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**NA400**  
**CMM401-0411**

**Serial Communication Module Instruction**  
**Manual**  
**V 1.1**

**June 2022**

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# 1. Hardware Operation Instructions

## 1.1 Order Number

400CMM4010411

## 1.2 Characteristic

The CMM401-0411 communication module has the following features:

- Support up to 4 extended serial ports;
- Serial port type RS485;
- Programmable serial interface;
- Independently accomplishing serial communication task, data exchange with CPU, non-need

CPU resource;

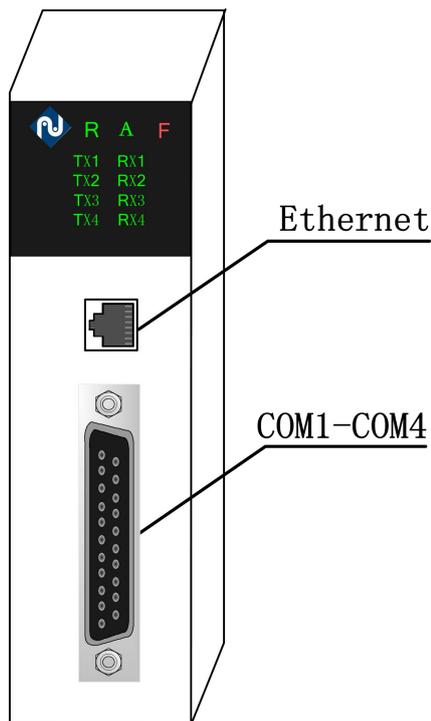
- A separate intranet is used for data exchange with the CPU module, which is separated from the intranet of the I/O module to reduce the burden of intranet communication;

- The maximum of communication nodes is 32 when using RS-232/RS-485 converter;
- Intelligent module , With watchdog function, the module can reset and reboot automatically

when fault;

- Non-need hardware setting, The CPU Module Load program on it automatically after startup;
- Hot plugging.

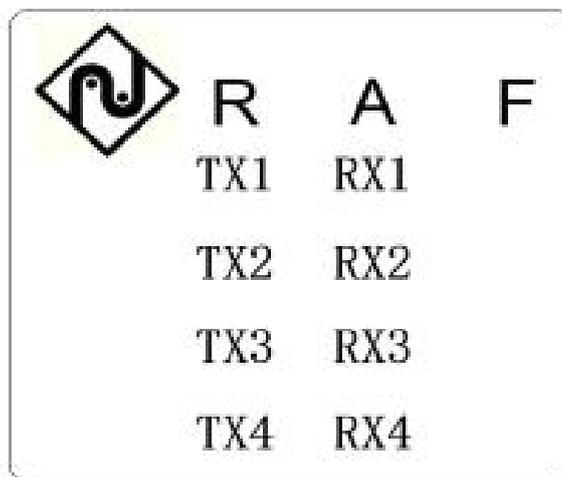
## 1.3 Outlook of CPU Module:



**CMM401-0411 Module**

### 1.4 Indicator LED Description:

The state specification of NA400 CMM401-0401 indication LED as follows:



**Indicator LEDs**

LED	Color	State	Meaning
R	Green	Flicker	Run normally
A	Green	Light / off	HIN work normally/ abnormally
F	Red	Light / off	Fault/ Runing normal

TX1~TX4	Green	Flicker / off	Serial port 1 is sending data/No Data is sending
RX1~RX4	Green	Flicker / off	Serial port 1 is receiving data/No Data is received

The detail meanings of the working state of the indicating lamp on the NA400 CMM401- 0411 module panel are as following:

- R: Running indicating lamp, lamp is green flickering when the module is running normally, and always light means program has been running but parameter is unloaded.
  - A: HIN Activated Indicating LED. When HIN works normally, the LED is light on, or it turns off.
  - F: Fault Indicating LED. The LED is light when the module is fault.
  - Tx1~Tx4: Data transmission indicating light for four serial ports (COM1~COM4). The corresponding "Tx" lamp lights when the serial port is sending data.
  - Rx1~Rx4: Data receiving indicating lights for four serial ports (COM1~COM4). The corresponding "Rx" lamp lights when the serial port is receiving data.
- Hardware Setting and External Interface.

