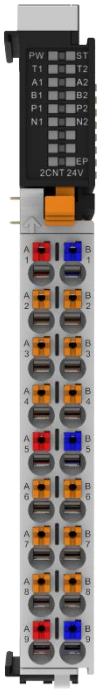
3.13 Communication serial port module (DF50-M-1COM-232/485/422)

- The communication serial port module supports 1 channel RS485, RS232, or RS422 (one of three options).
- Support Modbus/RTU/ASCII protocol, support master station, slave station, and free transparent working mode.
- RS485/RS232/RS422 interfaces can be used by devices that support Modbus RTU/ASCII protocols to interconnect with upper level PLCs or upper level computers
- Protection level IP20.



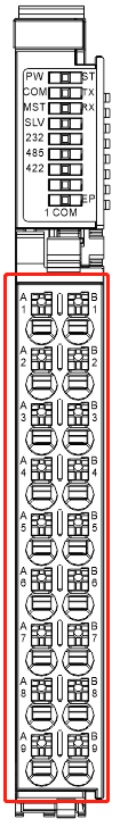
3.13.1 Specification parameters

Technical Information	
Product Description	Serial port module, 1 channel, supporting

	RS232/RS485/RS422
Number of channels	1
interface	RS232/RS485/RS422
protocol	Modbus RTU/ASCII master and slave modes; Free Agreement Mode
Baud	1200bps—500000bps
Data bits	7bit/8bit
Check digit	None/Even/Odd/Space/Mark
Stop bit	1bit/1.5bit/2bit
Maximum data frame length	128byte
Wiring parameters	
Connection technology: input end	PUSH-IN type wiring port
line type	Input
Crimping area of wire	0.14～1.5mm²/26～16AWG
Strip length	8～10mm
Installation method	DIN-35 type guide rail
Material parameters	
Colour	Black
Housing material	PC plastic,PA66
Consistency flag	CE
Environmental requirements	
Permissible ambient temperature (during operation)	-25～60℃
Permissible ambient temperature(storage)	-40～85℃
Protection type	IP20
Pollution leve	2.Comply with IEC 61131-2 standard
Working altitude	Without temperature influence:0～2000m
Relative humidity (non condensing)	5～95%RH
Anti vibration	4g, Complies with IEC 60068-2-6 standard
Impact resistance	15g,Complies with IEC 60068-2-27 standard
EMC - Immunity	Complies with EN 61000-6-2 standard
EMC-Radiated Interference	Complies with EN 61000-6-3 standard
Corrosion resistance	Complies with IEC 60068-2-42 and IEC 60068-2-43 standards
Permissible H2S pollutant concentration at 75% relative humidity	10ppm
Permissible SO2 pollutant concentration at 75% relative humidity	25ppm
Firmware upgrade	support

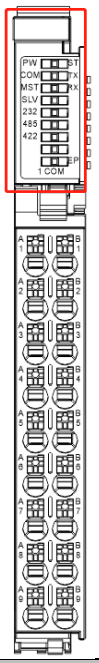
3.13.2 Hardware interface

3.13.2.1 Definition of wiring port



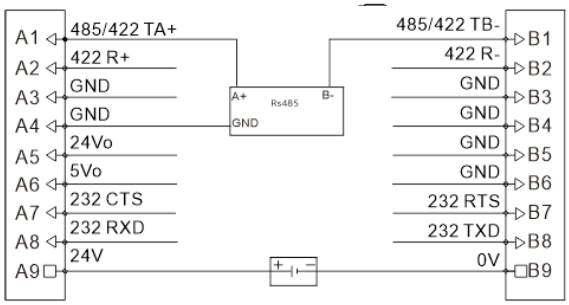
Serial Number	Signal	Serial Number	Signal	Explanatory note
A1	485/422 TA+	B2	485/422 TB-	RS485
A2	422 R+	B3	422 R-	RS422
A3	GND	B4	GND	GND
A4	GND	B5	GND	
A5	24Vo	B6	GND	24V load power supply
A6	5Vo	B7	GND	5V load power supply
A7	232CTS	B8	232RTS	RS232
A8	232RXD	B9	232TXD	RS232
A9	24V	B2	0V	24V input power supply

3.13.2.2 Definition of LED indicator lights

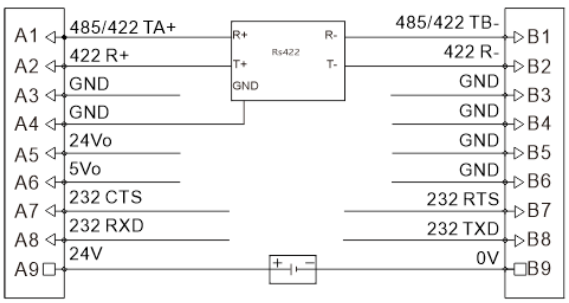


LED indicator light	Explanatory note
PW	Internal bus power supply is normal
	Abnormal internal bus power supply
ST	Power on stage: green light on: module initialization abnormal, green light off: module initialization normal
	Operation phase: green light flashing: module internal bus working normally, green light off: module internal bus working abnormally
COM	Green light on: input signal valid
	Green light off: invalid input signal
MST	Green light on: input signal valid
	Green light off: invalid input signal
SLV	Green light on: input signal valid
	Green light off: invalid input signal
232	In 232 mode, the light remains on: normal
	In 232 mode, the light remains off: abnormal
485	In 485 mode, the light remains on: normal
	In 485 mode, the light remains off: abnormal
422	In 422 mode, the light remains on: normal
	Under 422 mode, the light remains off: abnormal
TS	Green light flashing: communication transmission is normal
	Green light off: abnormal communication transmission
RX	Green light flashing: communication reception is normal
	Green light off: abnormal communication reception
EP	Green light on: module external interface power supply is normal
	Green light off: Abnormal power supply to the external interface of the module

