=On/Off, 1=0-10V, 2=0-5V, 3=2-10V, 4= 10-0V
208	Analog Output2 range - 0=On/Off, 1=0-10V, 2=0-5V, 3=2-10V, 4= 10-0V
209	Output1 tot 5, bit 0 thru 4 = relay 1 thru 5.
210	Output6 ,Analog output1, a number from 0-1000 representing 0% (closed) to 100% (open). When Range = On/Off mode, On=1000, Off=0.
211	Output7 Analog output2, a number from 0-1000 representing 0% (closed) to 100% (open). When Range = On/Off mode, On=1000, Off=0.
212	DAC_OFFSET , Calibration data for the 0-10VDC signal, internal variable maintained by tstat
213	Output1 Relay1_delay_OFF_TO_ON – delay time for output1 going from OFF to ON (sec)
214	Output2 Relay2_delay_OFF_TO_ON – delay time for output2 going from OFF to ON (sec)
215	Output3 Relay3_delay_OFF_TO_ON – delay time for output3 going from OFF to ON (sec)
216	Output4 Relay4_delay_OFF_TO_ON – delay time for output4 going from OFF to ON (sec)
217	Output5 Relay5_delay_OFF_TO_ON – delay time for output5 going from OFF to ON (sec)

Tstat8	Register and Description
218	(future)Output6 delay_OFF_TO_ON – delay time for output4 going from OFF to ON (sec)
219	(future)Output7 delay_OFF_TO_ON – delay time for output5 going from OFF to ON (sec)
220	output 1 current time left from OFF to ON
221	output 2 current time left from OFF to ON
222	output 3 current time left from OFF to ON
223	output 4 current time left from OFF to ON
224	output 5 current time left from OFF to ON
225	(reserved)output 6 current time left from OFF to ON
226	(reserved)output 7 current time left from OFF to ON
227	Output1 Relay1_delay_ON_TO_OFF – delay time for output1 going from ON to OFF (sec)
228	Output2 Relay2_delay_ON_TO_OFF – delay time for output2 going from ON to OFF (sec)
229	Output3 Relay3_delay_ON_TO_OFF – delay time for output3 going from ON to OFF (sec)
230	Output4 Relay4_delay_ON_TO_OFF – delay time for output4 going from ON to OFF(sec)
231	Output5 Relay5_delay_ON_TO_OFF – delay time for output5 going from ON to OFF(sec)
232	(future)Output6_delay_ON_TO_OFF – delay time for output4 going from ON to OFF(sec)
233	(future)Output7_delay_ON_TO_OFF – delay time for output5 going from ON to OFF (sec)
234	output 1 current time left from ON to OFF
235	output 2 current time left from ON to OFF
236	output 3 current time left from ON to OFF
237	output 4 current time left from ON to OFF
238	output 5 current time left from ON to OFF
239	(reserved)output 6 current time left from ON to OFF
240	(reserved)output 7 current time left from ON to OFF
241	"MODBUS_CYCLING_DELAY – delay time (in minutes) for switching out of heating or cooling and then back in."
242	"MODBUS_CHANGOVER_DELAY – delay time (in minutes) for switching from cooling into heating or vice versa."

Tstat8	Register and Description
243	Valve travel time. The time of the valve travel from one end to another end. The units is second.
244	Valve percent. Show the valve opened how much percent. READ ONLY
	"Interlock for each output, analog and digital output. 0, interlock always ON; 1, DI1 determine the interlock status(not used any more) ; 2, AI1 determine the interlock status, the range of AI1 must be ON/OFF; 3, AI2 determine the interlock status, the range of AI2 must be ON/OFF; 4, TIMER OR, the output OR with the period timer; 5, TIMER AND, the output AND with the period timer."
245	Interlock for output1
246	Interlock for output2
247	Interlock for output3
248	Interlock for output4
249	Interlock for output5
250	Interlock for output6
251	Interlock for output7
252	"Delay to open. The heating valve will open if the ambient temp less than the Freeze temp setpoint last the time this register set. The units is second."
253	Delay to close. The duration the heating valve open. The units is minute.
254	Auto Manual mode for outputs, bit 0 = relay1, bit1 = relay2… bit 5 = (out6) analogout1, bit6 = (out7) analogout2. In manual mode you can write to the output registers for debugging or from an external master to override the local PID logic.
255	Not used
256	Not used
257	Not used
258	Not used
259	Not used
260	Not used
261	Not used
262	"DEADMASTER_MODE = 0, the default, outputs will not change when deadmaster is triggered DEADMASTER_MODE = 1, the output will be trigger to “AUTO” mode if they were previously in manual DEADMASTER_MODE = 2, the outputs will go to manual on or off as defined in the following registers."
263	"Define output states when DEADMASTER_MODE = 2 (active) Bit0 is for relay 1, bit1 for relay 2 and so on up to output 5"
264	Analog Output1 goes to this value when DEADMASTER_MODE = 2 (active), 0-1000

Tstat8	Register and Description
265	Analog Output2 goes to this value when DEADMASTER_MODE = 2 (active), 0-1000
266	"Output1 Function setting: 0=normal, default. 1 = rotation (old disabled feature) 2 = lighting control, one keypad button can be assigned to toggle a relay on & off "
267	Output2 function setting (see above)
268	Output3 function setting (see above)
269	Output4 function setting (see above)
270	Output5 function setting (see above)
271	(future)Output6 function setting (see above)
272	(future)Output7 function setting (see above)
273	FAN_SPEED, current operating fan speed
	Relay Output Tables (bit0 = relay1, bit1 = relay2, bit2 = relay3, bit3 = relay4, bit4 = relay5)
	"Fan0 table is for the off state. Fan1, Fan2, and Fan3 are for the manual states. Fan4 is for the Auto state. These states are controlled by the user."
	The mode of operation (coasting, cooling, heating) is determined by the PID parameter.
274	Output 1 PID Interlock 0 = PID1, can assign each output to either PID1 or 2, the max or the min of the two PIDS
275	Output 2 PID Interlock 1 = PID2
276	Output 3 PID Interlock 2 = Maximum of PID1 and PID2
277	Output 4 PID Interlock 3 = Minimum of PID1 and PID2
278	Output 5 PID Interlock
279	Output 6 PID Interlock
280	Output 7 PID Interlock
281	PID2 Output table- Coasting
282	PID2 Output table- Cooling1
283	PID2 Output table- Cooling2
284	PID2 Output table- Cooling3
285	PID2 Output - Heating1
286	PID2 Output - Heating
287	PID2 Output - Heating3
288	FAN0_OPERATION_TABLE_COAST
289	FAN0_OPERATION_TABLE_COOL1
290	FAN0_OPERATION_TABLE_COOL2
291	FAN0_OPERATION_TABLE_COOL3
292	FAN0_OPERATION_TABLE_HEAT1
293	FAN0_OPERATION_TABLE_HEAT2

Tstat8	Register and Description
294	FAN0_OPERATION_TABLE_HEAT3
295	FAN1_OPERATION_TABLE_COAST
296	FAN1_OPERATION_TABLE_COOL1
297	FAN1_OPERATION_TABLE_COOL2
298	FAN1_OPERATION_TABLE_COOL3
299	FAN1_OPERATION_TABLE_HEAT1
300	FAN1_OPERATION_TABLE_HEAT2
301	FAN1_OPERATION_TABLE_HEAT3
302	FAN2_OPERATION_TABLE_COAST
303	FAN2_OPERATION_TABLE_COOL1
304	FAN2_OPERATION_TABLE_COOL2
305	FAN2_OPERATION_TABLE_COOL3
306	FAN2_OPERATION_TABLE_HEAT1
307	FAN2_OPERATION_TABLE_HEAT2
308	FAN2_OPERATION_TABLE_HEAT3
309	FAN3_OPERATION_TABLE_COAST
310	FAN3_OPERATION_TABLE_COOL1
311	FAN3_OPERATION_TABLE_COOL2
312	FAN3_OPERATION_TABLE_COOL3
313	FAN3_OPERATION_TABLE_HEAT1
314	FAN3_OPERATION_TABLE_HEAT2
315	FAN3_OPERATION_TABLE_HEAT3
316	FANAUT_OPERATION_TABLE_COAST
317	FANAUT_OPERATION_TABLE_COOL1
318	FANAUT_OPERATION_TABLE_COOL2
319	FANAUT_OPERATION_TABLE_COOL3
320	FANAUT_OPERATION_TABLE_HEAT1
321	FANAUT_OPERATION_TABLE_HEAT2
322	FANAUT_OPERATION_TABLE_HEAT3
323	VALVE_OPER_TABLE_COAST, Analog output state for each of the 7 modes of operation
324	VALVE_OPER_TABLE_COOLING1
325	VALVE_OPER_TABLE_COOLING2
326	VALVE_OPER_TABLE_COOLING3
327	VALVE_OPER_TABLE_HEATING1
328	VALVE_OPER_TABLE_HEATING2
329	VALVE_OPER_TABLE_HEATING3
330	Number of Universal Heating Stages (Max heat+cool = 6)

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Tstat8	Register and Description
331	Number of Universal Cooling Stages (Max heat + Cool = 6)
332	Number of Heating Stages in Original Table - (Maximum # of total heating and cooling states is 6)
333	Number of Cooling Stages in Original Table - (Maximum # of total heating and cooling states is 6)
334	PID1 VALVE OFF TABLE COASTING
335	PID1 VALVE OFF TABLE COOLING1
336	PID1 VALVE OFF TABLE COOLING2
337	PID1 VALVE OFF TABLE COOLING3
338	PID1 VALVE OFF TABLE HEATING1
339	PID1 VALVE OFF TABLE HEATING2
340	PID1 VALVE OFF TABLE HEATING3
341	Default occupied setpoint.
342	spare
343	spare
344	spare
345	(Day)Occupied setpoint
346	(Day)Occupied cooling setpoint dead band , offset from setpoint for cooling to begin. Units are 0.1 deg.
347	(Day)Occupied heating setpoint dead band , offset from setpoint for heating to begin. Units are 0.1 deg.
348	(Day)Occupied cooling setpoint (day cooling setpoint)
349	(Day)Occupied heating setpoint (day heating setpoint)
350	(Night)Unoccupied setpoin.
351	spare
352	(Night)Unoccupied heating setpoint dead band , heating deadband for the night (OFF) mode. Units of 1 deg.
353	(Night)Unoccupied cooling setpoint dead band , cooling deadband for the night (OFF) mode. Units of 1 deg.
354	(Night)Unoccupied heating setpoint
355	(Night)Unoccupied cooling setpoint
356	(TBD)Window interlock cooling setpoint
357	(TBD)Window interlock heating setpoint
358	PID2 Unoccupied (OFF) Setpoint
359	PID2 Occupied Setpoint
360	PID2 Heating Deadband TBD: can write to either deadband or to setpoint
361	PID2 Cooling Deadband, TBD: can write to either deadband or to setpoint
362	economy mode cooling setpoint

Tstat8	Register and Description
363	economy mode heating setpoint
364	POWERUP_SETPOINT , setpoint on power up
365	MAX_SETPOINT, Setpoint high, the highest setpoint a user will be able to set from the keypad.
366	MIN_SETPOINT, Setpoint Low, the lowest setpoint a user will be able to set from the keypad.
367	reserved,MAX_SETPOINT2
368	reserved,MIN_SETPOINT2
369	reserved,MAX_SETPOINT3
370	reserved,MIN_SETPOINT3
371	reserved,MAX_SETPOINT4
372	reserved,MIN_SETPOINT4
373	Setpoint increment on the display each time the user hits the up/down buttons. Units are 0.1Deg, 10 = 1Deg and so on.
374	"Freeze protect setpoint. If the ambient temperature less than the setpoint, the heating valve will open some time the Delay to off register set ."
375	reserved, wall setpoint
376	reserved,ceiling setpoint
377	reserved,average setpoint
378	reserved,unoccupied heating
379	reserved,unoccupied cooling
380	reserved,humidity setpoint
381	reserved,cuurent1 setpoint
382	Sensor to be used for the PID calculations, 1= external sensor analog input 1 , 2 = internal thermistor, 3 = average the internal thermistor and analog input1
383	Universal PID(PID2) input select, 0=none, 1=analog_in1, 2=analog_in2, 3=analog_in3, 4=analog_in4,5=analog_in5,6=analog_in6,7=analog_in7,8=analog_in8,9= humidity 10= co2
384	PID1, current PI calculation for PID number 1 (PID2 is in register 240)
385	COOLING PTERM , proportional term for PI calculation
386	COOLING ITEM
387	PID2 P term
388	PID2 I term
389	PID2, the current value of PID number 2
390	PID1 Units High byte - Upper 2 bytes of the PID1 units in ASCII
391	PID1 Units Low byte - Lower 2 bytes of the PID1 units in ASCII
392	PID2 Units High byte - Upper 2 bytes of the PID2 units in ASCII

Tstat8	Register and Description
393	PID2 Units Low byte - Lower 2 bytes of the PID2 units in ASCII
394	PID2 heating or cooling state derived from PID2 register 240, 0=coasting, 1=cooling1, 2=cooling2, 3=cooling3, 4=heating1, 5=heating2, 6=heating3, 14=cooling4, 15=cooling5, 16=cooling6, 17=heating4, 18=heating5, 19=heating6.
395	"KEYPAD_SELECT , variable to select various keypad arrangements. Refer to PAd description in Table 1: Advanced Menu Items"
	"Number of buttons on the keypad The keypad can have up to six buttons. The setting is not normally adjusted in the field. Care should be taken to coordinate with the settings in register 101, the Heat / Cool changeover parameter 395=0 , two buttons, for adjusting the setpoint. 395=1 , 4 buttons, lower pair for the mode and upper pair for the setpoint. 395=2 , 6 button keypad, with heat cool manual selection. Lower pair for the mode, next pair for the setpoint and upper pair for the heat or cool mode. 395=3 , 6 button keypad, with separate heating and cooling setpoints. Lower pair for the mode, next pair for the cooling setpoint and uppermost pair for the heating setpoint."
396	"SPECIAL_MENU_LOCK, Special menu lockout via keypad, serial port only, 0=Full Menu, 1=Menu Disabled, 2=Typical small menu system, 3 = The user can adjust the setpoint in menu mode, 4 = Partial menu enabled When the LOC parameter isset 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 allowsaccess to calibration of the internal and external temperature sensor (CAL and CAE) and the override time parameter (ORT). LOC = 3,The user can not do anything from keypad except enter menu mode.In menu mode,the user can set 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 LOC = 4,User can adjust setpoint and fan speed from keypad,and enter menu to operate part of menu,include CAL,pterm,iterm,SOP,cooling deadband,heating deadband,C/F units and factory default."
397	spare

