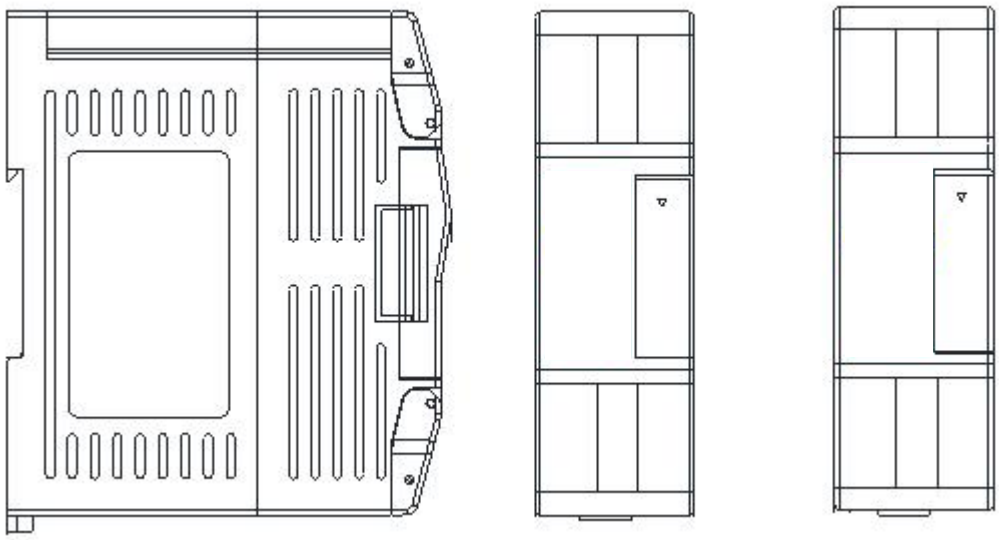
HNC PLC User Manual

Classic Programmable Logic Controller

Temperature & Humidity Module User Manual & Application Case



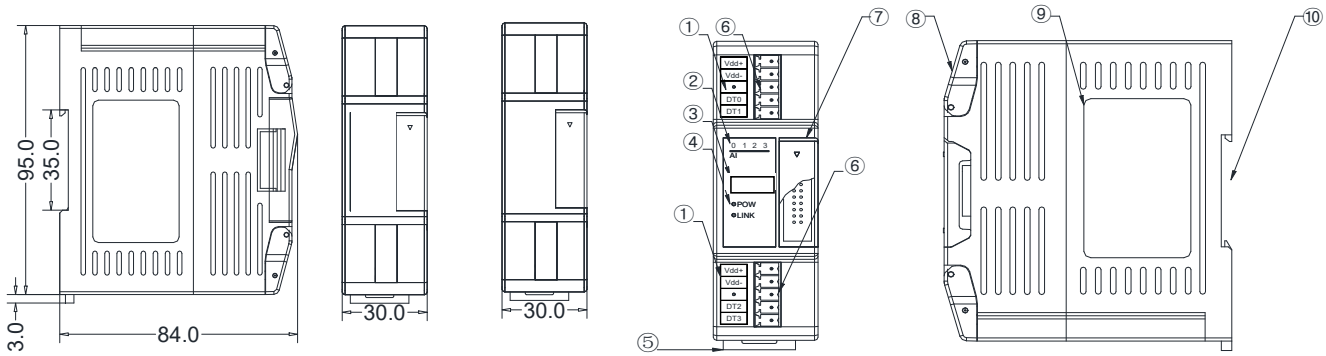
Contents

Temperature & Humidity Module Use Manual

1. Product model list and dimension

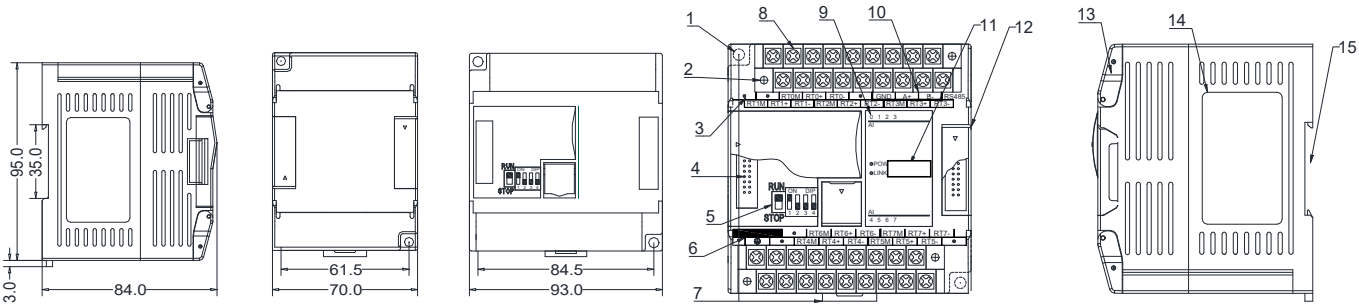
Ethernet Model	24V DC	Model	24V DC	Dimension
		TE-32DT	0.04A	30×95×82mm
		TE-4TC	0.07A	70×95×82mm
		TE-8TC	0.07A	
		TE-4RC	0.07A	
TE-8RCe	0.1A	TE-8RC	0.07A	93×95×82mm

Dimensions for TE-32DT



1. Terminal definition	6. Pluggable terminal
2. Analog input channel indicator	7. Module expansion port
3. Model	8. Transparent cover of module terminal
4. PWR power indicator, LINK module communication indicator	9. Module nameplate
5. Guide rail buckle	10. 35mm DIN guide rail

Dimensions for TE-4TC, TE-4RC, TE-8TC , TE-8RC



1. Fixed hole	8. Removable terminal
2. Removable terminal screw	9. Analog input channel indicator
3. Terminal definition	10. RS485 communication port
4. Module expansion port	11. PWR power indicator, LINK module communication indicator
5. DIP switch（4-channel module without DIP switch）	12. Module expansion port
6. External power supply terminal（DC24V and AC220V，Generally powered by the host PLC）	13. Transparent cover of module terminal
7. Guide rail buckle	14. Module nameplate
	15. 35mm DIN guide rail

2. Indicator description

2.1 Indicator description of TE-32DT

① PWR：Power indicator, green. Normally on-power normal; off - power abnormal.

② LINK: Multi-status indicator .three colors(Red. Yellow. Green) ,as follow:

Reference processing mode	Module bus state	LINK indicator state
Normal	MPU didn't identify the module and no communication	No light
	MPU has identified the module but no communication	Constant light in green
	Serial (TE-32DT) or parallel port in communication	Green jitter: indicator on 30ms and off 30ms
Firmware upgrade failed, reupgrade the module firmware	Without serial or parallel port in communication	Red flicker: indicator on 0.5s and off 0.5s
	With serial or parallel port in communication	Red is darkened and jitter alternately: indicator off 0.5s and jitter 0.5s

2.2 Indicator description of TE-4TC, TE-4RC, TE-8TC , TE-8RC

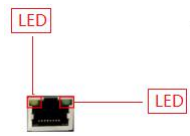
① PWR：Power indicator, green. Normally on-power normal; off - power abnormal.

② LINK: Multi-status indicator .three colors(Red. Yellow. Green) ,as follow:

Reference processing mode	Module bus state	LINK indicator state
Normal	No communication of module	No light
	MPU has identified the module but no communication	Constant light in green
	Serial or parallel port in communication	Green jitter: indicator on 30ms and off 30ms
Parallel power supply not enough, must connect to external power supply	Without serial or parallel port in communication	Yellow flicker: indicator on 0.5s and off 0.5s
	With serial or parallel port in communication	Yellow is darkened and jitter alternately: indicator off 0.5s and jitter 0.5s
Firmware upgrade failed, reupgrade the module firmware	Without serial or parallel port in communication	Red flicker: indicator on 0.5s and off 0.5s
	With serial or parallel port in communication	Red is darkened and jitter alternately: indicator off 0.5s and jitter 0.5s
Hardware failure and maintenance	Without serial or parallel port in communication	Constant light in red
	With serial or parallel port in communication	Red jitter quickly: indicator on 30ms and off 30ms

③ RJ45 Ethernet indicator: there are two Ethernet LEDs, green and yellow, as shown on the right picture:

Color	Status description
Green light is always on	Physical connection of TCP module and external device is normal;
Green light goes out	TCP module fails to connect with external device or the module itself is abnormal
Yellow light blinks	TCP module is connected to an external device normally, and blinking frequency indicates the data transmission speed. When speed is fast, human eye is not easy to distinguish it, at this time, yellow light is long bright.
Yellow light goes out	No data transmission communication of TCP module and external device