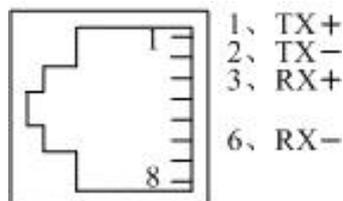
## 1.5 Technical Specifications

CMM Type	CMM401-0411
Order NO	400CMM4010411
Power Consumption	3.0W/5V
Current Consumption	600mA/5V
Number of expansion serials	4
Type of the serial port	RS485
Baud rate	2.4 ~38.4 kbps
Electrical isolation	Yes
Independent Interruption	Yes
Communication program	Programmable
Weight	250g
size wide×high×deep	40×145×158

## 1.6 External Interface

### 1.6.1 Ethernet Interface

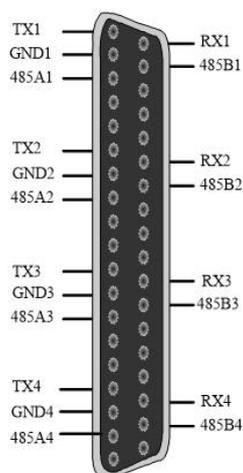
The module provides a 10M Ethernet interface with an IP address of 192.168.3.100, File and debugging program are transmitted through Ethernet interface.



### The definition of Ethernet Interface

### 1.6.2 Connecting Method

Serial communication module needs to be equipped with a serial communication cable. The module itself has a 37 -core D -type socket, which provides a standard RS-485 serial communication interface. Serial port 1 to serial port 4 support RS485 communication, support Modbus RTU Master or custom protocol.



DB37 port definition

## 2. Instructions for Using the Software

When users get the serial port module, they need to configure the CPU module and the communication module in the NPro programming software before they can be used. If you use Modbus communication, choose command mode configuration; if you use custom protocol, choose data area mode.

The command mode can set the Modbus RTU Master protocol and the Modbus RTU Slave protocol, which requires the NPro programming software.

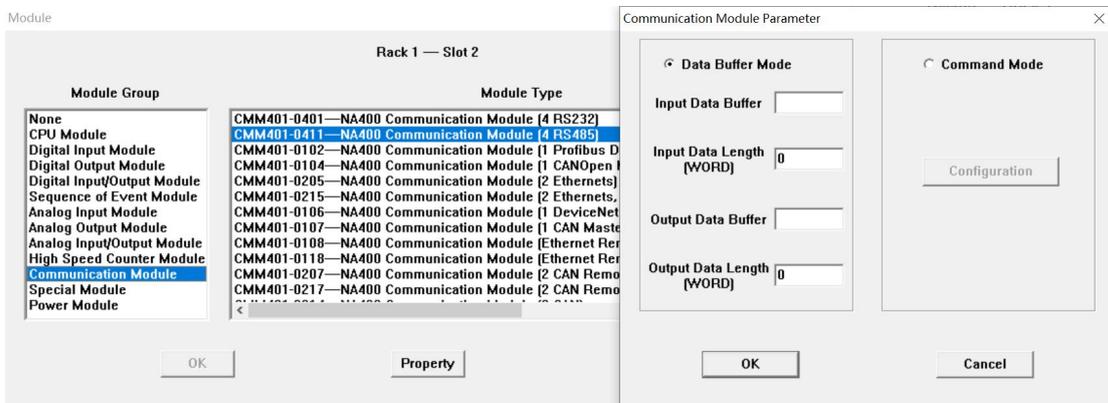
## 2.1 Command Mode (hardware bottom layer 2.0 and above )

In the NPro programming manual, MODBUS uses the following function codes:

Function Code (Decimal System)	Meaning
01	Read coil status
02	Read input status
03	Read maintenance mode register
04	Read input mode register
05	Force a single coil
06	Write a single register
15	Force multiple coils
16	Write multiple registers
20	Read variables
21	Write variables

### 2.1.1 MODBUS RTU MASTER

In the NPro software [Resources] - [PLC Configuration] - [ Chassis ] - [Module Properties], you can set the parameters of the serial communication module. The specific operations are as follows:



Configure the parameters of the CMM301-0401 serial communication module through the NPro programming software, and support the standard MODBUS RTU MASTER protocol.

