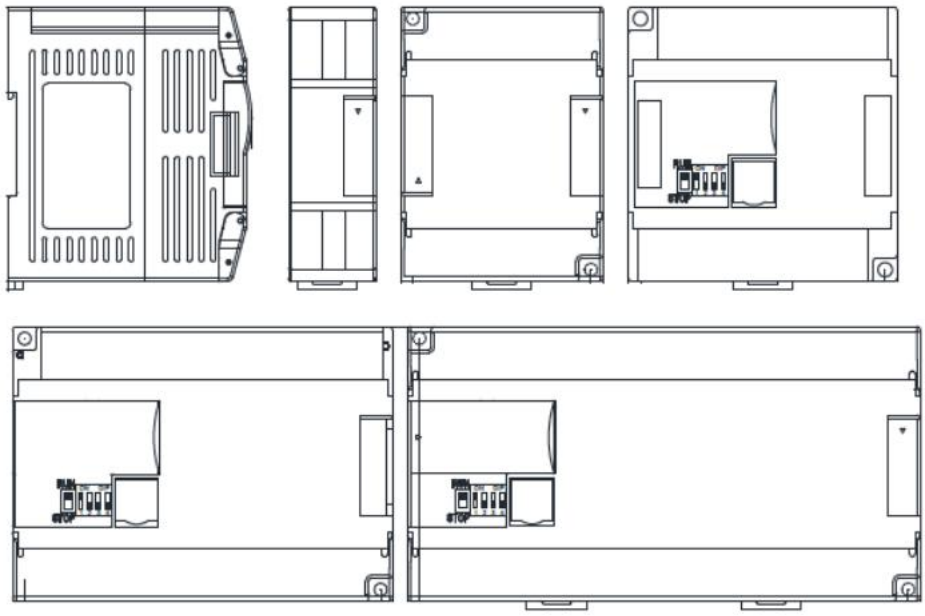
HNC PLC User Manual

Classic Programmable Logic Controller

Digital Module User Manual & Application Case



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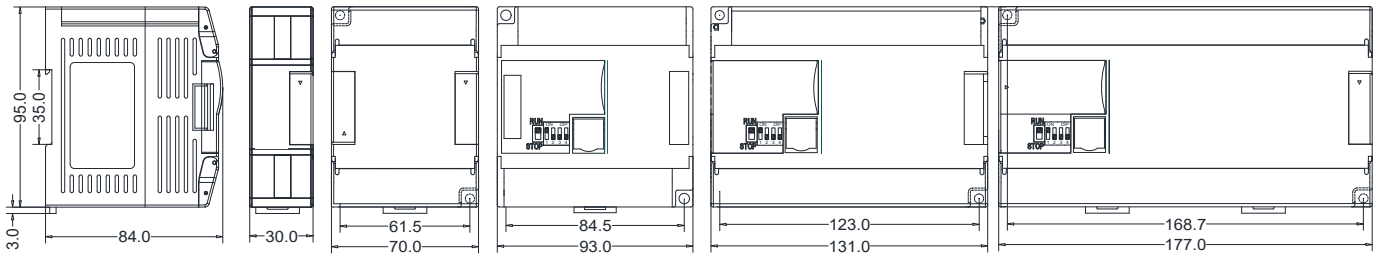
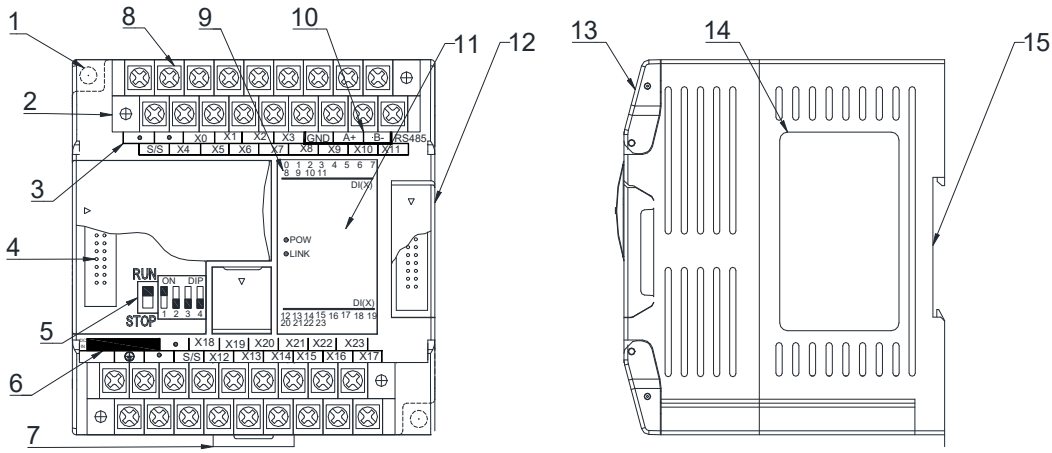
1. Product Model List and Dimension