3. Power supply specification

Item	DC Power Supply
Power supply voltage	24VDC -15%~+20%
Power supply frequency	——
Instantaneous surge	MAX 20A 1.5ms @24VDC
Power loss time	10ms or less
Fuse	0.3A，250V
24V Output voltage (for input and expansion)	None
Isolation Type	No Electrical isolation
Power Protection	DC input power polarity reverse, over voltage protection

4. Environmental specifications for product

Item	Environment Specification
Temperature/humidity	Operating temperature:0~+55℃ Storage temperature:-25~+70℃ Humidity: 5~95%RH, No condensation
Vibration resistance	10~57 HZ, amplitude=0.075mm, 57HZ~150HZ acceleration=1G, 10 times each for X-axis, Y-axis and Z-axis
Impact resistance	15G, duration=11ms, 6 times each for X-axis, Y-axis and Z-axis
Interference immunity	DC EFT:±2500V Surge:±1000V
Over voltage resistance	500VAC/1min between DC terminal and PE terminal
Insulation impedance	Between AC terminal and PE terminal @500VDC,>=5MΩ ,all input/output points to PE terminal @500VDC
Operating environment	Avoid dust, moisture, corrosion, electric shock and external shocks

5. Main parameters for modules

5.1 Main parameters for digital temperature and humidity modules

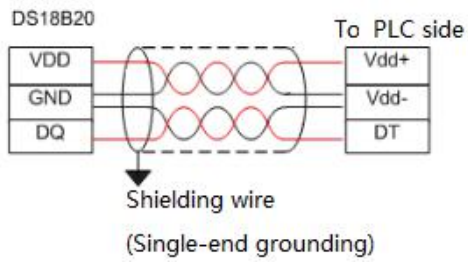
Item	TE-32DT
Input interface	DS18B20, RW1820, DS1990 sensor
Input Quantity	2 channels, each channel 16 points
Communication interface	RS485
Communication speed	2400~115200 Baud rate
Communication protocol	Standard Modbus
Power supply mode	PLC host internal power supply or independent external supply of 24VDC
Measured distance	≤200m(Wire resistance50Ω)
Measured range	DS18B20：-55~+125℃
Isolation mode	No isolation between channels,analog & digital optical isolation

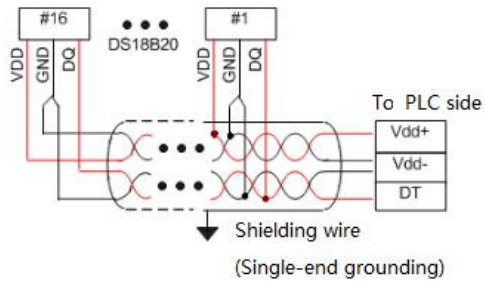
5.2 Main parameters for thermal resistance and thermocouple modules

Item	RTD input	Thermocouple input
Input range	Pt100, Pt1000, Cu50, Cu100	S, K, E, J, B, N, R, Wre3/25, Wre5/26, [0，20]mV, [0，50]mV, [0，100]mV
Resolution	0.1℃	0.1℃
Input impedance	6MΩ	6MΩ
Maximum input range	±13V	±30mA
Input indication	LED light ON means normal ,OFF means external disconnection	
Response time	560ms/4 Channel, 880ms/8 Channel	
Digital input range	16 bits, code range:0~32000	
Precision	0.1% F.S	
Power supply	MPU use internal power supply, expansion modules use external power supply 24VDC ±10% 5VA	
Isolation mode	Optoelectronic isolation, no isolation between channels, analog & digital optical isolation	
Power consumption	24VDC ±20%,50mA(maximum)	

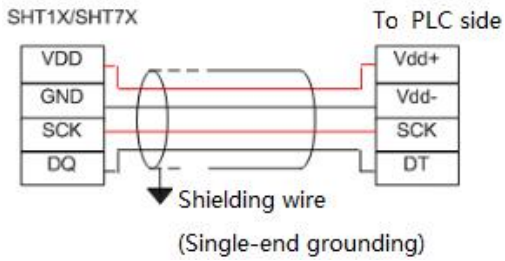
6. Wiring diagram

6.1 Digital temperature and humidity module: Single / multiple DS18B20, RW1820, DS1990 sensor input wiring diagram





SHT1X, SHT7X input wiring diagram



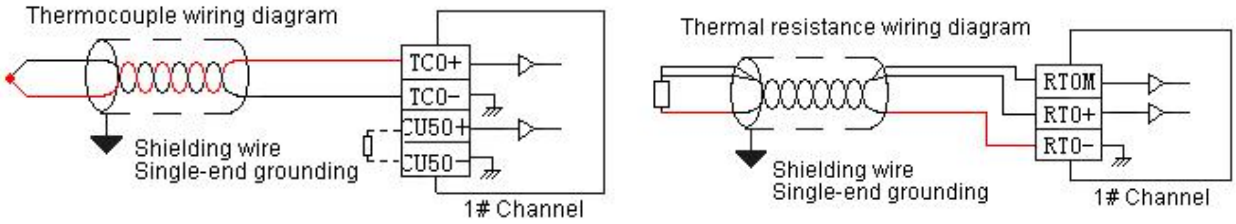
Note:

① VDD (Vdd +) and (Vdd-) are the sensor power terminals that can be wired nearby;

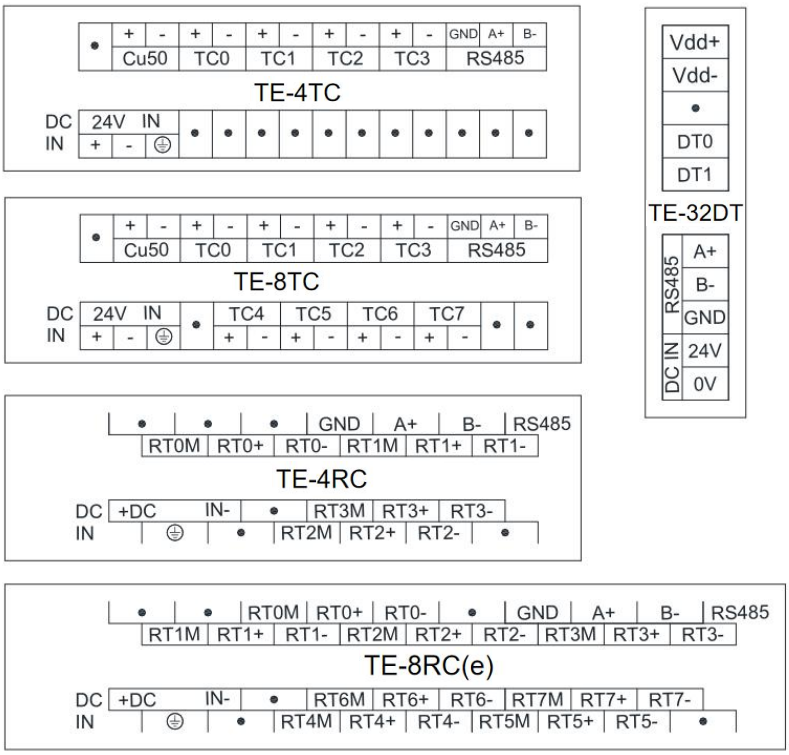
② Pin connection definition of DS18B20, RW1820, DS1990, SHT1X, SHT7X sensors can be seen in respective technical information;

③ Cables between sensor DS18B20, RW1820, DS1990 and module are recommended to use shielded 4-core twisted pair; one set of cable can be connected to ground (Vdd-) and signal lines (DT), the other set of cable can be connected to power supply and ground (Vdd-), the shield is single-point grounded at the source.

6.2 Thermal resistance and thermocouple module wiring diagram



7. Terminal wiring diagram



8. Module parameter table（CR code is corresponding to the Modbus register address）

8.1 Parameter table for digital temperature and humidity modules

Note: CR code is corresponding to the Modbus register address, the gray parts are read-only ,the white parts are readable and writable.

