

Humidity / Temp Transmitter With Waterproof Connector

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.

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-C1 is same as HUM-W1 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.

Specifications

General	
Power	15 to 24V AC or DC, $\pm 10\%$
Current Output Load	< 500 Ω
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
Filter	Sintered Stainless steel, 60um pore size
Relative humidity accuracy	up to $\pm 1.5\%$ RH
Temperature accuracy	up to $\pm 0.1\text{ }^{\circ}\text{C}$
Supply voltage	1.08 V ... 3.6 V
Average current	0.4 μA (at meas. rate 1 Hz)
Idle current	80 nA
Operating range	0...100 %RH, -40...125 $^{\circ}\text{C}$



HUM-D1



HUM-W1



HUM-C1

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Relative Humidity

Parameter	Conditions	Value	Units
RH accuracy	typ	± 1.8	%RH
	max.	See Figure 3	-
Repeatability	high	0.08	%RH
	medium	0.15	%RH
	low	0.25	%RH
Resolution	-	0.01	%RH
Hysteresis	-	± 1	%RH
Specified range	extended	0 to 100	%RH
Response time	t63%	6	s
Long-term drift	typ	<0.25	%RH/y

Temperature

Parameter	Conditions	Value	Units
T Accuracy	typ	± 0.2	$^{\circ}\text{C}$
	max.	See Figure 7	-
Repeatability	high	0.04	$^{\circ}\text{C}$
	medium	0.07	$^{\circ}\text{C}$
	low	0.1	$^{\circ}\text{C}$
Resolution	-	0.01	$^{\circ}\text{C}$
Specified range	-	-40 to +125	$^{\circ}\text{C}$
Response time	t63%	2	s
Long-term drift	typ	<0.03	$^{\circ}\text{C}/\text{y}$

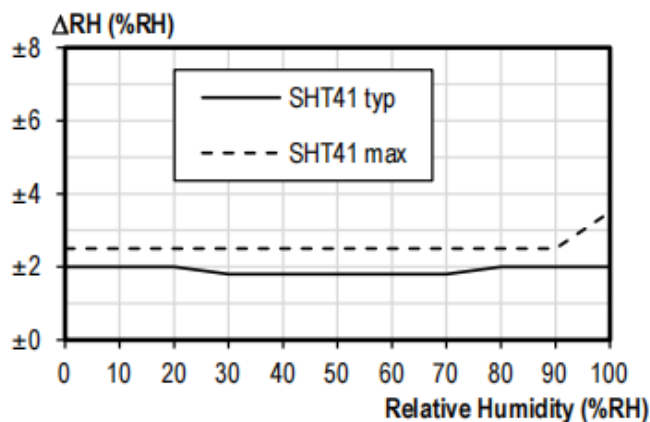


Figure 3: SHT41 typical and maximal relative humidity accuracy at 25 °C.

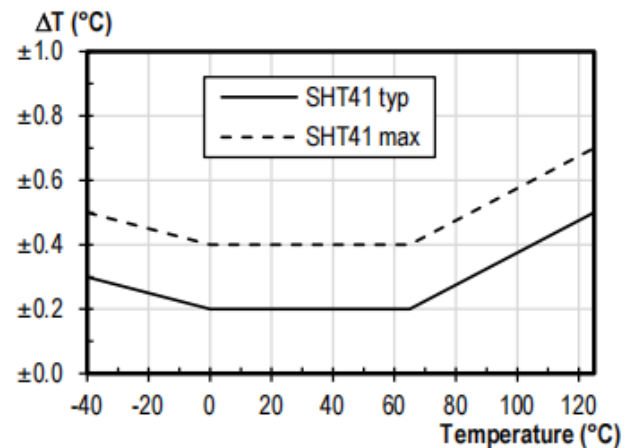


Figure 7: SHT41 typical and maximal temperature accuracy.

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A typical application circuit for SHT4x is shown on the left-hand side of Figure 1. After reaching the minimal supply voltage and allowing for the maximal power-up time of 1 ms the sensor is ready for I2C communication. The quickest way to measure humidity and temperature is pseudo-coded on the right-hand side of Figure 1. Together with the conversion formulae given in equations (1), (2), and (3), the digital signals can be translated into relative humidity and temperature readings.

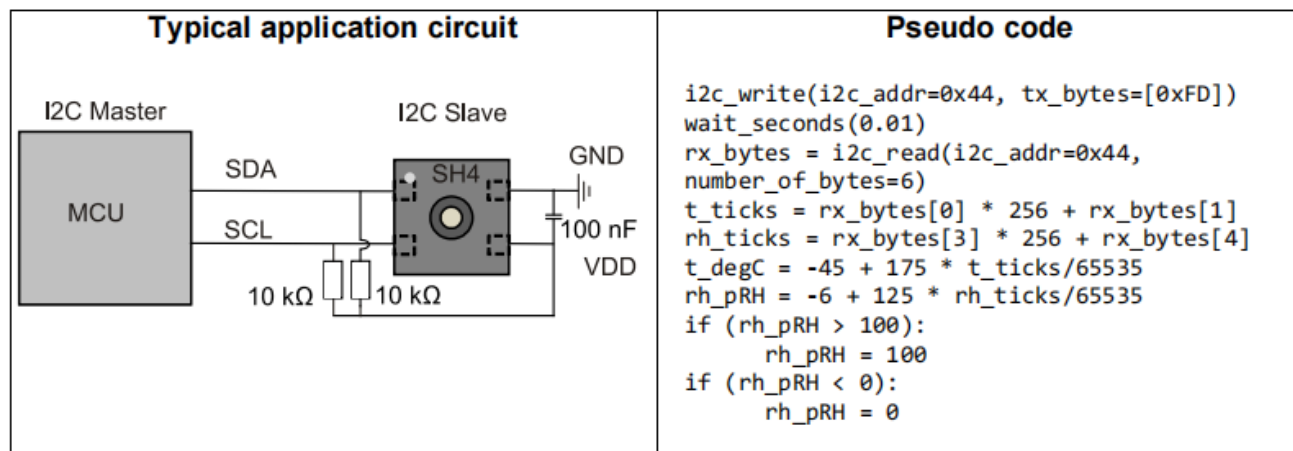


Figure 1: Typical application circuit (left) and pseudo code (right) for easy starting.