Ethernet Model	24VDC	Model	24VDC	Dimension
		TE-16X	0.03A	70×95×82mm
		TE-16Y-R	0.15A	
		TE-16Y-TN/R	0.1A	
		TE-8X8Y-R	0.08A	
		TE-8X8Y-TN/P	0.06A	
TE-24Xe	0.06A	TE-24X	0.03A	93×95×82mm
TE-12X12Y-Re	0.16A	TE-12X12Y-R	0.13A	
TE-12X12Y-TN/Pe	0.12A	TE-12X12Y-TN/P	0.09A	
TE-40Xe	0.07A	TE-40X	0.04A	131×95×82mm
TE-36Y-Re	0.34A	TE-36Y-R	0.31A	
TE-36Y-TN/Pe	0.23A	TE-36Y-TN/P	0.2A	
TE-20X20Y-Re	0.18A	TE-20X20Y-R	0.15A	
TE-20X20Y-TN/Pe	0.16A	TE-20X20Y-TN/P	0.13A	
TE-32X32Y-Re	0.33A	TE-32X32Y-R	0.3A	177×95×82mm
TE-32X32Y-TN/Pe	0.23A	TE-32X32Y-TN/P	0.23A	





1.	Fixed hole	8.	Removable terminal
2.	Removable terminal screw	9.	Digital channel indicator
3.	Terminal definition	10.	RS485 communication port
4.	Module expansion port	11.	PWR power indicator、LINK module communication indicator
5.	DIP switch（8/16-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

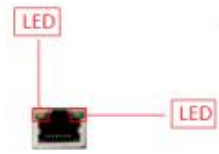
2. Indicator Description

① **PWR:** power indicator .green,constant light -Power normal; Not light - 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 picture:

Color	Status description
Green light is long bright	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, 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	AC Power Supply
Power supply voltage	24VDC -15%~+20%	100~240VAC
Power supply frequency	——	50~60Hz
Instantaneous surge	MAX 20A 1.5ms @24VDC	20A 1.5ms MAX @220VAC
Power loss time	10ms or less	20ms or less @220VAC
Fuse	0.3A，250V	2A, 250V
24V Output voltage (for input and expansion)	None	24V, -15%~+15%, 200mA (Max)
Isolation type	No Electrical isolation	Transformer isolation or optoelectronic isolation,1500VAC/1 minute
Power protection	DC input power polarity reverse, over voltage protection	DC 24V output over current 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	1500VAC/1min between AC terminal and PE terminal, 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