Tstat8	Register and Description
398	ICON TABLE
	Set when certain icons are on/off
	ICON1 : TBD list the icons here, one for Tstat6 and one for Ttsat7
398_0	(TBD)day icon
398_1	(TBD)night icon
398_2	(TBD)heating icon
398_3	(TBD)cooling icon
398_4	(TBD)fan icon
399	Last key pressed counter. Minutes since the used last pressed a key.
400	Keypad encoded value. Last keypress, READ ONLY
401	LED hundred's digit, , can drive the LEDs manually when the display register 381 is set to manual (5)
402	LED ten's digit, , can drive the LEDs manually when the display register 381 is set to manual (5)
403	LED one's digit code, can drive the LEDs manually when the display register 381 is set to manual (5)
404	LED discrete status symbols, can drive the LEDs manually when the display register 381 is set to manual (5)
405	"Rouding display. 0 = round the display to the nearest digit; 1 = round the display to the nearest 1/10 unit; 5 = round the display to the nearest 1/2 unit. 2,3,4 reserved."
406	The minimum address which the device can accept, use this to limit addresses to a certain defined band.
407	The maximum device address can be set. The device address should between min and max address, default is 254
408	Show the size of E2 chip. 0 = 24c02, 1 = 24c08/24c16.
409	"Assign the timer to be used for which feature. 0 = period timer, 1 = rotation timer, 2 = interlock, 3 = PWM timer."
410	Clock, year
411	Clock,month
412	Clock,week
413	Clock,day
414	clock, hours
415	clock,minutes
416	clock,seconds
417	alarm,not used now

Humidity / Temp Transmitter & Modbus

Tstat8	Register and Description
418	work day,wake time hour
419	work day,wake time minutes
420	work day,away time,hour
421	work day,away time,minute
422	work day,home time,hour
423	work day,home time,minute
424	work day,sleep time,hour
425	work day,sleep time,minute
426	weekend day,wake time hour
427	weekend day,wake time minutes
428	weekend,away time,hour
429	weekend,away time,minute
430	weekend,home time,hour
431	weekend,home time,minute
432	weekend,sleep time,hour
433	weekend,sleep time,minute
434	LCD turn off, 0 = turn off, 1 = normal
435	User name. line 1:characters 1 & 2
436	User name. line 1:characters 3 & 4
437	User name. line 1:characters 5 & 6
438	User name. line 1:characters 7 & 8
439	User name. line 2:characters 1 & 2
440	User name. line 2:characters 3 & 4
441	User name. line 2:characters 5 & 6
442	User name. line 2:characters 7 & 8
443	Internal sensor name. line 1:characters 1 & 2
444	Internal sensor name. line 1:characters 3 & 4
445	Internal sensor name. line 1:characters 5 & 6
446	Internal sensor name. line 1:characters 7 & 8
447	Input 1 user name. line 1:characters 1 & 2
448	Input 1 user name. line 1:characters 3 & 4
449	Input 1 user name. line 1:characters 5 & 6
450	Input 1 user name. line 1:characters 7 & 8
451	Input 2 user name. line 1:characters 1 & 2
452	Input 2 user name. line 1:characters 3 & 4
453	Input 2 user name. line 1:characters 5 & 6
454	Input 2 user name. line 1:characters 7 & 8

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Tstat8	Register and Description
455	Input 3 user name. line 1:characters 1 & 2
456	Input 3 user name. line 1:characters 3 & 4
457	Input 3 user name. line 1:characters 5 & 6
458	Input 3 user name. line 1:characters 7 & 8
459	Input 4 user name. line 1:characters 1 & 2
460	Input 4 user name. line 1:characters 3 & 4
461	Input 4 user name. line 1:characters 5 & 6
462	Input 4 user name. line 1:characters 7 & 8
463	Input 5 user name. line 1:characters 1 & 2
464	Input 5 user name. line 1:characters 3 & 4
465	Input 5 user name. line 1:characters 5 & 6
466	Input 5 user name. line 1:characters 7 & 8
467	Input 6 user name. line 1:characters 1 & 2
468	Input 6 user name. line 1:characters 3 & 4
469	Input 6 user name. line 1:characters 5 & 6
470	Input 6 user name. line 1:characters 7 & 8
471	Input 7 user name. line 1:characters 1 & 2
472	Input 7 user name. line 1:characters 3 & 4
473	Input 7 user name. line 1:characters 5 & 6
474	Input 7 user name. line 1:characters 7 & 8
475	Input 8 user name. line 1:characters 1 & 2
476	Input 8 user name. line 1:characters 3 & 4
477	Input 8 user name. line 1:characters 5 & 6
478	Input 8 user name. line 1:characters 7 & 8
479	Output 1 user name. line 1:characters 1 & 2
480	Output 1 user name. line 1:characters 3 & 4
481	Output 1 user name. line 1:characters 5 & 6
482	Output 1 user name. line 1:characters 7 & 8
483	Output 2 user name. line 1:characters 1 & 2
484	Output 2 user name. line 1:characters 3 & 4
485	Output 2 user name. line 1:characters 5 & 6
486	Output 2 user name. line 1:characters 7 & 8
487	Output 3 user name. line 1:characters 1 & 2
488	Output 3 user name. line 1:characters 3 & 4
489	Output 3 user name. line 1:characters 5 & 6
490	Output 3 user name. line 1:characters 7 & 8
491	Output 4 user name. line 1:characters 1 & 2
492	Output 4 user name. line 1:characters 3 & 4
493	Output 4 user name. line 1:characters 5 & 6

Tstat8	Register and Description
494	Output 4 user name. line 1:characters 7 & 8
495	Output 5 user name. line 1:characters 1 & 2
496	Output 5 user name. line 1:characters 3 & 4
497	Output 5 user name. line 1:characters 5 & 6
498	Output 5 user name. line 1:characters 7 & 8
499	Output 6 user name. line 1:characters 1 & 2
500	Output 6 user name. line 1:characters 3 & 4
501	Output 6 user name. line 1:characters 5 & 6
502	Output 6 user name. line 1:characters 7 & 8
503	Output 7 user name. line 1:characters 1 & 2
504	Output 7 user name. line 1:characters 3 & 4
505	Output 7 user name. line 1:characters 5 & 6
506	Output 7 user name. line 1:characters 7 & 8
507	Output 8 user name. line 1:characters 1 & 2
508	Output 8 user name. line 1:characters 3 & 4
509	Output 8 user name. line 1:characters 5 & 6
510	Output 8 user name. line 1:characters 7 & 8
511	Schedule_B character 1
512	Schedule_B character 2
513	Schedule_B character 3
514	Schedule_B character 4
515	Schedule_C character 1
516	Schedule_C character 2
517	Schedule_C character 3
518	Schedule_C character 4
519	Schedule_D character 1
520	Schedule_D character 2
521	Schedule_D character 3
522	Schedule_D character 4
523	Wall character 1
524	Wall character 2
525	Wall character 3
526	Wall character 4
527	Ceiling character 1
528	Ceiling character 2
529	Ceiling character 3
530	Ceiling character 4
531	Outdoor character 1
532	Outdoor character 2

Tstat8	Register and Description
533	Outdoor character 3
534	Outdoor character 4
535	Average character 1
536	Average character 2
537	Average character 3
538	Average character 4
539	LCD screen1,select which information will display on LCD,range0 to 12
540	LCD screen2,select which information will display on LCD,range0 to 12
541	Demand response flag 0: disable 1:yes 2:no
542	(reserved)All registers except fan speed and manual input are not writable.0 = lock,1 = no lock
543	Enable/disable PIR correspond 1/0 respectively.
544	spaere
545	Reserve for factory test
546	Reserve for 3rd calibration capacitance value (future)
547	Reserve for 3rd calibration humidity value (future)
548	Reserve for 4th calibration capacitance value (future)
549	Reserve for 4th calibration humidity value (future)
550	Reserve for 5th calibration capacitance value (future)
551	Reserve for 5th calibration humidity value (future)
552	Reserve for 6th calibration capacitance value (future)
553	Reserve for 6th calibration humidity value (future)
554	Reserve for 7th calibration capacitance value (future)
555	Reserve for 7th calibration humidity value (future)
556	Reserve for 8th calibration capacitance value (future)
557	Reserve for 8th calibration humidity value (future)
558	Reserve for 9th calibration capacitance value (future)
559	Reserve for 9th calibration humidity value (future)
560	Reserve for 10th calibration capacitance value (future)
561	Reserve for 10th calibration humidity value (future)
562	(TBD)humdity sensor factory calibration data write lockA(only when A = 12 and B = 34, can write factory data)
563	(TBD)humdity sensor factory calibration data write lockB(prevent user do wrong operation to change calibration data)
564	lcd rotate enable, decide how many items will be shown on rotate mode,range0 to 21.Display item select:0:none 1:temperature 2:setpoint 3:AI1 4:AI2 5:AI3 6:AI4 7:AI5 8:AI6 9:AI7 10:AI8 11:MODE 12:USER INFO 13:CLOCK DATE 14:CLOCK TIME 15:CO2 16: HUMIDITY
565	schedule enable/disable control bit. 0 = disable 1 = enable, default: enable
566 - 583	decide which item will be shown in the display sequency.see up note

Tstat8	Register and Description
584 - 590	decide which item will be shown as the output item.
591	"PWM output range in COAST mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5"
592	"PWM output range in COOLING1 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5"
593	"PWM output range in COOLING2 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5"
594	"PWM output range in COOLING3 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5"
595	"PWM output range in HEATING1 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5"
596	"PWM output range in HEATING2 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5"
597	"PWM output range in HEATING3 mode. 0 = CLOSE, 1 = OPEN, 2 = 0-100%, 3 = 50-100%, 4 = 0-50%. MSb 4 bits correspond to output4 and LSB 4 bits correspond to output5"
598	spare
599	spare
600	spare
601	spare
602	calibration data of thermistor which on external humidity sensor
603 - 606	Keypad define : default value:128,64,8,4.
607	humidity sensor heater control 0=not heat, 1=heating.
608	humidity sensor manual input enable 0=disble 1=enable.
609	humidity sensor manual input value, raneg: 0 to 1000
610	CO2 sensor manual input enable 0=disble 1=enable.
611	CO2 sensor manual input value, raneg: 0 to 3000
612	CO2 sensor calibration data
613	PID2 OFF TABLE COASTING
614	PID2 OFF TABLE COOLING1
615	PID2 OFF TABLE COOLING2
616	PID2 OFF TABLE COOLING3
617	PID2 OFF TABLE HEATING1
618	PID2 OFF TABLE HEATING2
619	PID2 OFF TABLE HEATING3

Tstat8	Register and Description
620	PID2 VALVE OFF TABLE COASTING
621	PID2 VALVE OFF TABLE COOLING1
622	PID2 VALVE OFF TABLE COOLING2
623	PID2 VALVE OFF TABLE COOLING3
624	PID2 VALVE OFF TABLE HEATING1
625	PID2 VALVE OFF TABLE HEATING2
626	PID2 VALVE OFF TABLE HEATING3
627	spare
628	value of light sensor
629	PIR sensor select 1=PIR sensor enable 0=PIR sensor disable
630	PIR sensor real value
631	PIR sensor range 0:unocupied 1: occupied
632	PID2 VALVE TABLE COASTING
633	PID2 VALVE TABLE COOLING1
634	PID2 VALVE TABLE COOLING2
635	PID2 VALVE TABLE COOLING3
636	PID2 VALVE TABLE HEATING1
637	PID2 VALVE TABLE HEATING2
638	PID2 VALVE TABLE HEATING3
639	ID write protect. 0:enable ID write 1: disable ID write
641	PIR TIMER.
642	(VAV function) supply setpoint
643	(VAV function) Maximum supply setpoint
644	(VAV function) Minimal supply setpoint
645	(VAV function) Maximum airflow for cooling
646	(VAV function) Maximum airflow for heating
647	(VAV function) Minimal airflow
648	(VAV function) airflow setpoint
649	(VAV function) VAV function control bit0:VAV function enable/disable 0:(default)disable 1:enable bit1:airflow sensor present 0:NO 1:YES bit2: engineering units setting 0:in aireflow unit 1:in %
650	(VAV function) spare
651	(VAV function) PID3_VALVE_OPERATION_TABLE_BEGIN
652	(VAV function) PID3_VALVE_OPER_TABLE_COOL1
653	(VAV function) PID3_VALVE_OPER_TABLE_COOL2
654	(VAV function) PID3_VALVE_OPER_TABLE_COOL3
655	(VAV function) PID3_VALVE_OPER_TABLE_HEAT1
656	(VAV function) PID3_VALVE_OPER_TABLE_HEAT2
657	(VAV function) PID3_VALVE_OPER_TABLE_HEAT3