CR code	H04DT function description	CR code	TE-32DTfunction description
00H	Low byte for module code, and high byte for module version number		
01H	Communication address		
02H	Communication protocol: The low 4-bit of the low byte: 0 - N,8,2 For RTU，1 - E,8,1 For RTU，2 - O,8,1 For RTU，3 - N,7,2 For ASCII，4 - E,7,1 For ASCII，5 - O,7,1 For ASCII，6 - N,8, 1 For RTU The high 4-bit of the low byte: 0 – 2400，1 – 4800，2 – 9600，3 – 19200，4 – 38400，5 – 57600，6 - 115200		
03H~06H	Module name		
07H~08H	Default IP address: 192.168.1.111		
09~0AH	Reserve		
0BH	High byte subnet mask（b3~b0,1 indicates 255, 0 indicates 0, for example, subnet mask 255.255.255.0, b3~b0=1110）, low byte reserved		
0CH~0EH	Reserve		
0FH	Error code: 0-Normal, 1-Illegal firmware identity, 2-Incomplete firmware, 3-System data access exception, 4-No external 24V power supply		
10H~13H	Temperature input value of channel 1~4	10H~1FH	Temperature value in 1~16 path of channel 1
14H~17H	Humidity input value of channel 1~4	20H~2FH	Temperature value in 1~16 path of channel 2
18H~1BH	Signal type of channel 1~4 （ 0-DS18B20, RW1820, DS1990，1-SHT1x, SHT7x）	30H	A/D data bits of channel 1
1CH	Using identification of engineering value	31H	A/D data bits of channel 2

1DH~20H	Data lower-limit of channel 1~4	32H	Temperature disconnection alarm in 1~16 path of channel 1, each bit indicates 1 channel, 0- normal, 1- disconnection
21H~24H	Data upper-limit of channel 1~4	33H	Temperature disconnection alarm in 1~16 path of channel 2, each bit indicates 1 channel, 0- normal, 1- disconnection
25H~28H	A/D data bit of channel 1~4	34H	Configuration number of channel 1
29H~2CH	Zero point correction of channel 1~4	35H	Configuration number of channel 2
2DH	Sensor disconnection alarm of channel 1~4, each bit indicates 1 channel, 0- normal, 1- disconnection	36~75H	Serial numbers in 1~16 path of channel 1, each serial number occupies 4 registers
2EH~2FH	Reserve	76~B5H	Serial numbers in 1~16 path of channel 2, each serial number occupies 4 registers
30H-3FH	Serial numbers of channel 1~4, each serial number occupies 4 registers	B6~C5H	Reserve
40H-4FH	Reserve	C6H	Channel 1 clears the power-off counts in the configuration
		C7H	Channel 2 clears the power-off counts in the configuration

8.2 Parameter table for 4-channel thermal resistance and thermocouple modules

Note: CR code is corresponding to the Modbus register address, the gray parts are read-only ,the white parts are readable and writable.

CR code	Function description	
	TE-4RC	TE-4TC
00H	Low byte for module code, and high byte for module version number	
01H	Communication address	
02H	Communication protocol: The low 4-bit of the low byte: 0 - N,8,2 For RTU，1 - E,8,1 For RTU，2 - O,8,1 For RTU，3 - N,7,2 For ASCII，4 - E,7,1 For ASCII，5 - O,7,1 For ASCII，6 - N,8, 1 For RTU The high 4-bit of the low byte: 0 – 2400，1 – 4800，2 – 9600，3 – 19200，4 – 38400，5 – 57600，6 - 115200	
03H~06H	Module name	
07H~08H	Default IP address: 192.168.1.111	
09~0AH	Reserve	
0BH	High byte subnet mask（b3~b0,1 indicates 255, 0 indicates 0, for example, subnet mask 255.255.255.0, b3~b0=1110）, low byte reserved	
0CH-0EH	Reserve	
0FH	Error code: 0-Normal, 1-Illegal firmware identity, 2-Incomplete firmware, 3-System data access exception, 4-No external 24V power supply	
10H	channel 1 input value	channel 1 input value
11H	channel 2 input value	channel 2 input value
12H	channel 3 input value	channel 3 input value
13H	channel 4 input value	channel 4 input value
14H	channel 1 signal type, note 2	channel 1 signal type, note 3
15H	channel 2 signal type, note 2	channel 2 signal type, note 3
16H	channel 3 signal type, note 2	channel 3 signal type, note 3
17H	channel 4 signal type, note 2	channel 4 signal type, note 3
18H	Use the engineering value mark, note 5	Use the engineering value mark, note 5
19H	channel 1 engineering lower limiting value	channel 1 engineering lower limiting value
1AH	channel 2 engineering lower limiting value	channel 2 engineering lower limiting value
1BH	channel 3 engineering lower limiting value	channel 3 engineering lower limiting value
1CH	channel 4 engineering lower limiting value	channel 4 engineering lower limiting value
1DH	channel 1 engineering upper limiting value	channel 1 engineering upper limiting value
1EH	channel 2 engineering upper limiting value	channel 2 engineering upper limiting value
1FH	channel 3 engineering upper limiting value	channel 3 engineering upper limiting value
20H	channel 4 engineering upper limiting value	channel 4 engineering upper limiting value
21H	channel 1 sampling frequency, note 1	channel 1 sampling frequency, note 1
22H	channel 2 sampling frequency, note 1	channel 2 sampling frequency, note 1
23H	channel 3 sampling frequency, note 1	channel 3 sampling frequency, note 1
24H	channel 4 sampling frequency, note 1	channel 4 sampling frequency, note 1
25H	channel 1 zero point correction value	channel 1 zero point correction value
26H	channel 2 zero point correction value	channel 2 zero point correction value
27H	channel 3 zero point correction value	channel 3 zero point correction value
28H	channel 4 zero point correction value	channel 4 zero point correction value
29H	Channel 1~4 input disconnection alarm, note 4	Channel 1~4 input disconnection alarm, note 4
2AH	Reserve	Reserve
2BH~2FH		

8.3 Parameter table for 8-channel thermal resistance and thermocouple modules

CR code	Function description	
	TE-8RC	TE-8TC
00H	Low byte for module code, and high byte for module version number	
01H	Communication address	
02H	Communication protocol: The low 4-bit of the low byte: 0 - N,8,2 For RTU，1 - E,8,1 For RTU，2 - O,8,1 For RTU，3 - N,7,2 For ASCII，4 - E,7,1 For ASCII，5 - O,7,1 For ASCII，6 - N,8, 1 For RTU The high 4-bit of the low byte: 0 – 2400，1 – 4800，2 – 9600，3 – 19200，4 – 38400，5 – 57600，6 - 115200	
03H~06H	Module name	
07H~08H	Default IP address:192.168.1.111	
09~0AH	Reserve	
0BH	High byte subnet mask（b3~b0,1indicates 255, 0 indicates 0, for example subnet mask 255.255.255.0, b3~b0=1110）, low byte reserved	
0CH~0EH	Reserve	
0FH	Error code: 0-Normal, 1-Illegal firmware identity, 2-Incomplete firmware, 3-System data access exception, 4-No external 24V power supply	
10H	channel 1 input value	channel 1 input value
11H	channel 2 input value	channel 2 input value
12H	channel 3 input value	channel 3 input value
13H	channel 4 input value	channel 4 input value
14H	channel 5 input value	channel 5 input value
15H	channel 6 input value	channel 6 input value
16H	channel 7 input value	channel 7 input value
17H	channel 8 input value	channel 8 input value
18H	channel 1 signal type, note 2	channel 1 signal type, note 3
19H	channel 2 signal type, note 2	channel 2 signal type, note 3
1AH	channel 3 signal type, note 2	channel 3 signal type, note 3
1BH	channel 4 signal type, note 2	channel 4 signal type, note 3
1CH	channel 5 signal type, note 2	channel 5 signal type, note 3
1DH	channel 6 signal type, note 2	channel 6 signal type, note 3
1EH	channel 7 signal type, note 2	channel 7 signal type, note 3
1FH	channel 8 signal type, note 2	channel 8 signal type, note 3
20H	Use the engineering value mark, note 5	Use the engineering value mark, note 5
21H	channel 1 engineering lower limiting value	channel 1 engineering lower limiting value
22H	channel 2 engineering lower limiting value	channel 2 engineering lower limiting value
23H	channel 3 engineering lower limiting value	channel 3 engineering lower limiting value
24H	channel 4 engineering lower limiting value	channel 4 engineering lower limiting value
25H	channel 5 engineering lower limiting value	channel 5 engineering lower limiting value
26H	channel 6 engineering lower limiting value	channel 6 engineering lower limiting value
27H	channel 7 engineering lower limiting value	channel 7 engineering lower limiting value
28H	channel 8 engineering lower limiting value	channel 8 engineering lower limiting value
29H	channel 1 engineering upper limiting value	channel 1 engineering upper limiting value
2AH	channel 2 engineering upper limiting value	channel 2 engineering upper limiting value
2BH	channel 3 engineering upper limiting value	channel 3 engineering upper limiting value
2CH	channel 4 engineering upper limiting value	channel 4 engineering upper limiting value
2DH	channel 5 engineering upper limiting value	channel 5 engineering upper limiting value
2EH	channel 6 engineering upper limiting value	channel 6 engineering upper limiting value
2FH	channel 7 engineering upper limiting value	channel 7 engineering upper limiting value
30H	channel 8 engineering upper limiting value	channel 8 engineering upper limiting value
31H	channel 1 sampling frequency, note 1	channel 1 sampling frequency, note 1
32H	channel 2 sampling frequency, note 1	channel 2 sampling frequency, note 1
33H	channel 3 sampling frequency, note 1	channel 3 sampling frequency, note 1
34H	channel 4 sampling frequency, note 1	channel 4 sampling frequency, note 1
35H	channel 5 sampling frequency, note 1	channel 5 sampling frequency, note 1
36H	channel 6 sampling frequency, note 1	channel 6 sampling frequency, note 1
37H	channel 7 sampling frequency, note 1	channel 7 sampling frequency, note 1
38H	channel 8 sampling frequency, note 1	channel 8 sampling frequency, note 1
39H	channel 1 zero point correction value	channel 1 zero point correction value
3AH	channel 2 zero point correction value	channel 2 zero point correction value

CR code	Function description	
	TE-8RC	TE-8TC
3BH	channel 3 zero point correction value	channel 3 zero point correction value
3CH	channel 4 zero point correction value	channel 4 zero point correction value
3DH	channel 5 zero point correction value	channel 5 zero point correction value
3EH	channel 6 zero point correction value	channel 6 zero point correction value
3FH	channel 7 zero point correction value	channel 7 zero point correction value
40H	channel 8 zero point correction value	channel 8 zero point correction value
41H	Channel 1~8 input disconnection alarm, note 4	Channel 1~8 input disconnection alarm, note 4
42H~4FH	Reserve	Reserve

Note:

① Sampling frequency: 0 - 2 times, 1 - 4 times, 2 - 8 times, 3 - 16 times, 4 - 32 times, 5 - 64 times, 6 - 128 times, 7 - 256 times

② RTD signal type: 0 - Pt100, 1 - Pt1000, 2 - Cu50, 3 - Cu100

③ Thermocouple signal type: 0 - S, 1 - K, 2 - T, 3 - E, 4 - J, 5 - B, 6 - N, 7 - R, 8 – Wre3/25, 9- Wre5/26, 10 - [0,20]mV, 11 - [0,50]mV, 12 - [0,100]mV

④ Disconnection alarm：Each bit indicates 1 channel, 0-normal, 1-disconnection

⑤ 5. Use the engineering value mark：Each bit indicates 1 channel, 0-No, 1-Yes

9. Expansion modules installation

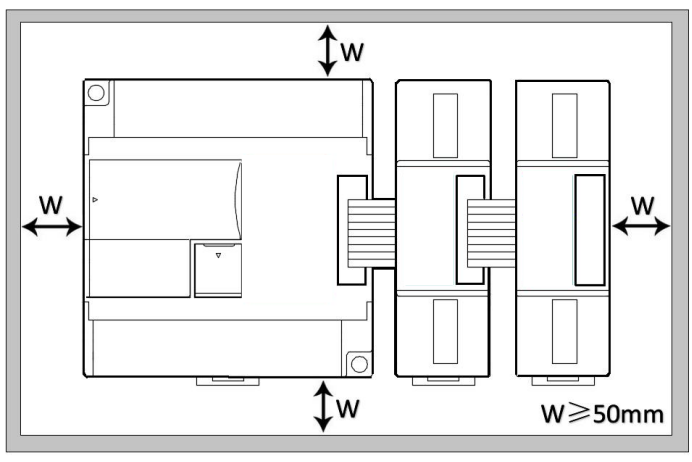
The PLC should be secured to an enclosed cabinet while mounting. For heat dissipation, make sure to provide a minimum clearance of 50mm between the unit and all sides of the cabinet. (See the figure.)

Rail Mounting: Use standard 35 mm rail.

Screw Mounting: Each MPU or expansion module has two positioning screw holes, the diameter of the hole is 4.5mm. Please refer to the dimension figure for the location of the positioning holes and their spacing.

To avoid over temperature and for a better heat dissipation, do not mount PLC to a position near to the bottom/top of the cabinet. Do not mount PLC in vertical direction.

Expansion Module Wiring: Connections between expansion modules and connections between module and MPU are achieved through bus. One expansion cable will be configured to every expansion module, for the connection between two different modules.Connection methods: turn the right side of extended interface (the last MPU or expansion module) over, plug the expansion cable in the extended interface, then press down the cover of the extended interface to reset the interface, the extended interface at the right side of the module will be reserved for expansion of the next module. Connect all expansion modules in turn in the same way.



Temperature & Humidity modules Application Case

1. Module used as remote IO

HNC TE series remote module is built-in one RS485 communication port (Some models with Ethernet communication port) supports serial bus(Use the RS485 communication port of module networking with communication port of host PLC, and host PLC controls the remote module by communication instructions), when using the serial bus to expand (that is, remote IO module), it doesn't have expansion limit of system points and can be distributed installation.

Distributed installation is very important for the system which needs to collect and monitor a large number of decentralized digital or analog signals(temperature, humidity, differential pressure, blowing rate, flow, fan speed, valve opening, etc.), it can easily achieve distributed installation control and unlimited points of expansion, greatly improving the control system configuration flexibility and future control expansion capabilities, reducing the number of signal wiring, also reducing the interference problem of too long analog signal line, saving the project investment costs.

The following will introduce the operation key points and techniques of modules used as remote IO.

1.1 Module power supply

When the module is used as remote IO, there are two optional models of 24VDC.If the module is powered normally, the PWR indicator will light.

1.2 Communication port introduction

① All modules are built-in RS485 port.

② As for TE-8RCe support Ethernet port.

③ RS485 communication port and Ethernet port can be used at the same time, for example, the RS485 of module communicates with PLC, Ethernet port can also communicates with multiple host computers (up to 7).

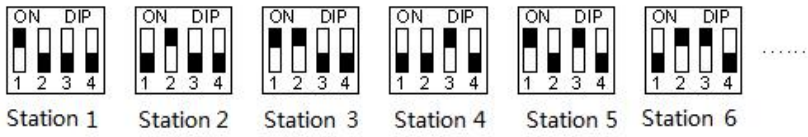
1.3 Communication protocols and default parameters

① RS485: Support standard Modbus RTU / ASCII protocol, it can communicate with the configuration, touch screen, text display, PLC and other third-party host computer, which must support Modbus protocol. Among them:

Address: 1 ~ 254 can be set; module address is divided into soft address and hard address, hard address has the highest priority.

Soft address: The address set through programming software - remote tool, address range 1-254;

Hard address: The address set through the 4-bit DIP switch of module hardware, address range 1-15. Hardware address setting example:



Baud rate：2400, 4800, 9600, 19200, 38400, 57600, 115200 optional;

Data format : N, 8, 2 RTU, E, 8, 1 RTU, O, 8, 1 RTU, N, 8, 1 RTU, E, 7, 1 ASCII, O, 7, 1 ASCII, N，7，2 ASCII optional.

RS485 default parameter：19200，N 8 2 RTU，station number is 1.

② Ethernet +: Support the standard Modbus TCP protocol, it can communicate with the configuration, touch screen, PLC and other third-party host computers, which must support Modbus TCP protocol. Among them:

Ethernet default parameters:

IP: 192.168.1.111

Subnet mask: 255.255.255.0

Gateway: 192.168.1.1

1.4 Introduce module parameter configuration method when the module is used as remote IO

There are three ways to configure remote IO parameters:

① It can be configured via programming software - tools - remote modules (recommended);

② It can be configured via MODW instructions through the serial communication.

1.5 Parameter configuration example: Configurate module by programming software remote module tool

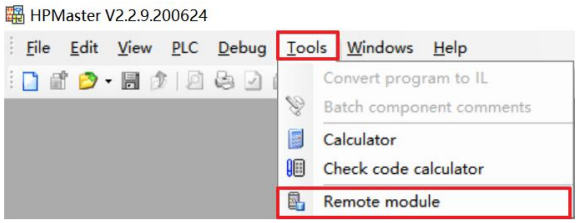
1.5.1 Hardware connection:

① Through the RS485 communication port (the terminals of A +,B- on the module) connection: If the computer has a serial port, you can use the converter of 232 to 485 connecting with the module; if it has one USB interface, you can use the converter of USB to 485 connecting with the module.

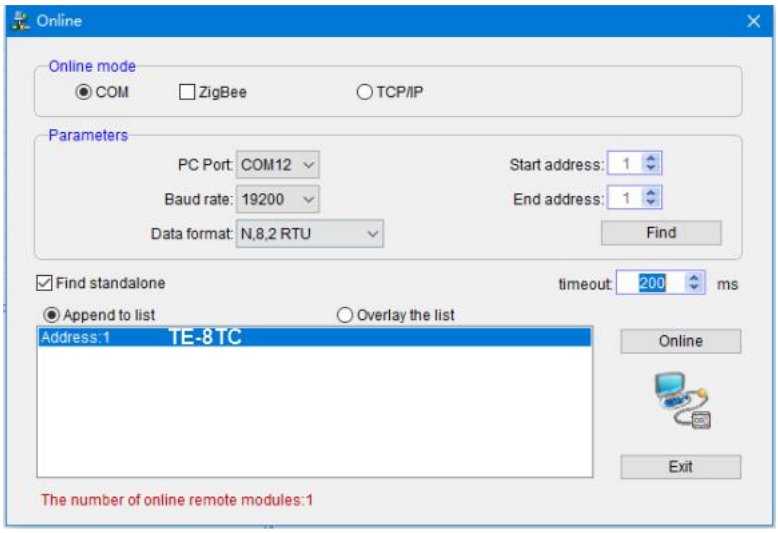
② Through the connection of Ethernet + communication interface: You can connect the module with the computer's network port directly by the standard network cable, or take the computer and module connected to the switch.