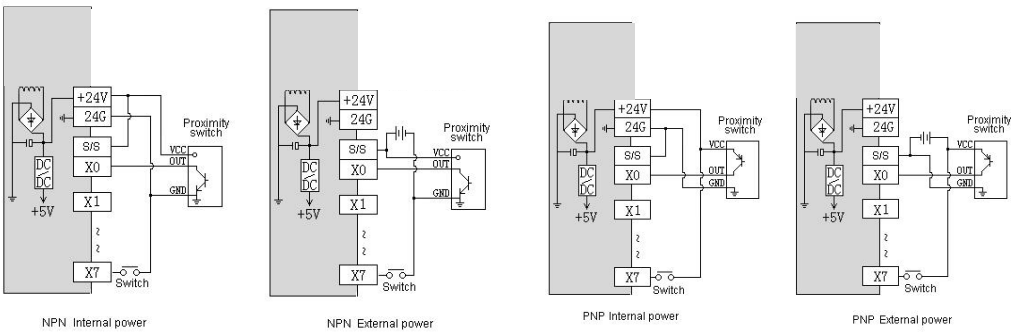
5. Digital Input (DI) Specification

Item	Digital Input (DI)
Input signal	No voltage contact or NPN/PNP
Action driving	ON>3.5mA OFF<1.5mA
Input impedance	Input Impedance≈4.3KΩ
Maximum input current	10mA
Reaction time	6.4ms DEFAULT, can be configured to 0.8~51.2ms
Isolation type	Independent optoelectronic isolation for each channel
Input indication	LED's lighting indicates ON, no light indicates OFF
Power supply	MPU internal power supply:DC power supply (SINK or SOURCE) 5.3mA@24VDC

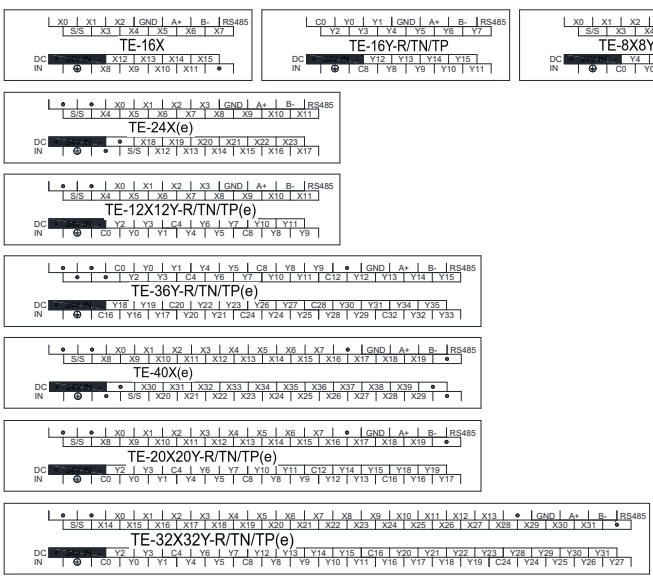
6. Digital Output (DO) Specification

Item		Output point type : Relay - R	NPN or PNP transistor output T/P
Maximum load	Resistive Load	2A/1 point, 8A/4 points COM	0.5A/1 point, 2A/4 points COM
	Inductive Load	50VA	5W/DC24V
	Lamp load	100W	12W/DC24V
Minimum Load		10mA	2mA
Voltage Specification		Below 250VAC, 30VDC	30VDC
Drive Capability		Maximum contact capacity: 5A/250VAC	1A MAX, 10 seconds
Reaction Time		Off→On 10ms, On→off 5ms	Off→On 10μs, On→Off 120μs
Isolation Type		Mechanical isolation	Independent optoelectronic isolation for each channel
Output Indication		LED's lighting indicates ON, no light indicates OFF	
Power Supply		MPU internal 24VDC power supply	