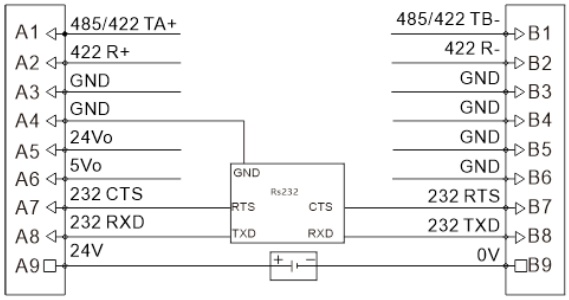
3.13.2.3 Wiring diagram



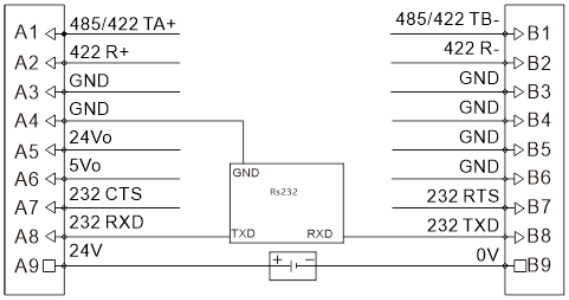
Rs485 control wiring



Rs422 control wiring



Rs232 with flow control wiring



Rs232 No Flow Control Wiring

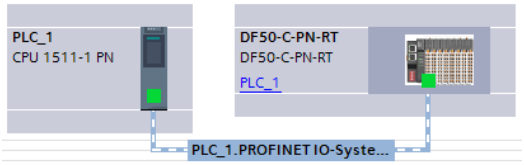
Note: A9 and B9 are external power input interfaces

3.13.3 Parameter Configuration Table

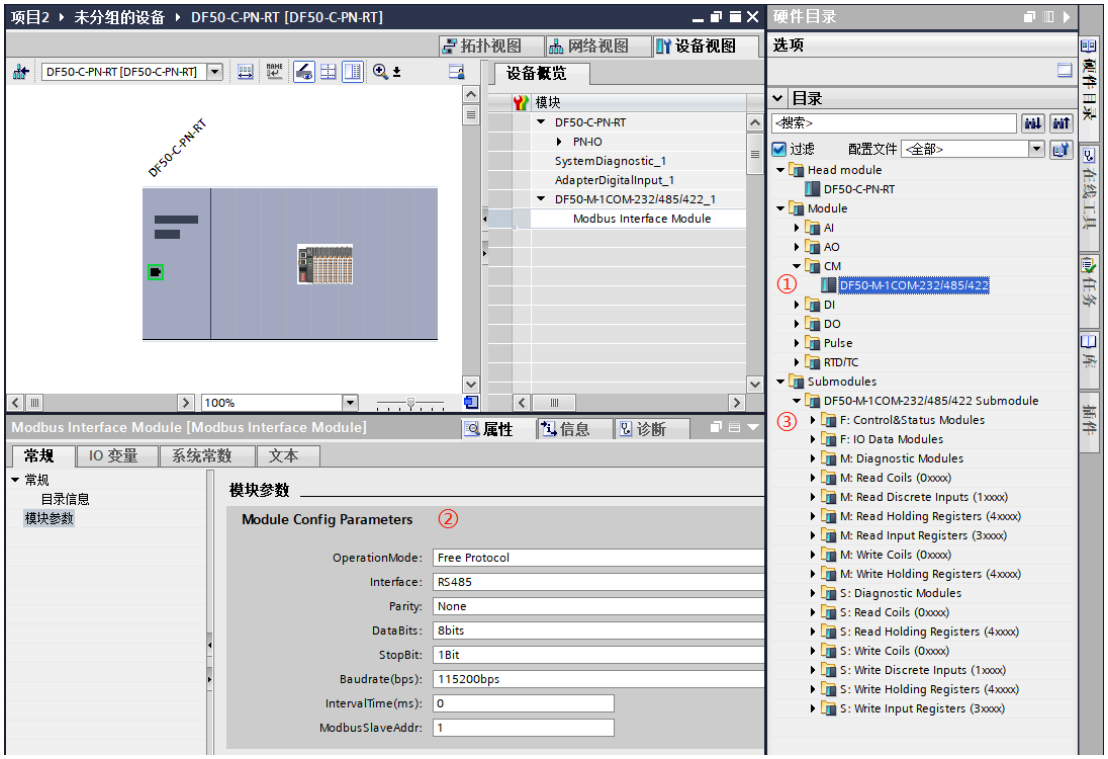
1. New construction project, installation of GSDML-V2.42-DF50-C-PN-RT file;

2. Add PLC equipment and DF50-C-PN-RT equipment to the project;

3. Connect the PLC to the DF50-C-PN-RT device



4. Enter the DF50-C-PN-RT device view and add a serial module sub slot;



① From the Module module list, locate the CM gateway module column. After clicking on it, the serial port module DF50-M-1COM-232/485/422 will be displayed. Double click to add it to the slot/slot of the DF50-C-PN-RT device on the left. DF50-C-PN-RT defaults to two slots/slots, with the first being SystemDiagnostic_ 1 diagnostic information, the second is AdapterDigitalInput_ The coupler comes with 8 DI inputs, and the serial module occupies the third slot/slot, and automatically adds a sub slot/sub slot Modbus Interface Module;

② The sub slot Modbus Interface Module is used for interface configuration and can

select different protocol modes, hardware interfaces, and serial communication formats.

IntervalTime is only valid under Free Protocol and Modbus RTU Slave, while SlaveAddr is only valid under Modbus RTU Slave.

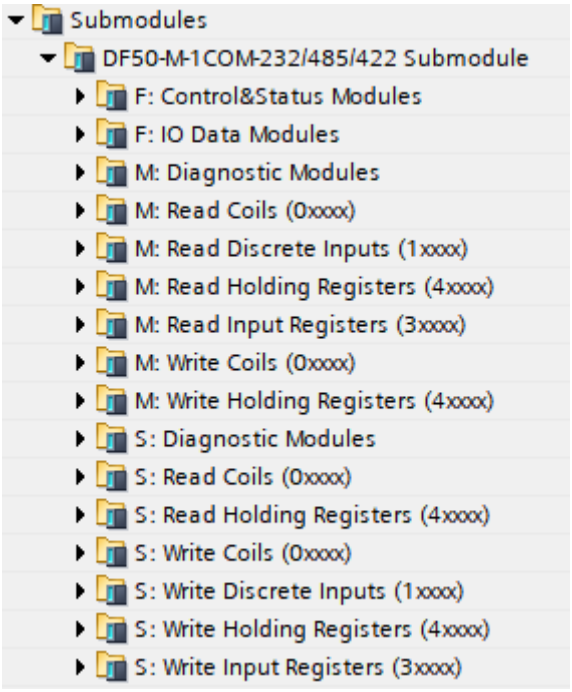
Interface Module configuration parameter table:

Module parameters	Parameter Meaning	Initial value
OperationMode	0:Free Protocol 1:Modbus RTU Master 2:Modbus RTU Slave	0:Free
Interfance	0:RS232 Flow OFF 1:RS232 Flow ON 2:RS485 3:RS422	2:RS485
Parity	0:None 1:Odd 2:Even	0:None
Data bits	0:8bits 1:7bits	0:8bits
Stop bit	0:1Bit 1:2Bits	0:1Bit
Baudrate	2400bps-256000bps	11:115200
IntervalTime	Free: The interval time between two data frames, in milliseconds Modbus RTU Slave: Slave Response Master Delay	0:0ms
Slave addr	The address of the module is valid in Modbus RTU Slave mode, but not in other modes。	1

③Select the applicable sub slots in the second step based on the selected operation mode, OperationMode

OperationMode	Corresponding sub slot

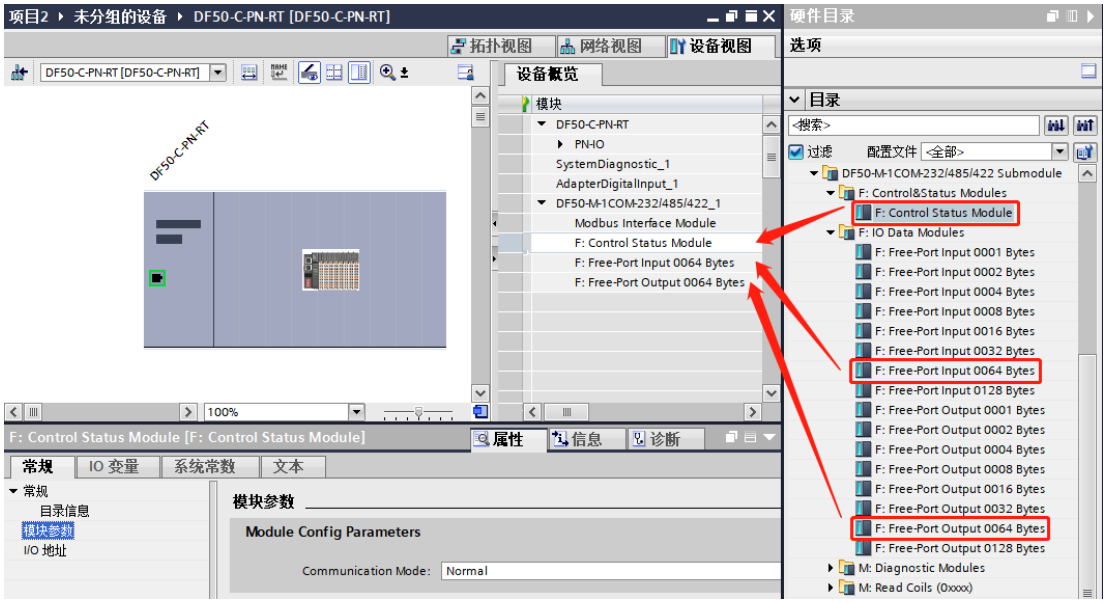
0:Free Protocol	2 seed slots starting with F
1:Modbus RTU Master	7 seed slots starting with M
2:Modbus RTU Slave	7 seed slots starting with S



Free Protocol mode

Add the corresponding sub slot in free transparent mode to the left list, where the F: Control Status Module sub slot is fixed to the second sub slot, the F: Free-Port Input sub slot is fixed to the third sub slot, and the F: Free-Port Input sub slot is fixed to the fourth sub slot.

F: The Control Status Module sub slot has a module parameter that defaults to Normal. Other functions are not currently available in this version.



F: The data structure of the Control Status Module sub slot is as follows:

output data			
Byte offset	name	length	meaning
Byte:0-1	CtrlWord	2byte	Control word
Byte:2	TxDataLEN	1byte	Sending data length
Byte:3	TxDataCNT	1byte	Send data sequence number
data in			
字节序号	名称	长度	meaning
Byte:0-1	StateWord	2byte	Status Word
Byte:2	RxDataLEN	1byte	Received data length
Byte:3	RxDataCNT	1byte	Receive data sequence number
Byte:4-11	/	8byte	hold

其中CtrlWord和State组成控制状态机，CtrlWord包含以下命令：

Command value	Command Name	meaning
16#00A1	CONFIGUREPORT	Configuration command (PN bus does not require operation)
16#00C1	WRITECUSTOM	Free mode write data command
16#00C2	READCUSTOM	Free mode data reading command

Note: After each power on configuration of the coupler, it will automatically send the CONFIGUREPORT command to configure the serial port module. After successful

configuration, the serial port module will enter the READCUSTOM state and feedback that the State Word state is 16 # 0003.

StateWord包含以下状态：

Normal state value	Status Name	meaning
16#0000	OP_SUCCESS	Configuration or write operation successful
16#0001	DATA_FULL	The data has been updated and is readable
16#0002	WRITE_IDLE	Write free, writable
16#0003	DATA_EMPTY	Read idle, receive data not updated
Error status value	Status Name	meaning
16#E0A1	WRITE_BUSY	Busy writing, unable to write
16#E0A2	DATA_LARGE	Data length exceeds the limit
16#E0A3	CMD_ERR	command error
16#E0A4	PARA_ERR	Configuration parameter error
16#E0A5	CHECK_ERR	Verification error
16#E0A6	SLAVE_NOEXIT	Slave device does not exist
16#E0A7	PACK_LOSS	Packet loss
16#E0A8	OVER_FLOW	data overflow

F: Free Port Input 0064 Bytes is the input data, totaling 64 Bytes;

F: Free Port Output 0064 Bytes is the output data, totaling 64 Bytes;

Free Protocol Use Cases:

The following will take reading pressure sensor data as an example to demonstrate the operating principle using pseudo code (ST language):

Variable declaration area:

```
TxDataCNT_Last :UINT:=65535;
RxDataCNT_Last :UINT:=65535;
RxByte_ARR:ARRAY[0..64] OF BYTE;
```

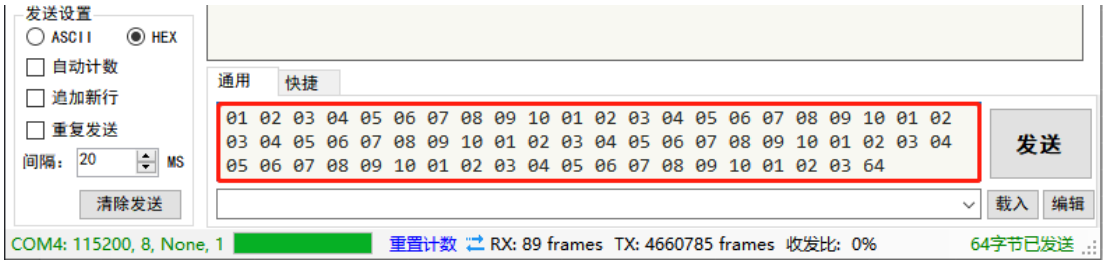
Program area:

```
IF RxDataCNT_Last<>RxDataCNT THEN
RxByte_ARR[0-17] := Free-Port Input[0-17];
    CtrlWord:=16#00C1;
    TxDataCNT:=TxDataCNT+1;
    TxDataLEN:=4;
    Free-Port Output[0-3] := “ST/r/n”;
    RxDataCNT_Last:=RxDataCNT;
END_IF
IF StateWord=0 THEN
    CtrlWord:=16#00C2;
END_IF
```

Free Protocol Botu Test:

Botu monitoring table test: Connect the module to a 485 to USB device and use a serial port assistant to send and receive data.

Receiving data test: After the module is configured to run freely, it will automatically enter the receiving mode. The serial port assistant will be used to send 64 bytes of data, and the received data, data length, serial number, and status information can be read in the variable monitoring table.

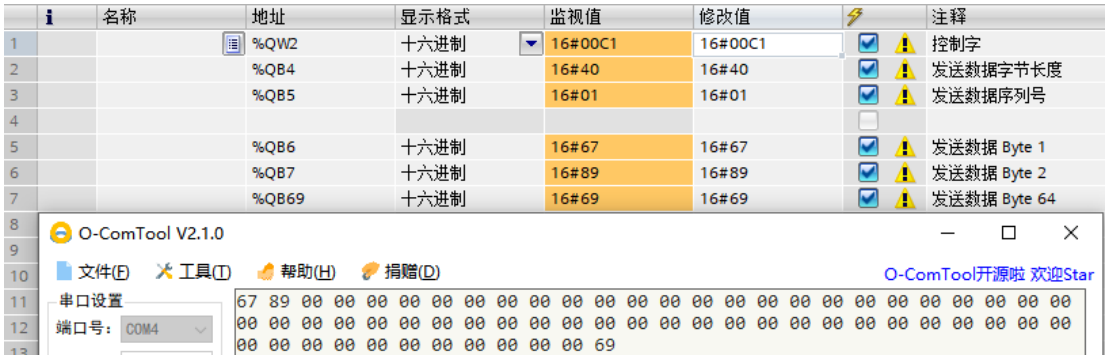


项目2 ▸ PLC_1 [CPU 1511-1 PN] ▸ 监控与强制表 ▸ 监控表_1

	名称	地址	显示格式	监视值	修改值		注释
1		%QW2	十六进制	16#0000	16#0000	☑	控制字
2		%QB4	十六进制	16#40	16#40	☑	发送数据字节长度
3		%QB5	十六进制	16#01	16#01	☑	发送数据序列号
4						☐	
5		%QB6	十六进制	16#67	16#67	☑	发送数据 Byte 1
6		%QB7	十六进制	16#89	16#89	☑	发送数据 Byte 2
7		%QB69	十六进制	16#69	16#69	☑	发送数据 Byte 64
8						☐	
9		%IW3	十六进制	16#0003		☐	状态字
10		%IB5	十六进制	16#40		☐	接收数据字节长度
11		%IB6	十六进制	16#01		☐	接收数据序列号
12						☐	
13		%IB15	十六进制	16#01		☐	接收数据 Byte 1
14		%IB16	十六进制	16#02		☐	接收数据 Byte 2
15		%IB78	十六进制	16#64		☐	接收数据 Byte 64
16		<新增>				☐	

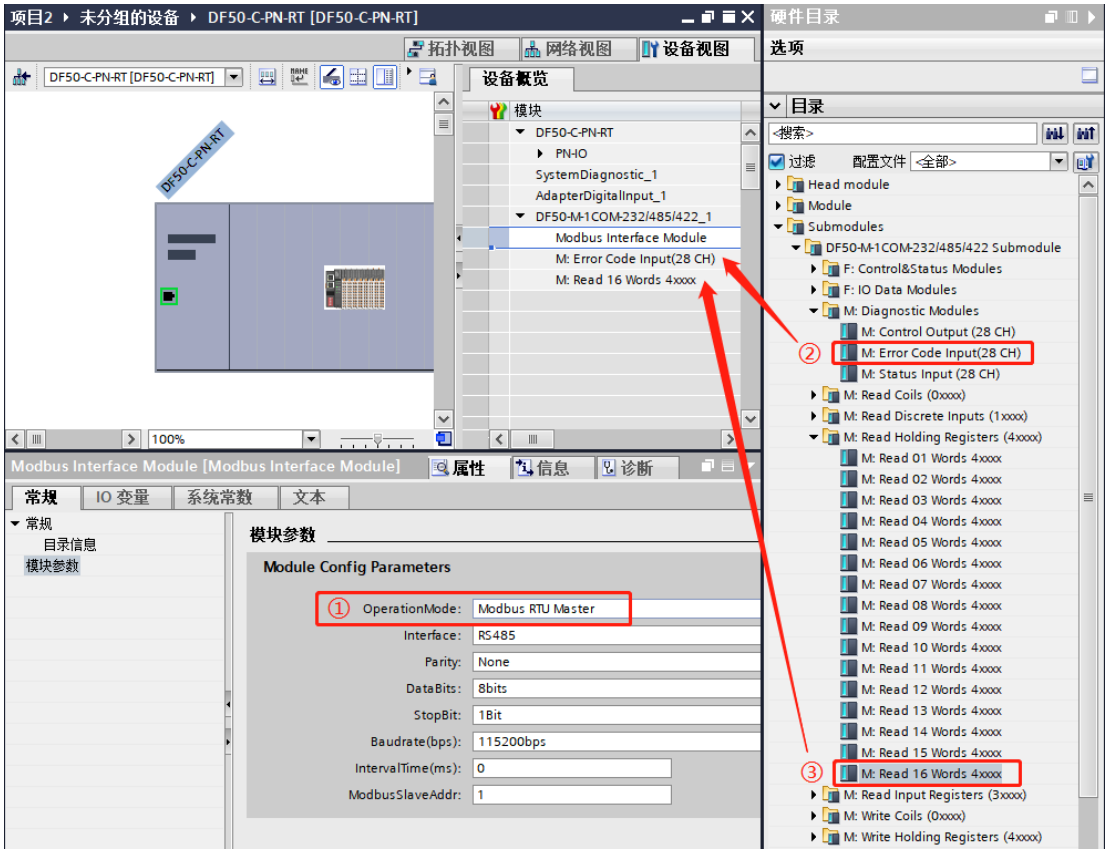
Sending data test: Set the control word to 16 # 00C1, the sending data length to 64 bytes, and the sending sequence number to 1. Assign the sending data Byte0,1 and Byte64 values respectively, and then execute the write action together. Use the serial port assistant to read the received 64Byte data, as shown in the following figure: (To

send again, simply loop and accumulate the sending sequence number)



4.2 Modbus RTU Master Mode

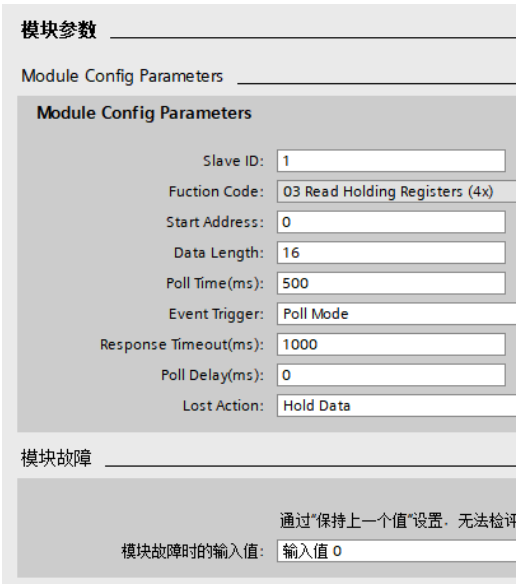
① Firstly, set the operating mode OperationMode to Modbus RTU Master mode:



② Add the diagnostic module M: Error Code Input (28 CH) to the second sub slot, which contains diagnostic information for the subsequent maximum of 28 sub slots, with each sub slot accounting for 2 Bytes of diagnostic information;

③ From the six function codes starting with M, select the one you want to add to the third sub slot. If you need to read and write more data, you can continuously add

different sub slot types, up to 28, plus the first interface sub slot and diagnostic sub slot, for a total of 30 sub slots. Right click on the properties of the third sub slot to configure protocol information.



Data definition:

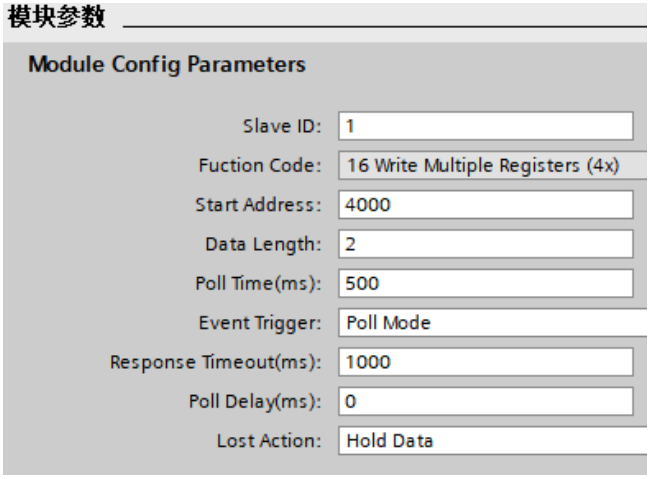
模块	...	机架	插槽	I 地址	Q 地址	类型
DF50-C-PN-RT		0	0			DF50-C-PN-RT
PN-IO		0	0 X1			DF50-C-PN-RT
SystemDiagnostic_1		0	1	0...1	0...1	SystemDiagnostic
AdapterDigitalInput_1		0	2	2		AdapterDigitalInput
DF50-M-1COM-232/485/422_1		0	3			DF50-M-1COM-232/485/4...
Modbus Interface Module		0	3 1			Modbus Interface Module
M: Error Code Input(28 CH)		0	3 CMD	3...58		M: Error Code Input(28 CH)
M: Read 16 Words 4xxxx		0	3 CMD	59...90		M: Read 16 Words 4xxxx
M: Write 02 Words 4xxxx		0	3 CMD		2...5	M: Write 02 Words 4xxxx

M: Error Code Input (28 CH) contains 28 word data, corresponding to the diagnostic information of 28 slave slots. The PLC program can clearly understand the current status of the slave station by monitoring the diagnostic information, which includes the following content:

Normal state value	Status Name	meaning
16#0000	OP_SUCCESS	Configuration or write operation successful
16#0001	DATA_FULL	The data has been updated and is readable
16#0002	WRITE_IDLE	Write free, writable
16#0003	DATA_EMPTY	Read idle, receive data not updated
Error status value	Status Name	meaning
16#E0A1	WRITE_BUSY	Busy writing, unable to write
16#E0A2	DATA_LARGE	Data length exceeds the limit
16#E0A3	CMD_ERR	command error
16#E0A4	PARA_ERR	Configuration parameter error
16#E0A5	CHECK_ERR	erification error
16#E0A6	SLAVE_NOEXIT	Slave device does not exist
16#E0A7	PACK_LOSS	Packet loss
16#E0A8	OVER_FLOW	OVERFLOW

M: Read 16 Words 4xxxx contains 16 word data, which represents the slave station with node address 1 and register values with addresses 0-15 based on configuration information;

M: Write 02 Words 4xxxx contains 2 word data. According to the configuration information, this data will be written to the slave station with node address 1 and registers with addresses 4000 and 4001;



Modbus RTU Master Use Cases:

Add sub slots as follows, and pay attention to configuring node addresses, registers, cycles, etc. for each sub slot.

▼ DF50-M-1COM-232/485/422_1		0	3			DF50-M-1COM-232/485/422
Modbus Interface Module		0	3 1			Modbus Interface Module
M: Error Code Input(28 CH)		0	3 CMD	3...58		M: Error Code Input(28 CH)
M: Read 008 Bits 0xxxx		0	3 CMD	59		M: Read 008 Bits 0xxxx
M: Read 008 Bits 1xxxx		0	3 CMD	60		M: Read 008 Bits 1xxxx
M: Read 02 Words 4xxxx		0	3 CMD	61...64		M: Read 02 Words 4xxxx
M: Read 02 Words 3xxxx		0	3 CMD	65...68		M: Read 02 Words 3xxxx
M: Write 008 Bits 0xxxx		0	3 CMD		2	M: Write 008 Bits 0xxxx
M: Write 01 Words 4xxxx		0	3 CMD		3...4	M: Write 01 Words 4xxxx

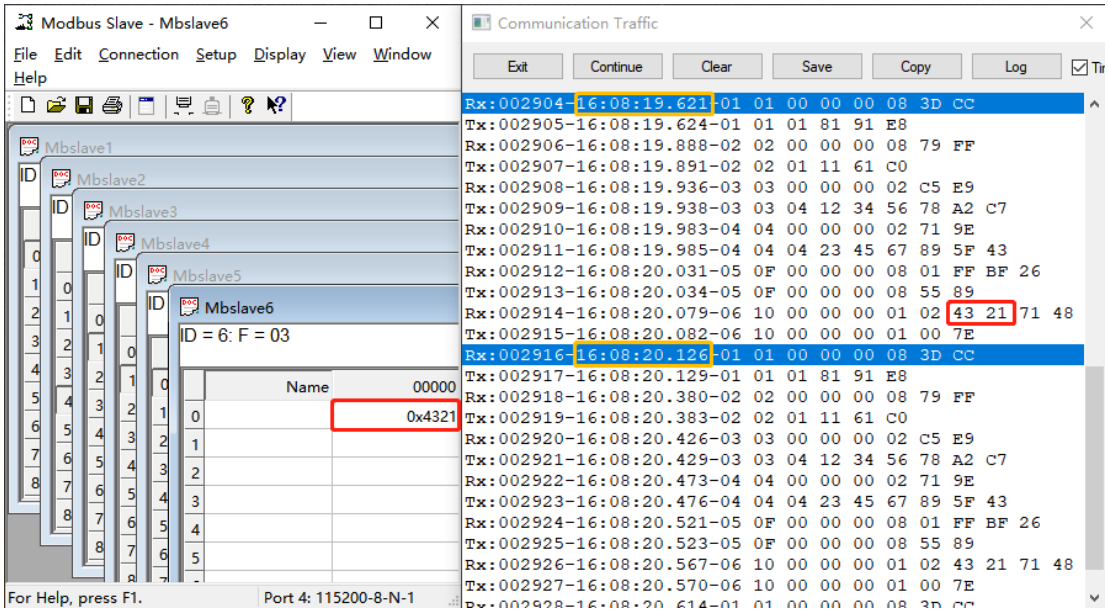
Create a new variable table to send and receive data:

项目2 ▸ PLC_1 [CPU 1511-1 PN] ▸ 监控与强制表 ▸ Modbus RTU Master

	名称	地址	显示格式	监视值	修改值		注释
1		%IW3	十六进制	16#0001			子槽3 Read 008 Bits 0xxxx的状态字
2		%IW5	十六进制	16#0001			子槽4 Read 008 Bits 1xxxx的状态字
3		%IW7	十六进制	16#0001			子槽5 Read 02 Words 4xxxx的状态字
4		%IW9	十六进制	16#0001			子槽6 Read 02 Words 3xxxx的状态字
5		%IW11	十六进制	16#0000			子槽7 Write 008 Bits 0xxxx的状态字
6		%IW13	十六进制	16#0000			子槽8 Write 01 Words 4xxxx的状态字
7							
8		%IB59	十六进制	16#81			子槽3 Read 008 Bits 0xxxx的线圈输入数据
9							
10		%IB60	十六进制	16#11			子槽4 Read 008 Bits 1xxxx的离散量输入数据
11							
12		%IW61	十六进制	16#1234			子槽5 Read 02 Words 4xxxx的保持寄存器输入数据1
13		%IW63	十六进制	16#5678			子槽5 Read 02 Words 4xxxx的保持寄存器输入数据2
14							
15		%IW65	十六进制	16#2345			子槽6 Read 02 Words 3xxxx的输入寄存器输入数据1
16		%IW67	十六进制	16#6789			子槽6 Read 02 Words 3xxxx的输入寄存器输入数据2
17							
18		%QB2	十六进制	16#FF	16#FF		子槽7 Write 008 Bits 0xxxx的线圈写入数据
19							
20		%QW3	十六进制	16#4321	16#4321		子槽8 Write 01 Words 4xxxx的保持寄存器写入数据

Using Modbus Slave software, create 6 slave stations to communicate with the module, and obtain the status of each slave station through IW3~IW14. The current

display is normal, and the communication data message and timestamp are shown in the following figure:

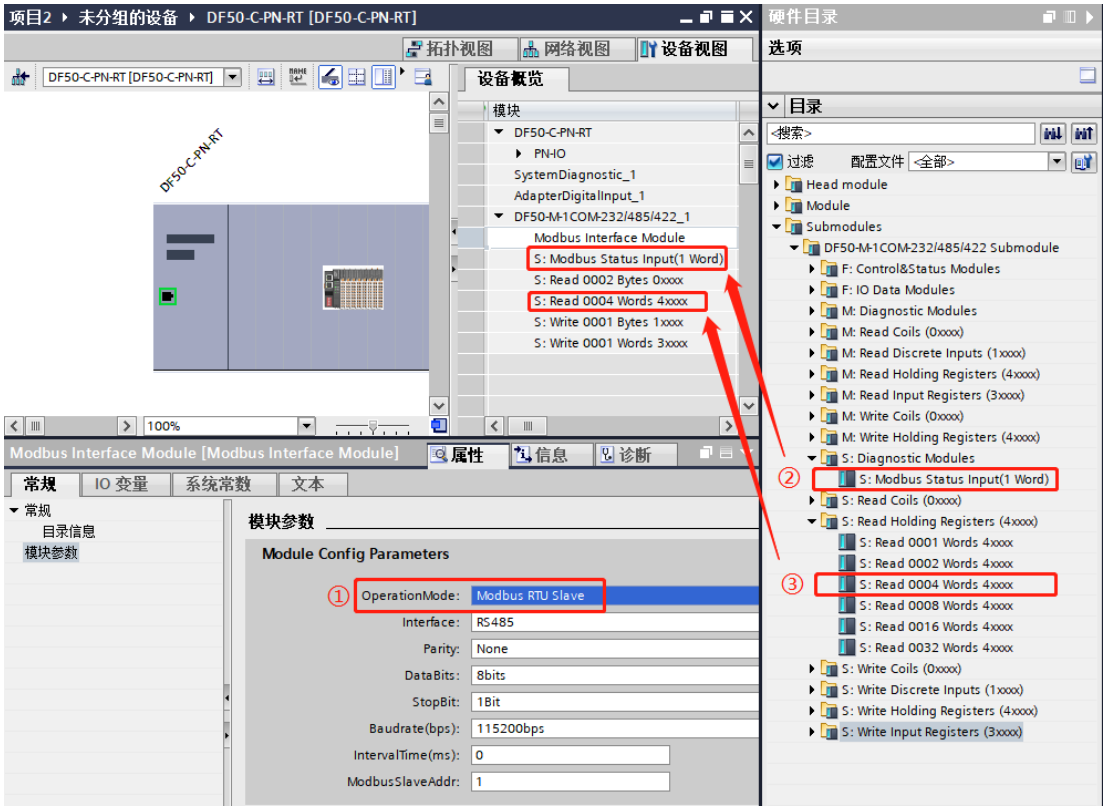


Mbslave6 的 The red box indicates that the holding register value of Mbslave6 corresponds to the writing of sub slot 8, and the data of 16 # 4321 is correct;

The yellow box represents the polling time of Mbslave1, corresponding to the reading cycle of the coil value in sub slot 3. The sub slot is configured with a 500ms polling cycle, and the actual test is 20.126s -19.621s=505ms, which is consistent with the configuration.

4.3 Modbus RTU Slave mode

① Firstly, set the operation mode OperationMode to Modbus RTU Slave mode, set the Slave response Master delay time IntervalTime (which can be 0), and finally set the node address of the Slave.



② Add the diagnostic module S: Modbus Status Input (1 Word) to the second sub slot, which contains the diagnostic information of the SLAVE slave station.

③ From the six types starting with S, select the one you want to add to the third sub slot. If you need to read and write more data, you can continuously add different sub slot types, up to 28, plus the first interface sub slot and diagnostic sub slot, for a total of 30 sub slots. Right click on the properties of the third sub slot to configure protocol information. Both read and write can set the first address of the register. Input data to set whether the data will be reset or held after a module failure:

Modbus RTU Slave Use Cases:

Firstly, set the interface configuration parameters to Modbus RTU Slave mode, with a node address of 1, and then insert 6 seed slots with a data length of 64Byte;

DF50-M-1COM-232/485/422_1	0	3			DF50-M-1COM-232/485/422
Modbus Interface Module	0	3 1			Modbus Interface Module
S: Modbus Status Input(1 Word)	0	3 CMD	3...4		S: Modbus Status Input(1 Word)
S: Read 0064 Bytes 0xxxx	0	3 CMD	5...68		S: Read 0064 Bytes 0xxxx
S: Read 0032 Words 4xxxx	0	3 CMD	69...132		S: Read 0032 Words 4xxxx
S: Write 0064 Bytes 0xxxx	0	3 CMD		2...65	S: Write 0064 Bytes 0xxxx
S: Write 0064 Bytes 1xxxx	0	3 CMD		66...129	S: Write 0064 Bytes 1xxxx
S: Write 0032 Words 4xxxx	0	3 CMD		130...193	S: Write 0032 Words 4xxxx
S: Write 0032 Words 3xxxx	0	3 CMD		194...257	S: Write 0032 Words 3xxxx

Create a new variable table to send and receive data: 6 sub slots correspond to 4 address areas

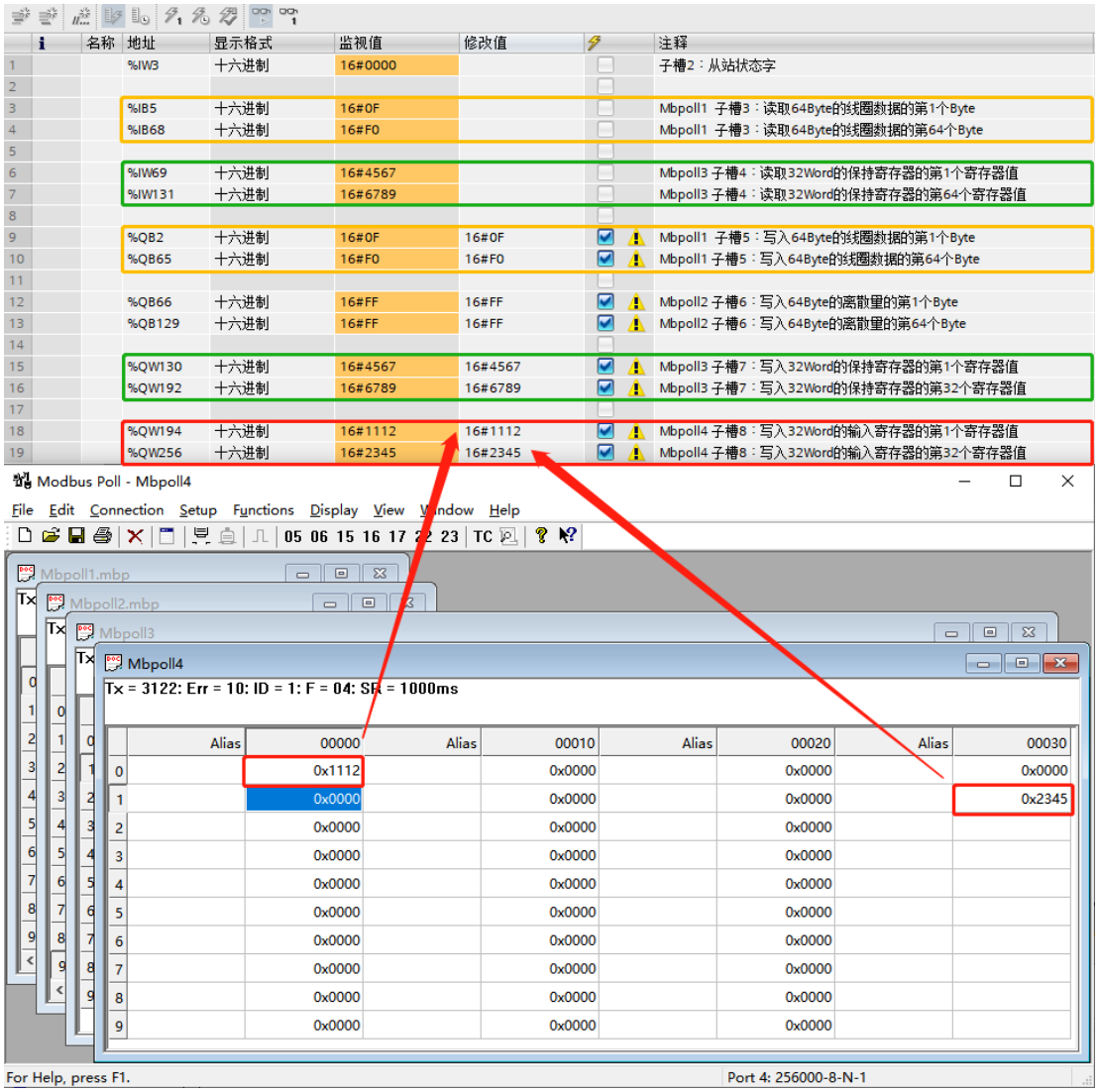
Sub slot 1 and sub slot 3 correspond to the coil 0xxxx address area of Mbpoll1, which can read and write self verification;

Sub slots 2 and 5 correspond to the holding register 3xxxx address area of Mbpoll3, which can read and write self verification;

Sub slot 4 corresponds to the discrete 1xxxx address area of Mbpoll2, and data is read through Mbpoll2;

Sub slot 6 corresponds to the input register 4xxxx address area of Mbpol4, and

data is read through Mbpol4. The data is the contents of register 0 address 16 # 1112 and register 31 address 16 # 2345, respectively



S: Modbus Status Input (1 Word) is the diagnostic information of the slave station. The PLC program can clearly understand the current slave station status by monitoring the diagnostic information, which includes the following content:

Normal state value	Status Name	meaning
16#0000	OP_SUCCESS	Configuration or write operation successful
16#0001	DATA_FULL	The data has been updated and is readable
16#0002	WRITE_IDLE	Write free, writable
16#0003	DATA_EMPTY	Read idle, receive data not updated

Error status value	Status Name	meaning
16#E0A1	WRITE_BUSY	Busy writing, unable to write
16#E0A2	DATA_LARGE	Data length exceeds the limit
16#E0A3	CMD_ERR	command error
16#E0A4	PARA_ERR	Configuration parameter error
16#E0A5	CHECK_ERR	Verification error
16#E0A6	SLAVE_NOEXIT	Slave device does not exist
16#E0A7	PACK_LOSS	Packet loss
16#E0A8	OVER_FLOW	data overflow

3.13.4 Mechanical Installation

Installation dimensions

The installation size information is shown in the following figure.