1.5.2 Software operation steps:

① Click on the the menu bar tool of programming software- "remote module":

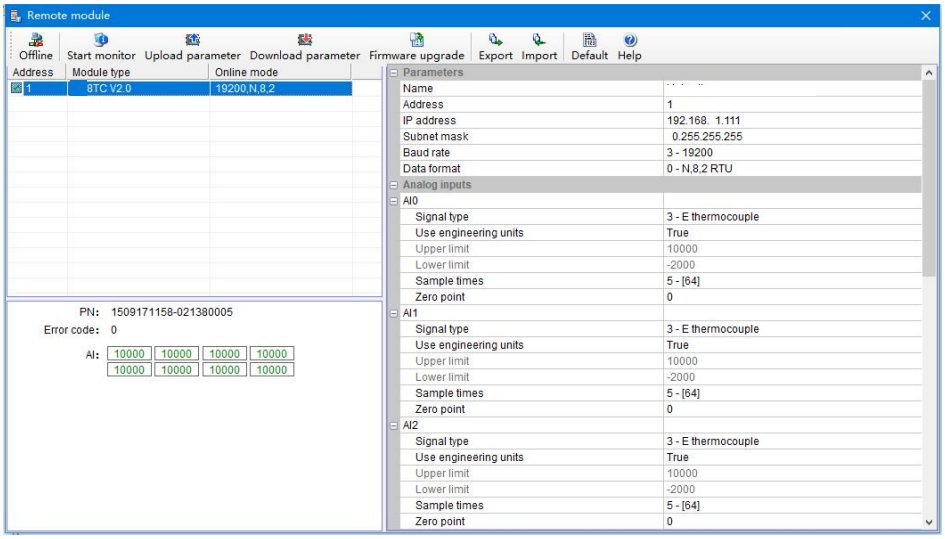


Click the button  in the pop-up window to open the "Online" window. The module default address is 1,19200, N 8 2 RTU, the online success is as follows:

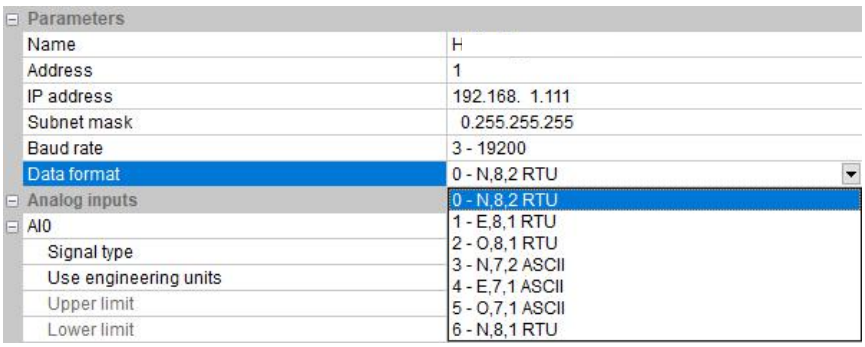


If there is only one machine connected with 485 line, then check "stand-alone search"; if there are more than one, then remove the button of "stand-alone search", and set the start address and end address, so that all the machines connected with 485 line can be found and achieve parameter configuration.

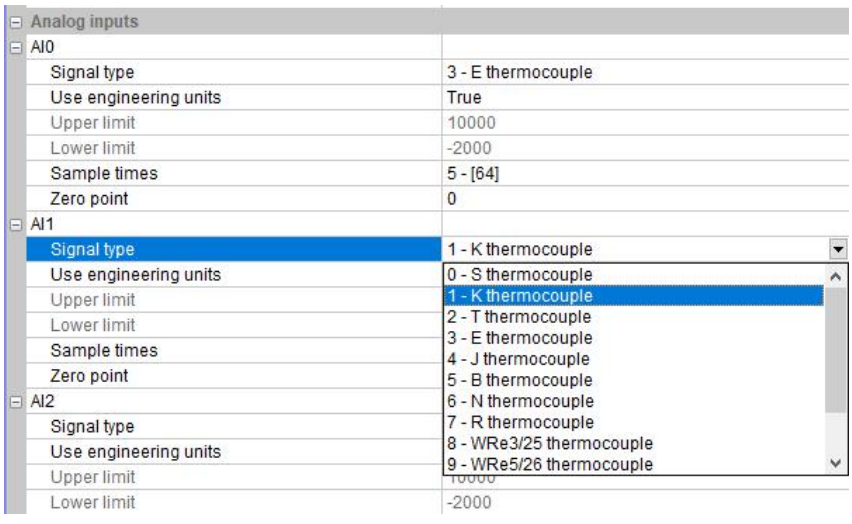
Click to exit, enter the configuration interface, as shown below:



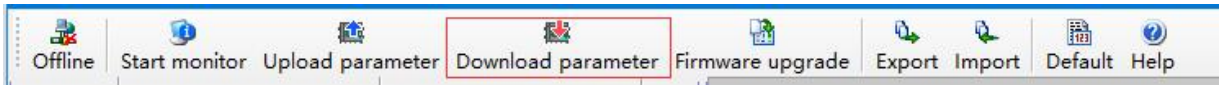
We can change the module name, address, IP, subnet mask, baud rate, data format and other communication parameters in the communication parameter area.



In the external analog input area, we can set the signal type of each channel, choose whether to use engineering value or not((for temperature module, the default use of engineering value)), the upper and lower limits of engineering value(it can be set if you check the use of engineering value), sampling times and zero correction.



After setting, select the "Download parameter" to download the parameter into the module.



In addition, we can do the following operations through the remote module tool:

① Online monitor the channel value of module, error code.

② Upload the module paramater, upgrade the module firmware, then make the module support new features.

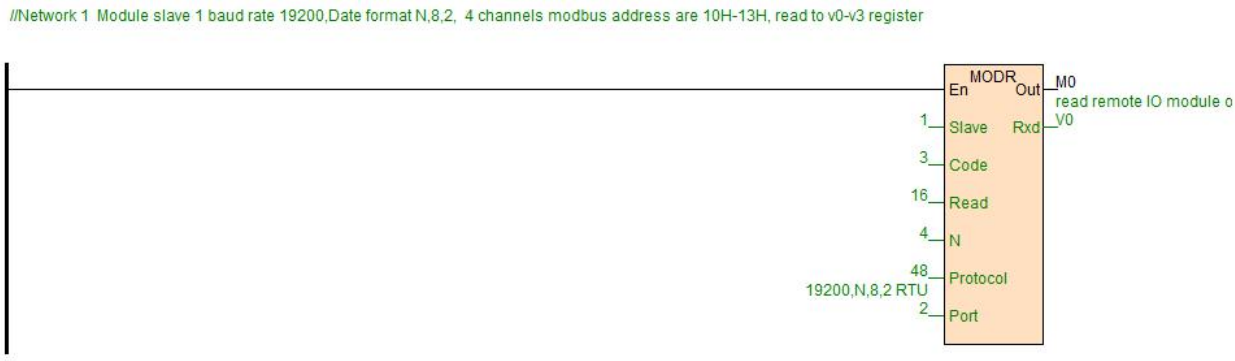
③ It can export the module configuration to save or import and restore the default value.

1.6 Remote IO appliciation example(RS485 mode): PLC reads 4-channel temperature value of TE-4RC module

① Hardware wiring: PLC connects to 485 port of module by shielded twisted pair, A + connects to A +, B- connects to B-, if the PLC connects to multiple remote IO modules, it needs to use hand in hand way to connect.

② Modbus address: From the above 4-channel analog CR parameter table shows that, the channel 1 ~ 4 input values are stored in 10H ~ 13H of TE-4RC module.

③ PLC program: Host PLC wants to read the 4-channel temperature values of remote IO module TE-4RC, 4-channel temperature sensors for PT100, -2000 ~ 8500 indicates -200.0 ~ 850.0 ℃. In this example, TE-4RC communication is the default parameter: Station number address is 1, baud rate is 19200, data format is N 8 2 RTU. The program of PLC reads the 4-channel temperature values is as follows:



The host PLC reads the 4-channel temperature values of TE-4RC by Modbus read instruction MODR, the start address is 10H (hexadecimal), that is, the decimal value is 16. When the communication is successful, M0 is ON, the temperature values which are read back will be stored in V0-3, V0=235, indicating that the actual temperature of the first channel is 23.5℃, the same as V3=867, indicating that the actual temperature of the fourth channel is 86.7℃.