Tstat8	Register and Description
658	(VAV function) PID3 cooling deadband
659	(VAV function) PID3 heating deadband
660	(VAV function) PID3 Pterm
661	(VAV function) PID3 Iterm
662	(VAV function) PID3 heat stage(max 6 stages)
663	(VAV function) PID3 cool stage(max 6 stages)
664	(VAV function) PID3 output
665	(VAV function) PID3_DIGITAL_OUTPUT_BEGIN
666	(VAV function) PID3_DIGITAL_OUTPUT_COOL1
667	(VAV function) PID3_DIGITAL_OUTPUT_COOL2
668	(VAV function) PID3_DIGITAL_OUTPUT_COOL3
669	(VAV function) PID3_DIGITAL_OUTPUT_HEAT1
670	(VAV function) PID3_DIGITAL_OUTPUT_HEAT2
671	(VAV function) PID3_DIGITAL_OUTPUT_HEAT3
672	(VAV function) PID3_VALVE_OFF_TABLE_BEGIN
673	(VAV function) PID3_VALVE_OFF_TABLE_COOL1
674	(VAV function) PID3_VALVE_OFF_TABLE_COOL2
675	(VAV function) PID3_VALVE_OFF_TABLE_COOL3
676	(VAV function) PID3_VALVE_OFF_TABLE_HEAT1
677	(VAV function) PID3_VALVE_OFF_TABLE_HEAT2
678	(VAV function) PID3_VALVE_OFF_TABLE_HEAT3
679	(VAV function) PID3_DIGITAL_OFF_OUTPUT_BEGIN
680	(VAV function) PID3_DIGITAL_OFF_OUTPUT_COOL1
681	(VAV function) PID3_DIGITAL_OFF_OUTPUT_COOL2
682	(VAV function) PID3_DIGITAL_OFF_OUTPUT_COOL3
683	(VAV function) PID3_DIGITAL_OFF_OUTPUT_HEAT1
684	(VAV function) PID3_DIGITAL_OFF_OUTPUT_HEAT2
685	(VAV function) PID3_DIGITAL_OFF_OUTPUT_HEAT3
686	spare
687	spare
688	spare
689	spare
690	spare
691	HEAT/COOL mode user
692	SN write enable
693	spare
694	spare
695	Internal thermister manual value
696	spare

Tstat8	Register and Description
697	spare
698	spare
699	spare
700	spare
701	spare
702	spare
703	spare
704	spare
705	PID3_DAY_SP,
706	PID3_NIGHT_SP,
707	spare
708	spare
709	spare
710	spare
711	spare
712	spare
713	spare
714	TSTAT_NAME_ENABLE,//default value = 0x56 indicate tstat name function is present
715	TSTAT_NAME1,
716	TSTAT_NAME2,
717	TSTAT_NAME3,
718	TSTAT_NAME4,
719	TSTAT_NAME5,
720	TSTAT_NAME6,
721	TSTAT_NAME7,
722	TSTAT_NAME8,
723	spare
724	spare
725	SHOW_ID //this regisger will let user display current ID, the time will depending on the written value
726	TRANSDUCER_RANGE_MIN, //When set analog output to transducer mode, use these two reg to set range: range_min = 10 means 0V accodrding to 10C
727	TRANSDUCER_RANGE_MAX,
728	ICON_MANUAL_MODE, //manual icons enable/disable 0:auto icon 1: manual icon
729	ICON_MANUAL_VALUE,//when set icon to munual mode, set value here
730	SETPOINT_UNLIMIT,
731	CO2_SELF_CAL,if CO2 sensor is present, set 1 to enable CO2 self calibration function, 0 means disable
732	CO2_SELF_CAL_TIME, set the time of self calibration will take
733	CO2 self calibration value

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Tstat8	Register and Description
734	CO2_RANGE
735	PIR_THRESHOLD_HI, PIR sensor triggered high level
736	PIR_THRESHOLD_LO, PIR sensor triggered low level
737	system mode1 name1
738	system mode1 name2
739	system mode1 name3
740	system mode1 name4
741	system mode2 name1
742	system mode2 name2
743	system mode2 name3
744	system mode2 name4
745	system mode3 name1
746	system mode3 name2
747	system mode3 name3
748	system mode3 name4
749	system mode4 name1
750	system mode4 name2
751	system mode4 name3
752	system mode4 name4
753	system mode5 name1
754	system mode5 name2
755	system mode5 name3
756	system mode5 name4

Continuously Modulating Valve

Description



DM-8-MOD-24VDC is based on DM-8-MOD, we add a Bracket.So the actuator can be mounted on the ball valve in any of four 90° positions.It cantains damper actuator and Vavle body and so on.

Materials
Bracket Stainless steel 304
Valve Brass
Spindle Chromed Brass
Screws Stainless steel 304

Advantages
-Easy to install
-Low sound power level
-Leakage rate: tight sealing
-Long life cycles



1. Damper Actuator

Description
Continuously modulating type damper actuator is controlled by DC 0~10V or 4~20mA signal, and can provide 0~10VDC position feedback signal. It is specially designed for damper control in HVAC system. There are 4, 6, 8Nm models for optional.

Characteristics
● Various Signals Control
Standard type: 0~10Vdc control; the setting position of J3 is at point V, If you want 0~10Vdc or 4~20mA control type, please inform about it in your order. We will adjust the PCB in factory. You can use J3 setting to switch the control signals between 2~10VDC and 4~20mA: point “V” is for 2~10VDC control; point A is for 4~20mA control.
●Simple Installation
Fix with square damper shaft. Damper shaft dimensions see below Dimension Diagram. The rotating angle of the actuator can be set by internal potentiometer (PT1). The match between working range and feedback signal is automatically done by the actuator.
● Manuel Operation
It can be operated manually if needed: push the manual button on the actuator, the gearings inside the actuator will break away. The damper can be operated manually when keep pushing the manual button. PLEASE DO NOT OPERATE WHEN POWER ON!
● High Dependable Performance
Modulating type damper actuator uses bi-directional magnetic clutch synchronous motor. It has overload protection and overtime protection, and no need limitator needed, the actuator will stop automatically when it runs to the end. And the damper actuator has a precision of 15° adjustable mechanical limitator.

Specification

Model	DM-8-MOD-24VDC
Torque	≥8Nm
Operation Time (50Hz/90º)	≈156s
Rated Voltage	24VDC/AC±10% (50/60Hz)
Cable	0.5~1.5mm2
Power Consumption	4VA when operating
Control Signal	DC0~10V or 4~20mA
Factory Setting	Working condition: DA (J1) Axle rotates to 0º(J4) when signal is lost
Position Precision	±5%
Rotate Angel	90º<limitation≤ 95º
Noise Level	Maximum 45dB(A)
Position Indicator	Mechanical indication
Protection Class	IP 40
Ambient Temperature	-5 ° C~+50° C
Storage Temperature	-30° C~+70° C
Usage Life	>60000 times

* The accessories include 2 limitative baffles, 2 baffle setscrews (M3×6), 1 actuator body setscrews (ST4.8×12.5), and 1 aluminum gasket.

2. Valve Body

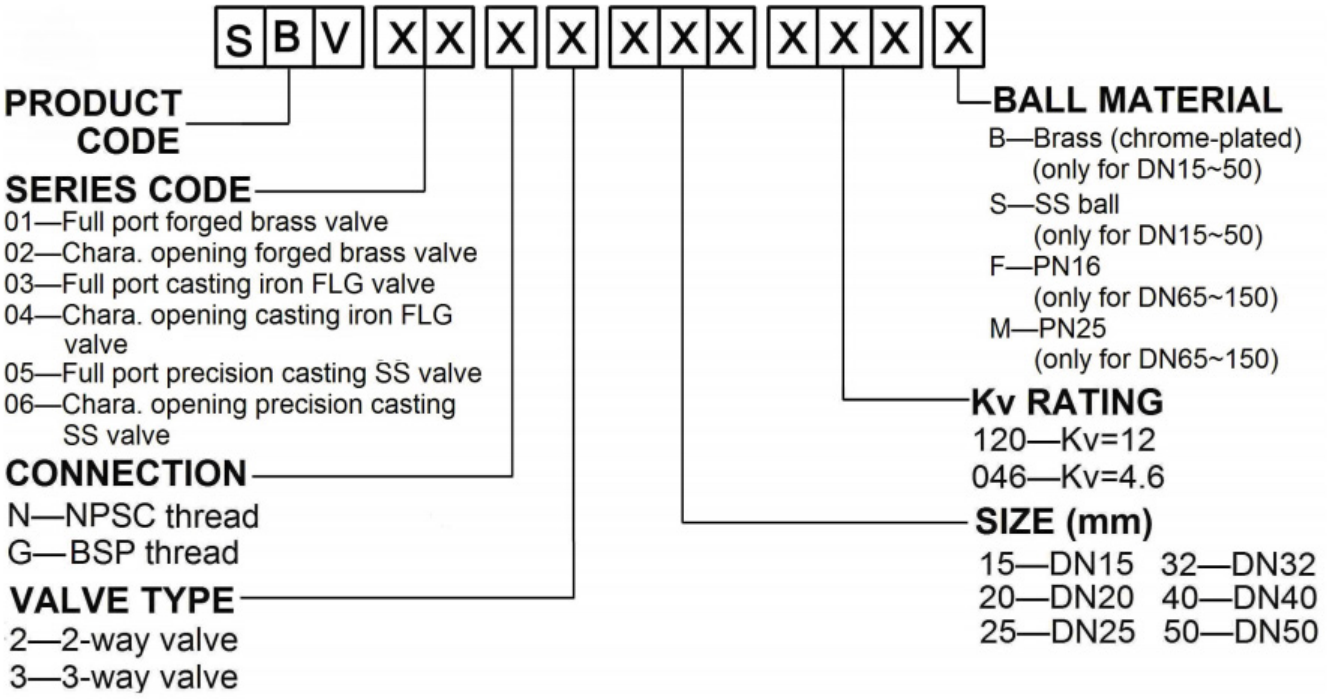
DESCRIPTION

SBV series ball valve bodies are widely used to control water flow in central air-conditioning, heating system. Controlled by standard floating signal or 3-point signal from angle rotation actuators, the valve ball can be rotated to different angle. There two flow control type: SBV01 full port ball valve body and SBV02 characterized ball valve body. The valves are 3-piece structure, and have six sizes: DN15, DN20, DN25, DN32, DN40 and DN50. The ball sealing inside the valve is made of PTFE material of high lubricating ability and wearability. It makes the valve has high closing-off pressure and great hermetization. The valves can be matched with SBA01,SBA03 and SBA04 series actuators.

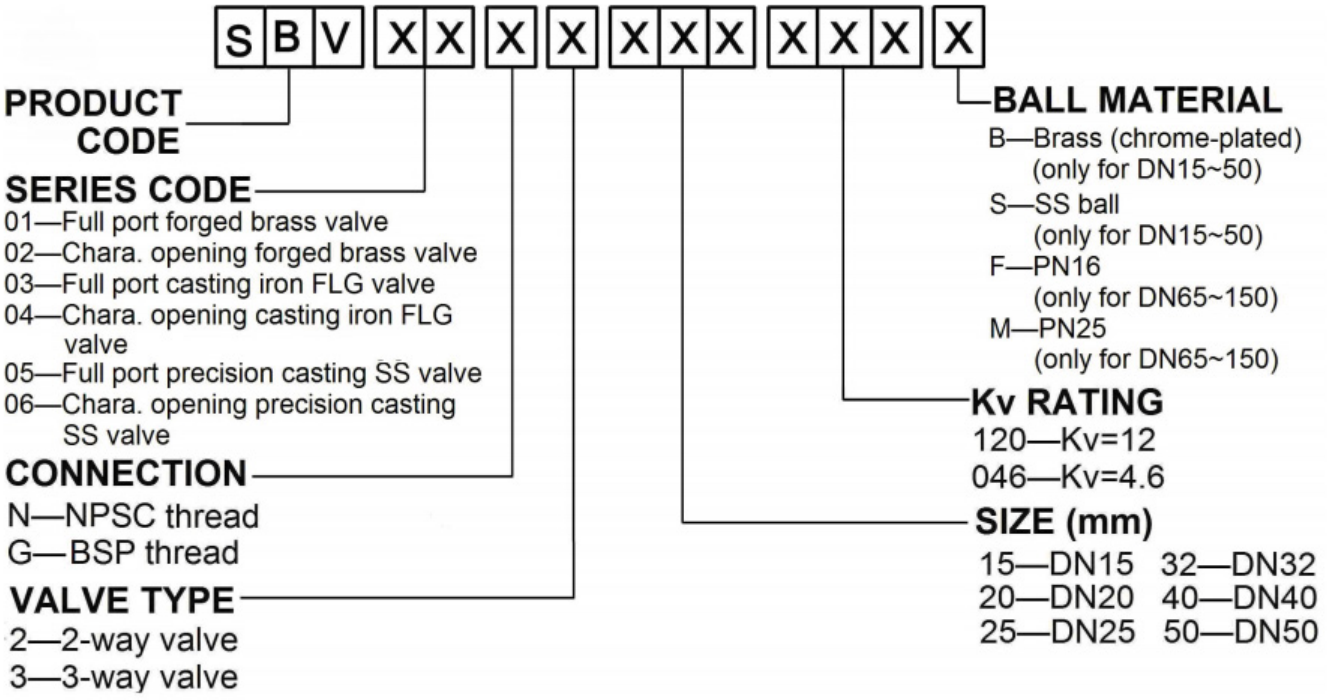
ACTUATOR APPLICATION	VALVE SIZE	ACTUATOR CONNECTION
SBA01	DN15, DN 20, DN 25	Press button
SBA03	DN15, DN 20, DN 25	Bolt
SBA04	DN32, DN 40, DN 50	Bolt