No.	Function code	Slave address	Register address	Register number	Data buffer	Scan mode	Control bit(M)
1	Disable	0	0	0		Fast scan	0
2	Disable	0	0	0		Fast scan	0
3	Disable	0	0	0		Fast scan	0
4	Disable	0	0	0		Fast scan	0
5	Disable	0	0	0		Fast scan	0
6	Disable	0	0	0		Fast scan	0
7	Disable	0	0	0		Fast scan	0
8	Disable	0	0	0		Fast scan	0
9	Disable	0	0	0		Fast scan	0
10	Disable	0	0	0		Fast scan	0
11	Disable	0	0	0		Fast scan	0
12	Disable	0	0	0		Fast scan	0
13	Disable	0	0	0		Fast scan	0
14	Disable	0	0	0		Fast scan	0
15	Disable	0	0	0		Fast scan	0
16	Disable	0	0	0		Fast scan	0
17	Disable	0	0	0		Fast scan	0
18	Disable	0	0	0		Fast scan	0
19	Disable	0	0	0		Fast scan	0

Module parameter configuration description:

**【Protocol】** Currently supports MODBUS RTU MASTER protocol and MODBUS RTU SLAVE protocol, you can choose "None" if you do not use the protocol.

**【Communication Troubleshooting】** Keeping the original value (default) or clearing it refers to the data processing on the CPU side after the serial port module is disconnected from the external device (keeping the last communication data or clearing the data).

**【Command Interval】** ( data range 20-60000ms, default: 500 ), the delay time before sending the next MODBUS command after a command is sent and a correct message is received or a timeout alarm is responded.

**【Receive Timeout】** ( data range 100-60000ms, default: 500 ), after the master station sends a command, it waits for the slave station to respond. If the time exceeds this time, the system alarms and the communication times out, and the next command is processed.

**【Slow scan ratio】** ( data range 1-255, default: 2 ), for example, if it is set to 5, then the interval time of the MODBUS master reading data is 5 times longer than the time set by the parameters (command interval, receiving timeout). It is to read 5 times at a fast speed and only once at a slow speed.

**【Input (read) scan method】** Fast scan (default), slow scan.

**【Output (write) scan method】** Continuous fast output (default) , continuous slow output, change output, position control output

**Continuous output :** Write command operations are performed at the same time period as the read command.

**Every change output :** When the output data changes, output the write command, and stop outputting after receiving the normal reply message (at this time, the corresponding CPU area register value remains unchanged).

**Bit control output :** Allocate a bit register. When the register value is 1, the write command is continuously output, and when it is 0, it is not output (at this time, the CPU register value remains unchanged, and the value corresponding to the latest output write command is maintained).

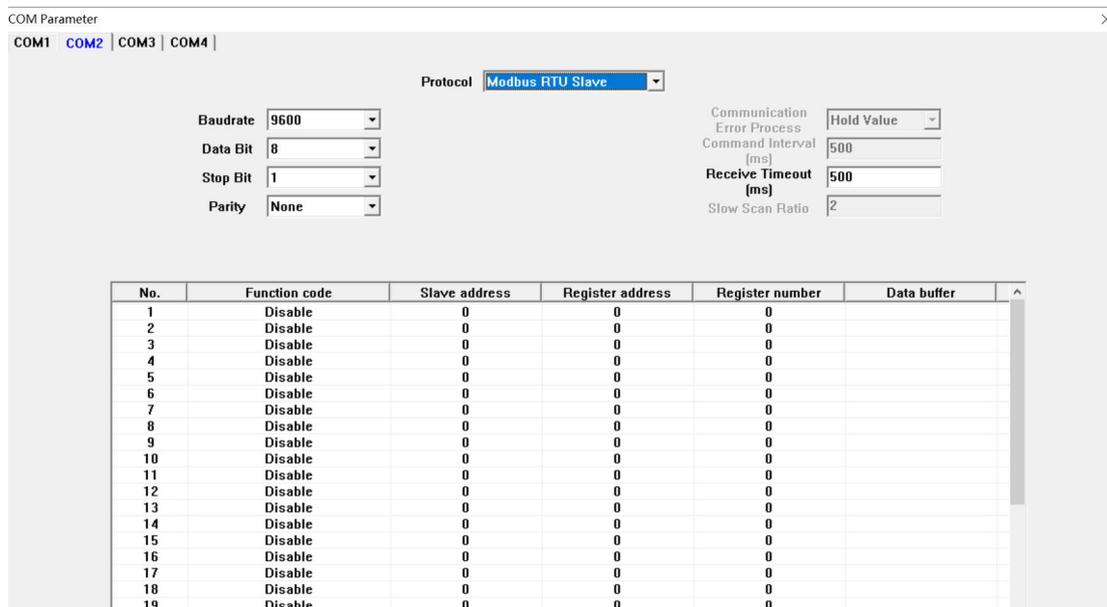
**【Equipment fault location】** If the CMM301-0411 serial communication module is configured on the PLC rack, each serial port acts as the MODBUS master to read the communication status flags of the slaves as shown in the table below. The module serial numbers are in the configuration order, starting from the first rack and increasing from left to right. There are 64 bits in total , which respectively indicate the status of 1-16 devices behind serial ports 1-4, and report 1 for faults, otherwise it is 0.