1.7 Remote IO appliciation example (Ethernet mode): PLC reads and writes every channel input values of TE-8RCe module

① Hardware wiring: PLC and module Ethernet port connected with a shielded network cable, they can be connected directly or through the switch.

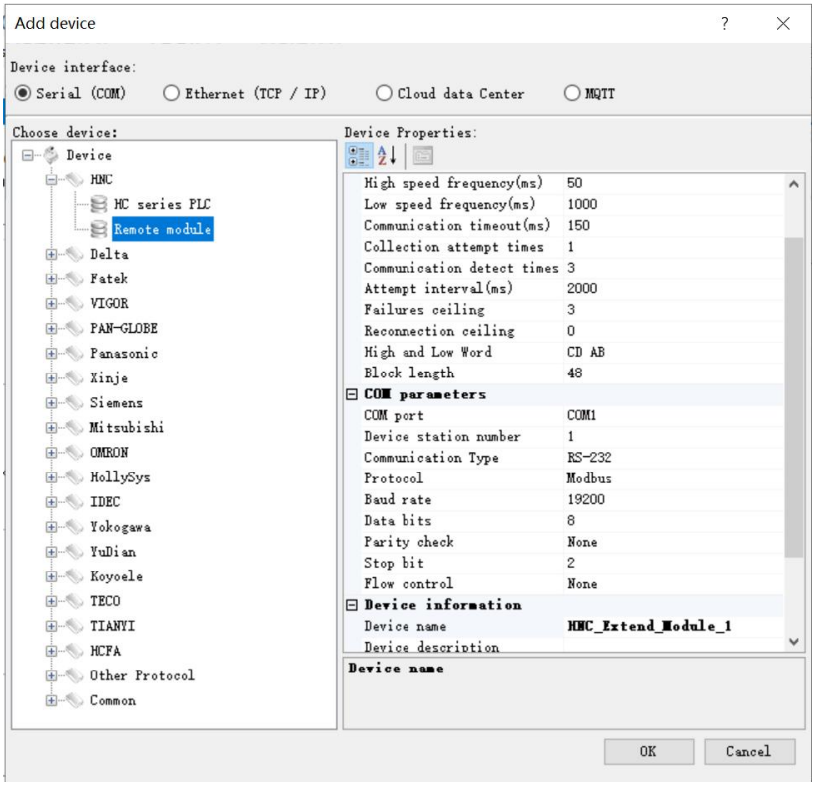
② Modbus address: From the above TE-8RCe analog module CR parameter table shows that the input values of 8-channel thermal resistance module input channel 1 ~ 8 are stored in the address 10H ~ 17H.

③ PLC program: Read the 8-channel measurements of remote Ethernet module TE-8RCe , if the module IP address is 192.168.1.112, station number address is 1, the read results are stored in the V10 ~ V17, as follows:

1.8 Remote IO appliciation example: HTCloud Designer configuration communicates directly with TE-8TC module

① 1, Open HTCloud Designer, select the "new project", choose to add the device in the "device", then choose serial port or Ethernet according to the module which supports the Ethernet or RS485, this example for serial port, the serial port number of USB to 485 is COM12, as shown below:

Default parameter 19200 N 8 2 RTU for the module, station number address is 1. And directly select HNC remote module driver in serial port：

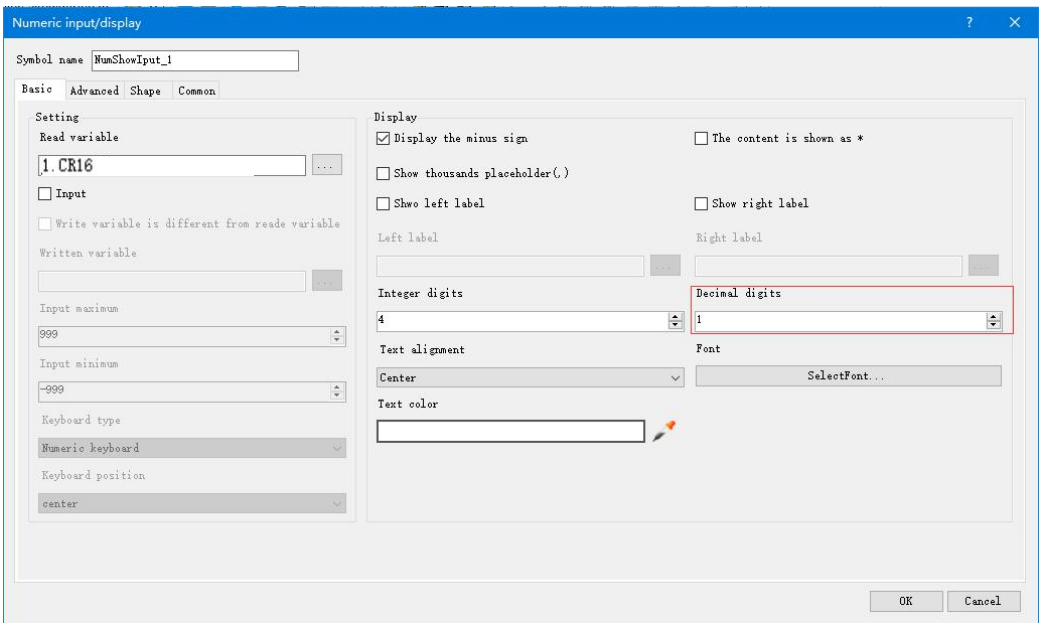


Click OK, then we are prompted to start set up variables, the establishment of eight variables indicates 8 channels:

Device properties | Add | Batch add | Delete | Online | Off

	Variable name	Register type	Register address	Address length	Data type	Read-write mode	Acquisition frequency	Variable description
1	CR16	CR	16	1	Integer	Read and write	Normal	
2	CR17	CR	17	1	Integer	Read and write	Normal	
3	CR18	CR	18	1	Integer	Read and write	Normal	
4	CR19	CR	19	1	Integer	Read and write	Normal	
5	CR20	CR	20	1	Integer	Read and write	Normal	
6	CR21	CR	21	1	Integer	Read and write	Normal	
7	CR22	CR	22	1	Integer	Read and write	Normal	
8	CR23	CR	23	1	Integer	Read and write	Normal	

Then set up the screen, we can use the display primitives to bind the corresponding channel variable values. If you need to display the decimal places, it can set the corresponding decimal places on the display primitive. As shown below:



1.9 TE-32DT module usage features introduction

TE-32DT supports sensor signal types: DS18B20, RW1820, DS1990.

Module parameters: TE-32DT module has 2 channels, each channel can measure the maximum 16 points of temperature, a total of 32 temperature points can be measured. Measuring temperature range: -55 ~ +125 ℃, ≤ 200m distance to per channel (line resistance 50Ω). So, how to use the TE-32DT module properly?

The following are the main points of this section:

① Remote module tool usage;

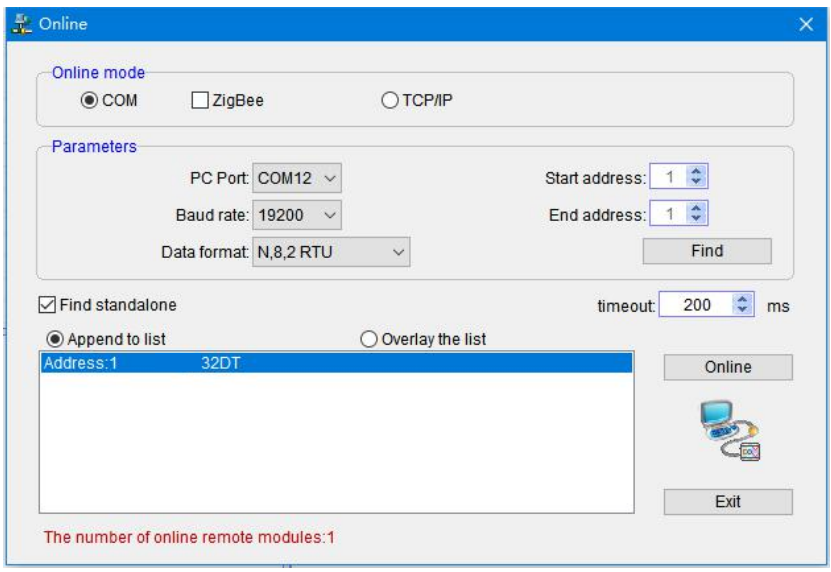
② How to wire sensor?

③ how to replace broken sensor?

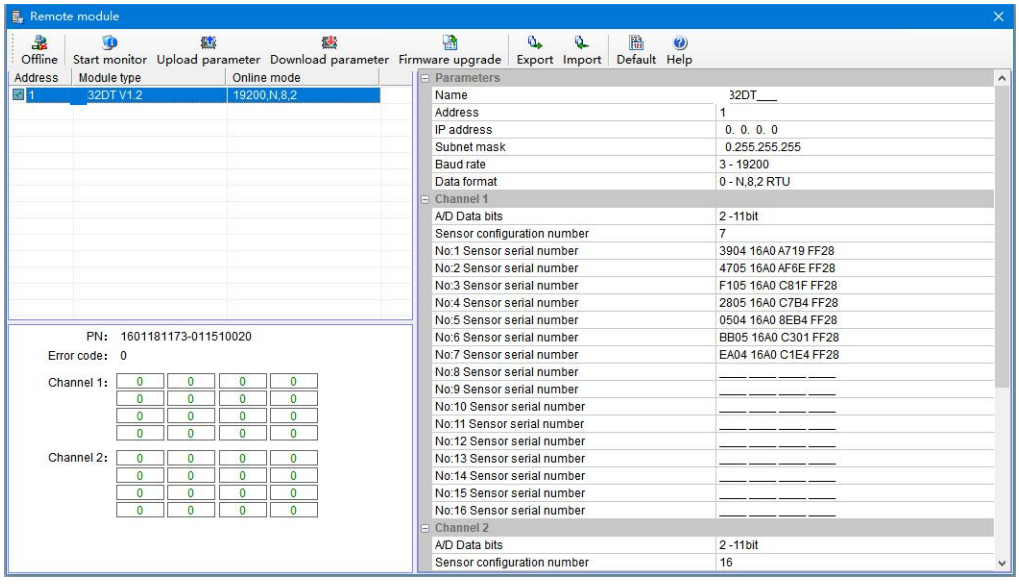
④ how to replace broken module?

First, let's look at the hardware wiring. How to connect TE-32DT with the remote module tools of PLC software?

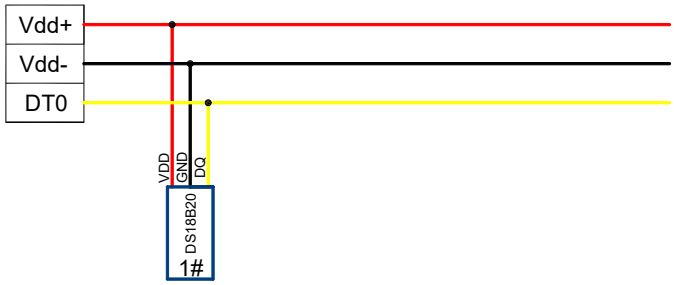
Hardware connection and power supply: PC-side USB transferred to 485 (PC with serial port can also use 232-to-485 converter), then connected to the communication port A + B- of 485 in TE-32DT module. TE-32DT module is powered by DC24V switching power supply. After the module is powered on, then click the menu bar tools - Remote module - Online, when online successfully, you will see:



Click "exit", or "×" to exit. In the absence of sensors, the default parameters of the module are shown below:



Then, we start to access sensors (the strict wiring diagram please refer to the above digital module wiring diagram), as shown in the following figure, we access the first sensor # 1:

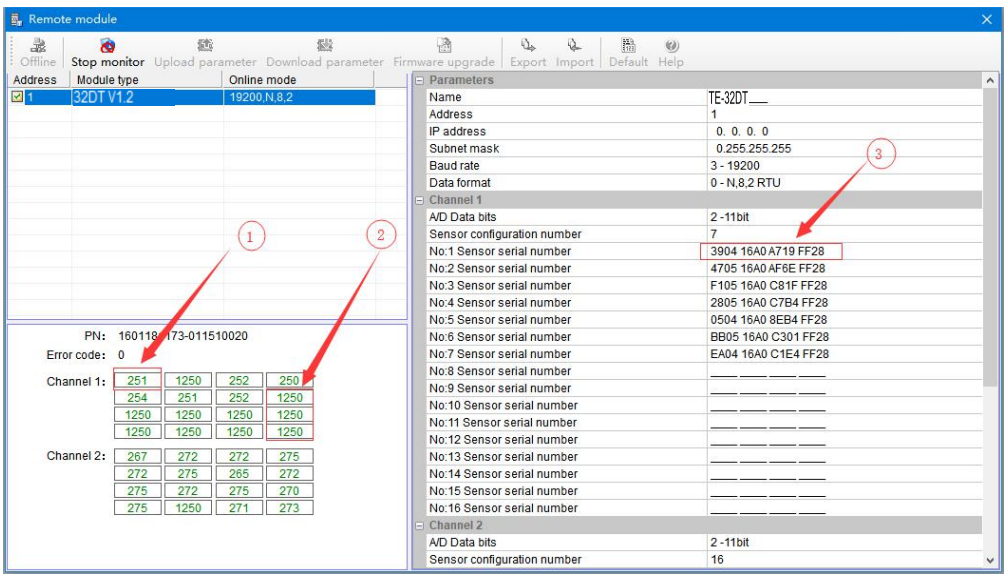


Click on "monitor", we can see 1 # sensor temperature value of channel 1 in the software, exit "monitor", click the "parameter upload", then you can view the serial numbers of the sensor. Read 1 # sensor temperature value and serial number as shown below:

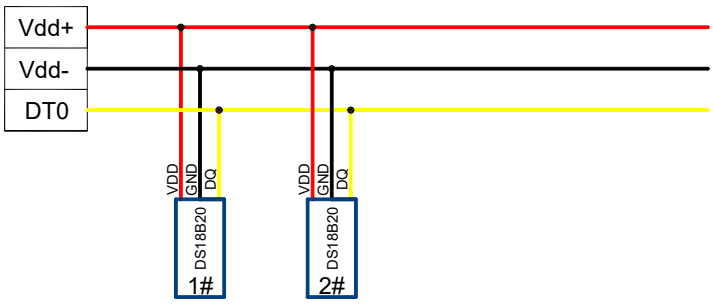
① Numerical 251 indicates that the current temperature is 25.1℃;

② No: 1 sensor serial number: 3904 16A0 A719 FF28, that is, 1# sensor serial number;

③ Numerical 1250 indicates that the maximum value of engineering quantity displayed by the channel (-55 ~ + 125℃, that is, -550 ~ 1250) when the sensor is not connected.



Then we access the second sensor (for the strict wiring diagram, please refer to the above digital module wiring diagram), the access interval time of adjacent sensors should be greater than 10 seconds. Wiring diagram is as follows:

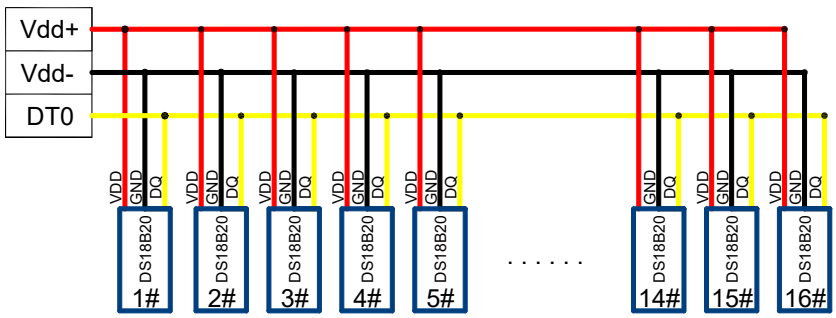


The read temperature and serial number as follows:

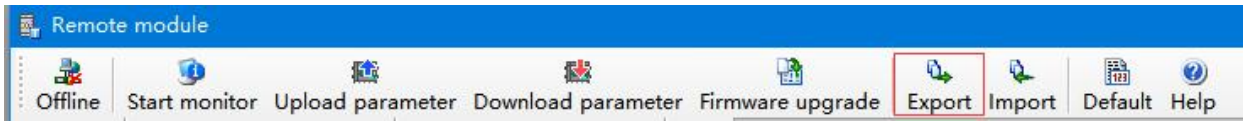
Channel 1:				
	248	253	253	247
	254	250	255	1250
	1250	1250	1250	1250
	1250	1250	1250	1250

Channel 1	
A/D Data bits	2 -11bit
Sensor configuration number	7
No:1 Sensor serial number	3904 16A0 A719 FF28
No:2 Sensor serial number	4705 16A0 AF6E FF28

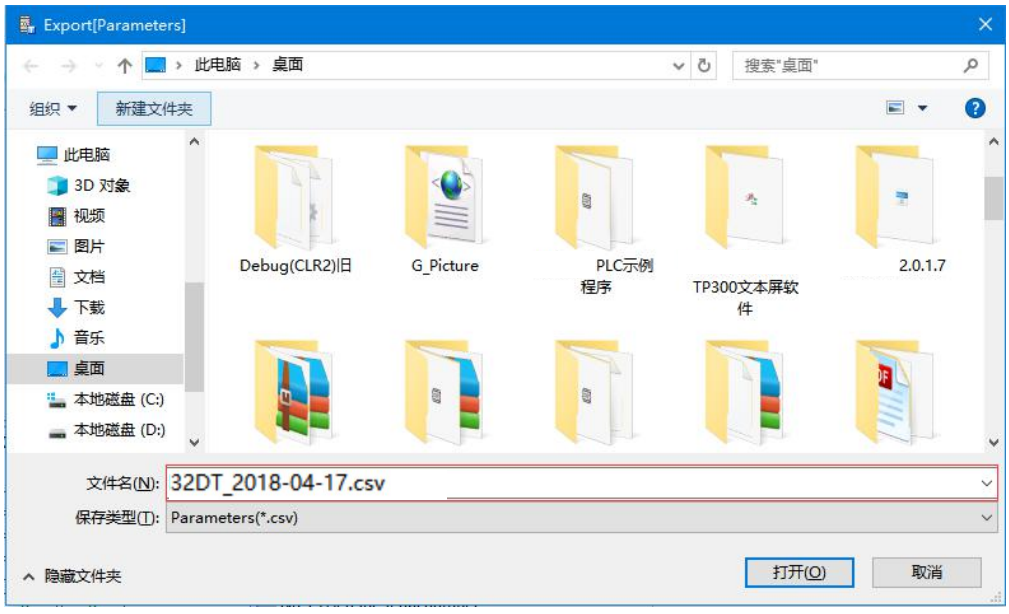
And so on, then we follow the order, from left to right continue to install sensors (adjacent sensors access interval needs more than 10 seconds), until the 16th sensor, which will record the temperature of each channel and the serial number.



After the 16 sensors of channel 1 accessed, channel 2 is accessed in the same way, when accessed, we follow the way from near to far or from far to near. After finishing the access of all sensors, we have to save the configuration parameters of TE-32DT module, this step is very important! (The back will introduce the application occasions). The specific operation is as follows, in the menu bar of remote module tool has an export function, we click export:



After export, click save：



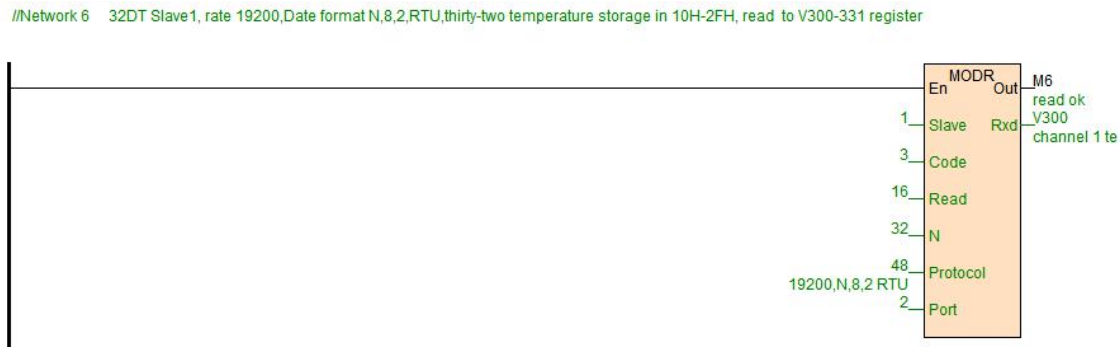
The above operation, the module line is connected, the parameters are also saved. Next host PLC needs to read the temperature from the module.

TE-32DT can communicate with the host PLC throughthe 485 port, TE-32DT used as the remote IO, it can communicate with the host PLC.

We can see according to the online help of PLC software - Hardware Manual - Expansion Module Parameters - Digital Temperature And Humidity Module Parameter Table, or the above《Digital Temperature and Humidity Module Parameter Table》, the temperature values of channels 1 and 2 exist in the module CR register.

Channel 1: 10H ~ 1FH; Channel 2: 20H ~ 2FH.

When the module is used for remote IO, the module is connected to the host PLC through the A + B- of serial RS485. The module default baud rate is 19200, data format is N 8 2 RTU, the default station number defaults to 1 and supports Modbus protocol. So communication program is as follows:



The above introduce the normal use steps and methods for TE-32DT. Then we will introduce how to deal with the common problems and on-site problems when using TE-32DT.

FAQ for TE-32DT module

① If multiple sensors are connected before the TE-32DT module is powered on, then what will happen if the TE-32DT module is powered on again?

A: If multiple sensors are connected before the TE-32DT module is powered on, at this time, power on the TE-32DT module, then the TE-32DT module will automatically search all the sensors and randomly write them into the registers (CR10H ~ 2FH), that is, the order is out of order. So we can see the sequence of operation steps is very important. First, give the module power supply, and then according to the sequence from near to far, or from far to near to access sensors.

② If in the process of using, one of the temperature sensors is broken(any position), how to replace the sensor at this time?

A: The module does not need to be powered down, simply remove the damaged sensor, put a new one, then TE-32DT module will automatically identify and determine it. The temperature read by new sensor will automatically replace the damaged sensor, without affecting the other normal sensors' temperature acquisition.

③ If in the process of using, multiple temperature sensors are broken(any position, such as 3), how to replace these sensors at this time?

A: Just remove these damaged sensors and replace them with new ones in order.

The sequence here that is described earlier, it means the sequence of access sensors at the beginning, from near to far or from far to near. For example, the 16 sensors of channel 1 begin to be accessed from near to far in order, when using, the 2 #, 7 # and 13 # sensors are broken. At this point, the module need't power off, remove the 2 #, 7 #, 13 # sensors, put on new ones, according to the sequence, first access to the original position 2 # sensor, then 7 #, and finally the sensor position 13 #. In this way, the TE-32DT module will automatically identify and determine, the temperature values read by new sensors will automatically replace the damaged sensor, without affecting the other normal sensors' temperature acquisition.

In a similar way, if accessing to sensors according to from far to near, then when replacing them also from far to near.

④ If in the process of using, TE-32DT module itself is damaged, at this time, how to deal with to make sure that the sensors configured in front of are still the same order and can work normally?

A: The method for saving the module parameters was introduced in the previous section. Here you can use this configuration parameter to reflect the importance of the TE-32DT module configuration parameters.

TE-32DT module is damaged, at this moment, we only need to import the previously saved module parameters to new TE-32DT module through the remote module tool, import the previous configuration table, and finally click parameters download to download the parameters into the module.

The each position's temperature value and the sequence of the module will be consistent with the previous module.This can be very convenient to solve the replacement damaged modules problems.

⑤ The 4th point introduces the inportance of TE-32DT module parameter table, so does it mean that we should re-save a parameter table every time after replacing the probe?

A: Yes. After replacement each time, save a copy, this is a very rigorous and safe operation.

⑥ In the actual application, how to clear the TE-32DT module parameter configuration?

A: There are two ways, one for software removal configuration and one for hardware removal configuration. The following introduction:

Software removal configuration, click the default value in the channel without accessing any sensor, then click the parameter download to clear the configuration (sensor serial number).

Hardware removal configuration, configuration can be cleared (sensor serial number) by powering off and powering on the module for three times without accessing any sensor in the channel. The times of channel removal power-down configuration can be viewed in CRC6H and CRC7H.

⑦ TE-32DT channel indicator on the module is 0 and 1, what are the states of always-on and flashing?

A: 0 and 1 always-on means that the channel is working normally, flashing indicates that the sensor is disconnected.

⑧ For TE-32DT module, how to do the channel sensor communication break alarm?

When the module is used as remote IO, the module and the host PLC are connected via RS485 serial port of A+B-. The default baud rate of module is 19200, the data format is N 8 2 RTU, the default station number is 1, supporting Modbus protocol. Disconnected alarm of CR32~33 channels are read back in V32V33. Through WTOB, we know that M300~315 are obtained as the disconnected alarm status bits corresponding to the 16 sensors in channel 1. M316~331 are the disconnected alarm status bits corresponding to the 16 sensors in channel 2, so the communication program is as follows:

⑨ What is the role of configuring the number of sensors?

A: If the number of sensors in the TE-32DT channel is less than the number of configured sensors, then the corresponding indicator of channel 0 and channel 1 will flash and alarm. When the actual number of sensors is greater than or equal to this configuration number, no alarm is issued.

⑩ What does numerical value of 850 mean when monitoring?

A: Check the manual of DS18B20 chip, find that the ground wire of the 850th-bit chip is dangling, so check the sensor wiring.