7. Digital Input/Output (DI/DO) Wiring Diagram



8. Terminal Wiring Diagram

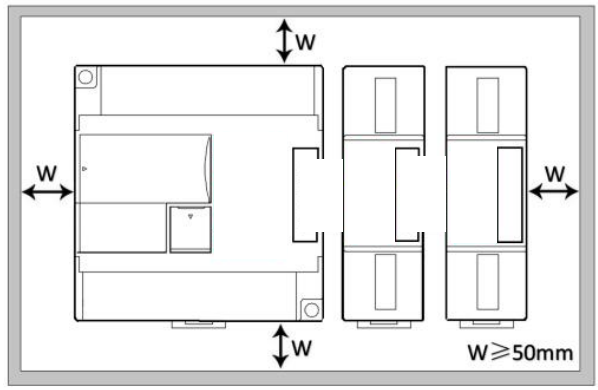


9. Module Parameter Table (CR code is corresponding to the Modbus register address)

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-16X, TE-16Y-R, TE-16Y-TN/TP, TE-8X8Y-R, TE-8X8Y-TN/TP, TE-24X(e), TE-12X12Y-R(e),, TE-12X12Y-TN/TP(e), TE-40X(e), TE-36Y-R(e), TE-36Y-TN/TP(e), TE-20X20Y-R(e), TE-20X20Y-TN/TP(e), TE-32X32Y-R(e), TE-32X32Y-TN/TP(e)
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 mask255.255.255.0， 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~4FH	DI channel 1~64 input value
50H~8FH	DO channel 1~64 output value
90H	DI filter time ms，0 - 0.8、1 - 1.6、2 - 3.2、3 - 6.4、4 - 12.8、5 - 25.6、6 - 51.2
91H~9FH	Reserve

10. Mounting and Installation



The modules 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.

Rail Mounting: Use standard 35 mm rail.

Screw Mounting: Each remote 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 it to a position near to the bottom/top of the cabinet. Do not mount it in vertical direction.

Digital Module Application Case

1. Module Used as Remote I/O

The 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.

1.1 Module power supply

The power supply is 24VDC. If the module is powered normally, the PWR indicator will light.

1.2 Communication port introduction

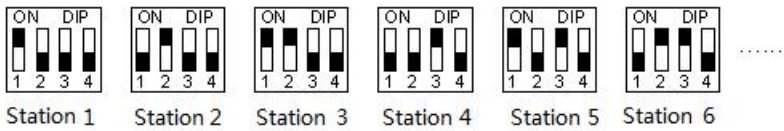
① All digital modules are built-in RS485 port.

② 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

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.

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 Module parameter configuration method introduction, when the module is used as remote IO

There are two 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: The module is configured by programming software remote module tool

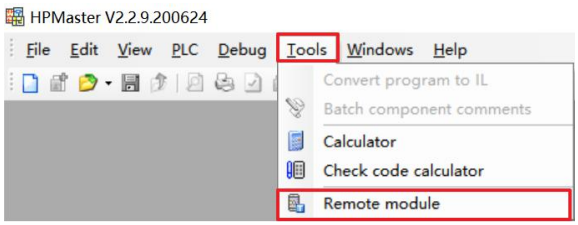
Hardware connection

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.

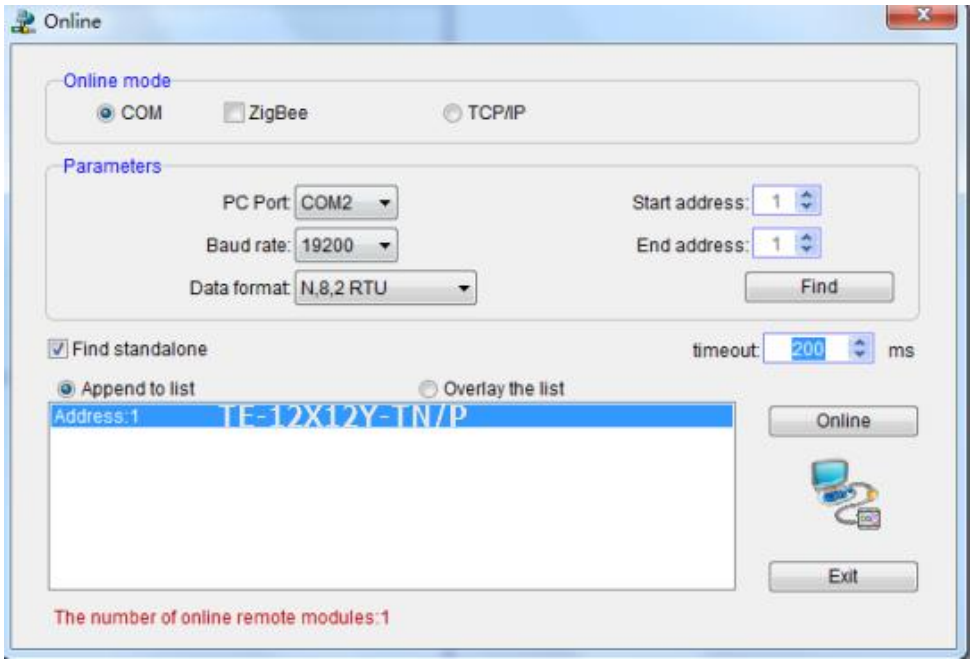
② Through the connection of Ethernet + communication interface: You can connect the module with the computer's network port directly by the standard network cable, or take the computer and module connected to the switch.