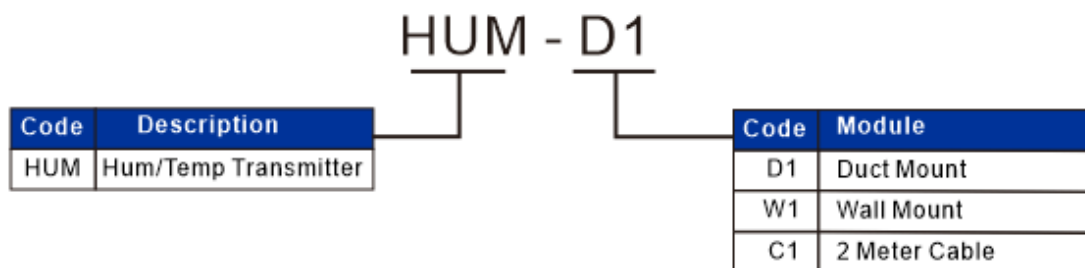
Note:

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



Humidity / Temp Transmitter with Waterproof Connector

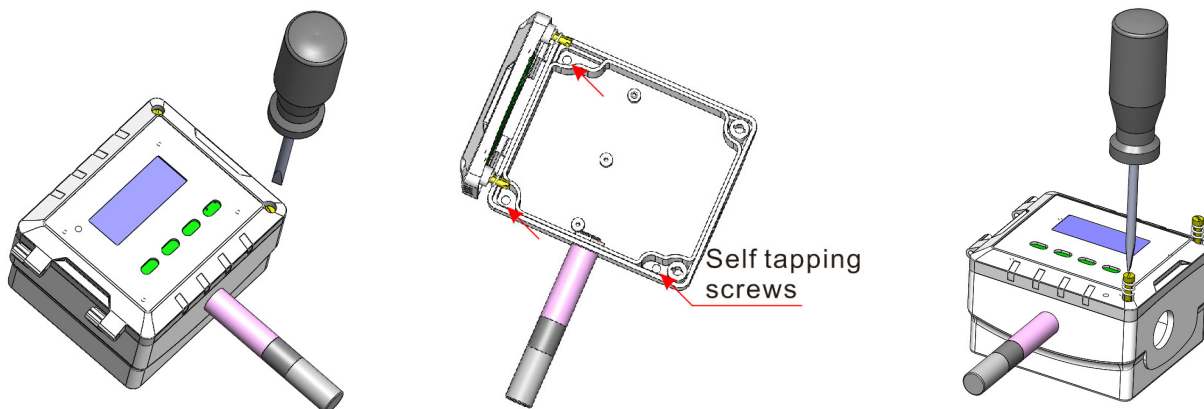
Dimensions



Installation Mounting

HUM-D1 & HUM-W1

- 1) Unfasten the slotted screw on the enclosure. Turn the slotted screw $\frac{1}{2}$ 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.



Humidity / Temp Transmitter with Waterproof Connector

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 register 304
482	Dew point in unit C
490	Enthalpy of the air, [kJ/kg]
538	Light sensor value. The resolution is 0.1 lux;
...	

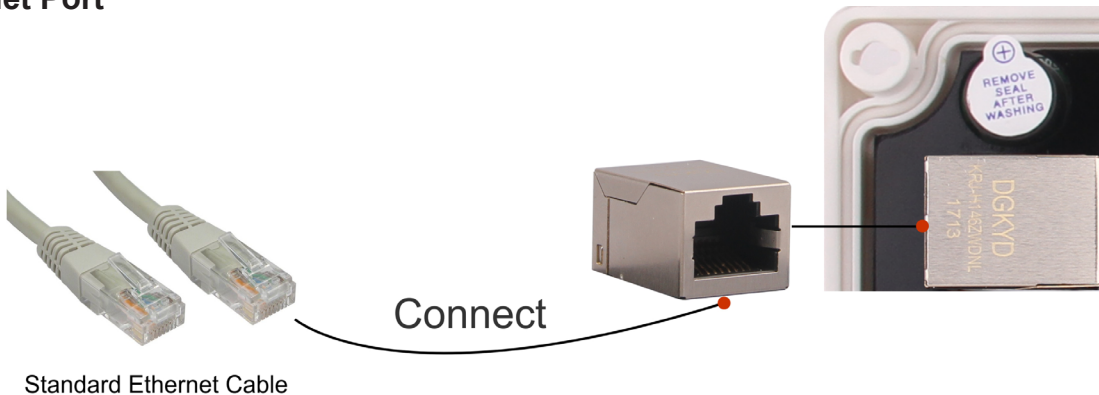
Bacnet

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 download an excel spreadsheet (03ModbusBacnetRegisterList.xls) at the following link: <http://tinyurl.com/ybaj9d3u>