Part Number Scheme



Technical Data

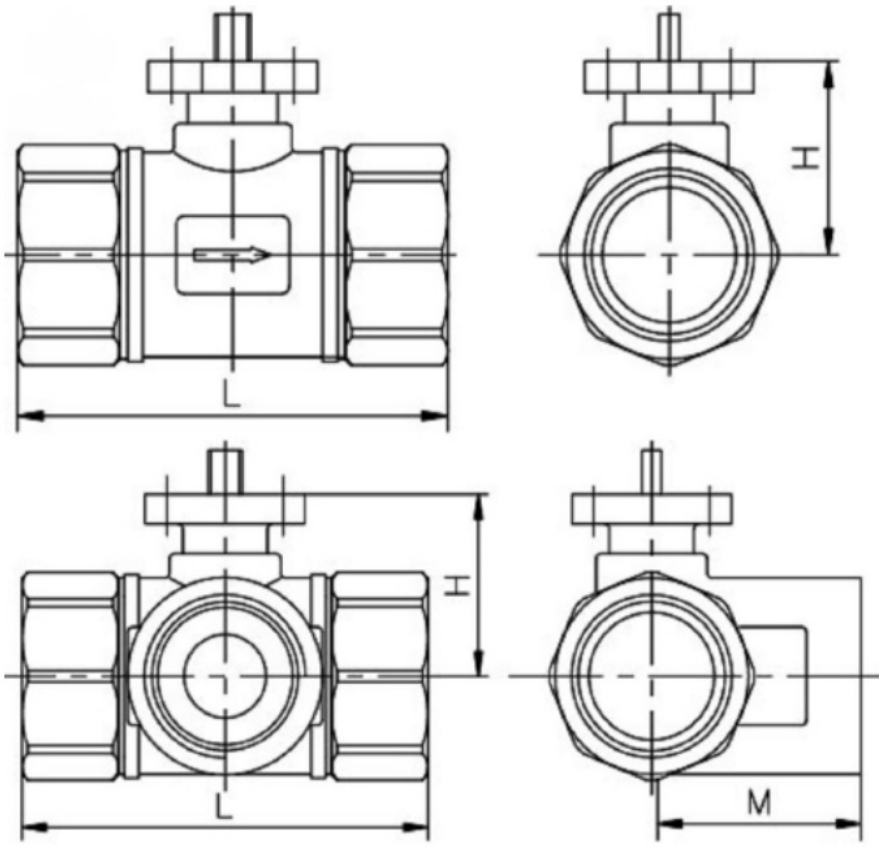


Material

MATERIAL	BODY	Forged brass / Precision casting stainless steel
	BALL	Casting brass (chrome-plate) / stainless steel
	SEAT	PTFE (Poly tetrae fluoro ethylene)
	STEM	Stainless steel / brass
	O-RING	NBR
WORKING MEDIA		Chilled/hot water or 50% glycol
MEDIA TEMPERATURE		2 ° C~94 ° C

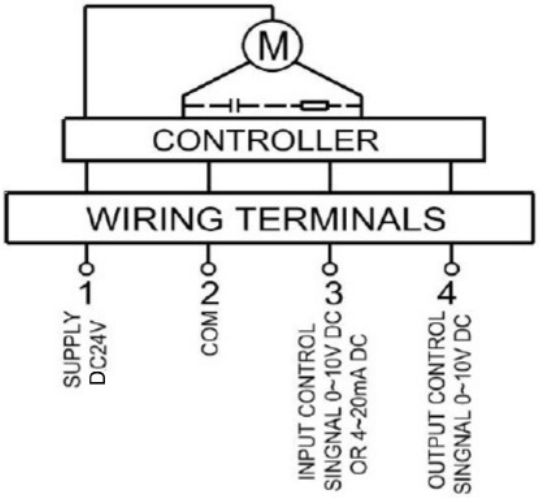
Dimension

SIZE (mm)	DIMENSION (mm)				THREAD (G)	MAX. PIPE THREAD SIZE (mm)
	L		H	M		
	2-way	3-way				
15	68	68	32	33	G1/2	13
20	68	68	32	35	G3/4	13
25	84	84	37	44	G1	17
32	98	98	48	50	G11/4	19
40	98	105	48	50	G11/2	19
50	122	123	52	62	G2	29



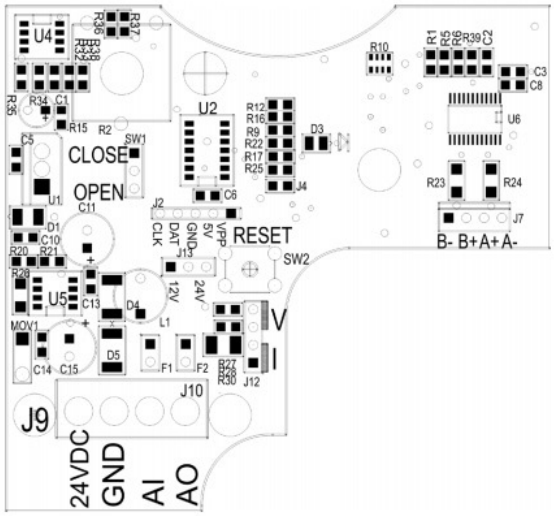
Note: Only suitable for 13×13mm or 10×10mm foursquare damper shaft. Other sizes of aluminum gaskets can be made when the Damper Shaft dimension “a” is smaller than 10mm.

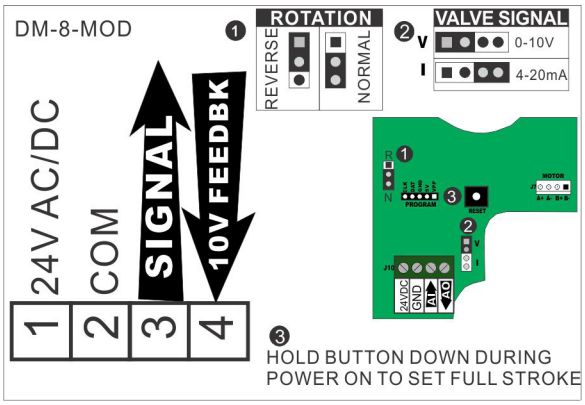
Wiring Diagram

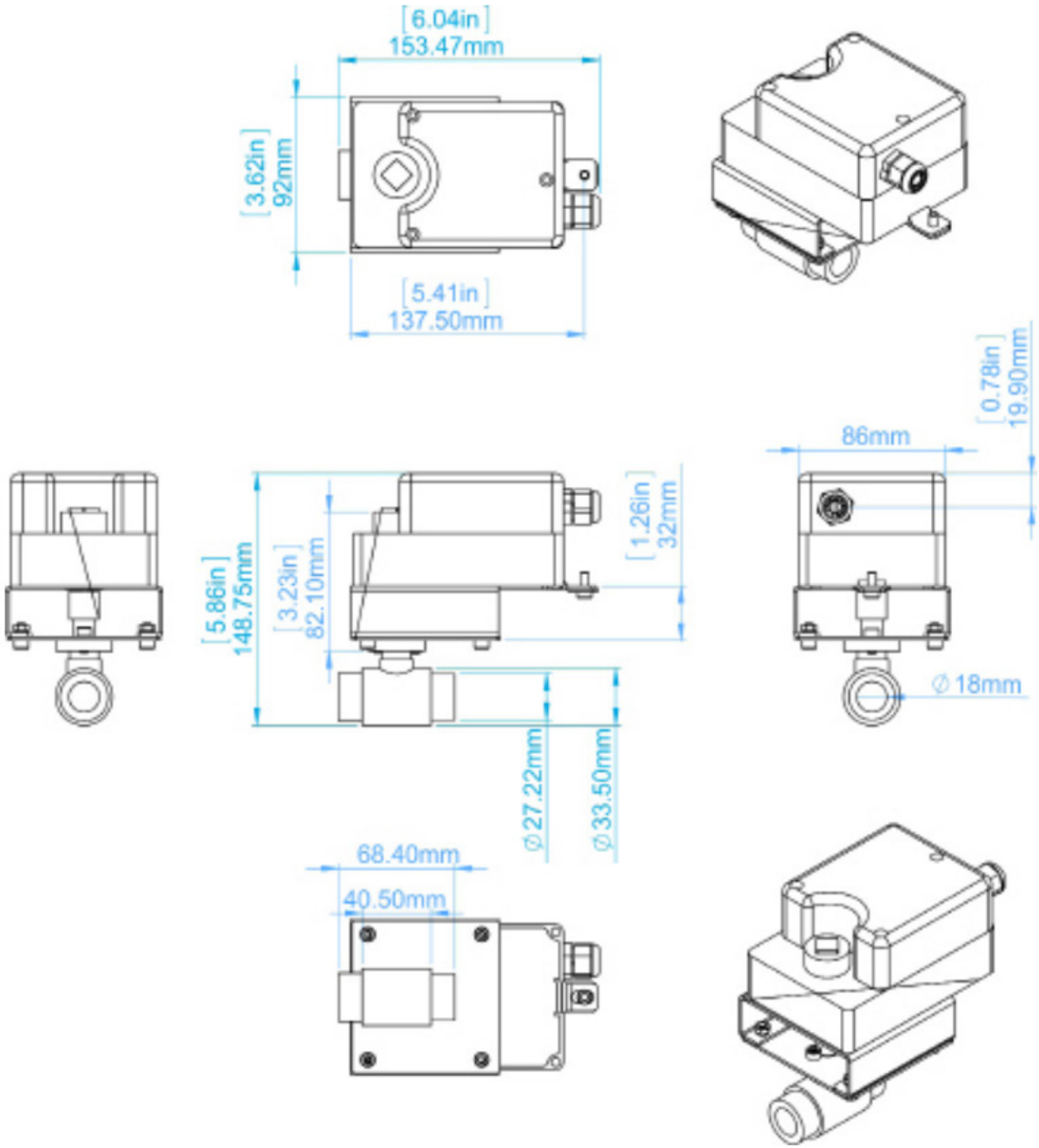


INPUT CONTROL SIGNAL		ROTATE DIRECTION
DA	RA	
INCREASING	DECREASING	↻
DECREASING	INCREASING	↺

PCB Setting Diagram






[6.04in]
153.47mm
[3.62in]
92mm
[5.41in]
137.50mm
[0.78in]
19.90mm
86mm
[5.86in]
148.75mm
[3.23in]
82.10mm
[1.26in]
32mm
Ø18mm
Ø27.22mm
Ø33.50mm
68.40mm
40.50mm

Motorized Ball Valve

DN12~DN50, 2 way / 3 way Motorized Ball Valve

Motorized ball valve is using bi-directional motor, and mainly used in central air-conditioning system, heating system, water treatment, and production industry to control the flow of chilled/ hot medium.



DN12~DN25



DN32~DN50

Actuator Specification

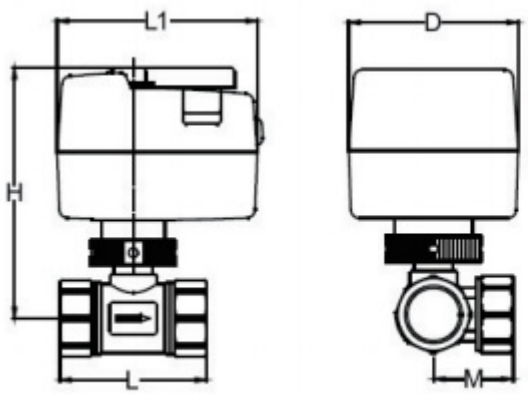
Power Supply	24VAC	220VAC	24VAC
Frequency	50/60Hz		
Power	3VA on load	5VA on load	4VA on load
Control Signal	3-point floating / electric on/off		DC0(2) ~ 10V DC4(0) ~ 20mA
Default Setting	-------		Input 0 ~ 10V DC Feedback 0 ~ 10V DC Running Status DA
Torque	DN12 ~ DN25		>= 4Nm
	DN32 ~ DN50		>= 6Nm
Stroke Time(0~90⁰)	DN12 ~ DN25	about 45s (50Hz/90⁰) / 90s for optional	
	DN32 ~ DN50	about 60s (50Hz/90⁰) / 120s for optional	
Rotation Angle	90⁰ <= Mechanical Limitation < 95⁰		
Cable	0.5 ~ 1mm²		
Material	Cover	Fire-retardent ABS engineering plastic	
	Chassis	Fire-retardent Reinforced nylon PA6 - 110	
	Gear	POM, Fire-retardent Reinforced nylon PA6-230, Brass HPb59-1	
Temperature	Operating: -5 ~ +50⁰C; Storage: -30 ~ +70⁰C		
Protection Class	IP54		

Valeve Description

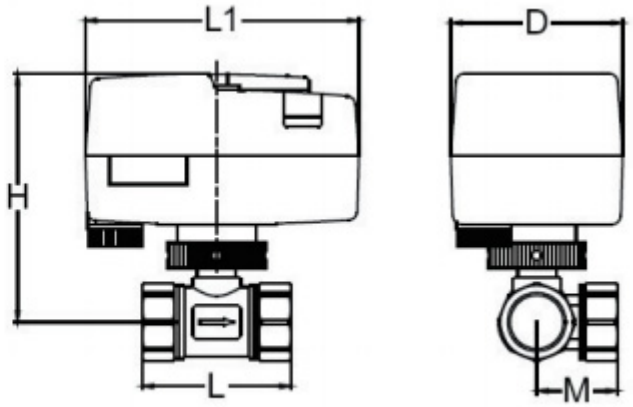
Working Media	Chilled / hot water or <= 50% glycot
Media Temperature	2 ~ 94⁰C
Rated Body Pressure	PN25
Flow Characteristic	Equal Percentage
Leakage	A.B port 0~0.01% Kv AB port 0.5% Kv
Connection Type	Thread
Closing-off Pressure	600kPa
Rotation Angle	90⁰
Installation Level	Horizontal / Vertical

Material	
Valve Body	Forged Brass
Valve Ball	Stainless Steel / Casting Brass (chrome-plate)
Valve Seat	PTFE
Valve Shaft	Stainless Steel / Forged Brass
Seal	NBR

Dimension



DN12~DN25



DN32~DN50

Size	Rated Body Pressure	Kv	Dimension(mm)					
			L		H	M	L1	D
			2 way	3 way				
DN12	PN25	4.0	68	68	115	33	92	77
DN18		6.3	68	68	115	34		
DN25		10	82	84	120	43		
DN32		16	98	104	131	50	123	78
DN40		25	105	111	131	50		
DN50		40	122	143	135	61		

DN 65 ~ DN150, 2 way Motorized Ball Valve

Motorized ball valve is using bi-directional motor, and mainly used in central air-conditioning system, heating system, water treatment, and production industry to control the flow of chilled/ hot medium.



DN65~DN100



DN125~DN150

Actuator Specification

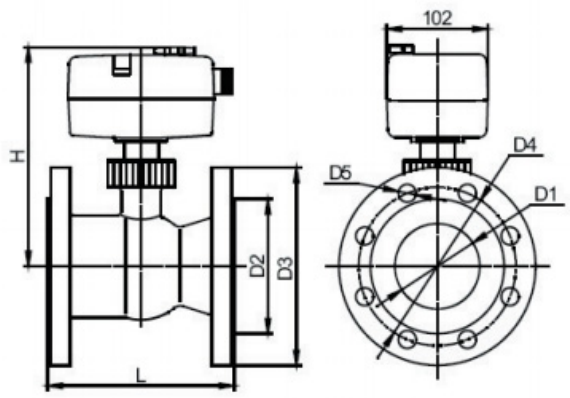
Power Supply (50/60Hz)		24VAC	220VAC	24VAC
Power	DN65 ~ DN100	4.5VA on load	8.5VA on load	5.5VA on load
	DN125 ~ DN150	10VA on load		11VA on load
Control Signal		3-point floating / electric on/off		DC0(2) ~ 10V DC4(0) ~ 20mA
Default Setting		--------		Input 0 ~ 10V DC Feedback 0 ~ 10V DC Running Status DA
Torque		DN65 ~ DN100		>= 25 Nm
		DN125 ~ DN150		>= 65 Nm
Stroke Time(0~90⁰)		120s (50Hz)		
Rotation Angle		90⁰ <= Mechanical Limitation < 95⁰		
Cable		0.5 ~ 1mm²		
Material	Cover	Fire-retardent ABS engineering plastic		
	Chassis	Casting Aluminum Alloy		
	Gear	DN65 ~ DN100	POM, Steel	
		DN125 ~ DN150	Brass, HPb59-1, Steel (40Cr, 45)	
Temperature		Operating: -5 ~ +50⁰C; Storage: -30 ~ +70⁰C		
Protection Class		IP54		

Valve Specification

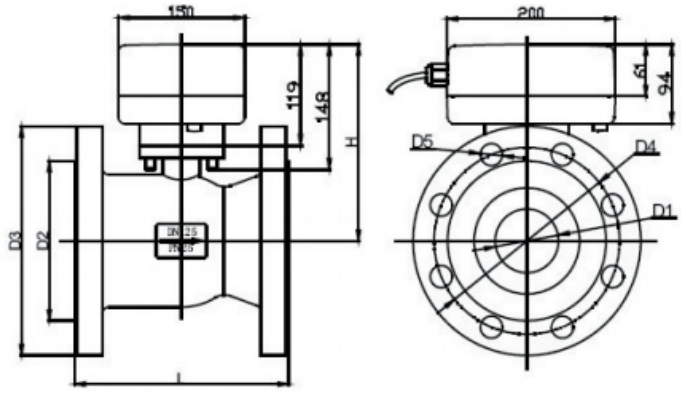
Working Media	Chilled / hot water or <= 50% glycol
Media Temperature	2 ~ 94°C
Rated Body Pressure	PN16 / PN25
Flow Characteristic	Equal Percentage
Leakage	Less than 0~0.01% Kv
Connection Type	Flanged
Closing-off Pressure	600kPa
Rotation Angle	90°
Installation Level	Horizontal / Vertical

Material	
Valve Body	Casting Iron
Valve Ball	Stainless Steel
Valve Seat	PTFE
Valve Shaft	Stainless Steel
Seal	NBR

Dimension



DN65~DN100

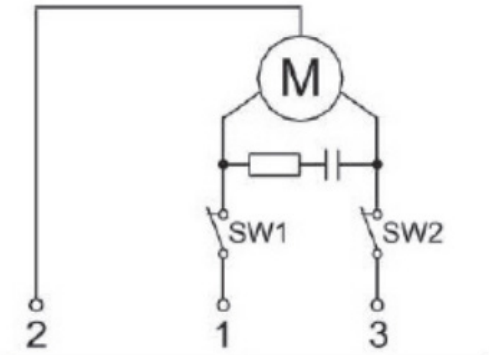


DN125~DN150

Size	Rated Body Pressure	Kv	Dimmension (mm)						
			L	H	D1	D2	D3	D4	D5
DN65	PN16 (PN25)	64	190 (190)	216 (216)	82 (82)	120 (120)	185 (185)	145 (145)	18 (18)
DN80		102	190 (190)	216 (216)	82 (82)	136 (136)	200 (200)	160 (160)	18 (18)
DN100		163	230 (230)	226 (226)	102 (102)	156 (162)	220 (236)	180 (190)	18 (23)
DN125		260	254 (254)	232 (232)	125 (125)	188 (188)	250 (270)	210 (220)	18 (26)
DN150		416	267 (267)	250 (250)	154 (154)	210 (215)	285 (300)	240 (250)	22 (26)

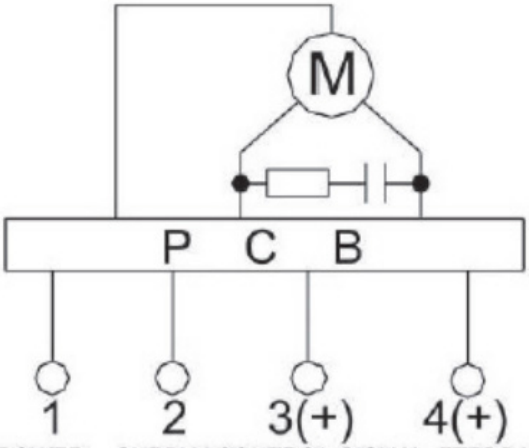
Wiring Diagram

WIRING



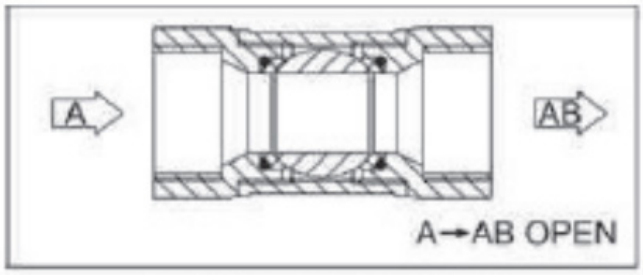
POWER	ROTATING DIRE.
1-2	0°
2-3	90°

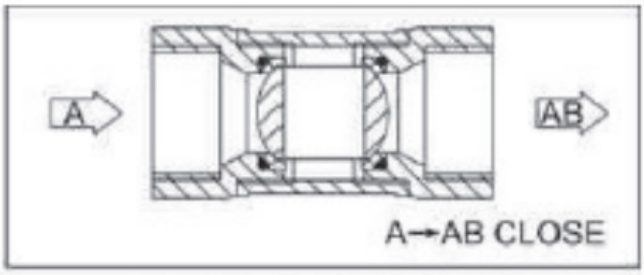
PCB SETTING

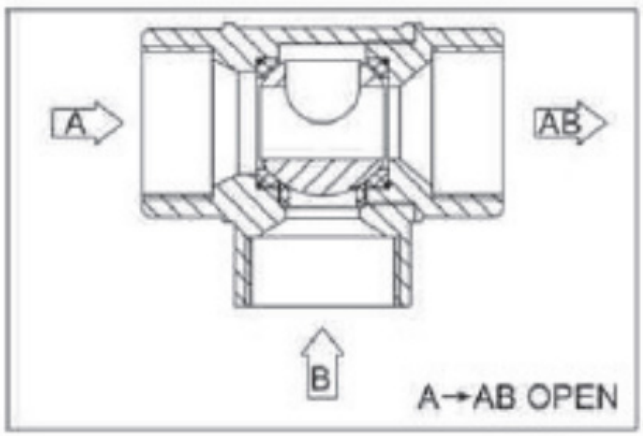


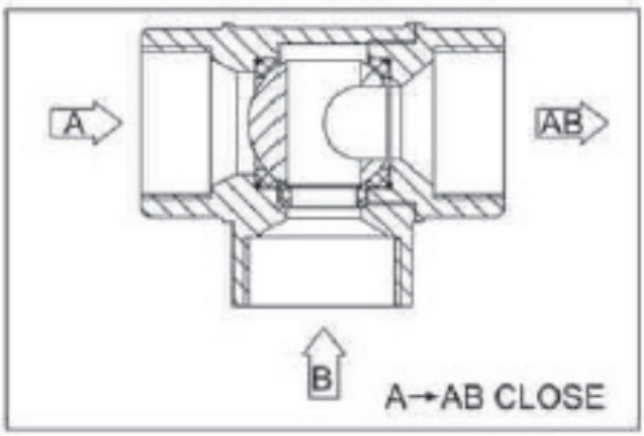
1	2	3(+)	4(+)
POWER SUPPLY 24VAC	SUPPLY SIGNAL COM	CONTROL SIGNAL (0)2~10VDC OR (0)4~20mA DC	FEEDBACK SIGNAL 0~10VDC

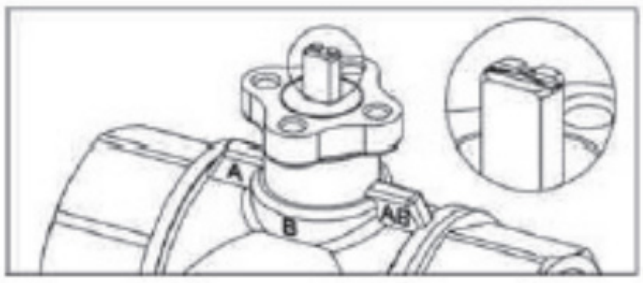
INPUT CONTROL SIGNAL		ACTUATOR ROD
DA	RA	
INCREASE	DECREASE	0°
DECREASE	INCREASE	90°

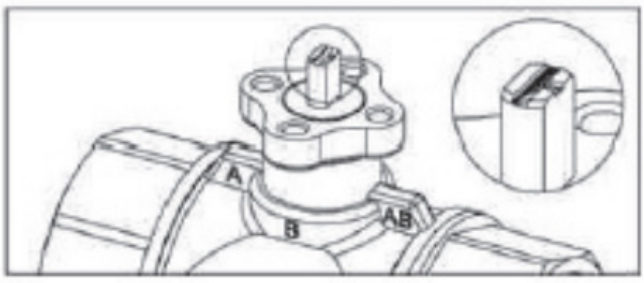












Lighting Control Relay

Description

This latching, HID lighting control relay is equipped with permanent magnetic latching technology. It is rated for a 25A circuit at 300VAC.



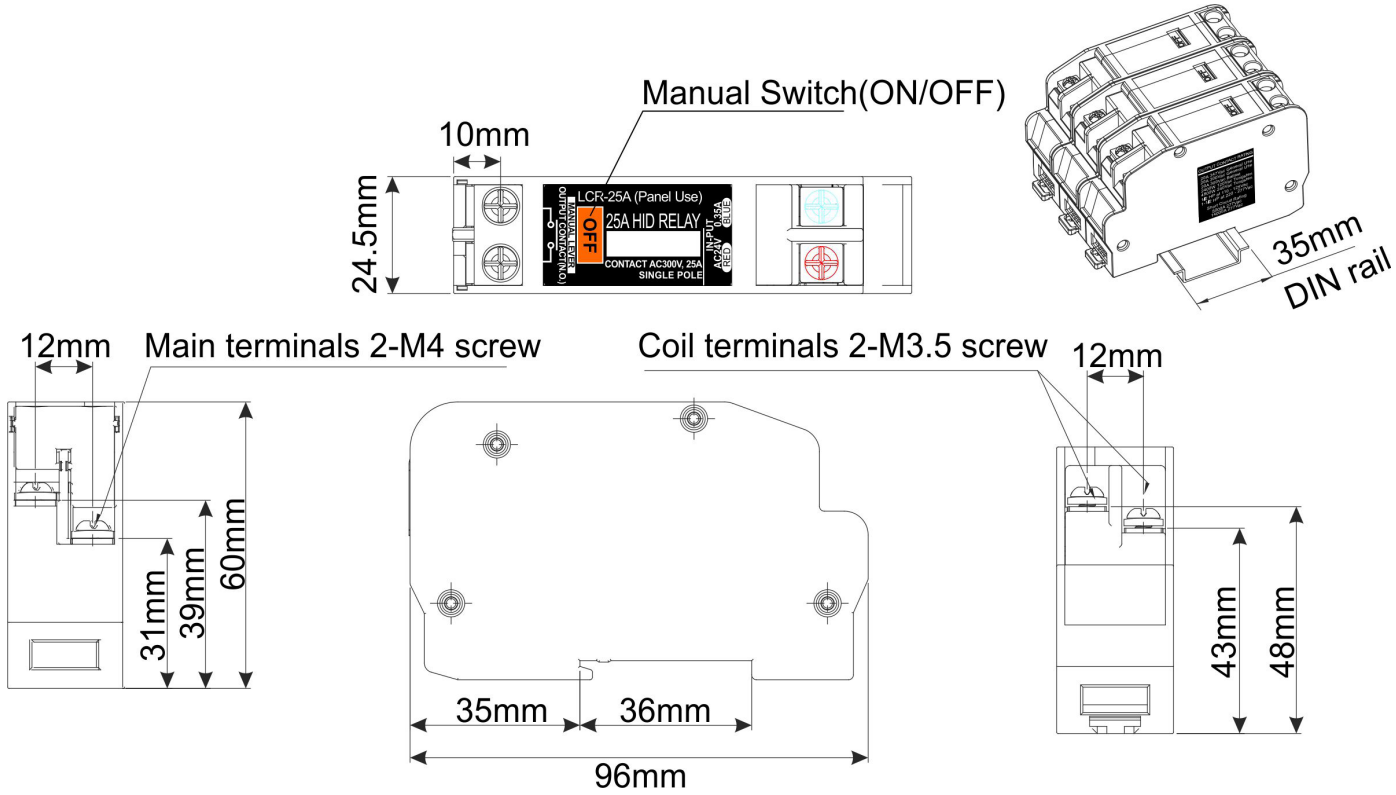
Highlights:

- Permanent Magnetic-Latching Technology
- Extended-Life Contact Design
- Threaded Contact for Easy Wiring
- 24V AC Operating Voltage
- Short circuit rating: 5000A 277VAC, 14000A 277VAC
- Support manual switch: on/off

Application:

Electrical heating, compressor controls, Latching controls

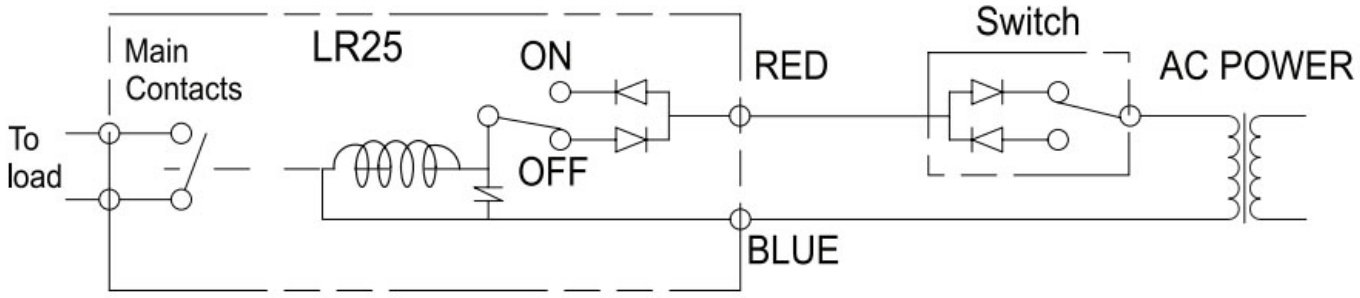
Dimensions



Specification

Spec.	Nominal voltage VAC	Sset voltage VAC(Min.)	Reset voltage VAC(Min.)	Nominal operating current (A)	Nominal operating power (VA)	Maximum allowable voltage
Coil ratings	24	18	18	0.35	8.4	30.0
Contact ratings	Maximum switch current			25(A)		
	Maximum switch voltage			AC 300(V)		
	Max. Switching capacity			7.5KVA		
	Resistive load (Cosø=1)			25(A) 300V AC		
	Inductive load			25(A) 300V AC		
	Incandescent lamp load			25(A) 220V AC		
	Fluorescent lamp load			25(A) 270V AC		
	Motor load			1/2HP 110 ~ 125V AC		
				1-1/2HP 220 ~ 277V AC		
	Short Circuit Rating			5000A 277V AC		
				14000A 277V AC		
	Insulation resistance			Min. 100Ω(DC 500V Meggre)		
	Dielectric strength			AC 2000V (50/60Hz) for 1 minute (AC 1800V between same pole contacts)		
	Mechanical life			Min. 200,000 operations		
	Electical life			Min. 50,000 operations		
	Operatating ambient temperature			-55C ~ +60C (in case, it should not be forzen)		
	Humidity			35% ~ 85% RH		

Note: 1. Nominal operating current and coil resistance are measured at + 20C
2. Operating Coil (AC 6, 12, 24, 48, 100/100, 200/200V, 50/60Hz




LCR-25A (Panel Use)
25A HID RELAY
IN-PUT
AC24V 0.35A
RED BLUE
CONTACT AC300V 25A
SINGLE POLE
OFF
MANUAL LEVER
OUTPUT CONTACT(N O)
OUTPUT CONTACT RATING
20A 347Vac General Use
20A 300Vac General Use
20A 300Vac Ballast
2400W 120Vac Tungsten
4800W 240Vac Tungsten
1/2 HP at 110 – 125Vac
1-1/2HP at 220 – 277Vac
Short Circuit Rating
5000A 277Vac
14000A 277Vac

Mechanical Relay Board

Humidity / Temp Transmitter & Modbus

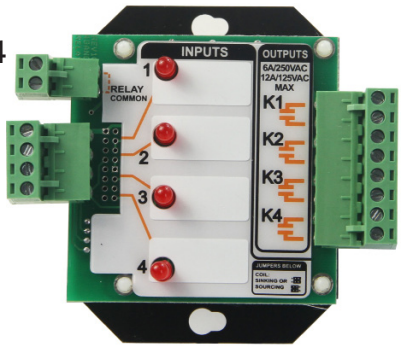
Descriptions

The MRB Mechanical Relay Board comes in two versions, a 4 pack and an 8 pack version. The boad features an area for adding your own label, which can slide in and out for making changes. The coils are very low power, requiring less than 30ma at 24VAC. The SPST relay is rated at 6A/250VAC, 12A/125VAC. Jumpers on each output can also be set to route a common ground and switched 24VAC to each terminal. Each relay has an LED, as well as a status LED for the 24VAC.

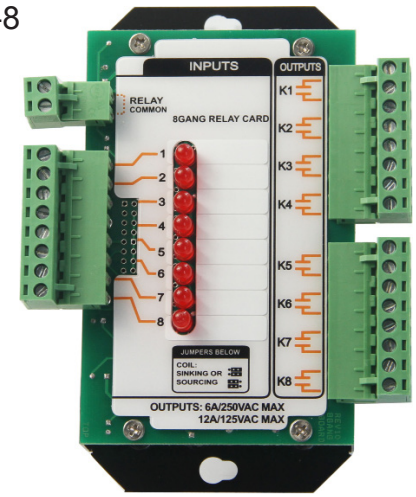
Features:

- Works with positive and negative ground systems.
- Jumpers can set each relay to two different operating
- Modes: common switched 24VAC or dry contact.
- UR approved
- Panel mount base, removable face plate
- LED for each low voltage relay

MRB-4



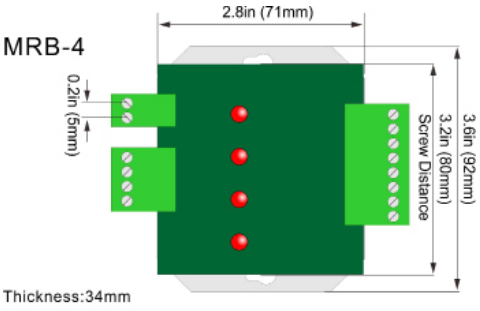
MRB-8



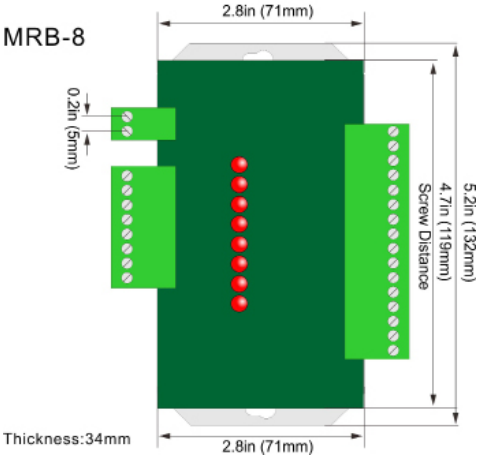
Specifications

CONTACT	
Initial Contact Resistance, (By Voltage Drop 60VDC 1A)	<100mOhm
Contact Material	Silver Cadmium Oxide
Switching Capacity	12A/125VAC, 6A/250VAC, 6A/28VDC
Relay	UL E169380
Operating Time(at nominal voltage)	< 10 ms
Release Time(at nominal voltage)	< 5 ms
Max Switching Power	1500VA/168W
Max Switching Voltage	250VAC/28VDC
COIL DATA	
Coil Voltage	24VAC
Coil Resistance	400ohm(+/-10%)
Nominal Operating Power	0.36W
CHARACTERISTICS	
Operating Temp. Range	-55 to 85°C
Operating Relative Humidity	0 to 93%
4 gang dimensions	92 x 100 x 34mm
8 gang dimensions	132 x 100 x 34mm

MRB-4



MRB-8

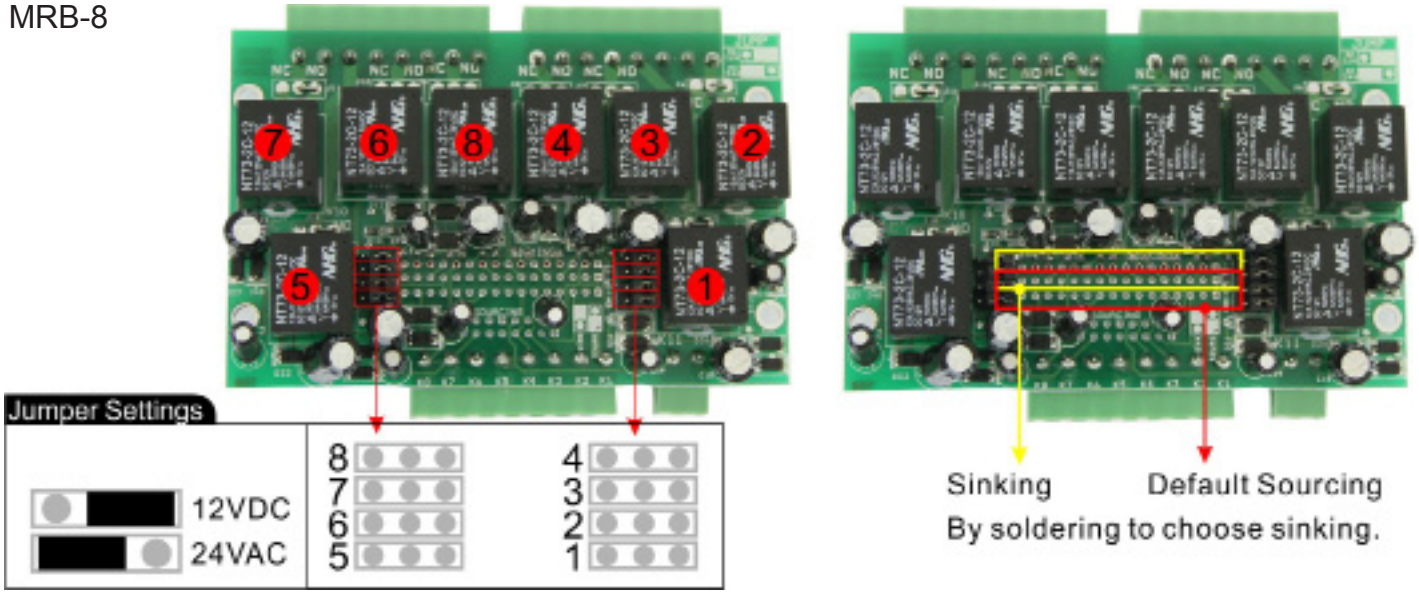


Jumper Settings

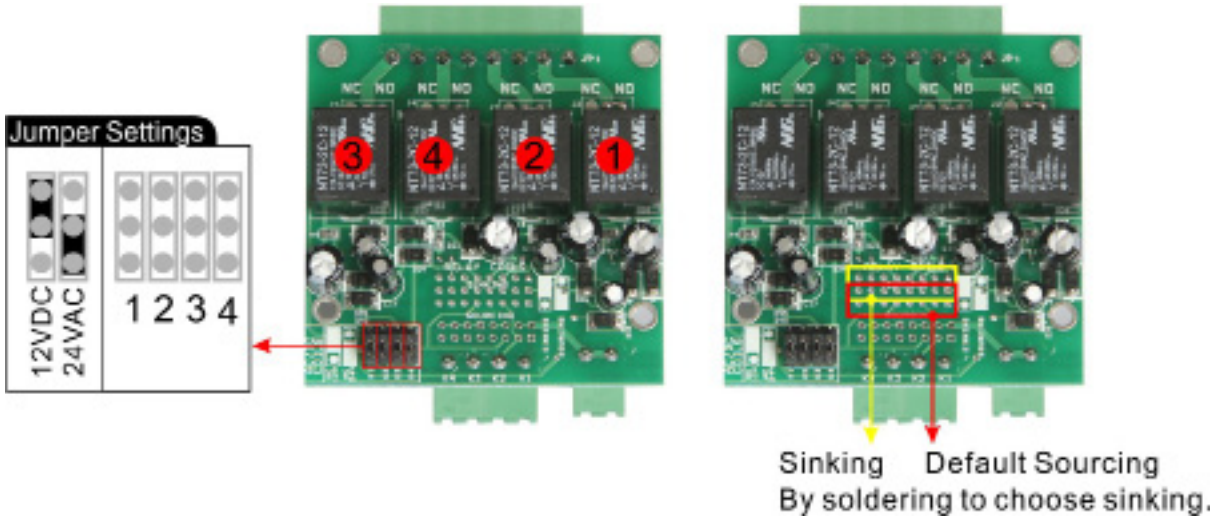
The MRB-8 has 8 relays and 8 jumpers. Each relay has its own jumper that can be configured as shown by the picture below. The default setting is 24VAC for the relay coils. By moving a jumper, the user can select 12VDC coils. When using 12VDC mode, the board can be operated in sourcing or sinking modes, sourcing mode is the default. If you would like to adjust the board to operate in sinking mode this can be done by soldering a jumper and cutting a trace, please review the schematic or contact us for assistance.

Notes about the sinking and sourcing jumpers:
1. The relays can be used with either sourcing or sinking DC sources for the coils, the default setting is sourcing.
2. When using the relays with 24vac coils, the jumpers must be left in their default sourcing setting.
3. The sourcing/sinking jumpers are not actually populated with jumpers since this 'sinking' feature will not be used by the vast majority of users. To use the sinking mode feature you will need to solder some jumper wires to the PCB, the feature is there for those that know how to read the schematic and do this on their own. If you know you need the sinking mode setup you can mention this during ordering and we will pre-configure for you.