Software operation steps

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

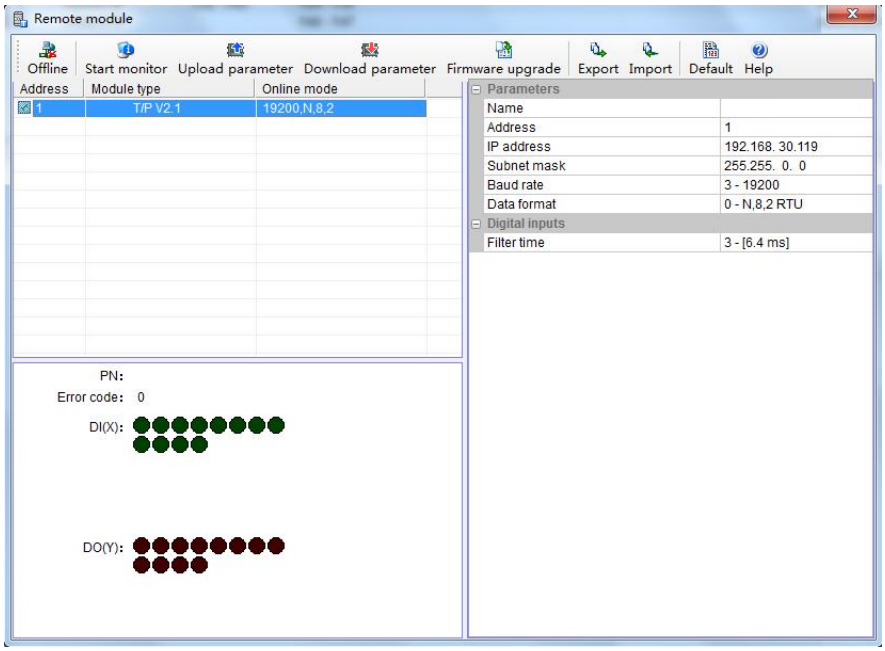


Click the button  in the pop-up window to open the "Online" window. The module default address is 1,19200, N 8 2 RTU, the online success is as follows:

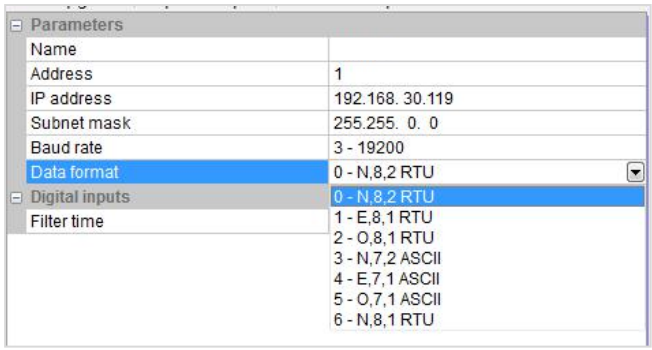


If there is only one machine connected with RS485 line, then check "stand-alone search"; if there are more than one, then remove the button of "stand-alone search", and set the start address and end address, so that all the machines connected with 485 line can be found and achieve parameter configuration.