Structure Graphic



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-D1 & HUM-W1

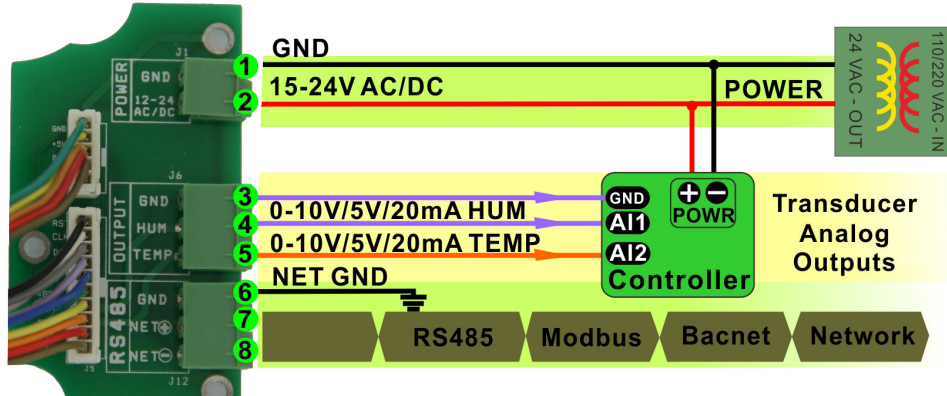


Humidity / Temp Transmitter with Waterproof Connector

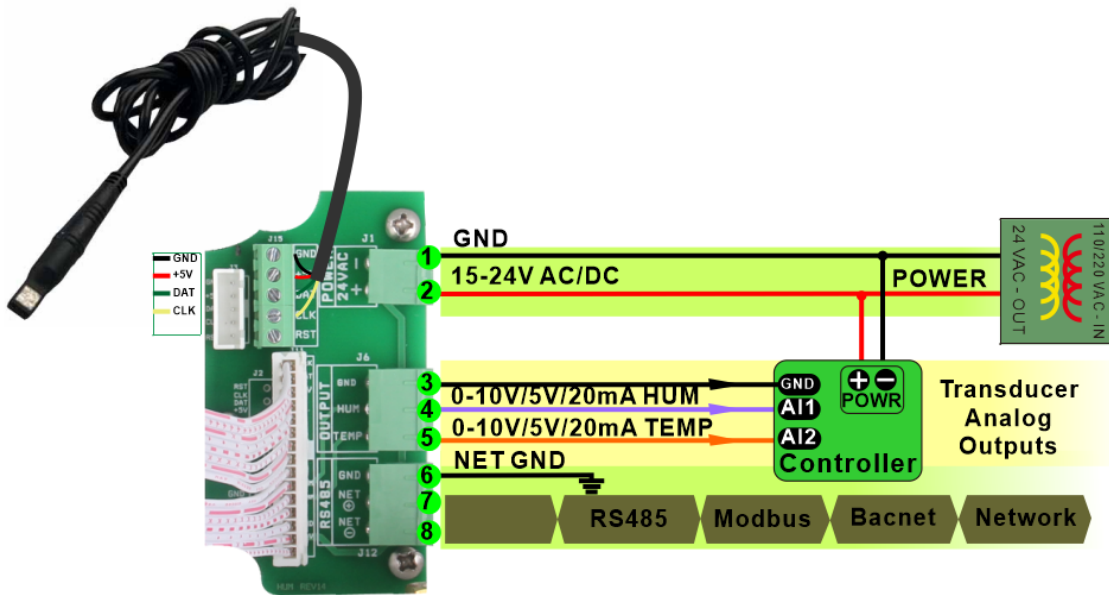
Wiring Diagram

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-D1 & HUM-W1Rev 26

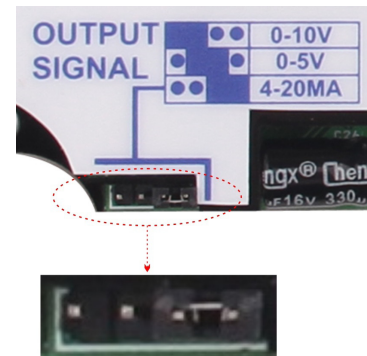


HUM-C1



Output Jumper Settings

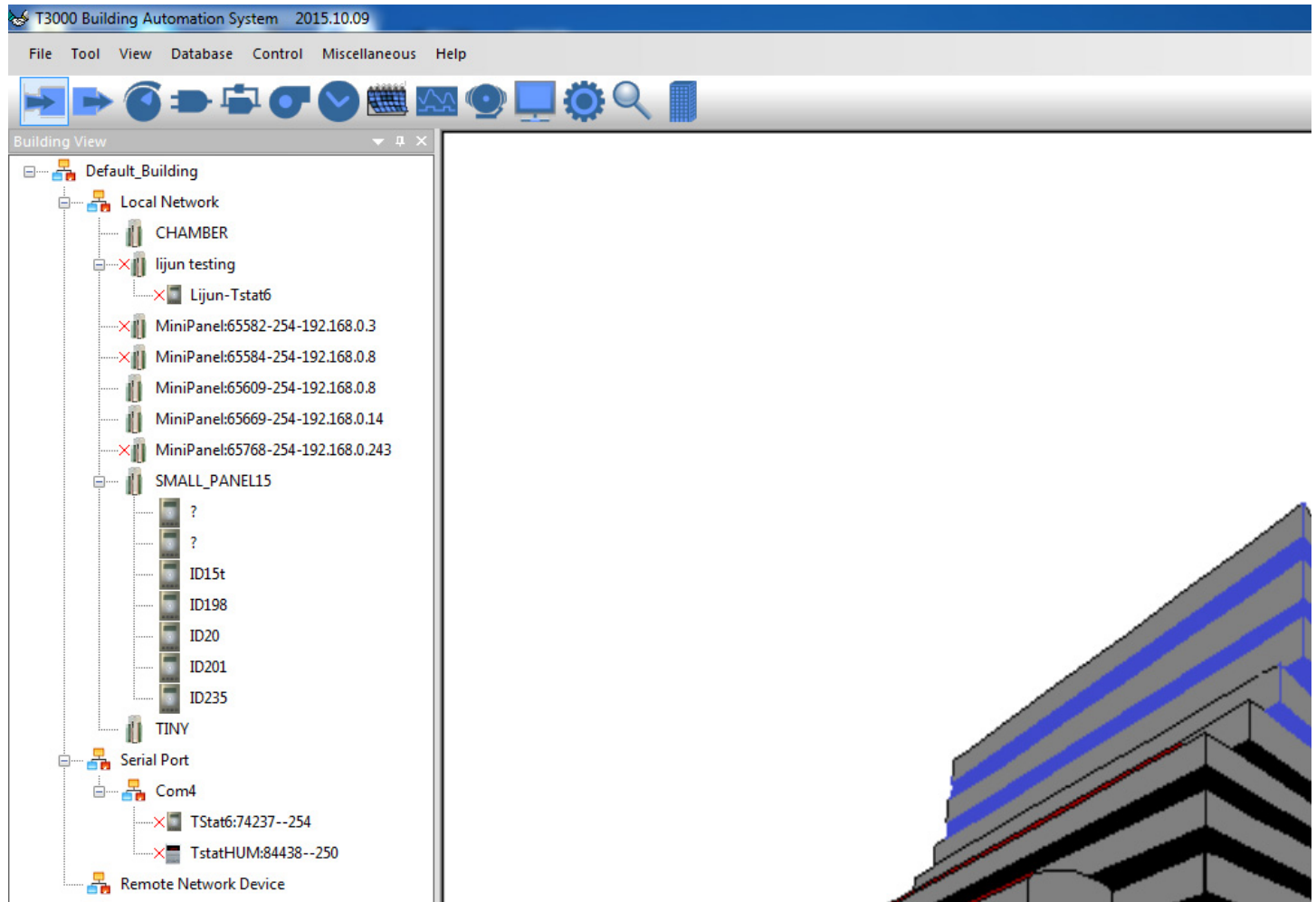
In this mode the device acts as a traditional transducer where it sends out three analog signals, all you need to do is to set this one single jumper to the appropriate signal type: 4-20mA, 0-10V, or 0-5V.



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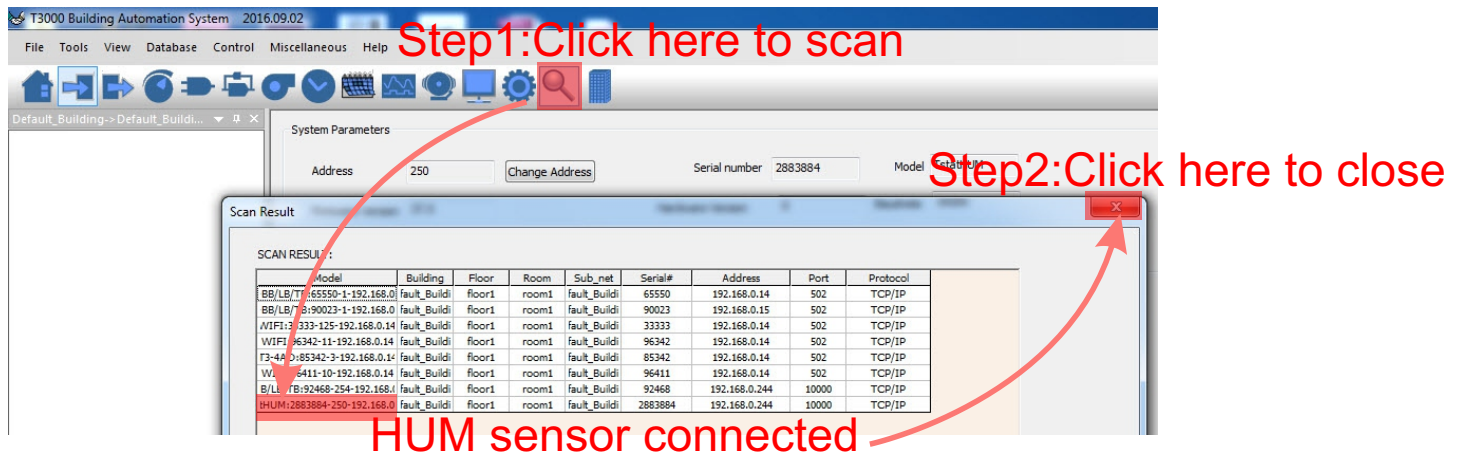
T3000 Operation

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



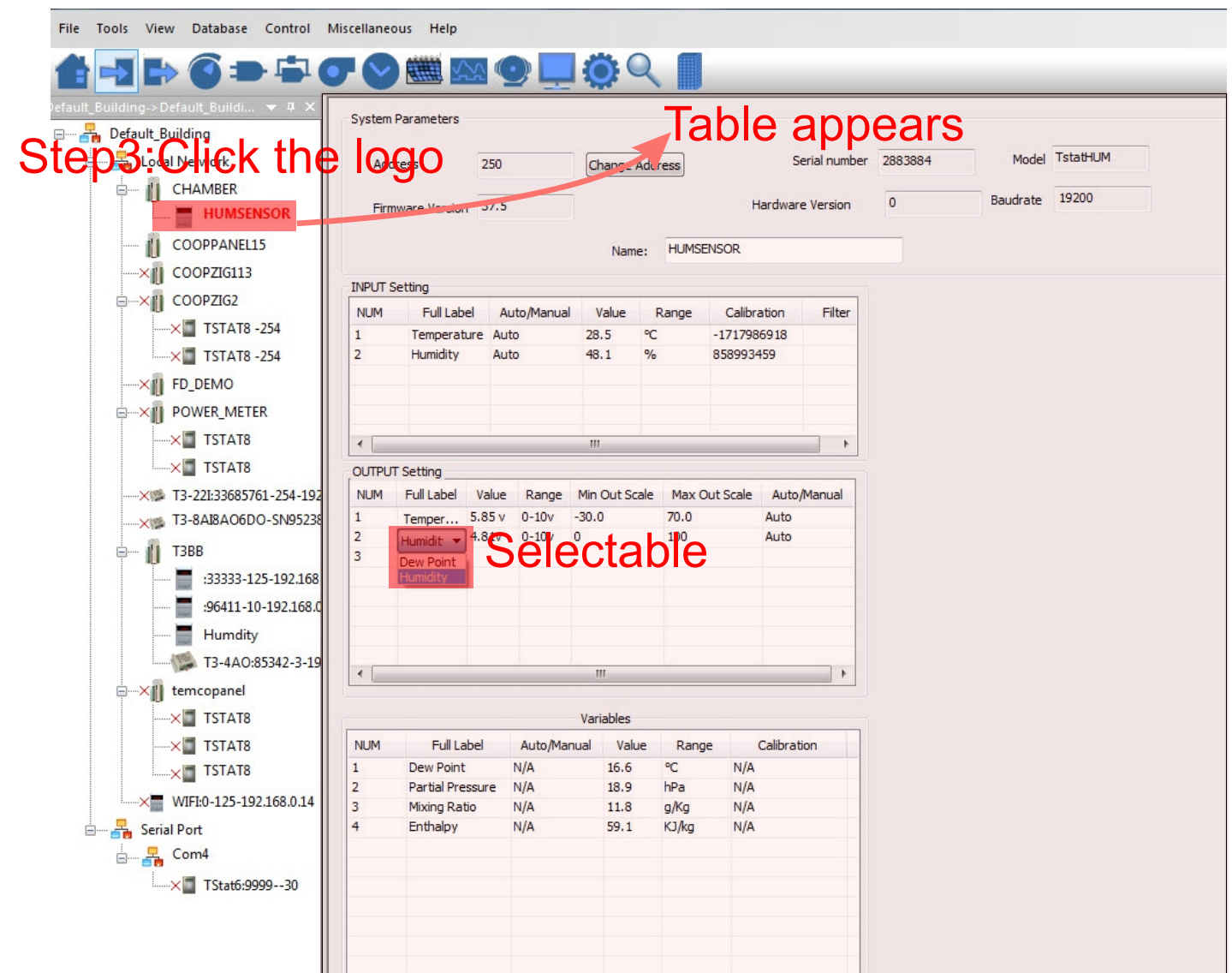
Humidity / Temp Transmitter with Waterproof Connector

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.



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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:

System Parameters

Address: 250 Serial number: 2883884 Model: HUM Sensor
Firmware Version: 37.5 Hardware Version: 0 Baudrate: 19200
Name: HUMSENSOR

INPUT Setting

NUM	Full Label	Auto/Manual	Value	Range	Calibration	Filter
1	Temperature	Auto	30.3	°C	2.2	0
2	Humidity	Auto	81.2	%	0.0	0

OUTPUT Setting

NUM	Full Label	Value	Range	Min Out Scale	Max Out Scale	Auto/Manual
1	Temper...	6.03 v	0-10v	-30.0	70.0	Auto
2	Humidity	8.12v	0-10v	0	100	Auto
3						

Variables

NUM	Full Label	Auto/Manual	Value	Range	Calibration
1	Dew Point	N/A	26.7	°C	N/A
2	Partial Pressure	N/A	35.0	hPa	N/A
3	Mixing Ratio	N/A	22.2	g/Kg	N/A
4	Enthalpy	N/A	87.6	KJ/kg	N/A

Click here to change value (points to the Value column in the INPUT Setting table)

Click here to change Calibration (points to the Calibration column in the INPUT Setting table)

Scroll this to right to show table below (points to the scroll bar at the bottom of the Variables table)

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T3000 calibration

The screenshot shows the T3000 calibration software interface. The top left pane displays a network tree with 'Default_Building' selected. The main area contains fields for 'Serial number' (2883884), 'Model' (HUM Sensor), 'Hardware Version' (0), and 'Baudrate' (19200). A 'Calibration Table' button is highlighted with a red box and the text 'Click here'. Below this is a table with columns 'Range', 'Calibration', and 'Filter'. The 'Range' column has values '°C' and '%'. The 'Calibration' column has values '2.2' and '0.0'. The 'Filter' column has values '0' and '0'. A 'Factory Reset' button is on the right. The bottom pane is titled 'Graphic Mode' and contains a graph of Humidity (%) vs Frequency/Hz. The graph shows a linear relationship with data points at approximately (8850, 425), (8900, 485), (9000, 570), (9100, 655), and (9250, 765). The 'User Table' is selected, showing a table with columns 'NUM', 'Frequency', and 'Humidity(%)'. The 'Factory Table' is also visible, showing a table with columns 'NUM', 'Frequency', and 'Humidity(%)'. Red arrows point to the 'User Table' and 'Factory Table' buttons with the text 'Click here to choose User Table' and 'Click here to choose Factory Table' respectively. Another red arrow points to the 'Add' button with the text 'Click here to add NUM'. A red box around the graph area is labeled 'Show a table'.

Click here

Click here to choose User Table

Click here to add NUM

Click here to choose Factory Table

Show a table

NUM	Frequency	Humidity(%)
1	0	0.0

NUM	Frequency	Humidity(%)
1	8853	42.5
2	8910	48.5
3	9007	57.2
4	9132	66.0
5	9268	76.8

Graphic Mode

Humidity/%

Frequency/Hz

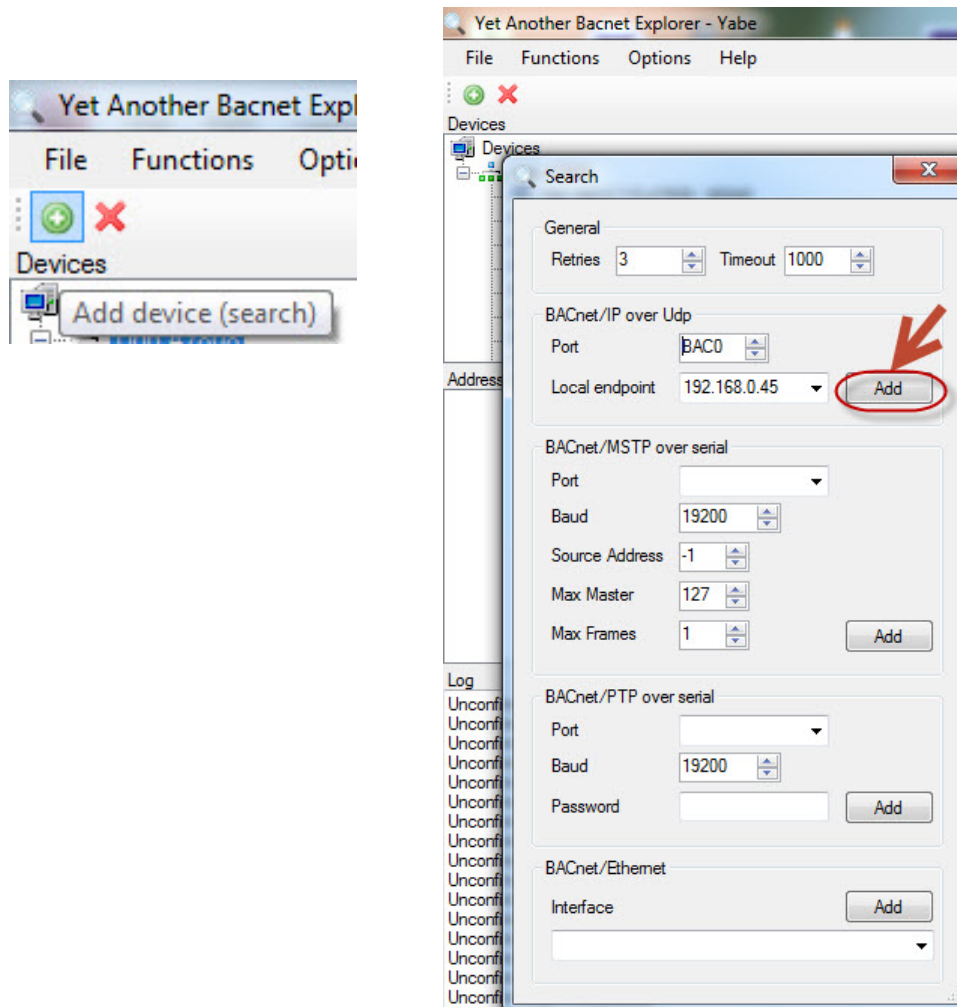
Humidity / Temp Transmitter with Waterproof Connector

Connecting to the device using Bacnet

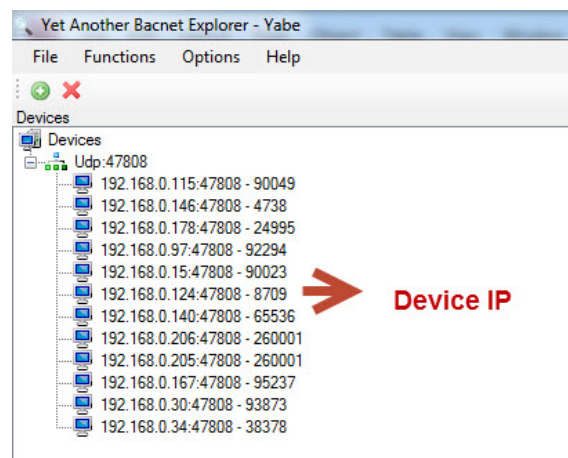
The device can be connected using Bacnet. Below are the steps:

Step 1. Download Yabe software as the link: <https://tinyurl.com/ycrt9jep> and install it.

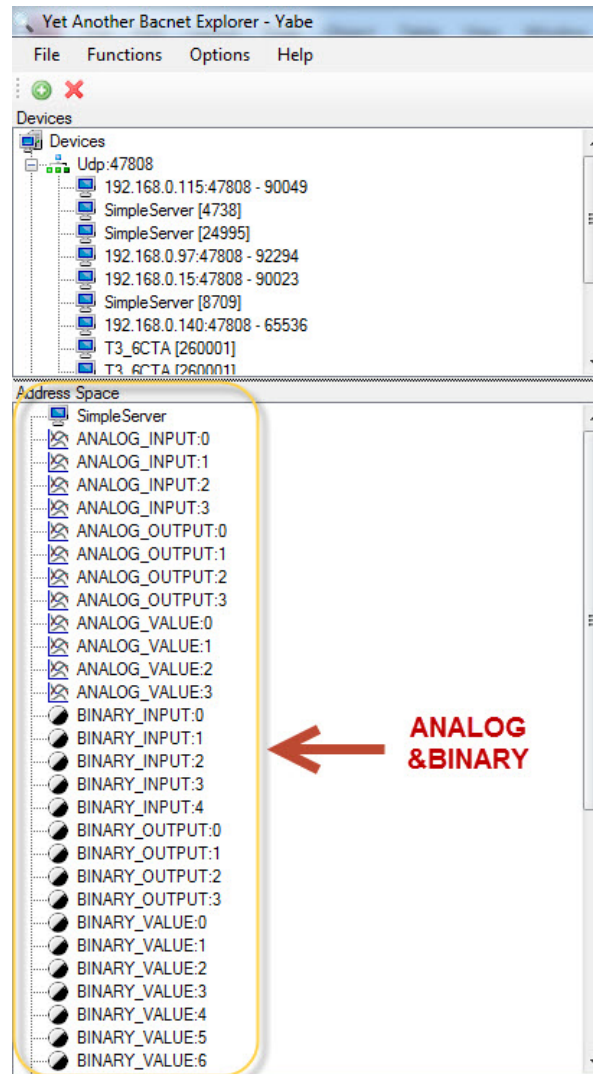
Step 2. Connect the device to the computer, select Bacnet protocol. Start the Yabe software, add the device.



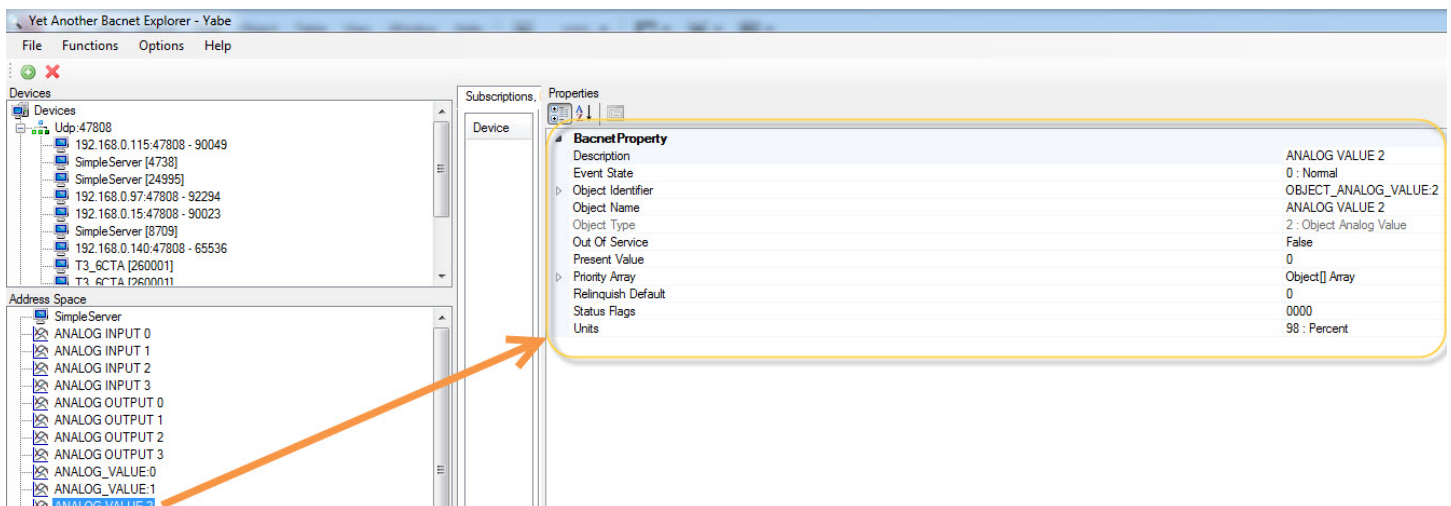
Step 3. You can find your device IP as below. Double click the left mouse button, you can find your device and the bacnet information in the "Address Space" tab.



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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 / Temp Transmitter with Waterproof Connector

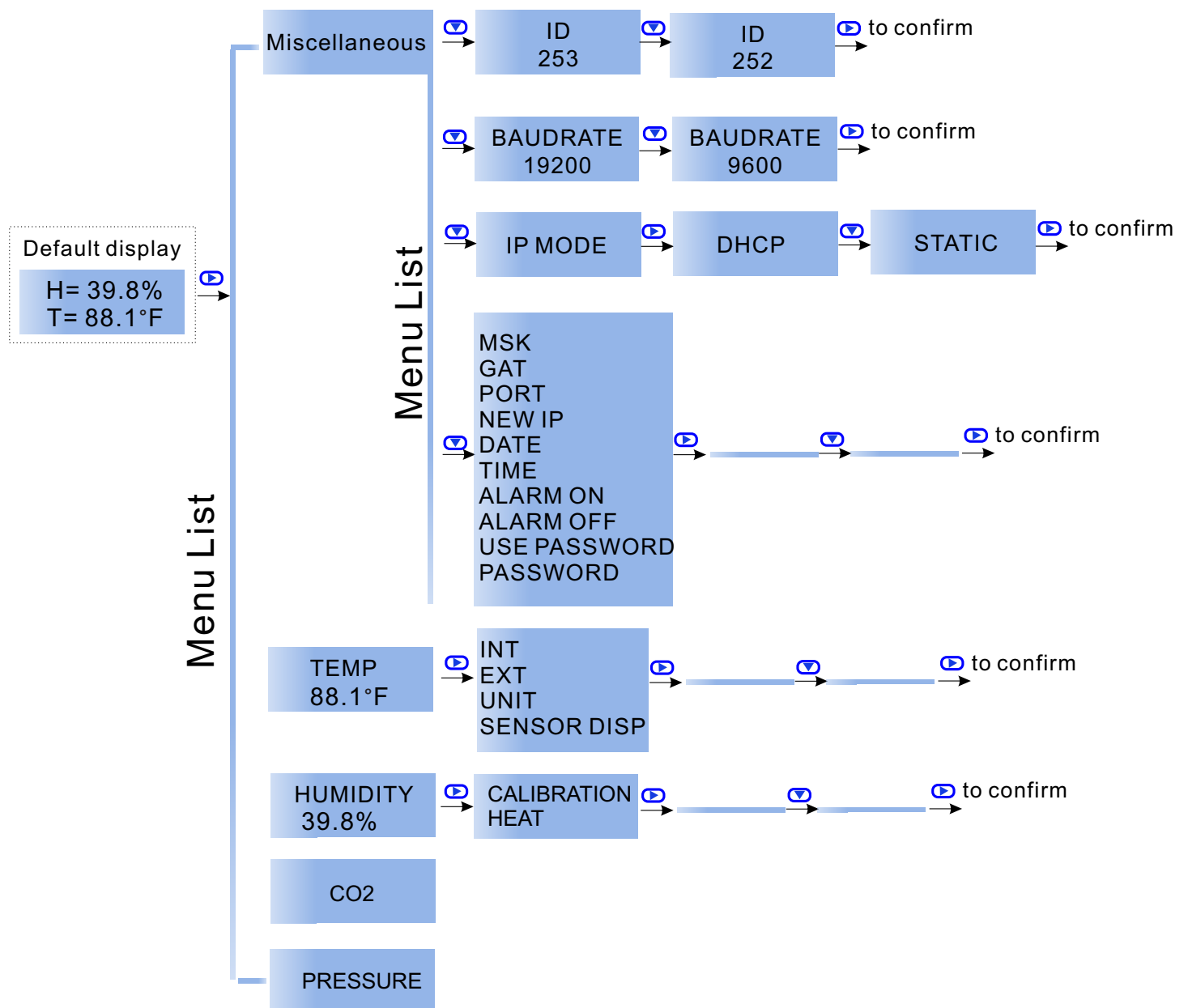
Voltage & Current Formula for HUM-D1/W1(Hardware=Rev9~12)	
0-10V output	Temperature (C) = (Voltage * 100 - offset) / 10
	Temperature (F) = (DegC) * 9 / 5 + 32
	Humidity = Voltage / 10
0-5V output	Temperature (C) = (Voltage * 100 - offset) / 20
	Temperature (F) = (DegC) * 9 / 5 + 32
	Humidity = Voltage / 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-D1/W 1(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	

Humidity / Temp Transmitter with Waterproof Connector

Hardware=Rev22+

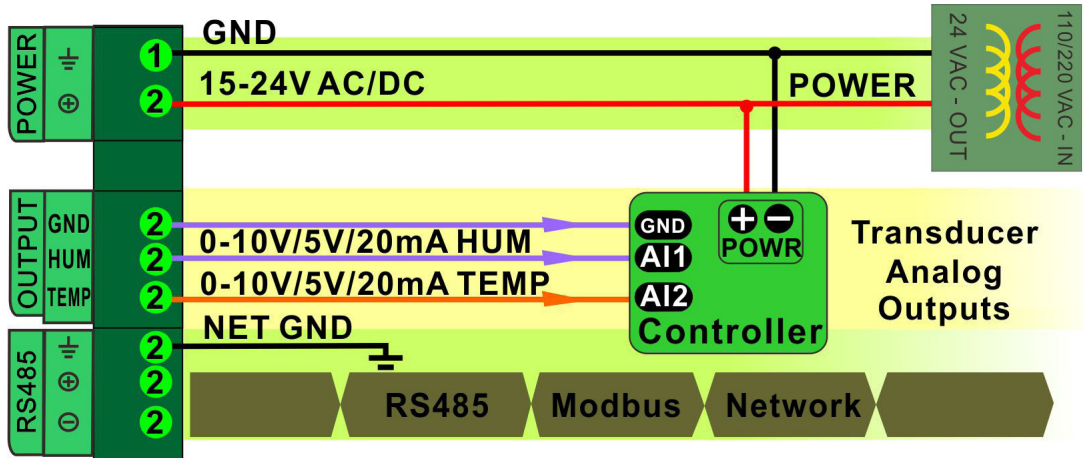


Getting Started

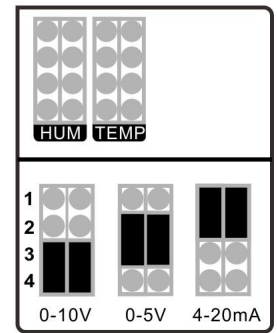
HUM-W1

External Inputs

HUM-W1 Rev 12 Wiring Diagram



Jumper Settings



Advanced Menu Item Instructions

a. Normal state

H= 42.2%
T= 62.7F

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.

ID
254

BAUDRATE
19200

UNITS
- F -

Humidity / Temp Transmitter with Waterproof Connector

Modbus Register List of HUM-D1/W1/C1

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 to 56	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

Humidity / Temp Transmitter with Waterproof Connector

Modbus Register List of HUM-D1/W1/C1

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 :temperature 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 6th 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

Humidity / Temp Transmitter with Waterproof Connector

Modbus Register List of HUM-D1/W1/C1

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

Humidity / Temp Transmitter with Waterproof Connector

Bacnet Register List of HUM-D1/W1/C1

Humidity Sensor uses BACNET protocol to communicate with others. Below table is for HUM-D/HUM-W1/HUM-C1

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	

Humidity / Temp Transmitter with Waterproof Connector

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

Note: HUM-W adjustable baud rate from around 9600 baud on up to 115200 baud. No parity, 8 bits, no stop bit (N81)

The image shows a 'Connection Setup' dialog box with the following sections:

- Connection:** A dropdown menu set to 'Serial Port'.
- Serial Settings:**
 - Communications Port (COM2) (dropdown)
 - 9600 Baud (dropdown)
 - 8 Data bits (dropdown)
 - None Parity (dropdown)
 - 1 Stop Bit (dropdown)
 - An 'Advanced...' button.
- Mode:** Radio buttons for 'RTU' (selected) and 'ASCII'.
- Response Timeout:** A text box with '1000' and '[ms]'.
- Delay Between Polls:** A text box with '1000' and '[ms]'.
- Remote Server:**
 - IP Address: A dropdown menu showing '127.0.0.1'.
 - Port: A text box with '502'.
 - Connect Timeout: A text box with '3000' and '[ms]'.

Buttons for 'OK' and 'Cancel' are located in the top right corner.