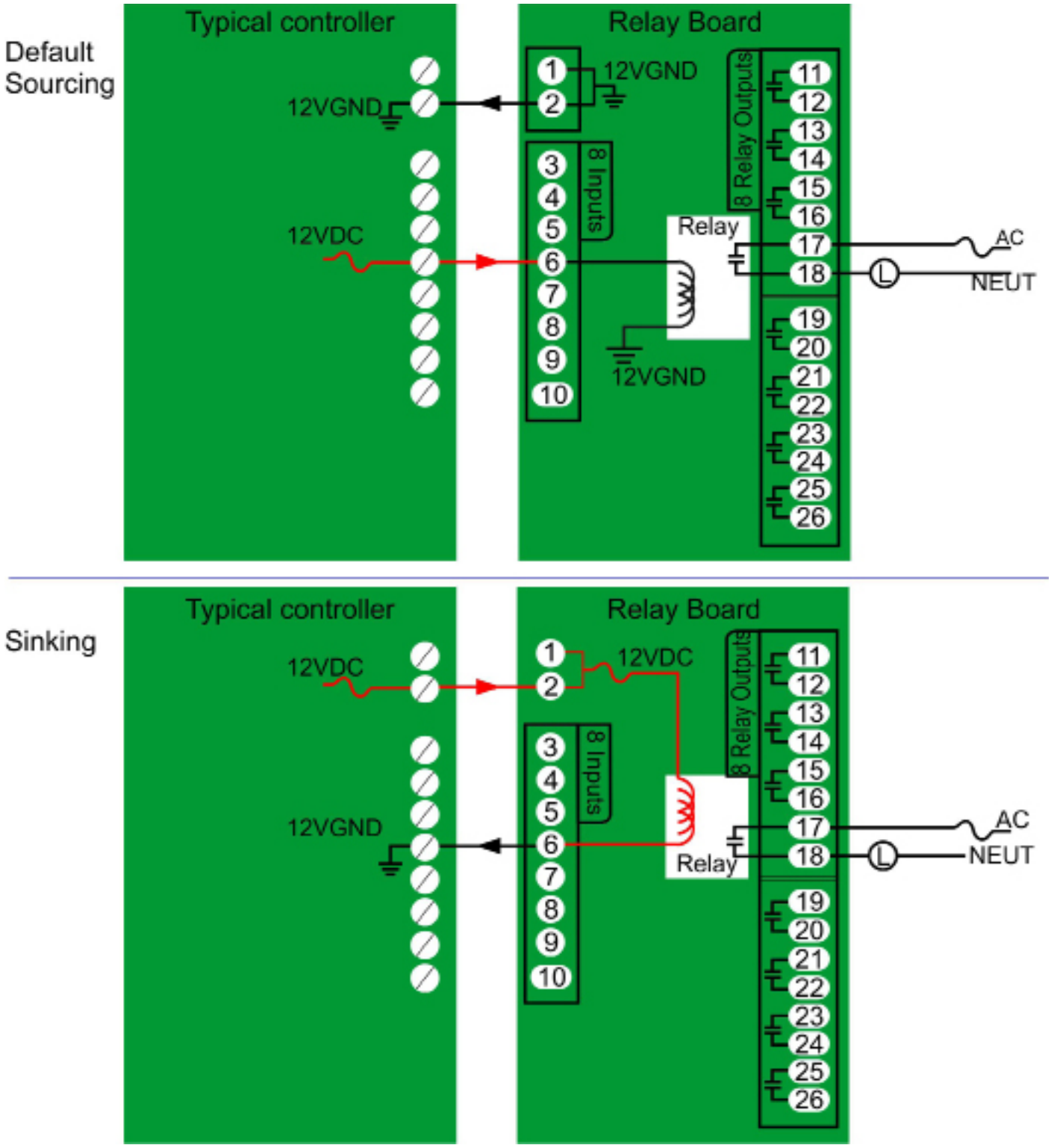
MRB-8



MRB-4

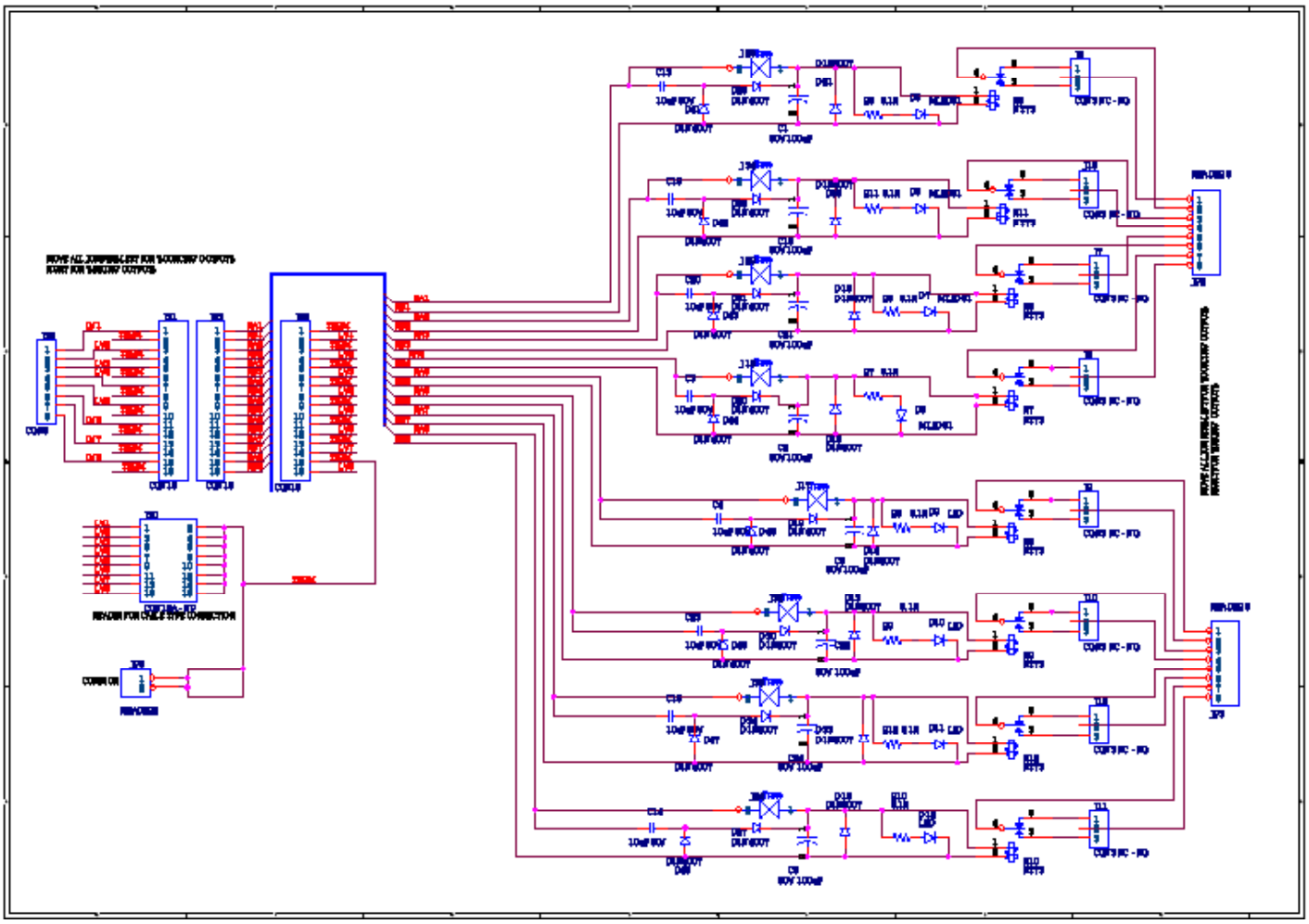


Sourcing and Sinking

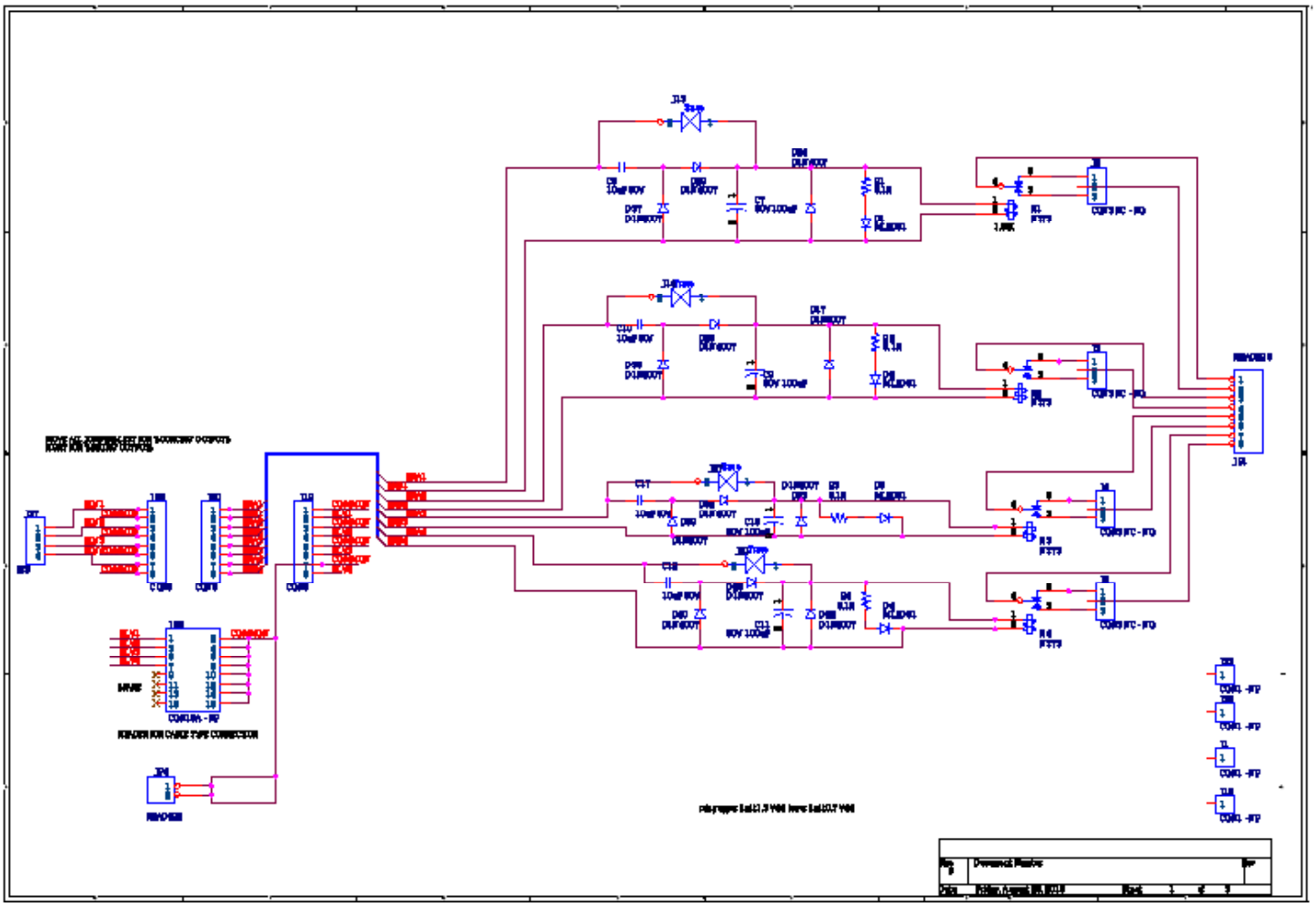


Schematic

MRB-8

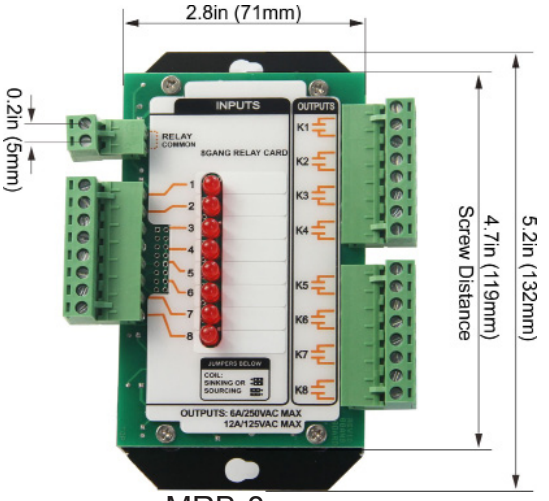


MRB-4

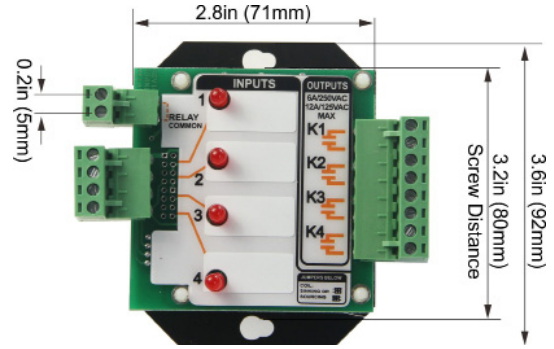


Getting Started

CONTACT	
Initial Contact Resistance, (By Voltage Drop 60VDC 1A)	<100mOhm
Contact Material	Silver Cadmium Oxide
Switching Capacity	12A/125VAC, 6A/250VAC, 6A/28VDC
Relay	UL E169380
Operating Time(at nominal voltage)	< 10 ms
Release Time(at nominal voltage)	< 5 ms
Max Switching Power	168W/1500VA
Max Switching Voltage	250VAC /28VDC
COIL DATA	
Coil Voltage	12VDC
Coil Resistance	400ohm(+/-10%)
Nominal Operating Power	0.36W
CHARACTERISTICS	
Operating Temp. Range	-55 to 85°C
Operating Relative Humidity	0 to 93%
4 gang dimensions	92 x 100 x 34mm
8 gang dimensions	132 x 100 x 34mm



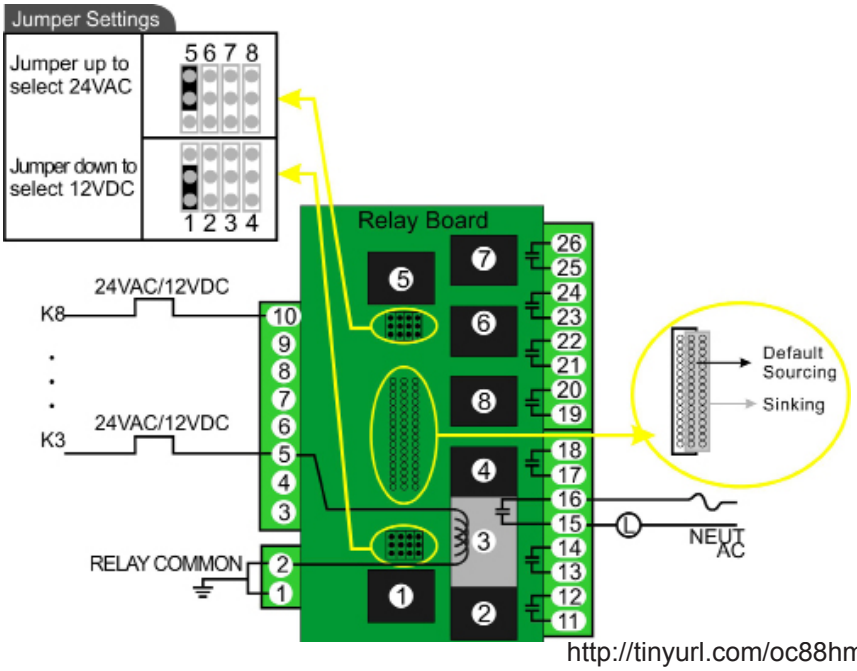
MRB-8



MRB-4

Jumper Settings

The MRB-8 has 8 relays and 8 jumpers. Each relay has its own jumper that can be configured as shown by the picture below. The default setting is 24VAC for the relay coils. By moving a jumper, the user can select 12VDC coils. When using 12VDC mode, the board can be operated in sourcing or sinking modes, sourcing mode is the default.



Notes about the sinking and sourcing jumpers:
1. The relays can be used with either sourcing or sinking DC sources for the coils, the default setting is sourcing.
2. When using the relays with 24vac coils, the jumpers must be left in their default sourcing setting.
3. The sourcing/sinking jumpers are not actually populated with jumpers since this 'sinking' feature will not be used by the vast majority of users. To use the sinking mode feature you will need to solder some jumper wires to the PCB, the feature is there for those that know how to read the schematic and do this on their own. If you know you need the sinking mode setup you can mention this during ordering and we will preconfigure for you.

http://tinyurl.com/oc88hm6

RB-XF Series Relay Board

Descriptions

The Relay Board comes in two versions, one with transformer and one without. The board features an area to put your own label. The coils are very low power, requiring less than 30ma at 24VAC. The SPST relay is rated at 12A/125VAC, 6A/250VAC. Each relay has an status LED. The relay board is designed mainly for isolation between thermostat and a fan coil or air handler, 3 relays @ 12A/125VAC, 6A/250VAC, 2 @110V 1A. There is a 24V/18VA transformer on RB-XF.

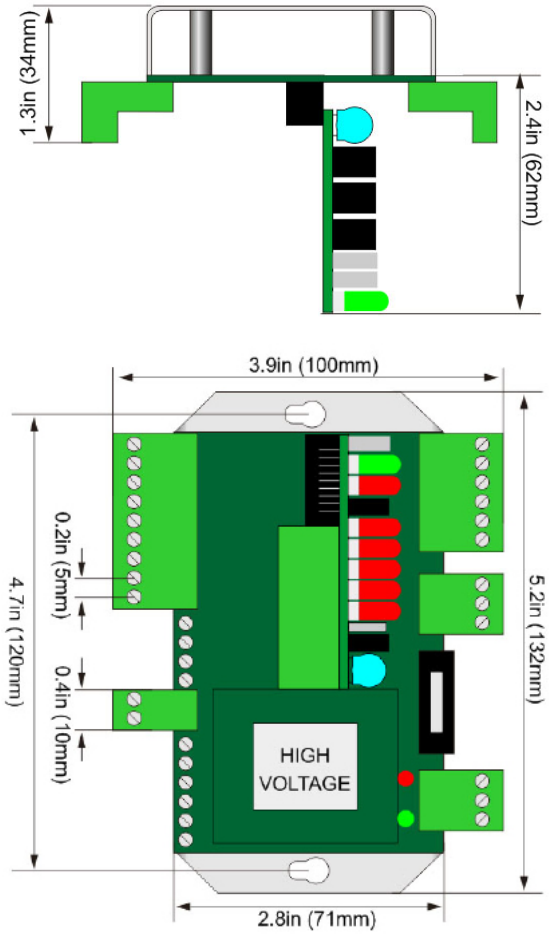



RB-XF-PB

Features:
- Control Modes: 24VAC 30ma coil or dry contact.
- Panel mount base, removable face plate
- LED for each low voltage relay

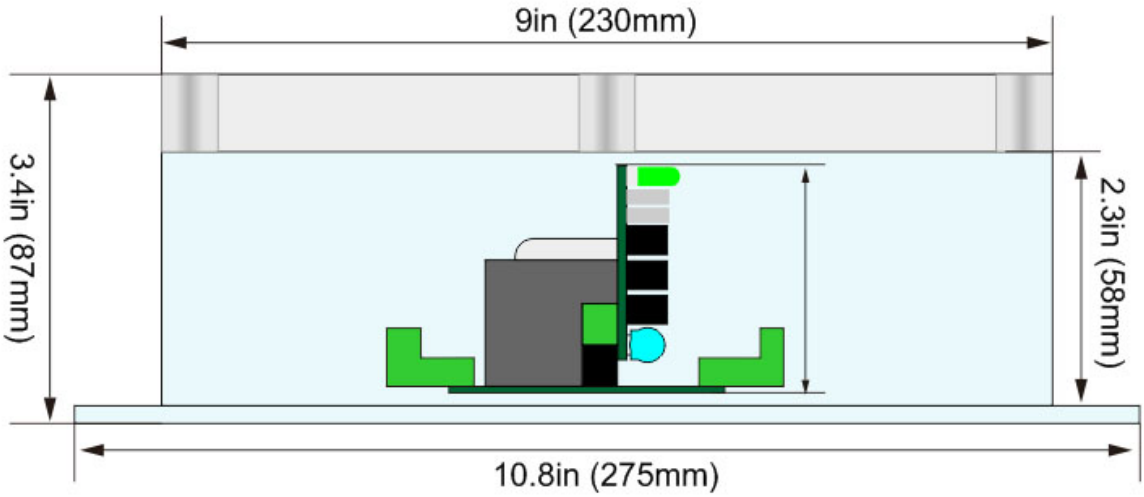
Specifications

CONTACT	
Initial Contact Resistance (By Voltage Drop 60VDC 1A)	<100mOhm
Contact Material	Silver Cadmium Oxide
Switching Capacity	12A/125VAC, 6A/250VAC, 6A/28VDC
Relay UL File	UL E169380
Operate Time(at nominal voltage)	< 10 ms
Release Time(at nominal voltage)	< 5 ms
Max Switching Power	1500VA/168W
Max Switching Voltage	250VAC/28VDC
COIL DATA	
Coil Voltage	24VAC
Coil Resistance	400ohm(+/-10%)
Coil Power Consumption	0.36W
Nominal Operating Power	less than 30 ma
CHARACTERISTICS	
Operating Temp. Range	-55 to 85°C
Operating Relative Humidity	0 to 93%
RB dimensions	132 x 100 x 62mm
RB-XF dimensions	132 x 100 x 62mm
RB-XF-PB dimensions	132 x 100 x 62mm



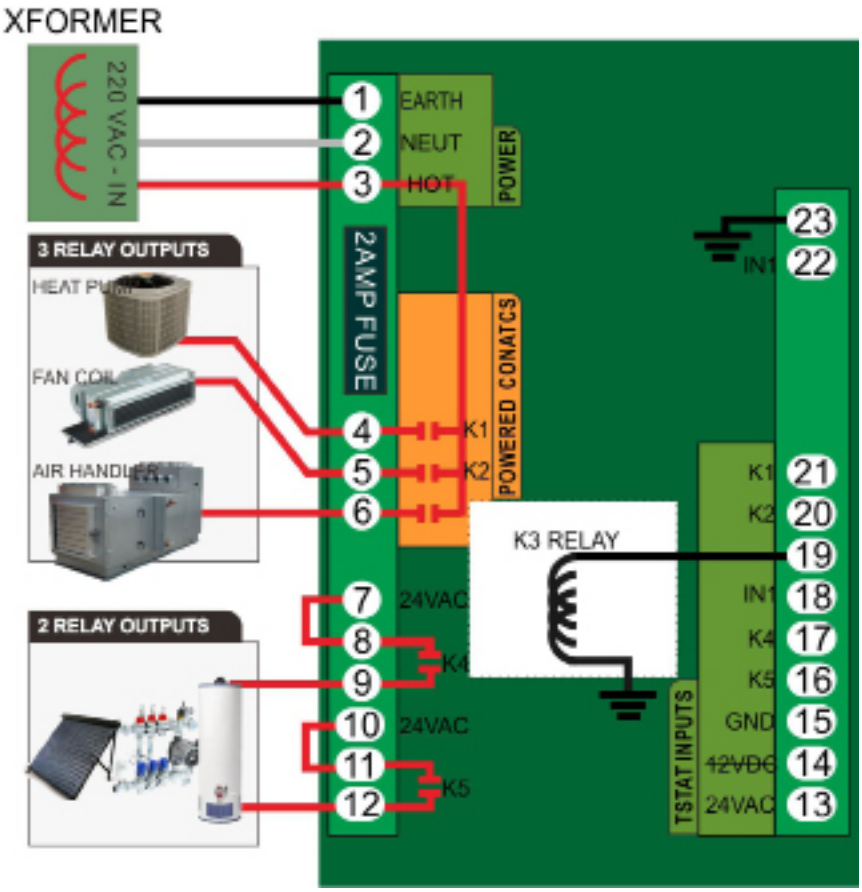
RB & RB-XF

Humidity / Temp Transmitter & Modbus

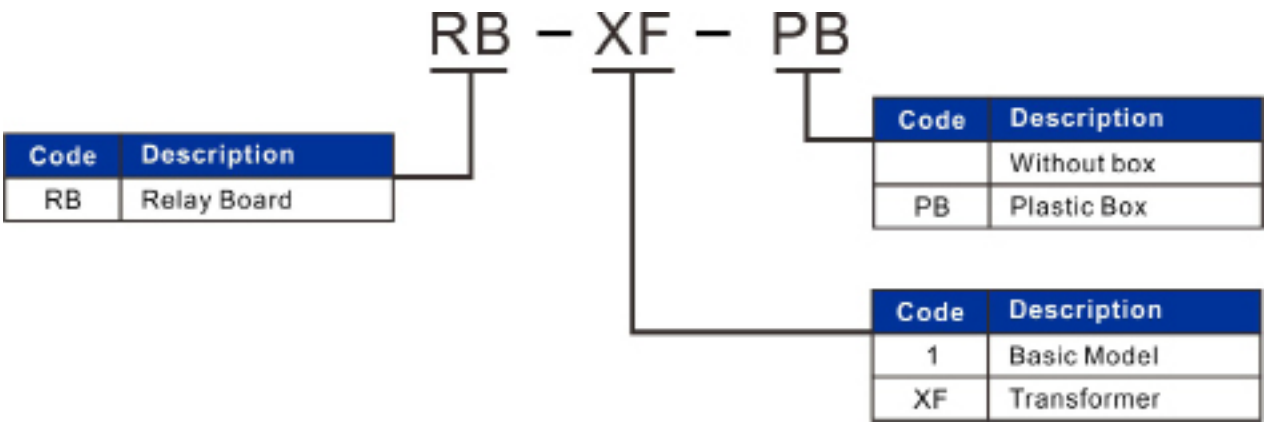


Wiring Diagram

Relay Board-24VAC
Typical Wiring Diagram



Part Number Scheme



Damper Actuator

Description

The Actuator is intended for On/Off and floating point controls in HVAC systems. It can easily mount on an 1/2” round or square shaft with solid screw sets. On/off type damper actuator uses bi-directional magnetic clutch synchronous motor. It has overload protection function, and does not need limitator switch. The actuator will stop automatically, because the motor is clutched when it is operating to the end.

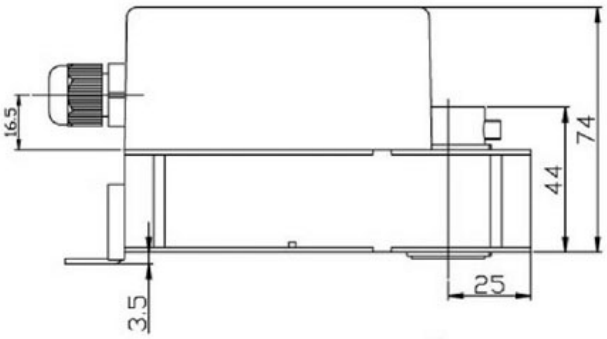


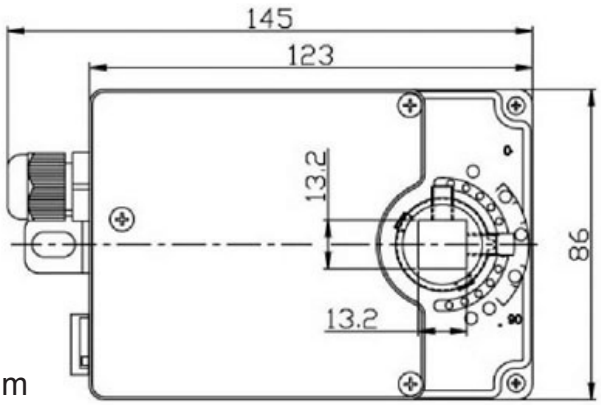
Highlights:

- Simple Direct Mounting
- Stall-Proof Synchronous AC Motor
- Adjustable Angle of Rotation with Mech. Stops
- Consistent running time
- Visual Position Indicator
- Optional overtime protection for longer motor life.

Specification

Supply	24Vac ±20%, 50-60Hz
Power consumption	2.5W
Recommended Wire Sizing	3V
Control	ON-OFF/ Floating point
Angle	90º < Mechanical limitation ≤ 95º
Torque	8Nm
Operating time (50Hz, 90°)	156s
Manual Override	external lever
Temperature:Ambient	-30 ° C to +50° C
Storage	-40° C to +80° C
Humidity	5 to 95% RH
Position indication	mechanical
Useful life	>60000 cycles





Unit: mm

Part Number Scheme

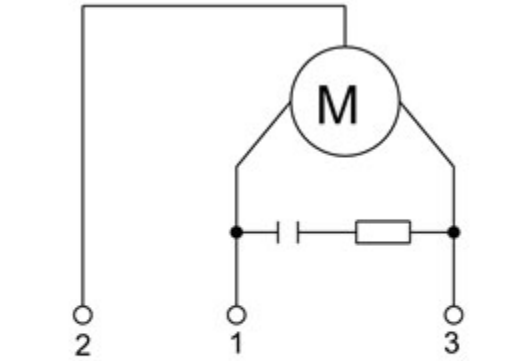
DM - 8 - FL

Code	Description
DM	Damper Motor

Code	Module
FL	Floating control/On off type

Code	Description
8	8 Newton-meters

Wiring Diagram



POWER SUPPLY	ROTATE DIRECTION
1-2	↺
3-2	↻

Mounting Installation

1 - Make sure Damper blade is at its fully closed position.

2 - From the bottom view, with the manual override lever pushed to the right.
Rotate actuator angle close to zero, depending on damper seal design.

3 - With Actuator angle set at almost zero, slide in actuator over shaft.

4 - Install bottom screw and thighten hex solid set screws

Note:
- The actuator should be mounted in a non corrosive area or sealed against unwanted agents.