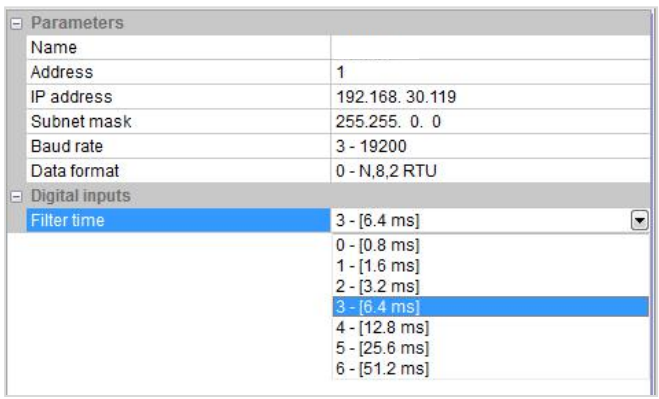
Click to exit, enter the configuration interface, as shown below:



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 switch input area, we can set the channel filter time.



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 monitoring the channel value of module, error code.

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

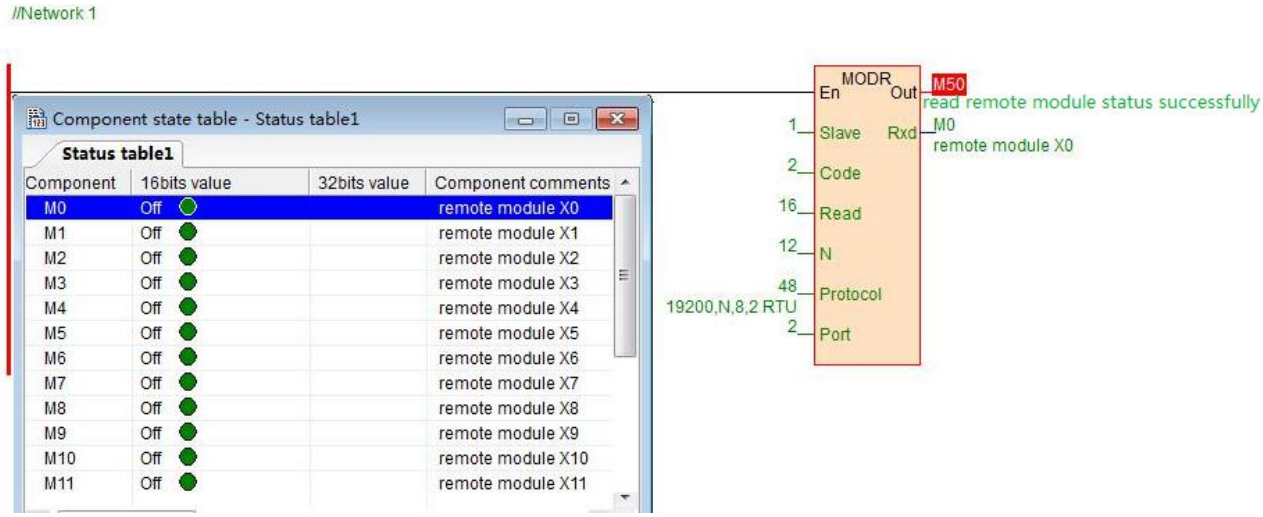
③ It can export the module configuration to save or import and restore the default value.

1.6 Remote IO application example(RS485): The PLC reads the 12 input channels status of the TE-12X12Y-TN 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: It can be seen from the above CR parameter list of digital module that the CR code 10H ~ 1CH of TE-12X12Y-TN module stores the input status of channels 1 ~ 12.