CPU Model	Numbers of CMM0401	System register	Status	Illustration
CPU301-0101	The first CMM0401	%SW1953	COM1 Slave Station 1-16 Status	1: Communication failure 0: Communication OK
		%SW1954	COM2 Slave Station 1-16 Status	
		%SW1955	COM3 Slave Station 1-16 Status	
		%SW1956	COM4 Slave Station 1-16 Status	
	The second CMM0401	%SW1957	COM1 Slave Station 1-16 Status	1: Communication failure 0: Communication OK
		%SW1958	COM2 Slave Station 1-16 Status	
		%SW1959	COM3 Slave Station 1-16 Status	
		%SW1960	COM4 Slave Station 1-16 Status	

			Status	
The third CMM0401	%SW1961	COM1 Slave Station 1-16	COM1 Slave Station 1-16 Status	1: Communication failure 0: Communication OK
	%SW1962	COM1 Slave Station 1-16	COM1 Slave Station 1-16 Status	
	%SW1963	COM2 Slave Station 1-16	COM2 Slave Station 1-16 Status	
	%SW1964	COM2 Slave Station 1-16	COM2 Slave Station 1-16 Status	
The fourth CMM0401	%SW1965	COM3 Slave Station 1-16	COM3 Slave Station 1-16 Status	1: Communication failure 0: Communication OK
	%SW1966	COM3 Slave Station 1-16	COM3 Slave Station 1-16 Status	
	%SW1967	COM4 Slave Station 1-16	COM4 Slave Station 1-16 Status	
	%SW1968	COM4 Slave Station 1-16	COM4 Slave Station 1-16 Status	

### 2.1.2 MODBUS RTU SLAVE

Configure the parameters of the CMM301-0401 serial communication module through the NPro programming software, and support the standard MODBUS RTU Slave protocol.



**【Baud Rate】 【Data Bits】 【Stop Bit】 【Check】** Same as the master setting.

**【Function Code】** The protocol is the standard MODBUS RTU protocol, and the appropriate

iate function code is selected according to different measuring point types and functions.

**【Slave Address】** 1-255

**【Register Address】** 0-65535 (no need to specify addresses according to standard Modbus protocol)

**【Number of Registers】** 1-120

**【Data area】** % M , %N , %MW , %NW , %V

Testing point type	Reading function code	Writing function code
M	01	05/15
N	01	05/15
MW	03	06/16
NW	03	06/16
V	03	06/16

### 2.1.3 Example

For example: the master reads the value of the slave %MW1 and puts it into %MW10 , one at a time, and the slave address is 1 .

The screenshot shows a configuration window for a Modbus RTU Slave. The 'Protocol' is set to 'Modbus RTU Slave'. Communication parameters include Baudrate: 9600, Data Bit: 8, Stop Bit: 1, Parity: None, and a Slow Scan Ratio of 2. Timing parameters include Command Interval (500 ms), Receive Timeout (500 ms), and Hold Value. Below these settings is a table for configuring registers:

No.	Function code	Slave address	Register address	Register number	Data buffer
1	0x03 read holding registers	1	0	1	%mw1
2	Disable	0	0	0	
3	Disable	0	0	0	
4	Disable	0	0	0	
5	Disable	0	0	0	
6	Disable	0	0	0	
7	Disable	0	0	0	
8	Disable	0	0	0	
9	Disable	0	0	0	
10	Disable	0	0	0	
11	Disable	0	0	0	
12	Disable	0	0	0	
13	Disable	0	0	0	
14	Disable	0	0	0	
15	Disable	0	0	0	
16	Disable	0	0	0	

The slave configuration as follows:

Among them, the 0X03 function code means the function code for reading the word register, the slave address is filled with 1, the number of registers is 1, the data area to be read is %MW1 and %MW1 is mapped to the register address 0.

The master station configuration as follows:

COM1 | COM2 | COM3 | COM4

Protocol: Modbus RTU Master

Baudrate: 9600  
Data Bit: 8  
Stop Bit: 1  
Parity: None

Communication Error Process: Hold Value  
Command Interval (ms): 500  
Receive Timeout (ms): 500  
Slow Scan Ratio: 2

No.	Function code	Slave address	Register address	Register number	Data buffer	Scan mode	Control bit(M)
1	0x03 read holding registers	1	0	1	%mw10	Fast scan	0
2	Disable	0	0	0		Fast scan	0
3	Disable	0	0	0		Fast scan	0
4	Disable	0	0	0		Fast scan	0
5	Disable	0	0	0		Fast scan	0
6	Disable	0	0	0		Fast scan	0
7	Disable	0	0	0		Fast scan	0
8	Disable	0	0	0		Fast scan	0
9	Disable	0	0	0		Fast scan	0
10	Disable	0	0	0		Fast scan	0
11	Disable	0	0	0		Fast scan	0
12	Disable	0	0	0		Fast scan	0
13	Disable	0	0	0		Fast scan	0
14	Disable	0	0	0		Fast scan	0
15	Disable	0	0	0		Fast scan	0
16	Disable	0	0	0		Fast scan	0

The 0X03 function code means the function code for reading the word register, the slave address is 1, and the number of registers is 1. Because the value of %MW1 has been mapped to 1, the register address is 0, and the data area reads data from the master station. The address to be stored later is %MW10.

### 3. Notes

#### 3.1 Hardware limitations of The CMM401-0411

For different hardware bottom versions, only one corresponding method can be adopted: modules below hardware bottom layer 3.0 can only use data area mode, and modules above hardware bottom layer 3.0 can only use command mode.

#### 3.2 Software Limitations for CMM401-0411

① The configuration part of the data area mode (applicable to NPro5.8.0 and above) mainly includes serial port configuration and protocol configuration. Currently, only Modbus RTU Master protocol setting can be performed, and NA Comm configuration software (applicable to NACommV2.1 version) is required.

② Command mode can be used to set Modbus RTU Master protocol (applicable to NPro5.8.0 and above) and Modbus RTU Slave protocol (applicable to NPro6.0.4 and above), which requires NA Pro programming software.

#### 3.3 Extension of CMM401-0411

- ① If users use the standard MODBUS RTU protocol, they can directly configure the protocol with NA Pro or NA Build
- ② When users choose a custom protocol, they can only use C language programming through NA Build software
- ③ Each channel independently supports 16 devices
- ④ default baud rate is 9600bps , and the maximum distance is 2KM (using RS485 special twisted pair), and the long distance can be interrupted by RS485 or converted to optical fiber.

Basic characteristics of RS485 bus: According to the RS485 industrial bus standard, the RS485 industrial bus is a half-duplex communication bus with a characteristic impedance of 120  $\Omega$ , and its maximum load capacity is 32 effective loads (including the main control device and the controlled device).

RS485 bus baud rate and the transmission distance as follows:

theoretical value	0.56mm (24AWG) RS485 twisted pair	
	Baud rate (bps)	Maximum distance (m)
	2400	1800
	4800	1200
	9600	800
	19200	600

- ⑤ When configuring, pay attention to configuring the communication connection cable CNL401-0203
- ⑥ 8 local racks can be configured , and a maximum of 4 remote I/O stations can be configured per sub- station

Numbers of expansion racks for different CPU models & Numbers of remote IO stations

CPU class	Number of expansion racks	Number of remote IO substations
CPU401-02XX	4	64
CPU401-03XX	6	64
CPU401-04XX	8	64
CPU401-05XX	8	64
CPU401-06XX	8	64

### 3.4 Precautions When using NA400

- ① The redundant controller CPU401-0521 communicates with the free port of COM1 and COM2 , which cannot be used normally, because the COM ports of the master and slave CPUs cannot be connected in parallel normally, while the COM1 of the CPU401-0501 controller can pass the free port. Communicate with third-party devices because the COM1s of the master and slave CPUs are connected together through redundant cable jumpers
- ② NA400 controller Ethernet remote IO mode, its substations can be equipped with up to 64 substations, and the Ethernet master module only has NA400 , its remote IO substation can choose NA400/NA300/NA200H , if you choose daisy chain mode, only NA400 and NA300 can be selected
- ③ The number of OPCs connected to NA400 is limited to 16 , and the number of OPCs connected to NA300/NA200H/NA2000 is limited to 8
- ④ The real-time clock of PLC is powered by button battery after power failure, and the clock can run normally for more than 2 years. PLC is stored in Flash ROM . and programs are permanently saved
- ⑤ Pay attention to the bottom layer of the CPU and the bottom layer of the communication module, the serial port module supports direct configuration in NA Pro , and the serial port module supports the MODBUS master-slave protocol