③ PLC program: Host PLC wants to read the 12 channels input status of remote IO module TE-12X12Y-TN. In this example, TE-12X12Y-TN communication is the default parameter: Station number address is 1, baud rate is 19200, data format is N 8 2 RTU. The PLC reads the 12 channels input status of TE-12X12Y-TN module:



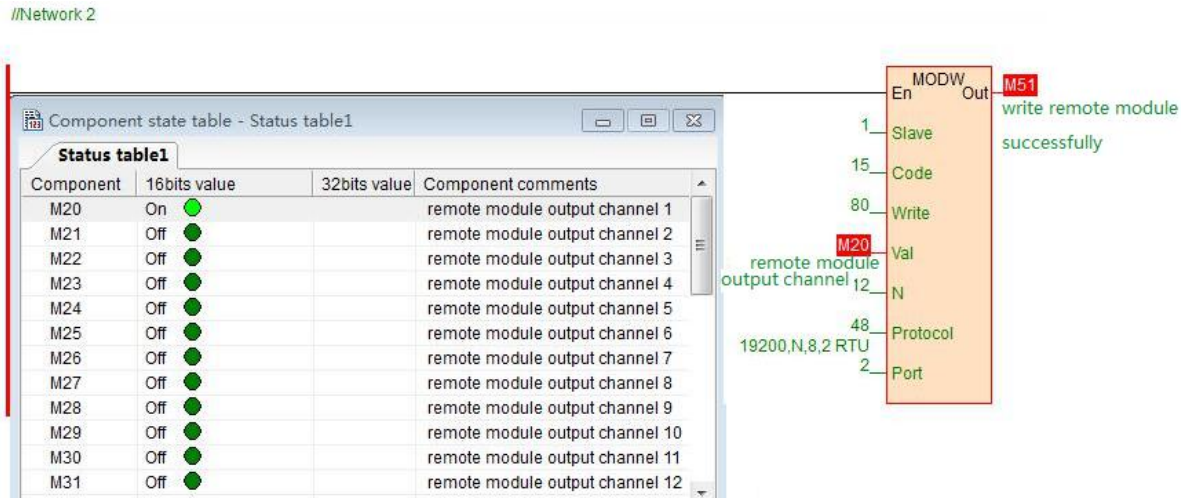
The host PLC reads the 12 channels input status of TE-12X12Y-TN by Modbus read instruction MODR, the start address is 10H (hexadecimal), that is, the decimal value is 16. When the communication is successful, M50 is ON, the input points status which are read back will be stored in M0-M11.

1.7 Remote IO application example (RS485 mode): The PLC writes the 12-channel output values of TE-12X12Y-TN 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 digital module CR parameter table shows that, the output channel 1 ~ 12 output values of 12-channel module are stored in address 50H~5CH.

③ PLC program: Host PLC wants to write the 12-channel output values of remote IO module TE-12X12Y-TN. In this example, TE-12X12Y-TN communication parameters: Station number address is 1, baud rate 19200, data format N 8 2 RTU. The program of writing 12-channel output values of TE-12X12Y-TN is as follows:



Host PLC writes the 12-channel output values of TE-12X12Y-TN by Modbus write instruction MODW, the start address is 50H(hexadecimal), that is, the decimal value is 80. When writing successfully, M51 is ON, the 12-channel values which will be written into are stored in M20-M31.

1.8 Remote IO application example(Ethernet): PLC read and write each channel input and output values of TE-32X32Y-TNe

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-32X32Y-TNe digital module CR parameter table shows that the input values of module input channel 1 ~ 32 are stored in the address 10H~30H. The output values of module output channel 1-32 are stored in 50H~70H.

③ PLC program: Read the 32-channel input status of remote Ethernet module TE-32X32Y-TNe and write the 32-channel output values of TE-32X32Y-TNe, if the module IP address is 192.168.1.112, station number address is 1, the read results are stored in the M100~M131, the values to be written are stored in the register M200-M231. As follows: