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CP340/CP341/CP440/CP441 Communication and Programming

SIMATIC S7

http://support.automation.siemens.com/WW/view/en/ID 88867653

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1 Overview

Siemens SIMATIC S7-series serial communication modules mainly include CP340, CP341, CP440-1, CP441-1/2, as well as 1SI 3964/ASCII and 1SI MODBUS/USS of ET200S, etc., and the communication protocols they support mainly include ASCII, RK512, 3964(R), MODBUS Master, MODBUS Slave and other loadable protocols, etc. SIMTIC S7-series serial communication modules and their supported communication protocols are in the corresponding relations shown in the table below:

	ASCII	3964(R)	RK512	MODBUS Master	MODBUS Slave
CP340	X	X	-	-	-
CP341	X	X	X	X	X
CP440	X	X	-	-	-
CP441-1	X	X	-	-	-
CP441-2	X	X	X	X	X

X: support, -: not support

Table 1: Corresponding relations between modules and protocols

In actual application, the above-stated serial communication modules may be used to realize serial communication for the following devices:

- 3rd-party DCS and PLC systems, etc.
- 3rd-party intelligent device and instrument, etc.
- Receiving data from scanner and bar-code reader, etc.
- Sending data to serial printer and other receiving devices
- All other user-defined protocol devices that support ASCII and MODBUS

This document mainly introduces applications of CP340, CP341, CP440, CP441-1 and CP441-2, as well as ASCII, MODBUS RUT protocols they support, and it also includes the routine used by each module for reference for readers.

Declaration: The virtual project stated in this document has major difference from the real project example, and the example is not programmed in accordance with the specified engineering design flow, and readers shall not confuse it with the real project example. The example is free of charge, and any user may copy or release it freely. The author of the program will not assume any liability for any functionality or compatibility, and users shall assume the related risks. Siemens will not provide error correction of this program example or hotline support. It is suggested that users

should read the related module operation manuals carefully to use them in a better way.

2 Introduction of related software and its applications

2.1 STEP7

STEP7 programming software is used to write PLC program, and it shall be purchased from Siemens. All procedure codes in this document are written with STEP7 V5.4 SP4.

2.2 PtP drive software package

PtP Param V5.1 is the drive software package for CP340/CP341/CP440/CP441, and parameters may only be distributed to the serial communication module and the function block necessary for communication programming may only be integrated in STEP7 after this drive software package is installed. This drive will be provided when the module is purchased, and it may also be downloaded through the following linkage. The updated software version is PtP Param V5.1 SP11 at present. http://support.automation.siemens.com/WW/view/en/27013524

2.3 MODBUS Master drive software package

This drive software package shall be installed when CP341 or CP441-2 is used in MODBUS master, but PtP Param V5.1 drive program software package shall be installed earlier. This drive software package may be purchased when purchasing MODBUS Dongle or be downloaded through the following link:

MODBUS Master drive (RTU) software package:

http://support.automation.siemens.com/WW/view/en/27774018

MODBUS Master drive (ASCII) software package:

http://support.automation.siemens.com/WW/view/en/25356060

2.4 MODBUS Slave drive software package

This drive software package shall be installed when CP341 or CP441-2 is used in MODBUS slave, but PtP Param V5.1 drive program software package shall be installed earlier. This drive software package may be purchased when purchasing MODBUS Dongle or be downloaded through the following link:

MODBUS Slave drive (RTU) software package:

http://support.automation.siemens.com/WW/view/en/27774276

MODBUS Slave drive (ASCII) software package:

http://support.automation.siemens.com/WW/view/en/25356060

2.5 ModScan32 / ModSlave

This is software provided by third party and may be downloaded from the Internet. ModScan32 may be used to emulate MODBUS Master to test its communication with MODBUS Slave. ModSlave may be used to emulate MODBUS Slave to test its communication with MODBUS Master.

3 Manual and related application documents

After all drive programs are installed, user may search for all CP module manuals from the computer, whose detailed position is "Start-> SIMATIC-> Documentation -> English", or they may be found directly from the folder of STEP7 installation path"… Program files-> Siemens -> Step7 -> S7MANUAL -> S7PtP_Cp".

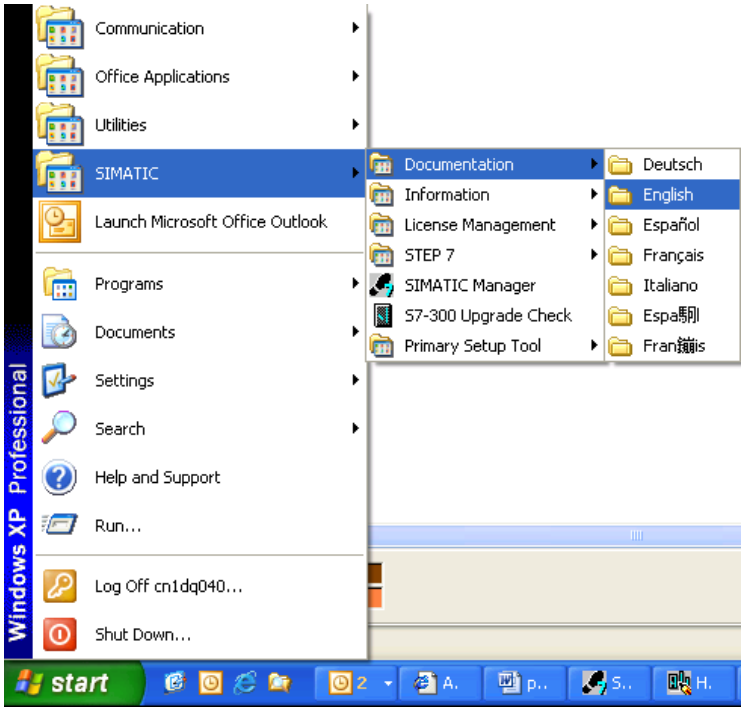


Fig. 1: Module manual path diagram

4 ASCII protocol communication

The communication mode in ASCII protocol is used to realize serial communication of user-defined protocol, and it is applicable to communication with the intelligent instrument, bar-code reader, scanner, and printer, etc. that support serial communication.

The following examples are used to introduce the ASCII protocol communication of Siemens serial communication modules CP340, CP341, CP440 and CP441.

4.1 ASCII protocol communication of CP340

4.1.1 Hardware catalog

PS 307	6ES7 307-1EA00-0AA0
CPU 315-2DP	6ES7 315-2AG10-0AB0
MMC	6ES7 953-8LG11-0AA0
CP340	6ES7 340-1AH01-0AE0

4.1.2 Configuration

1. Open STEP 7,and click File->New...to create a new project in name of ptp.

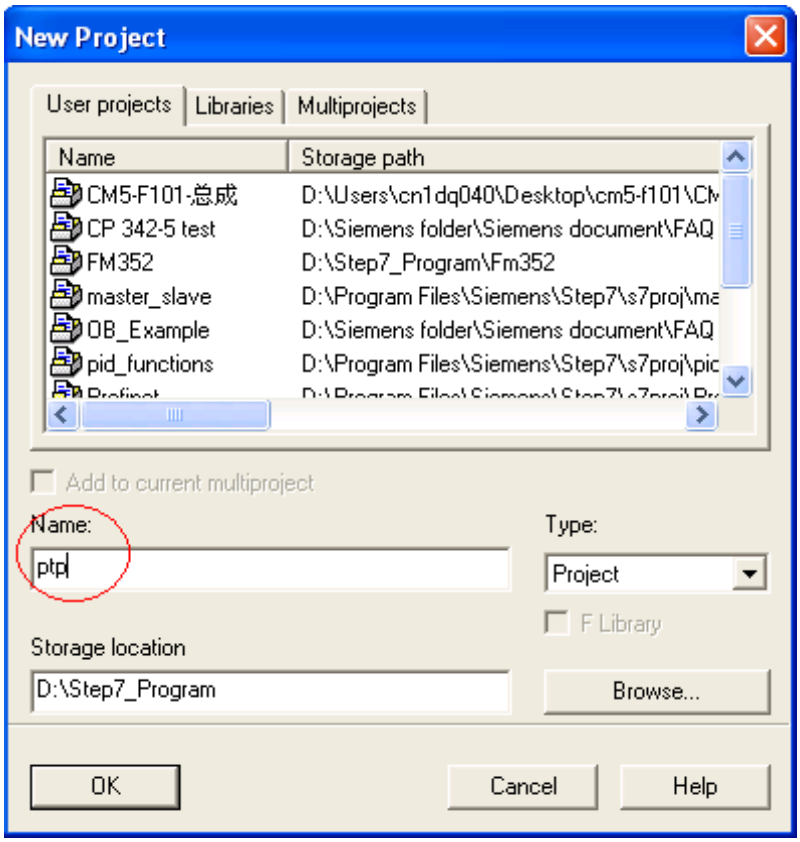


Fig. 2: Dialog box of New project

2. Right-click the project name, select Insert New Object->SIMATIC 300 Station to change the station name to CP340 ASCII.

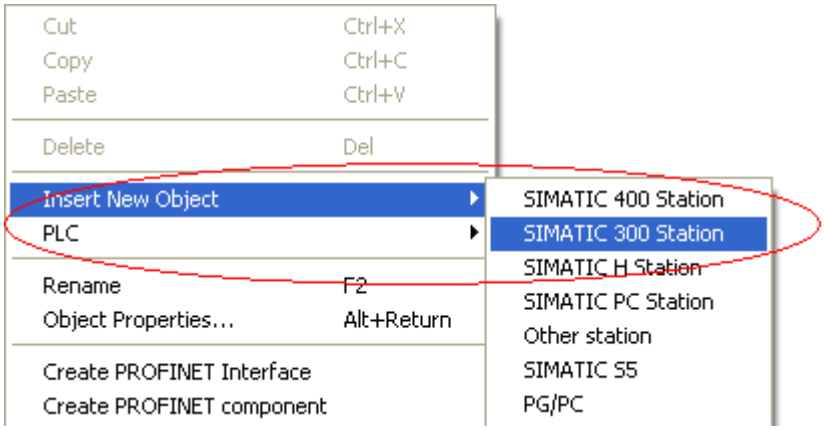


Fig. 3: Insert S7-300 station

3. Double-click Hardware to enter the hardware configuration interface and insert RACK, CPU315-2DP and CP340.

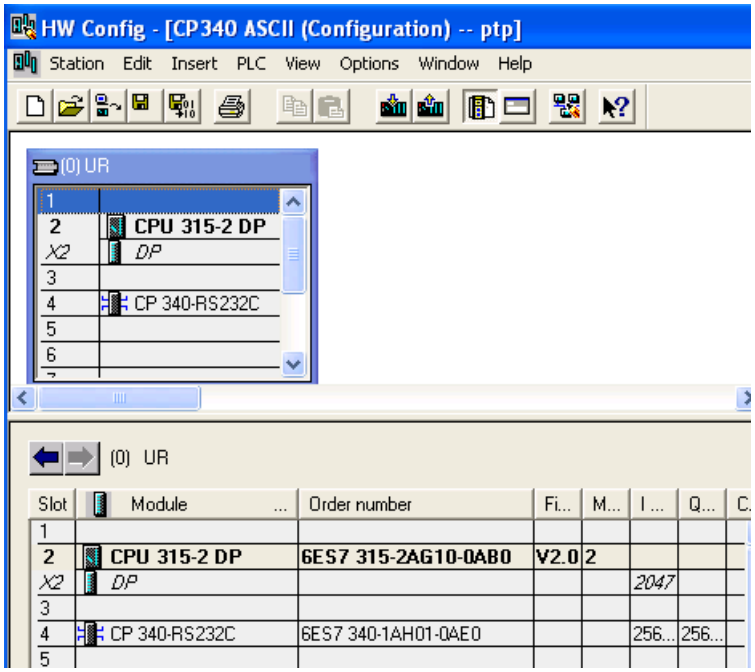


Fig. 4: Configuration hardware

4. Double-click CP340 module, and click Parameter... to configure CP340 parameters.

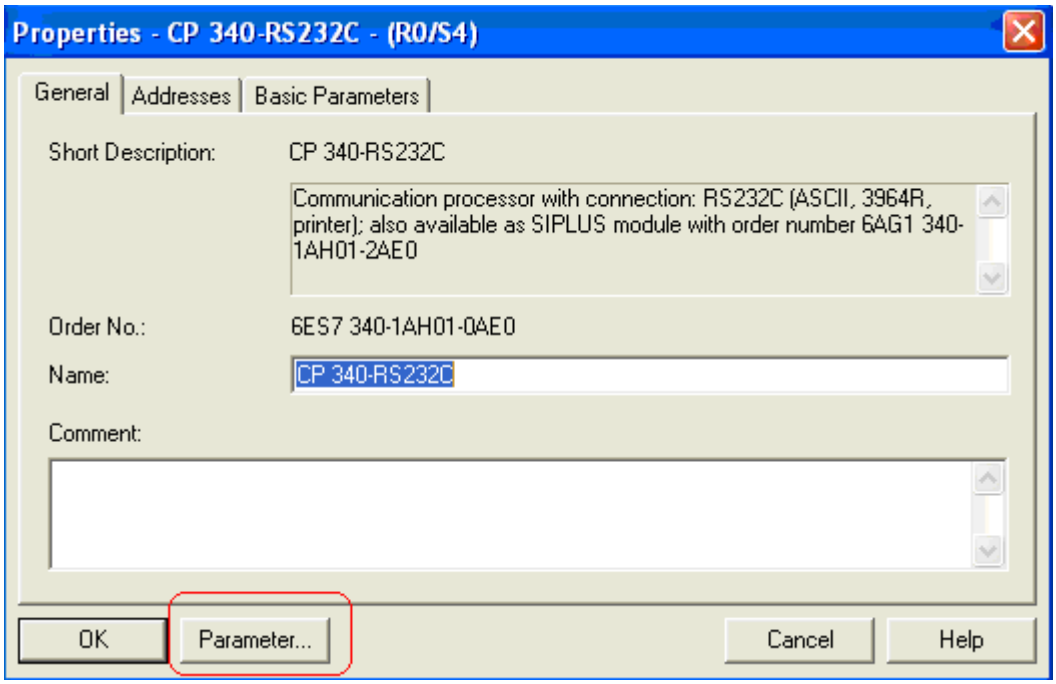


Fig. 5: CP340 Properties dialog box

5. Select ASCII from Protocol options.

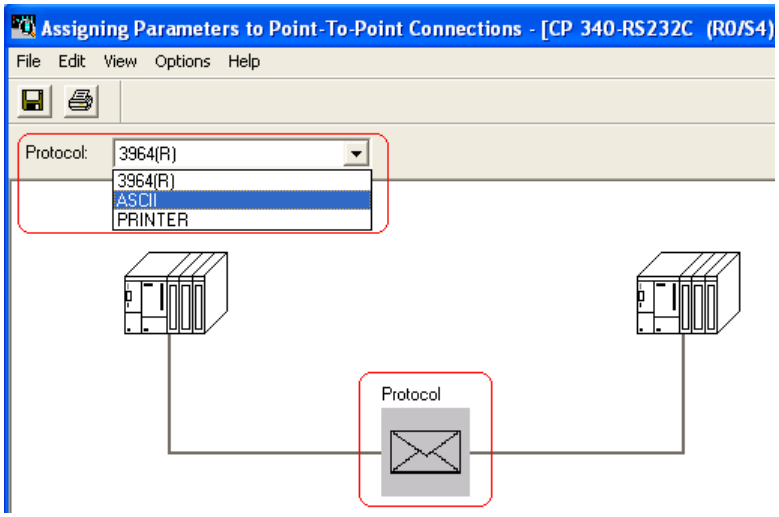


Fig. 6: Protocol selection

6. Double-click the envelop icon under Protocol to configure ASCII communication parameters. The set communication parameters shall be the same as those of the communication partner. Communication Baud rate: 9600bps，Data bit: 8 bits, Stop bit: 1 bit, Parity: none, Character delay time: 4ms, Other parameters shall be in default settings.

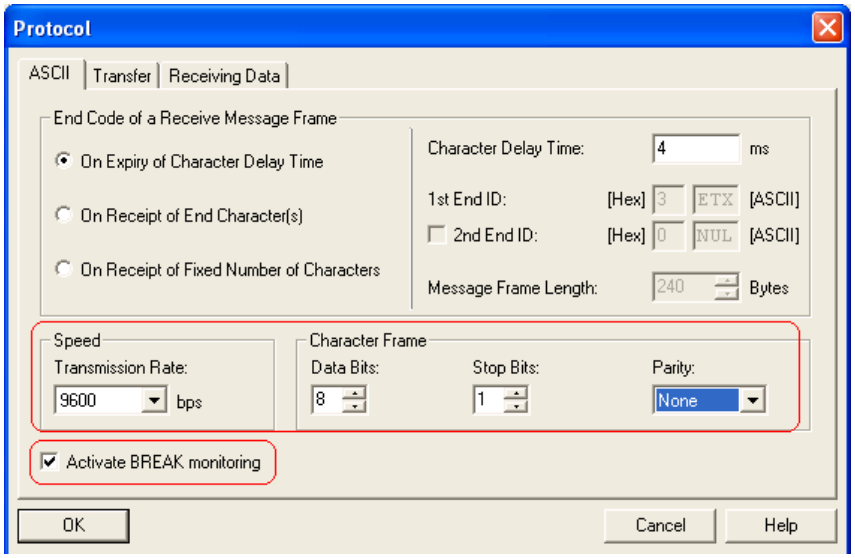


Fig. 7: Distributing communication parameters for ASCII protocol

As shown in the Fig. above, if "Activate BREAK monitoring" is selected, the SF red indicator of CP340 will be on when RS232C cable is not connected or the serial port of the communication partner is not activated.

7. If CP340 in RS422/485 interface is selected, the interface properties shall also be set, as shown below:

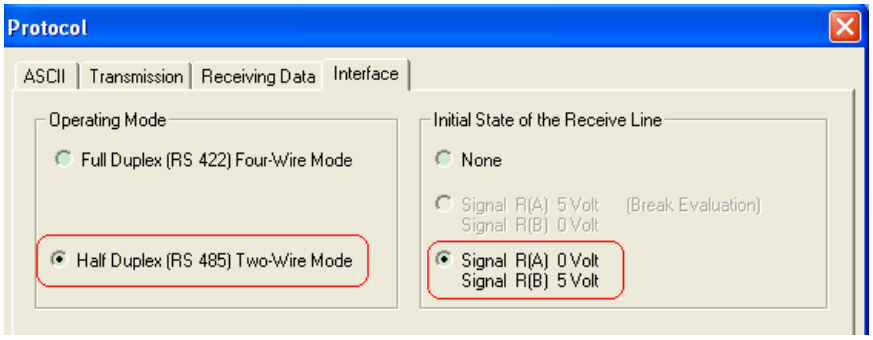


Fig. 8: Configuration interface parameters

When the interface is in RS485 type (half-duplex mode), the initial state of the receive side will be R(A)0V/R(B)5V, and it will not support wire-break detection function. When the interface is in RS422 type (full-duplex mode) and the initial state of the receive side is set as R(A)0V/R(B)5V, it will support wire-break detection function. These 2 states correspond to the following interface pins of the communication partner receive side:

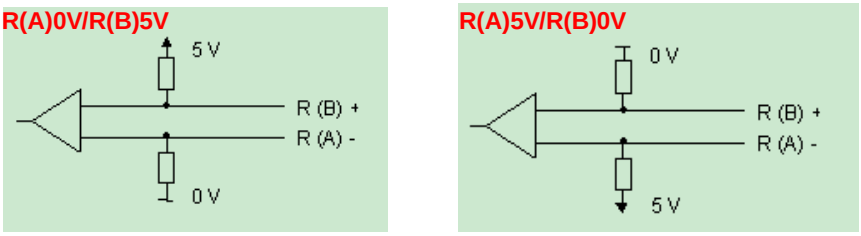


Fig. 9: Wiring of receiver at interface RS485/422

8. After the parameters are configured, click button to save and compile the hardware configurations. After it is confirmed that no error exists, download the hardware configurations to CPU to complete the whole hardware configuration process.

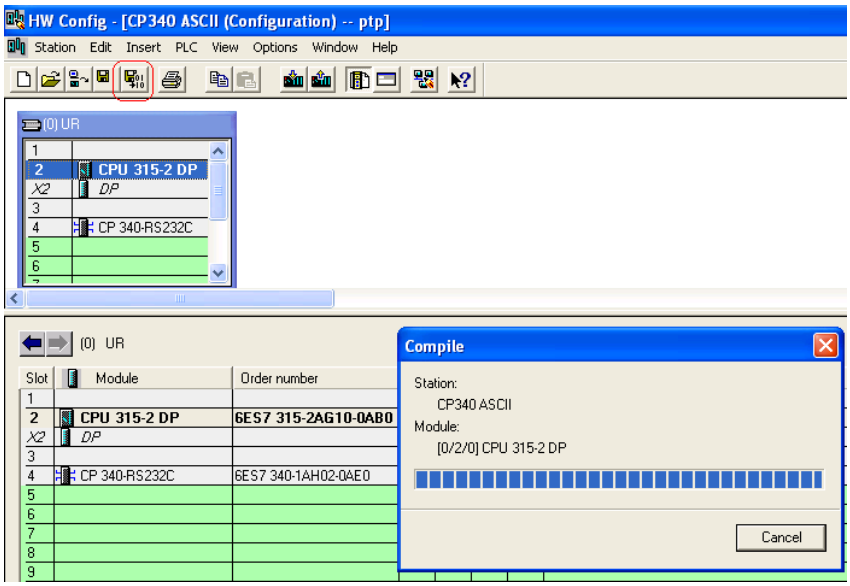


Fig. 10: Compile and save hardware configuration

4.1.3 Write communication program

1. Double-click OB1 to open OB1 programming screen. Invoke Send Function Block FB3 P_SEND from Libraries -> CP PtP -> CP340 and distribute instance data block DB3 to it. Set the block parameter LADDR as the start logic address 256 for module CP340 in hardware configuration.

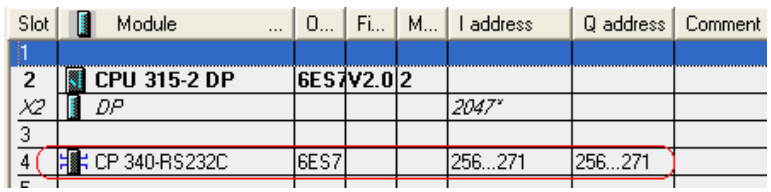


Fig. 11: Logic address of CP340

2. Create Send Data block DB1.

ddress	Name	Type	Initial value	Comment
*0.0		STRUCT		
+0.0	SEND_Data	ARRAY[1..50]		Temporary place
*1.0		BYTE		
=50.0		END_STRUCT		

Fig. 12: Send Data block DB1

3. Invoke Send Function block

The parameters of the send function block FB3 P_SEND of CP340 are set as in the table below:

LADDR	Start logic address in hardware configuration, which is 256 in this example
DB_NO	Send Data block number, which is 1(DB1) in this example
DBB_NO	Start address of Send Data, which is 0(DB1.DBB0) in this example
LEN	Length of send data, which is 10 in this example
REQ	trigger bit of Send Data, rising edge trigger, which is M0.0 in this example
R	Cancel communication, which is not available in this example
DONE	send complete bit, which is TRUE if Send completes and has no error
ERROR	error bit, TRUE indicating that it has an error
STATUS	Status word, ID error code. See CP340 manual for related descriptions

Table 3: Parameter definition of FB3 P_SEND

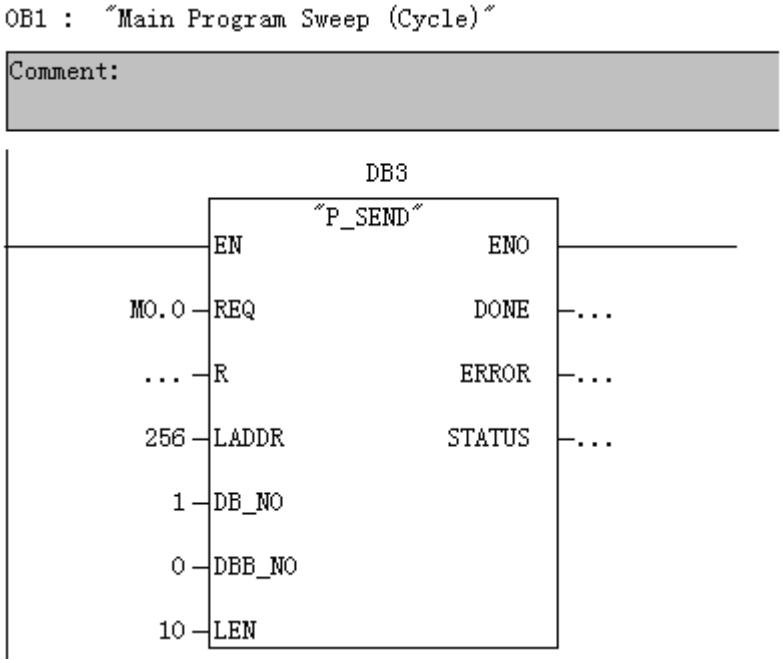


Fig. 13: Invoke FB3 P_SEND from OB1

4. Invoke Receive Function Block FB2 P_RCV from Libraries -> CP PtP -> CP340 and distribute instance data block DB2 to it. Set LADDR as the start logic address 256.

5. Create receive data block DB10.

ddress	Name	Type	Initial value	Comment
*0.0		STRUCT		
+0.0	SEND_Data	ARRAY[1..50]		Temporary place
*1.0		BYTE		
=50.0		END_STRUCT		

Fig. 14: Receive data block DB10

6. Invoke receive function block

The parameters of the receive function block FB2 P_RCV of CP340 are set as in the table below:

LADDR	Start logic address in hardware configuration, which is 256 in this example
DB_NO	Send Data block number, which is 10(DB10) in this example
DBB_NO	Start address of Send Data, which is 0(DB10.DBB0) in this example
LEN	Length of receive data, which is MW2 in this example. This value is not 0 only in the current cycle when data are received. The length of received data may be determined by checking the MW4 value.
EN_R	Enable receive bit, which is M0.1 in this example.
R	Cancel communication, which is not available in this example
NDR	Receive complete bit, which is TRUE if Receive completes and has no error
ERROR	error bit, TRUE indicating that it has an error
STATUS	status word, ID error code. See CP340 manual for related descriptions

Table 4: Parameter definition of FB2 P_RCV

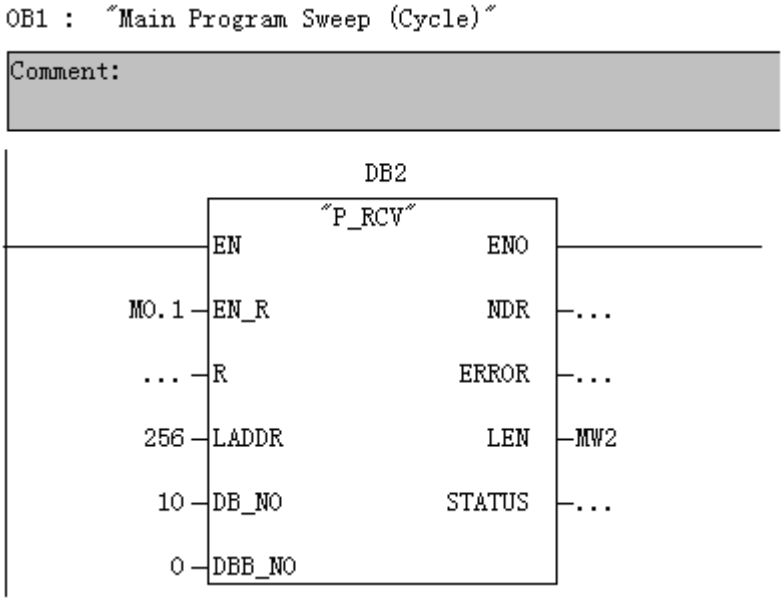


Fig. 15: Invoke FB2 P_SEND from OB1

4.1.4 Equipment connection

Use standard RS232C cable to connect serial ports of CP340 and computer. The detailed cable connecting method may be seen in CP340 Manual - Chapter B: Connecting cables.

4.2 ASCII protocol communication of CP341

4.2.1 Hardware catalog

PS 307	6ES7 307-1EA00-0AA0
CPU 315-2DP	6ES7 315-2AG10-0AB0
MMC	6ES7 953-8LG11-0AA0
CP341	6ES7 341-1AH01-0AE0

4.2.2 Configuration

1. Open the project ptp created above, and right-click the project name, select Insert New Object->SIMATIC 300 Station to change the station name to CP341 ASCII.

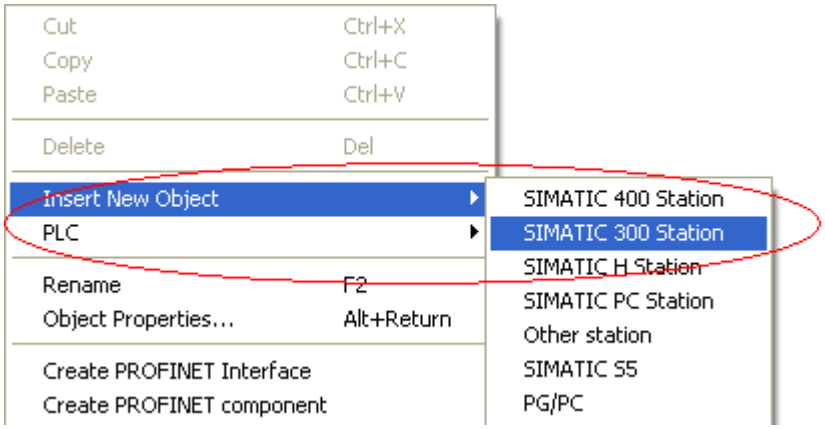


Fig. 19: Insert S7-300 station

2. Double-click Hardware to enter the hardware configuration interface and insert RACK, CPU315-2DP and CP341.

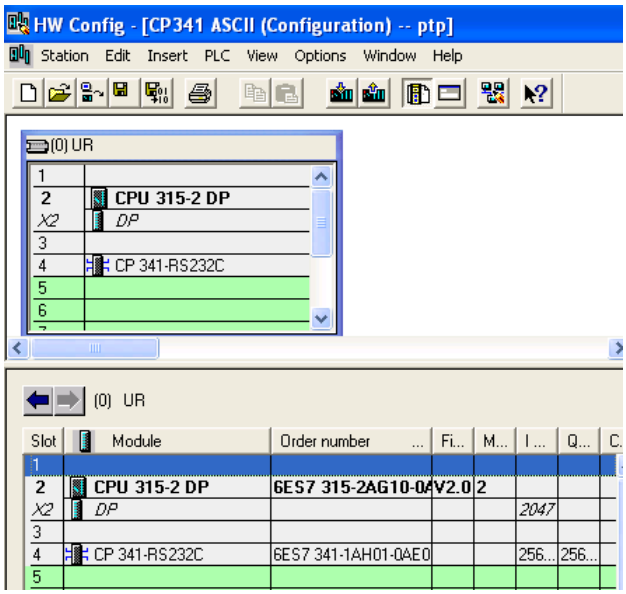


Fig. 20: Configuration hardware

3. Double-click CP341 module, and click Parameter... to configure CP341 parameters.

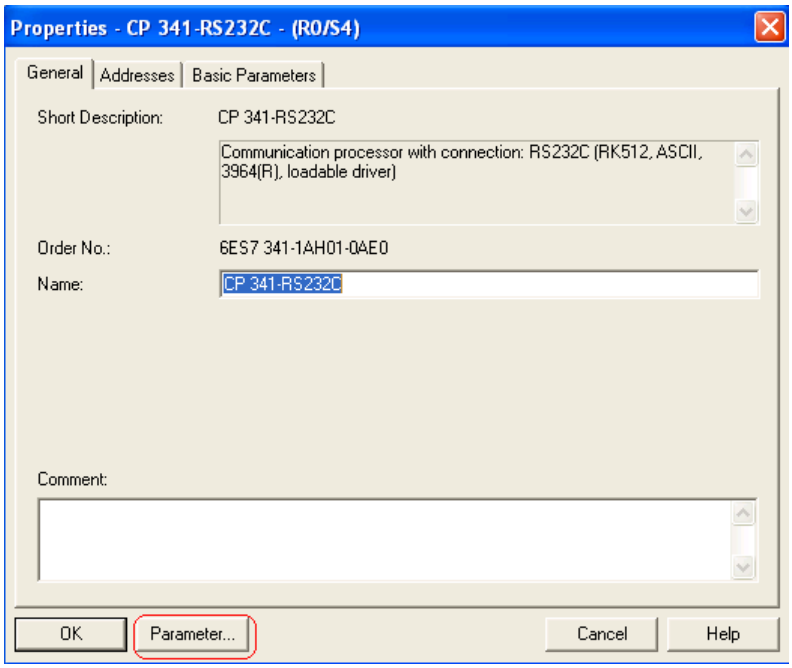


Fig. 21: CP341 Properties dialog box

4. Select ASCII protocol from Protocol options.

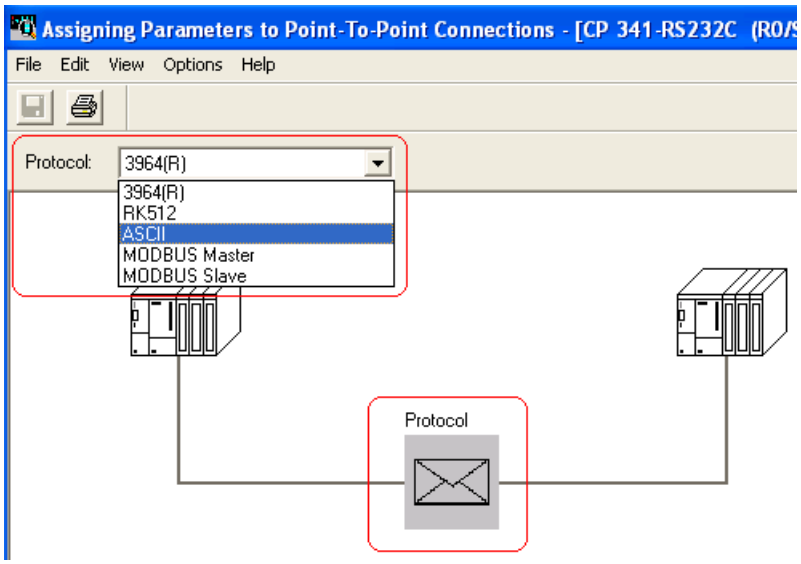


Fig. 22: Protocol selection

5. Double-click the envelop icon under Protocol to configure ASCII communication parameters. The set communication parameters shall be the same as those of the communication partner. Communication Baud rate:9600bps，Data bit: 8 bits, Stop bit: 1 bit, Parity: none, Character delay time:4ms，Other parameters shall be in default settings.

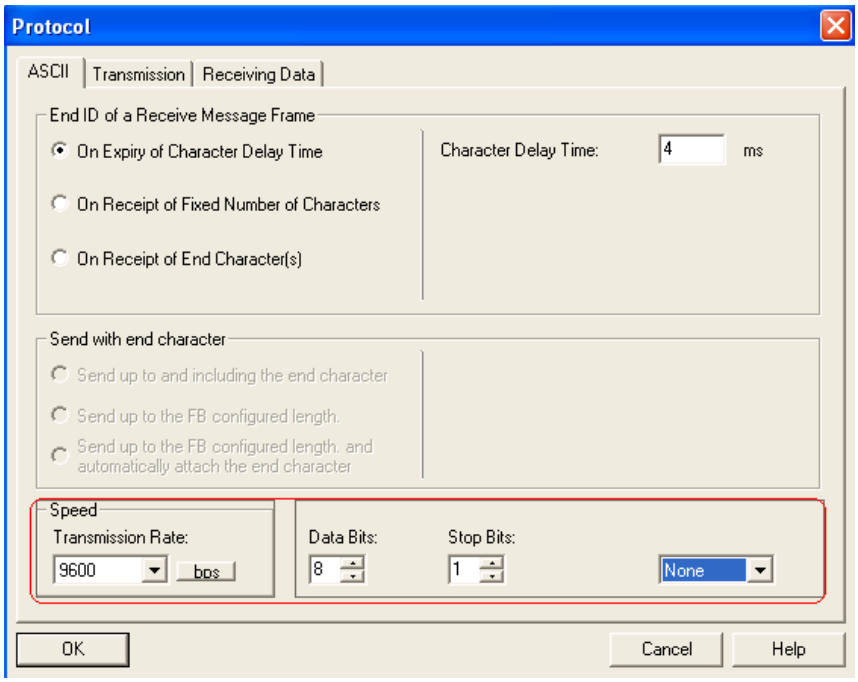


Fig. 23: Distributing parameters for ASCII protocol

6. If CP341 in RS422/485 interface is selected, the interface properties shall also be set, as shown in the Fig. below. Refer to the text above for initial state of receive side.

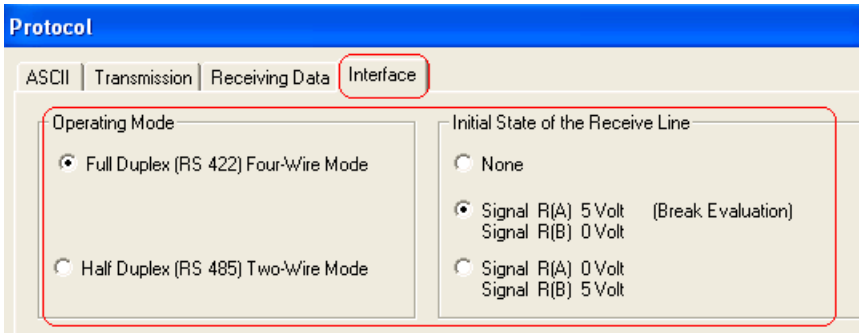


Fig. 24: Configuration interface parameters

7. After completing configuration, user may click  button to save and compile the hardware configuration and download it to CPU after confirming that no error exists. The whole hardware configuration process is completed by now.

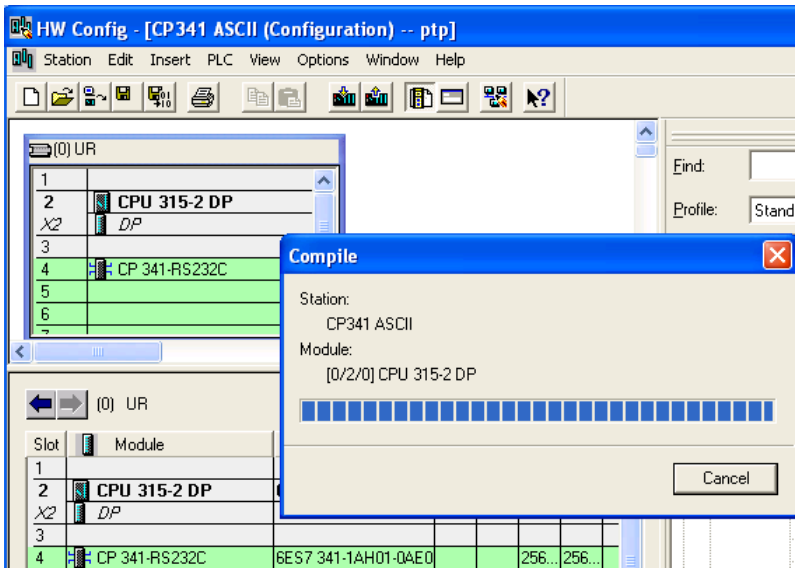


Fig. 25: Compile and save hardware configuration

4.2.3 Write communication program

1. Double-click OB1 to open OB1 programming screen. Invoke Send Function Block FB8 P_SND_RK from Libraries -> CP PtP -> CP341 and distribute instance data block DB8 to it. Set the parameter LADDR as the start logic address 256 for module CP340 in hardware configuration.

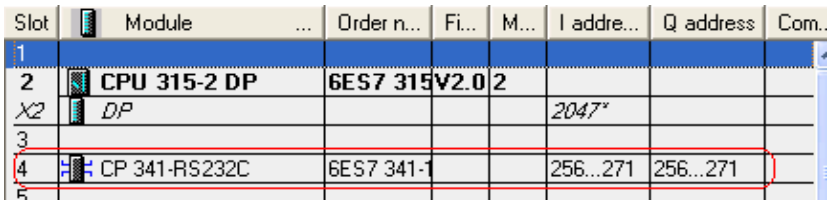


Fig. 26: Logic address of CP341

2. Create Send Data block DB1.

ddress	Name	Type	Initial value	Comment
*0.0		STRUCT		
+0.0	SEND_Data	ARRAY[1..50]		Temporary place
*1.0		BYTE		
=50.0		END_STRUCT		

Fig. 27: Send Data block DB1

3. Invoke Send Function block

The parameters of the send function block FB8 P_SND_RK of CP341 are set as in the table below:

LADDR	Start logic address in hardware configuration, which is 256 in this example
DB_NO	Send Data block number, which is 1(DB1) in this example
DBB_NO	Start address of Send Data, which is 0(DB1.DBB0) in this example
LEN	Length of send data, which is 10 in this example
REQ	trigger bit of Send Data, rising edge trigger, which is M0.0 in this example
R	Cancel communication
DONE	send complete bit, which is TRUE if Send completes and has no error
ERROR	error bit, TRUE indicating that it has an error
STATUS	status word, ID error code. See CP341 manual for related descriptions
Other parameters	Irrelevant to ASCII communication protocol, and not available in this example

Table 5: Parameter definition of FB8 P_SND_RK

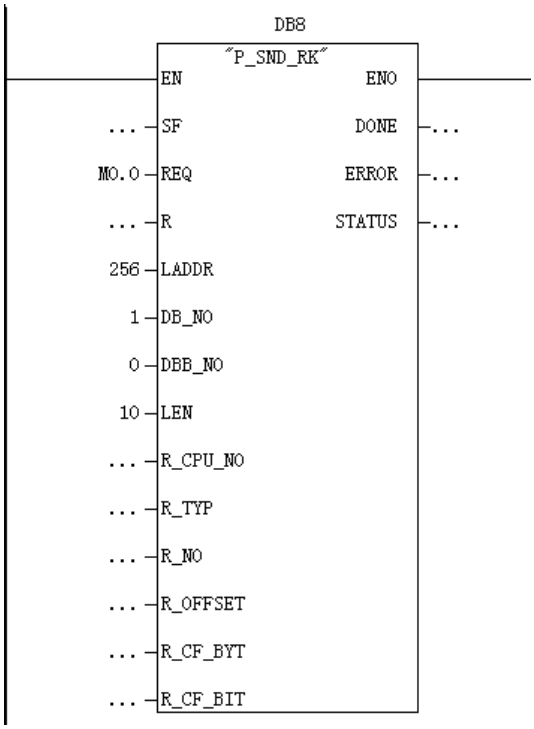


Fig. 28: Invoke FB8 P_SND_RK from OB1

4. Invoke Receive Function Block FB7 P_RCV_RK from Libraries -> CP PtP -> CP341 and distribute instance data block DB7 to it. Set LADDR as the start logic address 256 in hardware configuration.

5. Create receive data block DB10

ddress	Name	Type	Initial value	Comment
*0.0		STRUCT		
+0.0	SEND_Data	ARRAY[1..50]		Temporary place
*1.0		BYTE		
=50.0		END_STRUCT		

Fig. 29: Receive data block DB10

6. Invoke receive function block

The parameters of the receive function block FB8 FB7 P_RCV_RK of CP341 are set as in the table below:

LADDR	Start logic address in hardware configuration, which is 256 in this example
DB_NO	Send Data block number, which is 10(DB10) in this example
DBB_NO	Start address of Send Data, which is 0(DB10.DBB0) in this example
LEN	Length of receive data, which is MW2 in this example. This value is not 0 only in the current cycle when data are received. The length of received data may be determined by checking the MW4 value.
EN_R	Enable receive bit, which is M0.1 in this example.
R	Cancel communication, which is not available in this example
NDR	Receive complete bit, which is TRUE if Receive completes and has no error
ERROR	error bit, TRUE indicating that it has an error
STATUS	status word, ID error code. See CP341 manual for related descriptions
Other parameters	Irrelevant to ASCII communication protocol, and not available in this example

Table 6: Parameter definition of FB7 P_RCV_RK

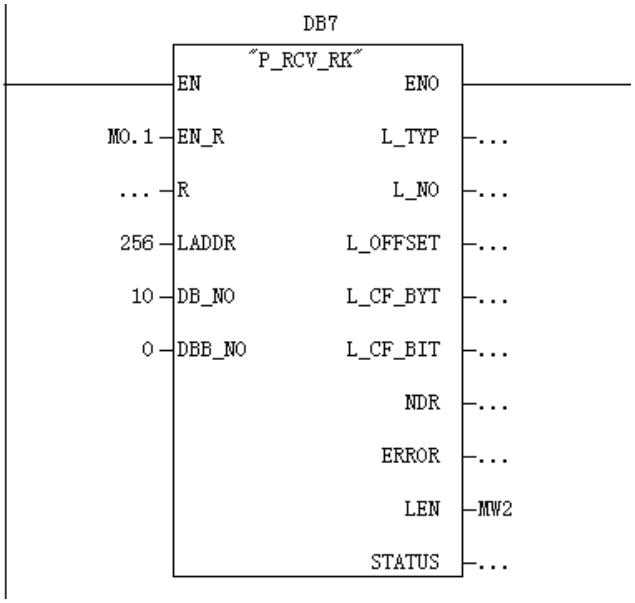


Fig. 30: Invoke FB7 P_RCV_RK from OB1

4.2.4 Equipment connection

Use standard RS232C cable to connect serial ports of CP341 and computer. The detailed cable connecting method may be seen in CP341 Manual - Chapter B: Connecting cables.

4.3 ASCII protocol communication of CP440

4.3.1 Hardware catalog

RACK-400	6ES7 400-1JA01-0AA0
PS407	6ES7 407-0KA02-0AA0
CPU	6ES7 414-3XJ04-0AB0
CP440	6ES7 440-1CS00-0YE0

4.3.2 Configuration

1. Open the project ptp that has been created, and right-click the project name, select Insert a new SIMATIC 400 Station to change the station name to CP440 ASCII.

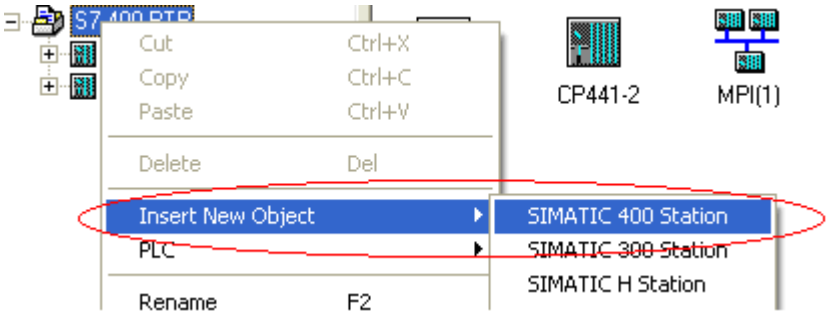


Fig. 34: Insert S7-400 station

2. Double-click Hardware to enter the hardware configuration screen and insert RACK-400,PS407,CPU414-3DP and CP440.

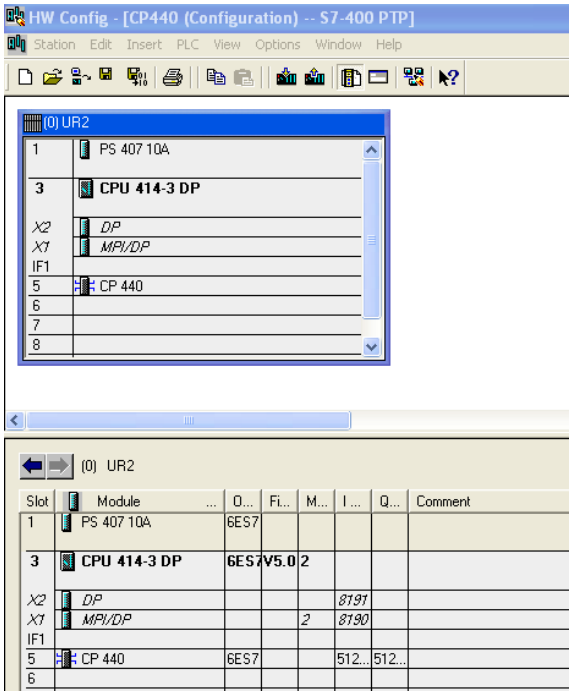


Fig. 35: Configuration hardware

3. Double-click CP440 module and click Parameter to configure CP440 parameters, and select ASCII protocol in Protocol options.

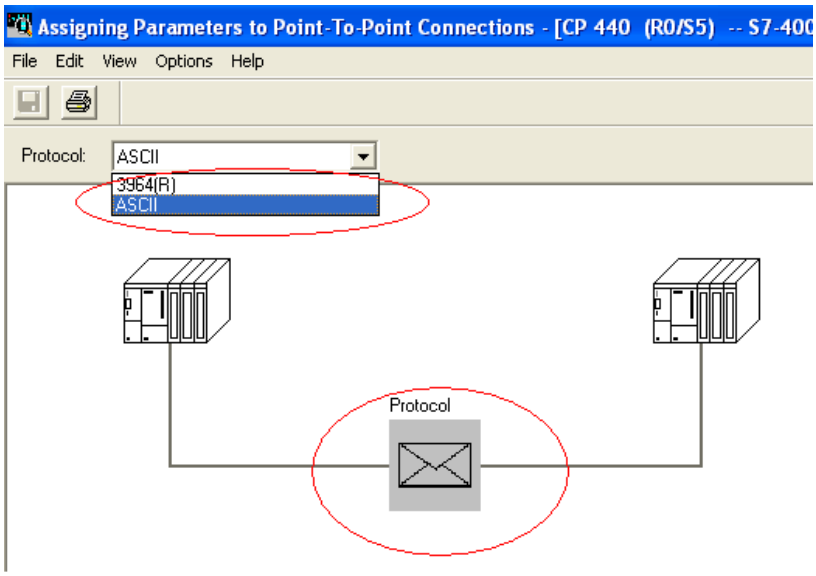


Fig. 36: Protocol selection

4. Double-click the envelop icon in Protocol to configure the performance parameters in it. The set communication parameters must match those of the communication partner. Baud rate: 9600bps，Data bit: 8 bits, ，Stop bit: 1 bit, Parity: none, Character delay time:4ms，other parameters may use default data.

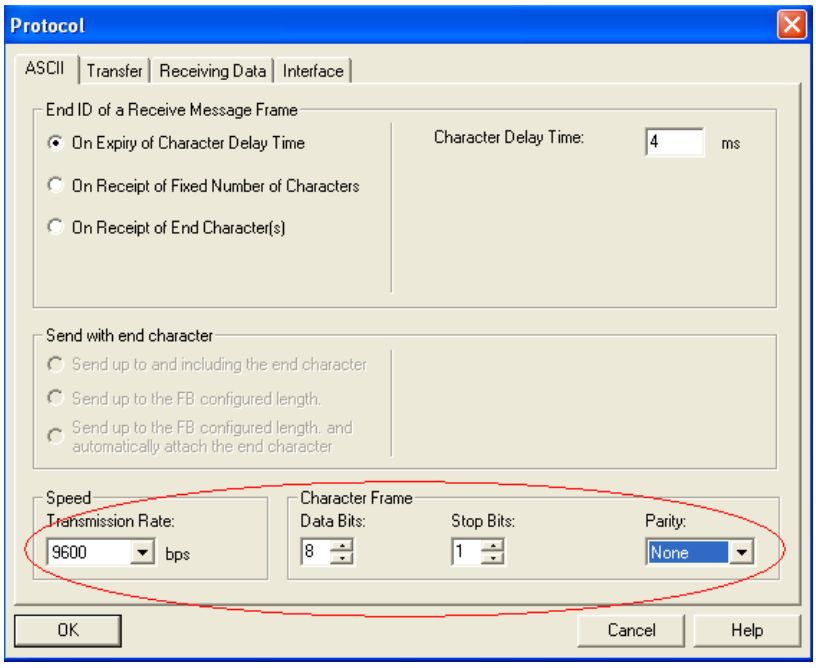


Fig. 37: Distributing parameters for ASCII protocol

5. As CP440 has only one type of RS422/485 interface, conversion equipment shall be required if it has different interface from the communication partner, and all other parameters shall be the same as CP340/341 when in ASCII communication.

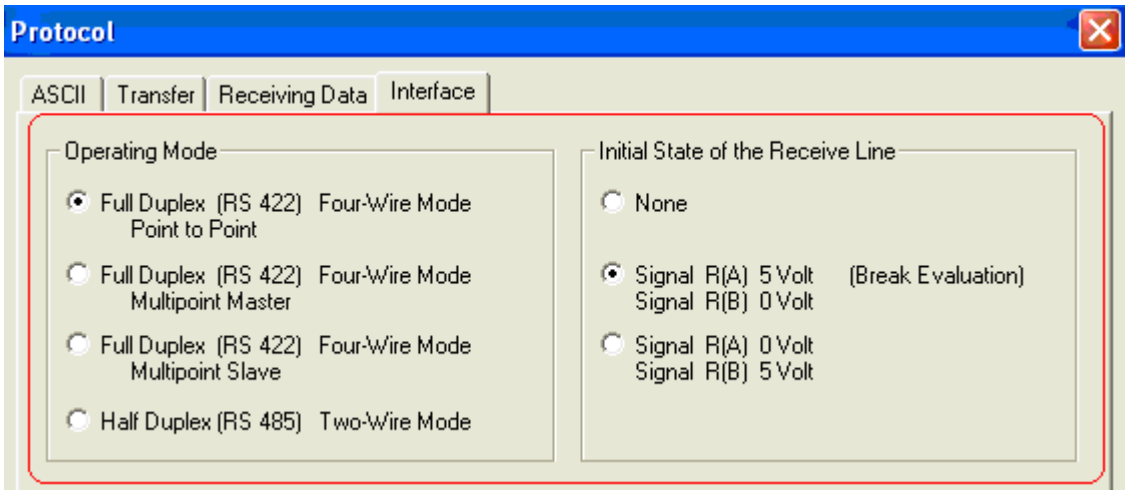
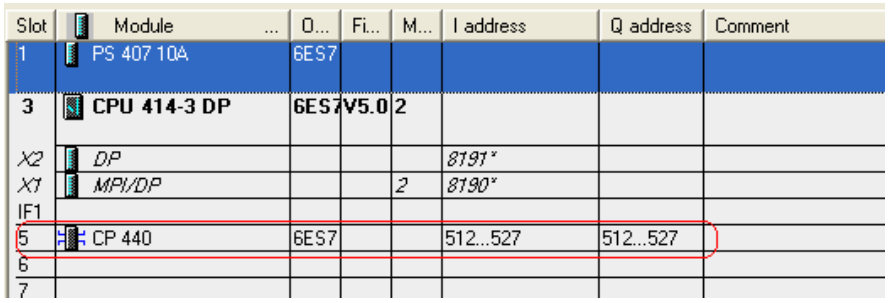


Fig. 38: Configuration interface parameters

6. After configuration completes, compile and save the hardware configuration, and download it after it is confirmed correct.

4.3.3 Write communication program

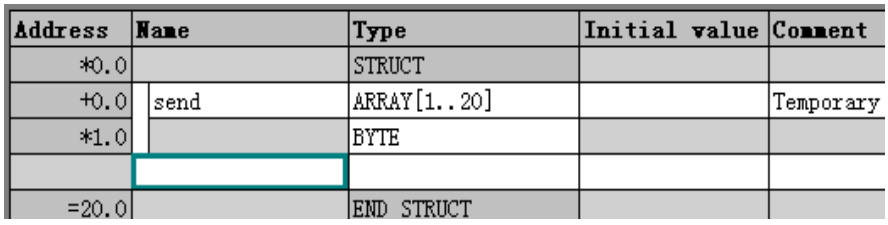
1. Double-click OB1 to open programming screen. Invoke Send Function Block FB10 SEND_400 from Libraries->CP PtP->CP440 and distribute instance data block DB10 to it. Set the parameter LADDR as the start logic address 512 in hardware configuration.



Slot	Module	...	O...	Fi...	M...	I address	Q address	Comment
1	PS 407 10A		6ES7					
3	CPU 414-3 DP		6ES7	V5.0	2			
X2	DP					8191*		
X1	MPI/DP				2	8190*		
IF1								
5	CP 440		6ES7			512...527	512...527	
6								
7								

Fig. 39: Logic address of CP440

2. Create a Send Data block DB1



Address	Name	Type	Initial value	Comment
*0.0		STRUCT		
+0.0	send	ARRAY[1..20]		Temporary
*1.0		BYTE		
=20.0		END_STRUCT		

Fig. 40: Send Data block DB1

3. Invoke Send Data block

The parameters of the send function block FB10 SEND_400 of CP440 are set as in the table below:

Name	Data	comments

	type	
REQ	BOOL	Send Data trigger bit, rising edge trigger, which is M0.0 in this example
R	BOOL	Cancel send, discontinue communication
LADDR	INT	Module start logic address in hardware configuration, which is 512 in this example
DB_NO	INT	Send Data block number, which is 1(DB1) in this example
DBB_NO	INT	Start address of Send Data, which is 0(DB1.DBB0) in this example
LEN	INT	Length of send data, which is 15 in this example
DONE	BOOL	send complete bit, which is TRUE if Send completes and has no error
ERROR	BOOL	error bit, which is TRUE if send has error
STATUS	WORD	status word indicating error code. If ERROR = 1, this status word includes error information, and user may check implication of the information code online or obtain the related instruction from CP440 manual.

Table 7: Parameter definition of FB10 SEND_440

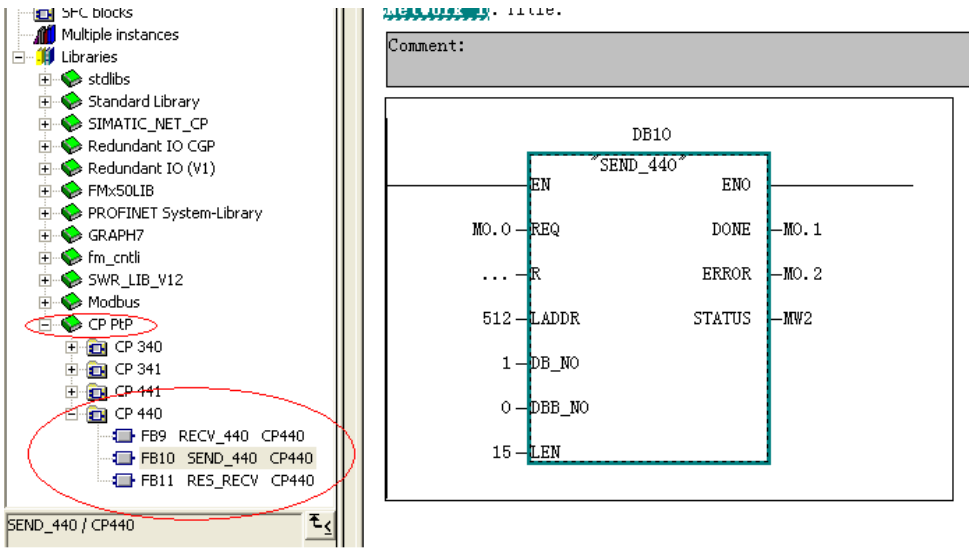


Fig. 41: Invoke FB10 SEND_440 from OB1

4. Invoke receive function block FB9 RECV_440 from the same folder in the library and distribute instance data block DB9 to it, and set LADDR as input start logic address 512 in hardware configuration.

5. Create receive data block DB2

6. Invoke receive function block

The parameters of the receive function block FB9 RECV_CP440 are set as in the table below:

Name	Type	Data format	comments
EN_R	Input	BOOL	Enable receive bit, which is M1.0 in this example.
R	Input	BOOL	Cancel communication and give up receive
LADDR	Input	INT	Module start logic address in hardware configuration, which is 512 in this example
DB_NO	Input	INT	Receive Data block number, which is 2(DB2) in this example
DBB_NO	Input	INT	Start address of Receive Data, which is 0(DB2.DBB0) in this example
NDR	Output	BOOL	Receive complete bit, which is TRUE if Receive completes and has no error
ERROR	Output	BOOL	error bit, which is TRUE if receive has error
LEN	Output	INT	Length (in byte) of receive data, which is not 0 only in the current cycle when data are received.
STATUS	Output	WORD	status word indicating error code. If ERROR = 1, this status word includes error information, and user may check implication of the information code online or obtain the related instruction from CP440 manual.

Table 8: Parameter definition of FB9 RECV_440

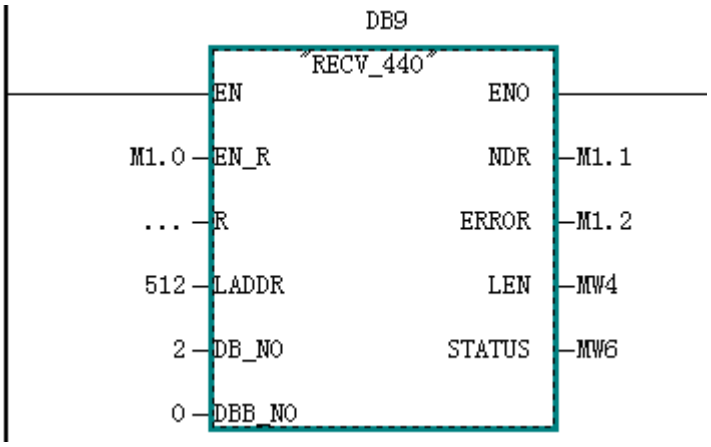


Fig. 42: Invoke FB9 RECV_440 from OB1

4.3.4 Equipment connection

CP440 module only provides one 15-pin RS422/485 serial port. Select RS422 or RS485 interface according to the wiring mode. Only one interface is valid. RS422 is 4-wire and in full-duplex mode while RS485 is 2-wire and in half-duplex mode. The detailed cable connecting method may be seen in CP440 Manual - Appendix B: Connecting cables.

4.4 ASCII protocol communication of CP441

CP441 communication module may select sub-module in different interface type according to the actual application in order to realize communication with one or more communication partners. CP441-1 (1 selectable sub-module interface), CP441-2 (2 selectable sub-module interfaces). The sub-module interfaces are in 3 types:

Order number	Interface type	comments
6ES7963-1AA00-0AA0	RS232C	9-pin D type connection
6ES7963-2AA00-0AA0	20mA TTY	9-pin D type connection
6ES7963-3AA00-0AA0	RS422/485	15-pin D type connection

Table 9: CP441 interface sub-module

The configuration process is introduced below with CP441-2 as an example.

4.4.1 Hardware catalog

RACK-400	6ES7 400-1JA01-0AA0
PS407	6ES7 407-0KA02-0AA0
CPU	6ES7 414-3XJ04-0AB0
CP441-2	6ES7 441-2AA03-0AE0 (Interface1：RS232C, interface used in this example) (Interface2：RS422/485)

4.4.2 Configuration

1. Open the project ptp that has been created, and insert a new SIMATIC 400 Station to change the station name to CP441 ASCII. Double-click Hardware to enter the hardware configuration screen, and insert the related module in steps stated above.

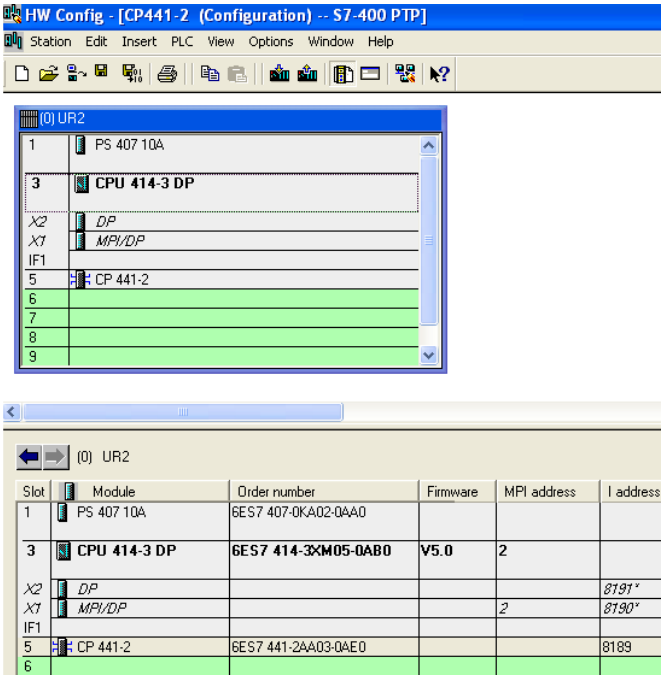


Fig. 43: Configuration hardware

2. Double-click CP441-2 module and click to enter Basic Parameters. Select Interface address, and designate interface type of the sub-module. RS232C interface is used in this example.

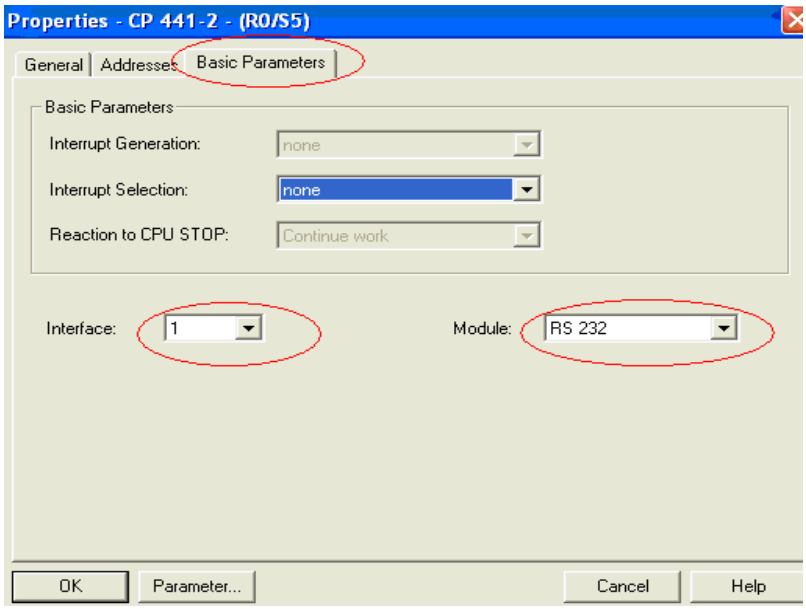


Fig. 44: Setting of basic interface parameters

3. Click Parameter, and configure CP441-2 parameters.

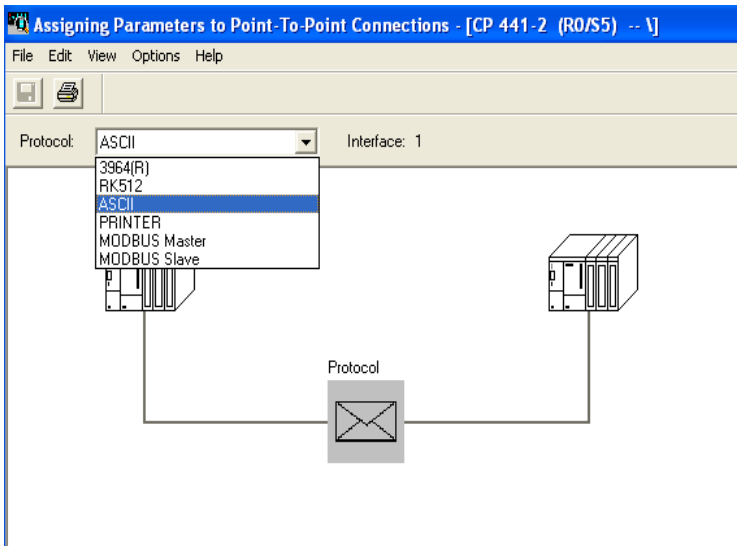


Fig. 45: Protocol selection

4. Double-click the envelop icon under Protocol to configure ASCII communication parameters. The set communication parameters shall be the same as those of the communication partner, and the others shall be in default values. The specific operations may be seen in the text above, which are not repeated here.

5. After completing configuration, return to Sub-module interface type selection interface, and click General to enter Interface ->PtP 1 and create a new PtP subnet, and then click OK to confirm.

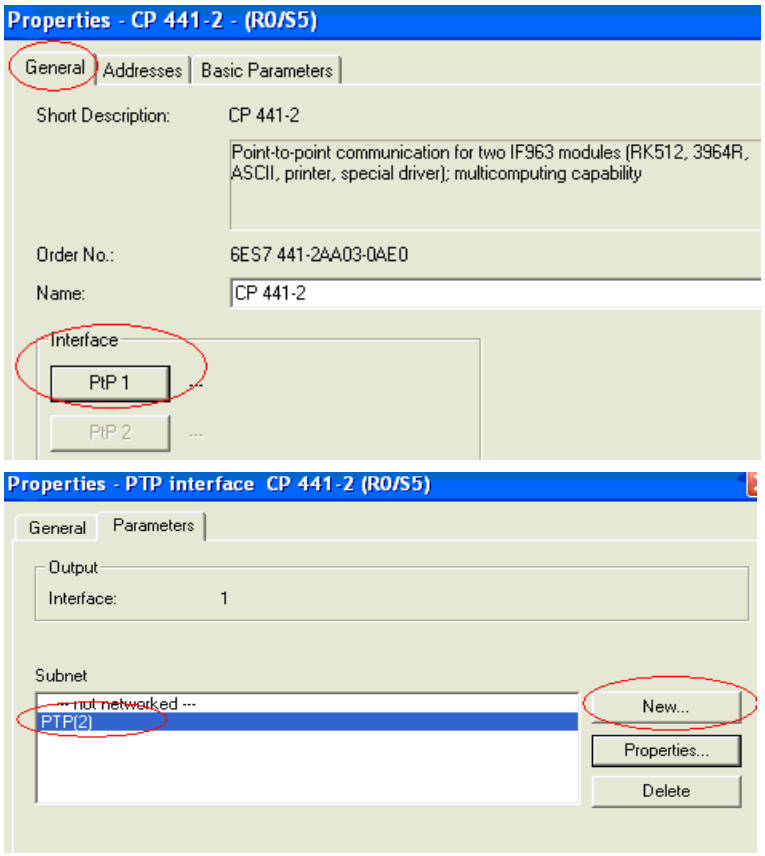


Fig. 46: Create new PtP network

PtP 1 interface is in connection status at this moment. PtP 2 has the same configuration, which is not introduced for it is not used in this example.

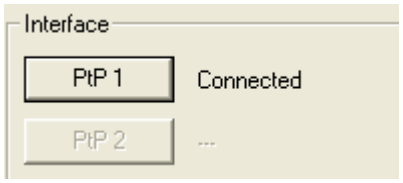


Fig. 47: Interface status after PtP is connected

6. Then open the configure network icon  in the hardware configuration screen to enter the network configuration interface.

Click to select the CPU in this station, and user may see that communication connection table appears under the page. Right-click the first line to insert new connection, and the connection is in "point-to-point connection" type.

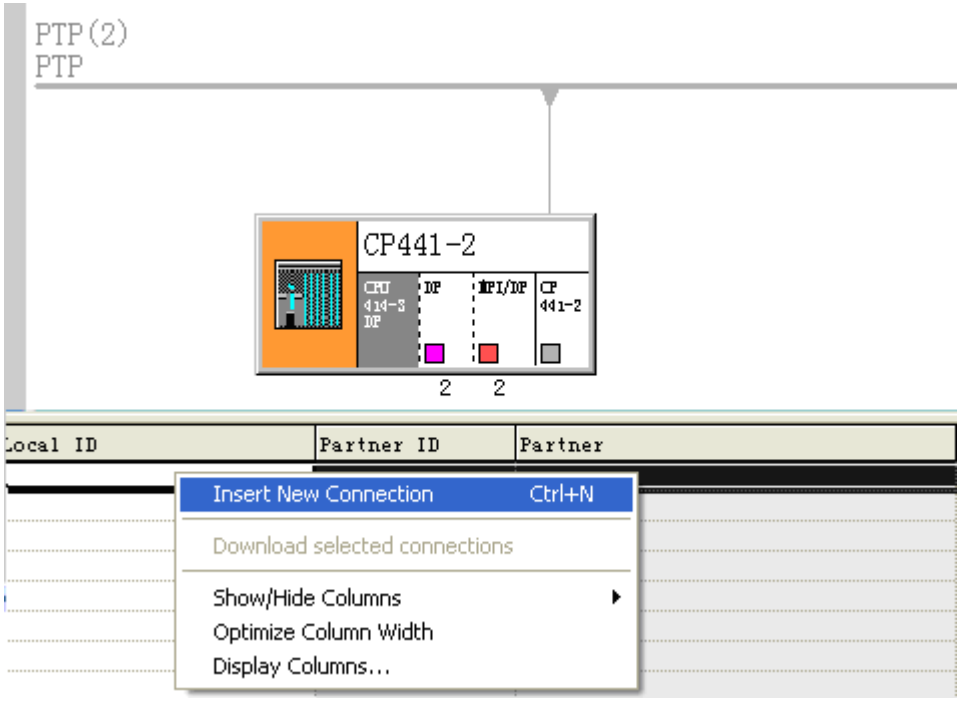


Fig. 48: Insert a new connection

7. Select "Unspecified" as the connection object. This option is used for connection with third-party devices and the devices without communication bus, including S7-CP PtP (CP340,CP341), S5-CP PtP and Printer, etc. If the communication partner is CP441, it shall be confirmed that it has been connected to a same PtP subnet and selected directly as the connection object.

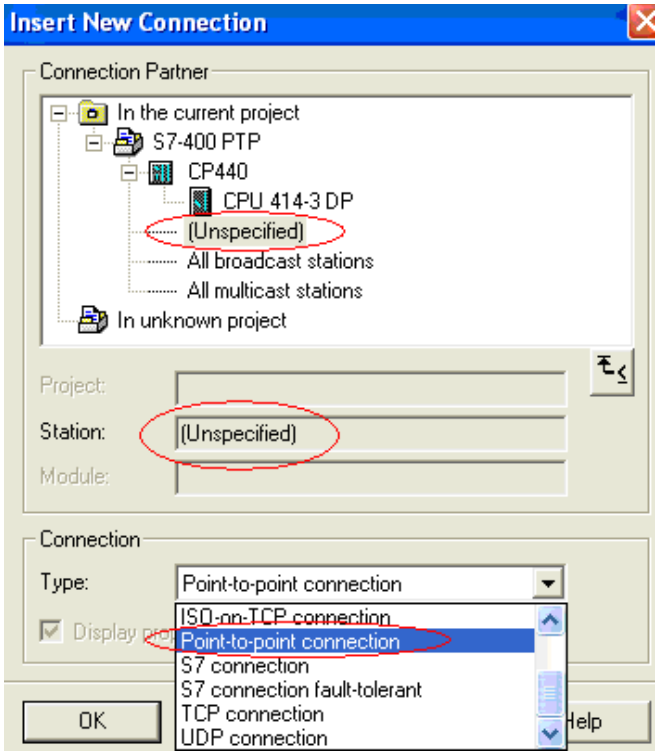


Fig. 49: Insert a new connection

8. After completing configuration, click OK to confirm. PtP connection properties screen will pop up at this moment.

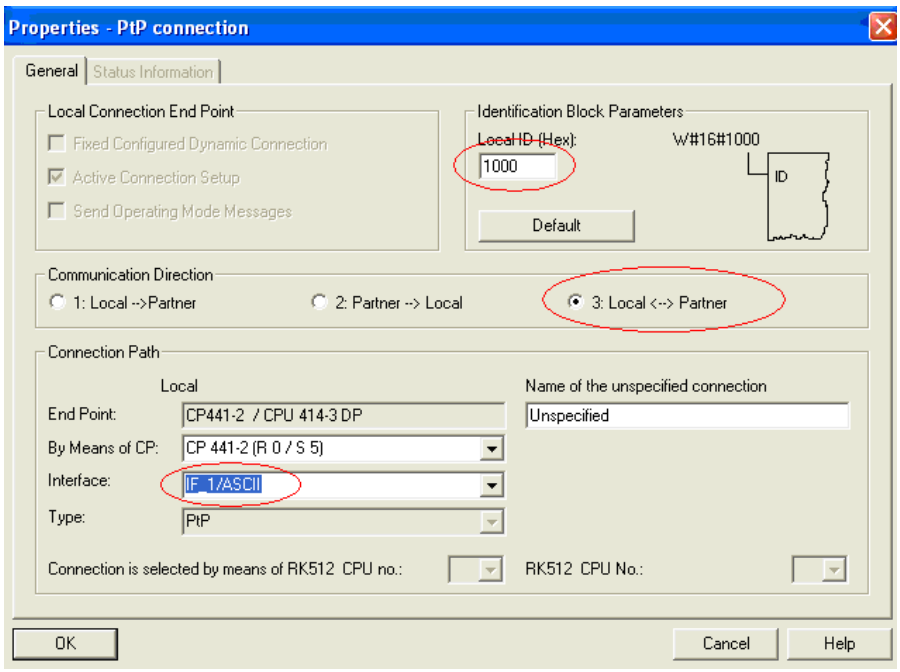


Fig. 50: Configuration connection

- One parameter Local ID (Hex) in this screen shall be noted for it will be used when programming to invoke system function block. You may modify it in manual way to fit the parameters in the program SFB that have been configured, but its range shall be noted: W#16#1000---W#16#1400。
- The "communication direction" may be selected according to the actual demand. In this example, the third type is used: Two-way communication. Click OK to confirm and compile the configuration, and download it after it is confirmed correct.

9. Confirm the connection status online, and click  as shown in the Fig. below. It may be seen that "Connection status" is "set up", showing that the connection has been created.

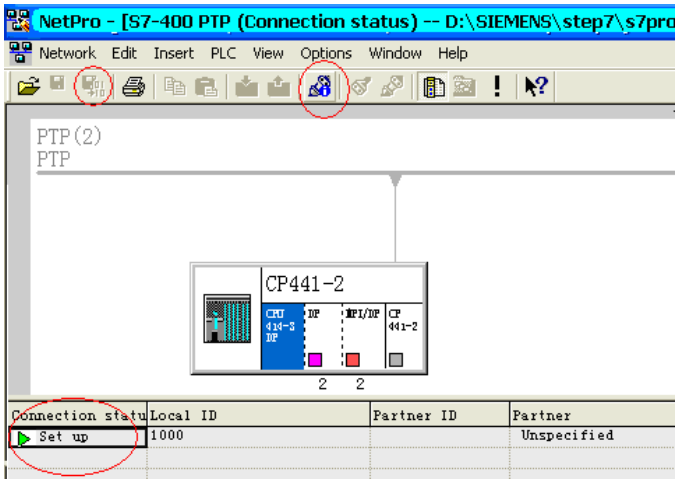


Fig. 51: Monitoring of connection status

4.4.3 Write communication program

1. Double-click OB1 to open the programming screen. Invoke SFB12 BSEND from Libraries->□Standard library->□System function blocks, and distribute instance data block DB12 to it and create send data block DB1.

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	SENDDATA	ARRAY[0..10]		Temporary
*1.0		BYTE		
=12.0		END_STRUCT		

Fig. 52: Send Data block DB1

2. Invoke send function block. The SFB12 BSEND parameters are set as shown in the table below:

Name	Data type	comments
REQ	BOOL	send request bit, rising edge trigger, which is M0.0 in this example
R	BOOL	Cancel communication
ID	WORD	Local ID number, which is obtained from the PtP connection properties and is hexadecimal.
R_ID	DWORD	Distinguish double word, which may be any data. However, if the program uses multiple BSEND blocks, different serial numbers shall be distributed to them.
SD_1	ANY	Data send area. DB area is used in this example, and the send data are in 5 bytes. Other addresses and data types may also be used for access, and the detailed information may be obtained from Step7 SFB12 online help.
LEN	WORD	Send data length, which is counted in bytes.
DONE	BOOL	Send complete bit, which is set as 1 if the task completes and has no error.
ERROR	BOOL	Error bit, which is set as 1 in case of error.
STATUS	WORD	Status word, indicating error code. The specific information may be seen in online diagnosis of module or from CP441 Manual - Chapter 9: Diagnosis information

Table 10: Parameter definition of SFB12 BSEND

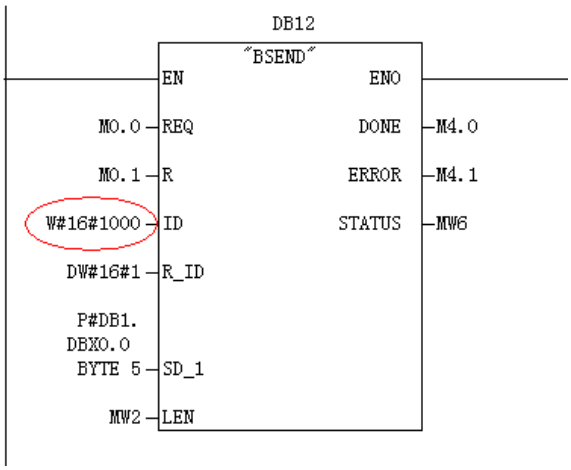


Fig. 53: Invoke SFB12 BSEND from OB1

3. At the same time, invoke SFB13 BRCV to receive data, and distribute instance data block DB13, and create a new DB block DB2 to receive data.

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	RCV	ARRAY[0..400]		Temporary
*1.0		BYTE		
=402.0		END_STRUCT		

Fig. 54: Receive data block DB2

Name	Data type	comments
EN_R	BOOL	Receive enable bit, allowing receive when it is 1. M8.0 is used in this example.
ID	WORD	Local ID number, which is obtained from the PtP connection properties and is hexadecimal.
R_ID	DWORD	W#16#0 must be used when in ASCII, 3964(R) communication.
RD_1	ANY	Data receive area. DB2 is used in this example to receive.
LEN	WORD	Receive data length memory area, in bytes
NDR	BOOL	Receive complete bit, which is TRUE if Receive completes and has no error
ERROR	BOOL	error bit, 1 indicating that it has an error
STATUS	WORD	Status word, indicating error code. The specific information may be seen in online diagnosis of module or from CP441 Manual - Chapter 9: Diagnosis information

Table 11: Parameter definition of SFB13 BRCV

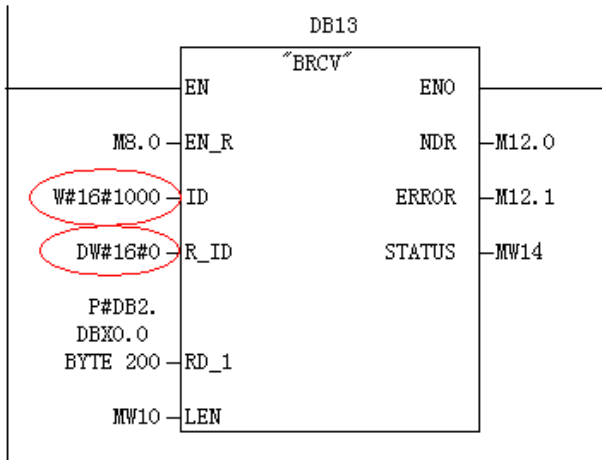


Fig. 55: Invoke SFB13 BRCV from OB1

4.4.4 Equipment connection

Use standard RS232C cable to connect serial ports of CP441-2 interface1 and computer. The detailed cable connecting method may be seen in CP441 Manual - Appendix B: Connecting cables.

5 MODBUS RTU Protocol communication

MODBUS RTU communication protocol is in master-slave mode. In the transmission process, the master sends a request telegram actively to the slave, and the slave returns an answer telegram. For details of MODBUS RTU protocol, please refer to related MODBUS RTU files or manuals.

5.1 MODBUS Slave protocol communication of CP341

5.1.1 Hardware catalog

PS 307	6ES7 307-1EA00-0AA0
CPU 315-2DP	6ES7 315-2AG10-0AB0
MMC	6ES7 953-8LG11-0AA0
CP341	6ES7 341-1AH01-0AE0
Dongle	6ES7 870-1AB01-0YA0

Dongle's support is necessary when using CP341 for MODBUS Protocol communication. Before it is used, install Dongle in the Dongle slot at the back of the CP341 module. Dongle and CP341 before and after inserting Dongle are shown as in the Fig. below:

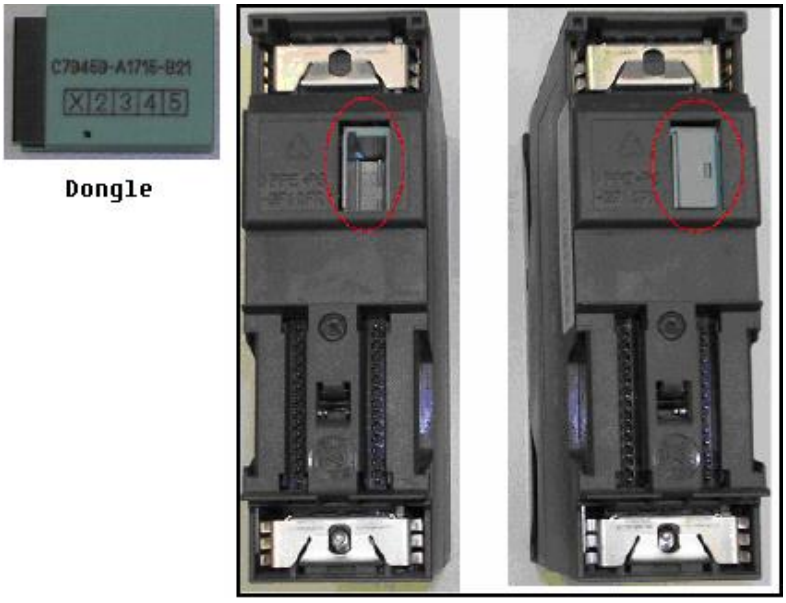


Fig. 57: Before and after inserting Dongle

5.1.2 Configuration

1. Open the project ptp created above, and right-click the project name, select Insert New Object->SIMATIC 300 Station to change the station name to CP341 Modbus-S.

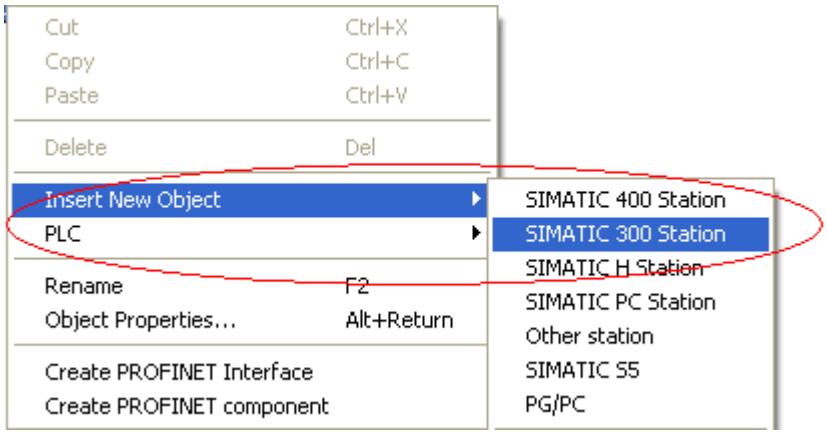


Fig. 58: Insert S7-300 station

2. Double-click Hardware to enter the hardware configuration interface and insert RACK, CPU315-2DP and CP341.

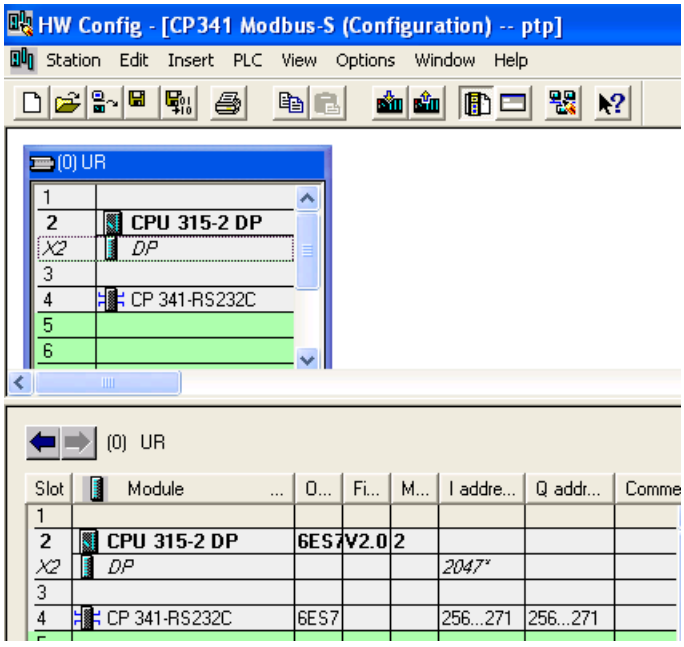


Fig. 59: Configuration hardware

3. Double-click CP341 module, and click Parameter... to configure CP341 parameters. Select MODBUS Slave from Protocol options.

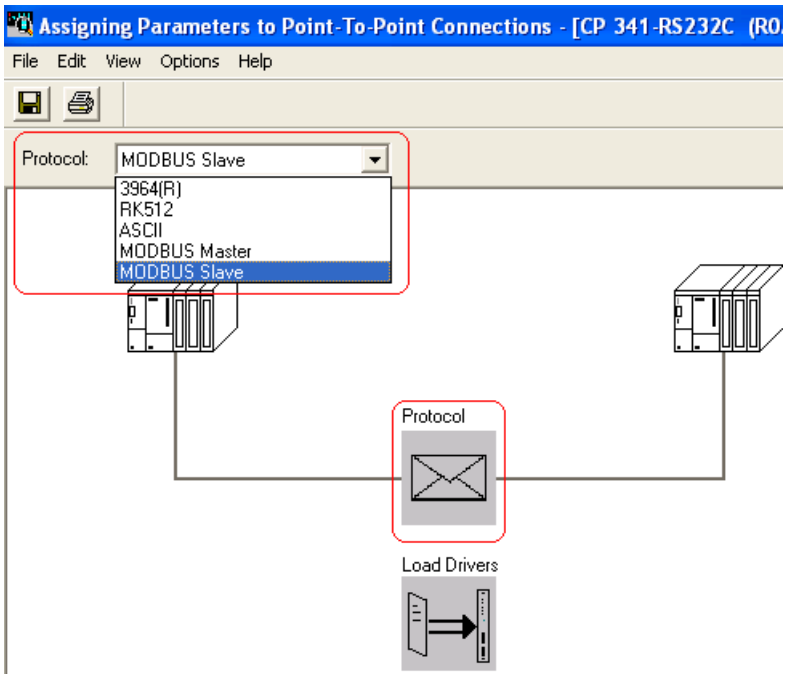


Fig. 60: Selecting communication protocol

4. Double-click the envelop icon under Protocol to configure MODBUS Slave parameter, and click MODBUS-Slave button.

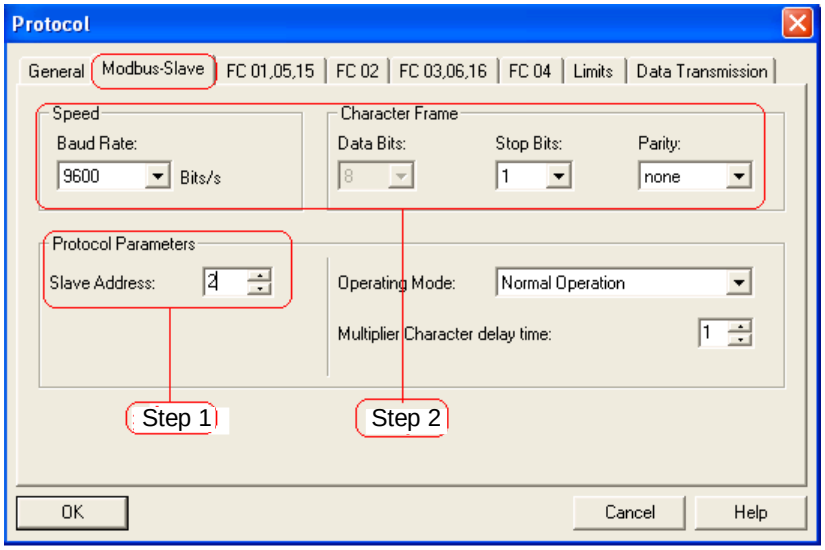


Fig. 61: Configure MODBUS Slave communication parameter

Step 1: set MODBUS Slave address, which is set as 2 in this example

Step 2: set parameters of MODBUS Slave, such as Baud rate, stop bit and check bit, etc.

Then configure the parameters represented by the function codes. For details, see the four figures below.

5. FC01,05,15: status of read and forced output bit. The left side is info transfer address, and the right side is corresponding PLC address area, viz. the left addresses from 0 to 100 match MODBUS address area 00001 to 00101, and the

corresponding Siemens data area is M0.0-M12.4. 101 to 200 match the MODBUS Address area 00102 to 00201, and the corresponding Siemens data area is Q0.0 to Q12.3. The slave addresses 201 to 300 and 301 to 400 match the Modbus address areas 00202 to 00301 and 00302 to 00401, and the corresponding Siemens data area is Timer, Counter.

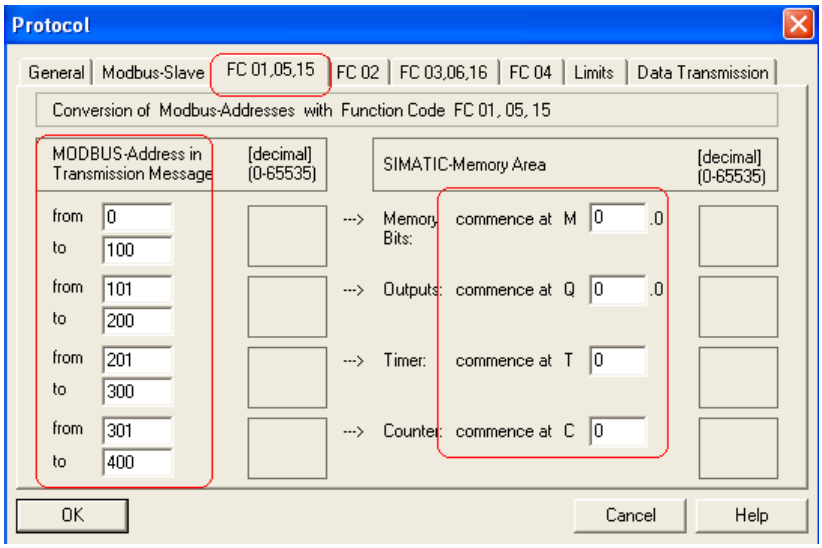


Fig. 62: Distribution of MODBUS Slave addresses

6. FC02 reads input data status, and the address matching is as stated above.

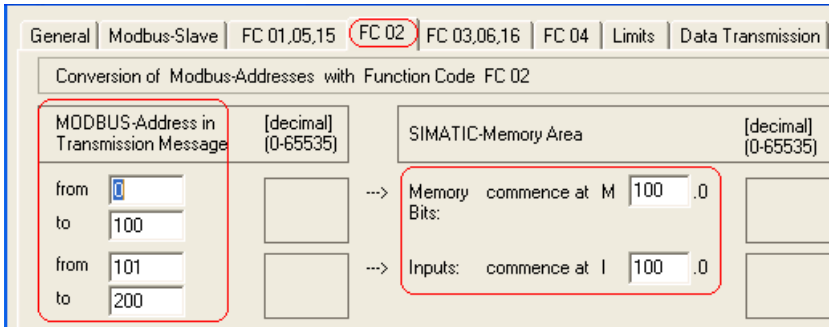


Fig. 63: Distribution of MODBUS Slave addresses

7. FC03,06,16 configuration output register data area corresponds to Siemens data area DB block.

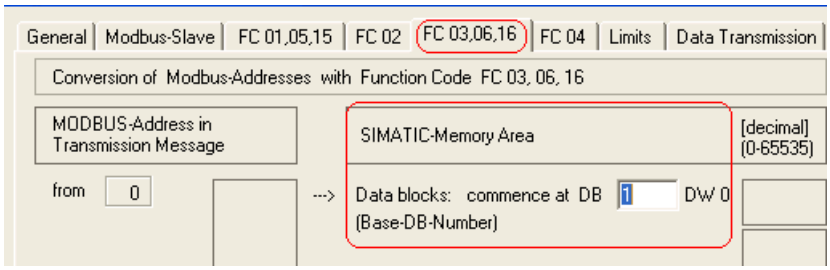


Fig. 64: Distribution of MODBUS Slave addresses

8. FC04 configuration input register data area also corresponds to Siemens data area DB block.

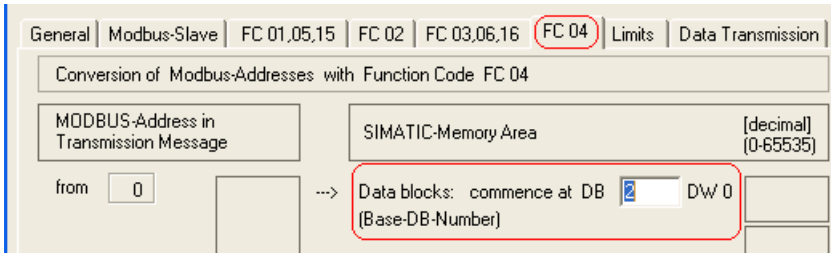


Fig. 65: Distribution of MODBUS Slave addresses

9. Setting limit values for writing parameters

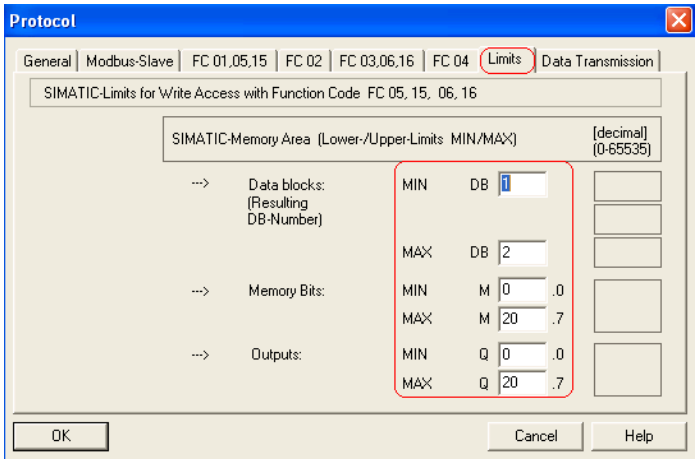


Fig. 66: Write parameter limit values for MODBUS Slave

10. If CP341 in RS422/485 interface is selected, the interface type shall also be set as shown in the Fig. below, and other parameters shall be in default settings.

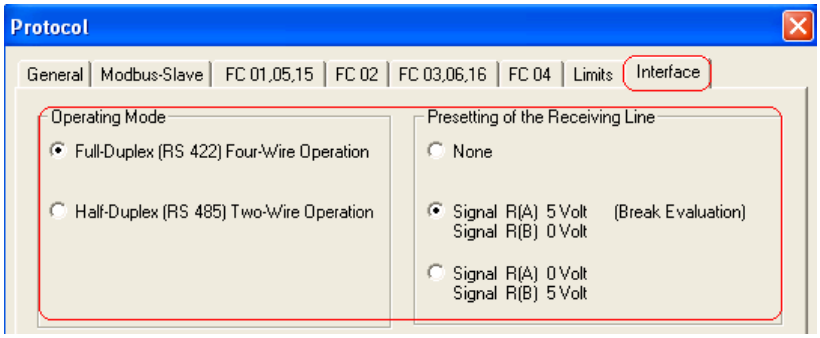


Fig. 67: Interface parameter assignment of MODBUS Slave

11. After configuration completes, a prompt will ask you whether you load the driver before it is saved.

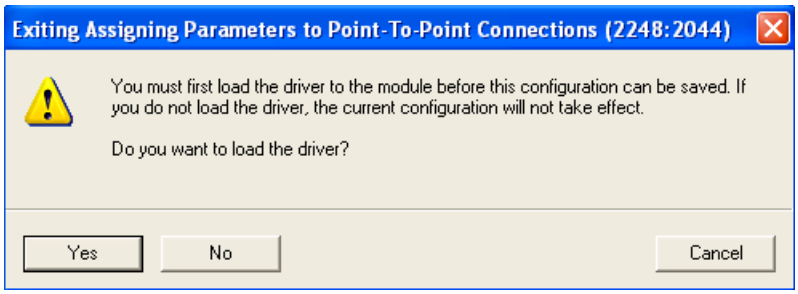


Fig. 68: Dialog box prompting loading driver

12.At this moment it must be connected to the actual PLC. Click Yes to load the driver. The CPU must be in STOP mode when in loading. After the driver is loaded, STEP7 will prompt "Driver already exists" if you load it another time. After configuration completes, click  button to save and compile the hardware configuration and confirm that it has no error.

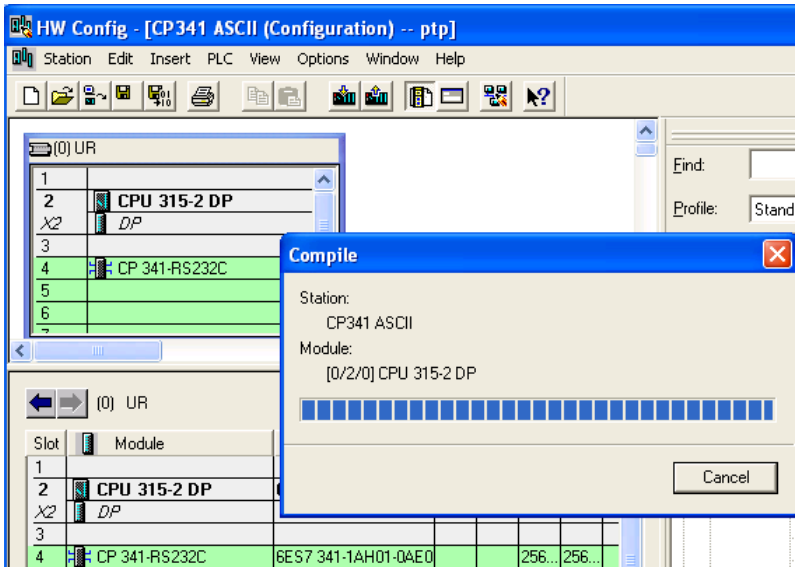


Fig. 69: Compile and save hardware configuration

5.1.3 Write communication program

1. Add FB7 and FB8 into the program Blocks in such method: double-click OB1 to open OB1 programming screen, invoke send program block FB8 and receive program block FB7 from Libraries->CP PtP->CP341, and then delete them from OB1 because these two function blocks will be used in MODBUS Slave communication.

2. Invoke MODBUS Slave function block FB80 at Libraries->Modbus->Modbus ->FB80. Distribute instance data block DB80, and set the parameter LADDR as start logic address 256 in the hardware configuration.

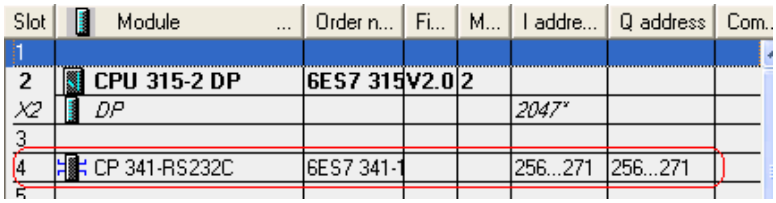


Fig. 70: Logic address of CP341

3. Invoke MODBUS Slave function block

LADDR	Start logic address in hardware configuration, which is 256 in this example
START_TIME	timeout initialization timer, which is T1 in this example
START_TIME	timeout initialization time value, which is 1s in this example
OB_MASK	I/O access error mask bit, which is M100.0 in this example
CP_START	FB initialization enable bit, which is M100.1 in this example
CP_START_FM	CP_START initialization rising edge bit, which is M100.2 in this example
CP_START_NDR	write from CP operation bit, which is M100.3 in this example
CP_START_OK	initialization succeed flag, which is M100.4 in this example
CP_START_ERROR	initialization fail flag, which is M100.5 in this example
ERROR_NR	error number, which is MW102 in this example
ERROR_INFO	error message, which is MW104 in this example. Refer to Modbus Slave Manual - Chapter 10

Table 12: Parameter definition of FB80

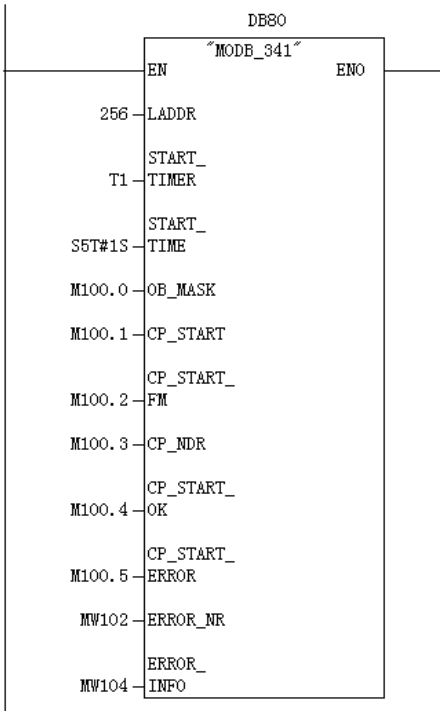


Fig. 71: Invoke FB80 from OB1

4. Create FC03,06,16 function code communication data block DB1.

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	FC030616_Data	ARRAY[1..50]		Temporary
*1.0		BYTE		
=50.0		END_STRUCT		

Fig. 72: Communication data block DB1

5. Create FC04 function code communication data block DB2.

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	FC04_Data	ARRAY[1..50]		Temporary
*1.0		BYTE		
=50.0		END_STRUCT		

Fig. 73: Communication data block DB2

5.1.4 Equipment connection

Use standard RS232C cable to connect serial ports of CP341 and computer. The detailed cable connecting method may be seen in CP341 Manual - Chapter B: Connecting cables.

5.1.5 Communication test

1. Download hardware configuration and program into CPU315-2DP firstly. Open MODBUS master emulation software Modscan32 in the computer.

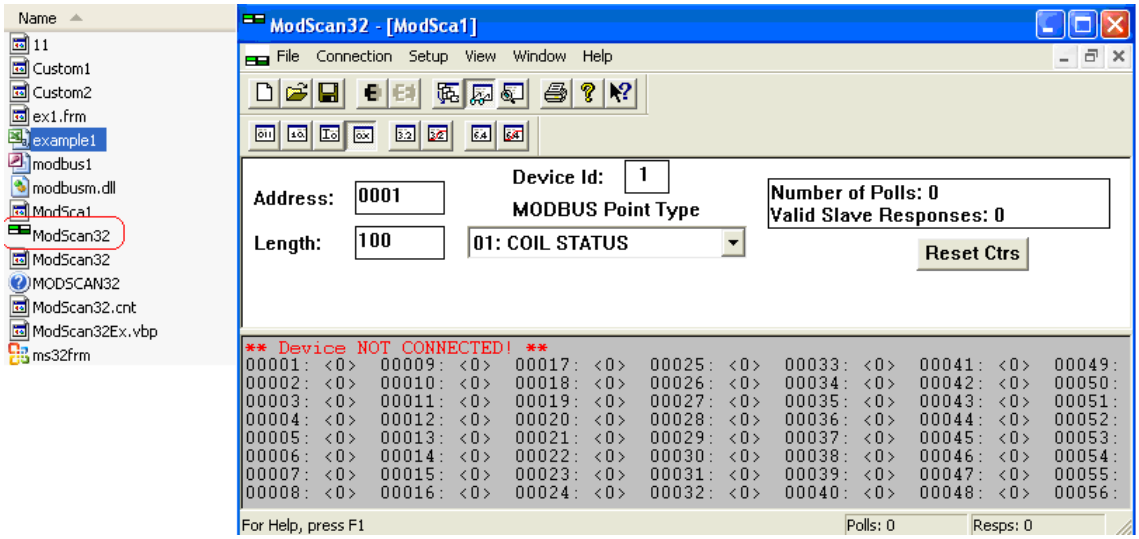


Fig. 74: Open Modscan32 software

2. Click Connection->Connect in Modscan32, as shown in the screen below. Select COM port COM1 connecting the computer with CP341, and set the Baud rate, data bit, stop bit and check mode, as shown in the Fig. below:

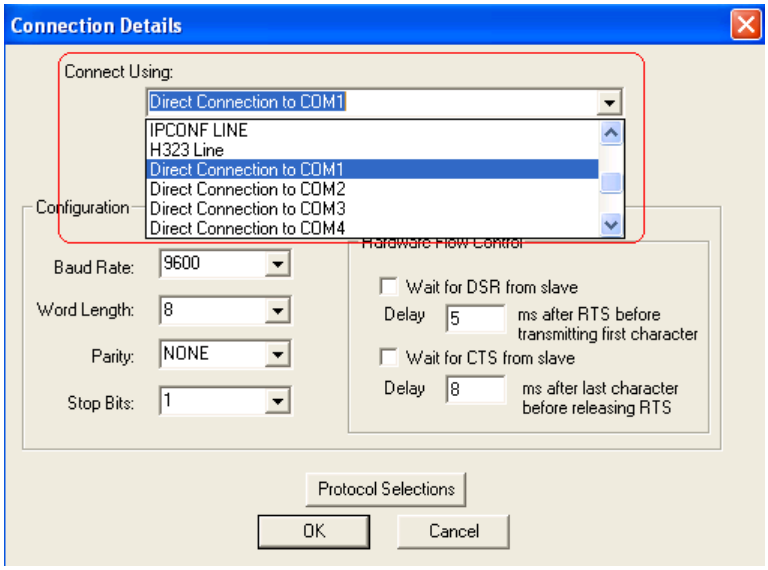


Fig. 75: Setting of Modscan32 communication parameter

3. After setting completes, click OK, and the following screen will be shown.

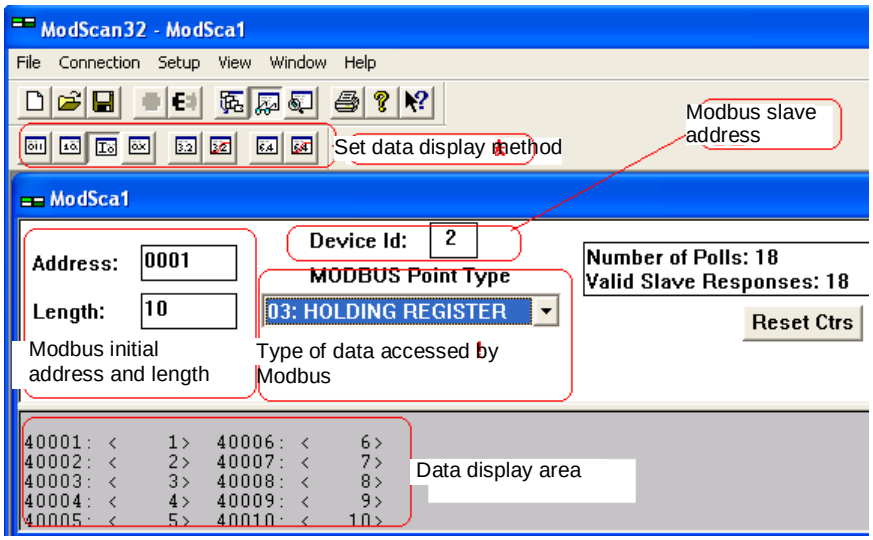
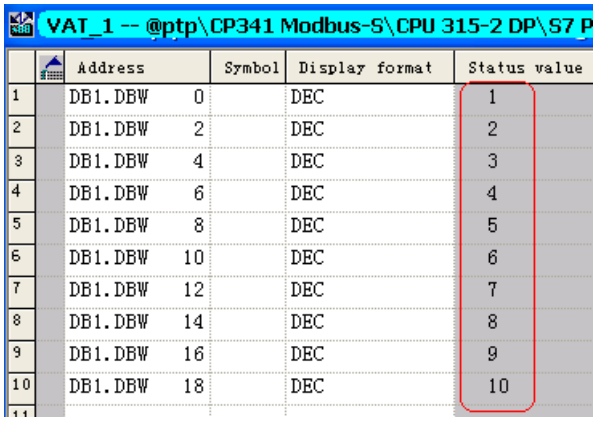


Fig. 76: Modscan32 operation interface

4. The 10 address data of the data display area correspond to the numeric values (1-10 for DBW0 - DBW10 respectively)of the first 10 words of DB1 in CPU, as shown in the Fig. below.



	Address	Symbol	Display format	Status value
1	DB1.DBW 0		DEC	1
2	DB1.DBW 2		DEC	2
3	DB1.DBW 4		DEC	3
4	DB1.DBW 6		DEC	4
5	DB1.DBW 8		DEC	5
6	DB1.DBW 10		DEC	6
7	DB1.DBW 12		DEC	7
8	DB1.DBW 14		DEC	8
9	DB1.DBW 16		DEC	9
10	DB1.DBW 18		DEC	10

Fig. 77: DB1 data monitor

5. It is only necessary to change the accessed data type in order to read other data, which is not introduced here.

6. For display of floating point number, it shall be explained that the high 16 bits and low 16 bits of the floating point number in PLC are opposite to those displayed in Modscan32, or in other words, the high 16 bits of the floating point number in PLC correspond to the low 16 bits of the floating point number displayed in Modscan32, and the low 16 bits of the floating point number in PLC correspond to the high 16 bits of the floating point number displayed in Modscan32, which may be handled in the program, as shown in the Fig. below:

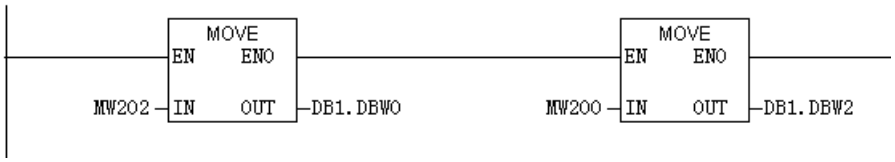


Fig. 78: Floating point number data processing

At this moment, the floating point number 40001 displayed in Modscan32 corresponds to the floating point number value of MD200, but MODBUS address corresponds to DB1.DBD0.

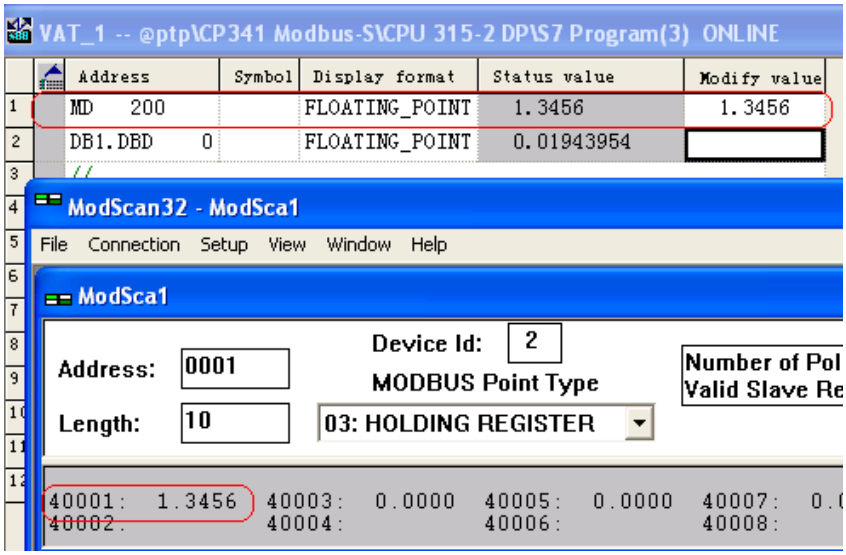


Fig. 79: Floating point number data exchange

If CP341 module with RS422/RS485 interface is used, RS422/485 converter shall be used when using computer serial port debugging program.

5.2 MODBUS Master protocol communication of CP341

5.2.1 Hardware catalog

PS 307	6ES7 307-1EA00-0AA0
CPU 315-2DP	6ES7 315-2AG10-0AB0
MMC	6ES7 953-8LG11-0AA0
CP341	6ES7 341-1AH01-0AE0
Dongle	6ES7 870-1AA01-0YA0

Insert Dongle into CP341, and the Dongle and CP341 before and after Dongle is inserted are shown in the Fig. below:

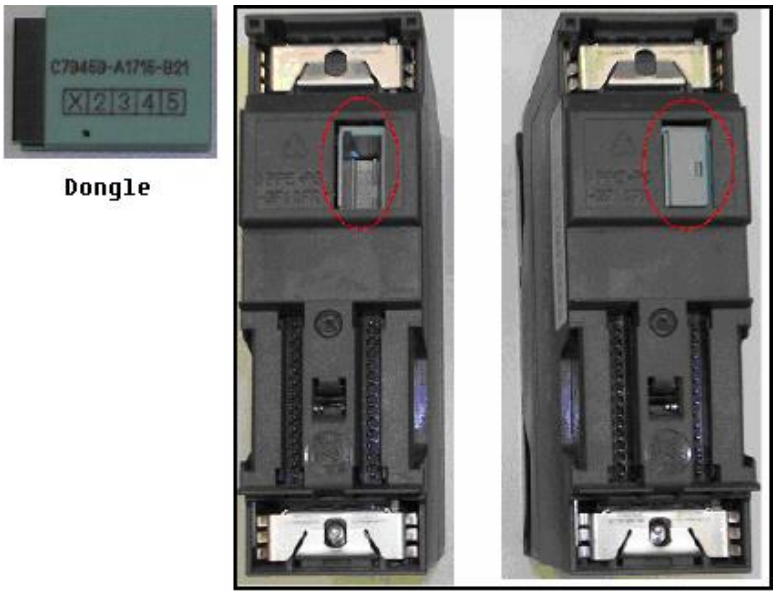


Fig. 80: Before and after inserting Dongle

5.2.2 Configuration

1. Open the project ptp created above, and right-click the project name, select Insert New Object->SIMATIC 300 Station to change the station name to CP341 Modbus-M.

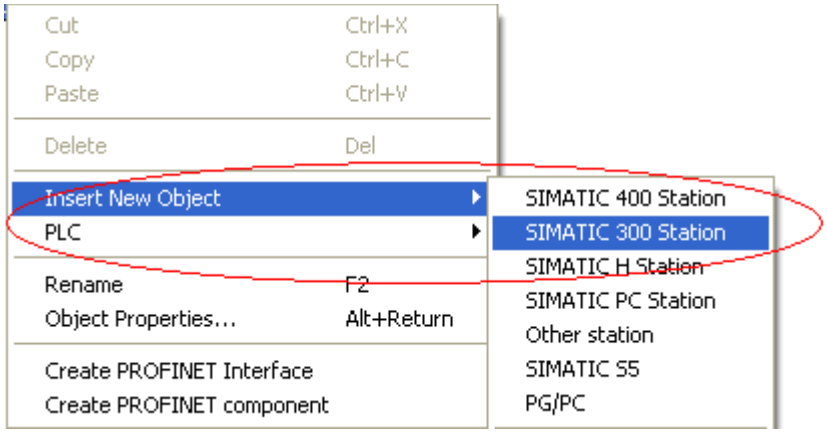


Fig. 81: Insert S7-300 station

2. Double-click Hardware to enter the hardware configuration interface and insert RACK, CPU315-2DP and CP341.

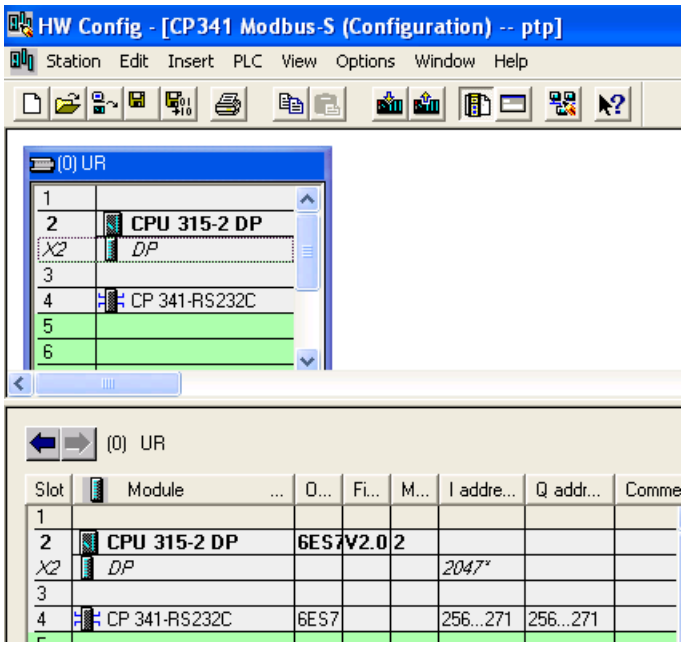


Fig. 82: Configuration hardware

3. Double-click CP341 module, and click Parameter... to configure CP341 parameters. Select MODBUS Master from Protocol options.

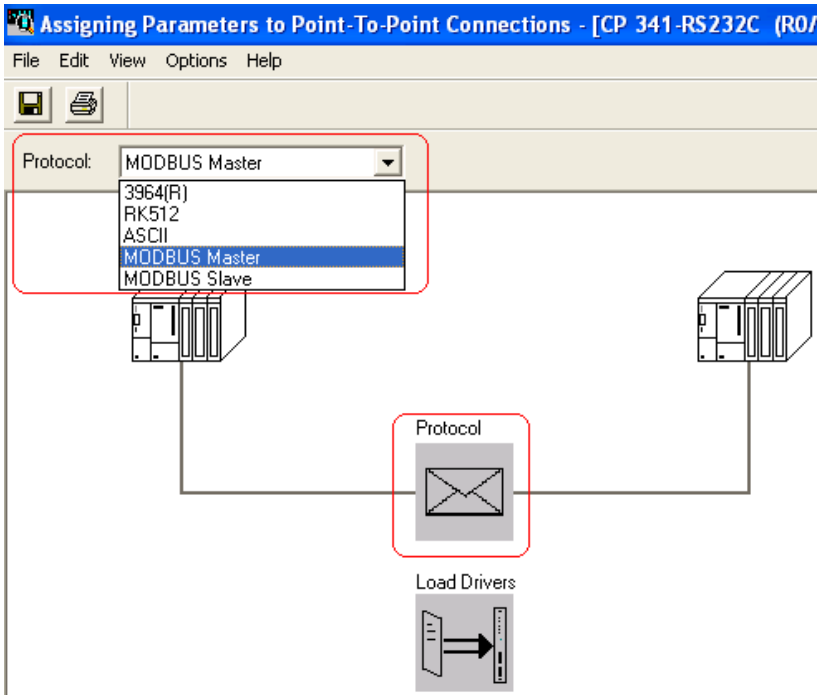


Fig. 83: Selecting communication protocol

4. Double-click the envelop icon under Protocol to configure Modbus Master parameter, and click Modbus-Master button to set communication Baud rate, etc.

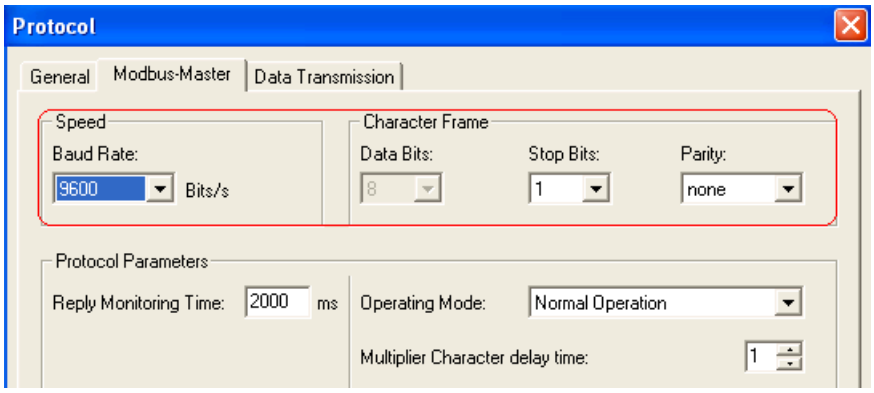


Fig. 84: Configure MODBUS Master communication parameter

5. After configuration completes, a prompt will ask you whether you load the driver before it is saved.

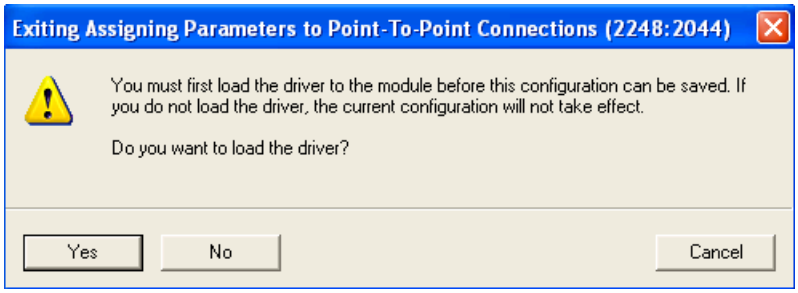


Fig. 85: Dialog box prompting loading driver

6. At this moment, it must be connected to the actual PLC. Click Yes to load the driver or click Load Drivers. The CPU must be in STOP mode when in loading.

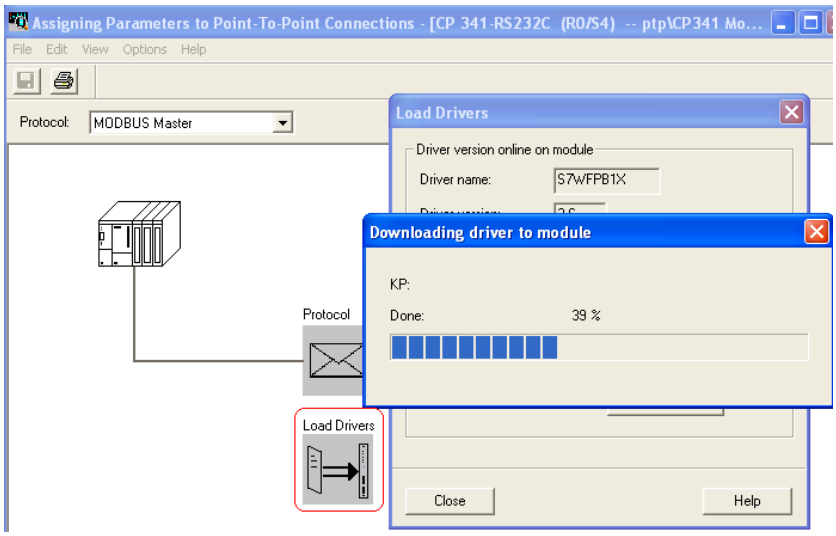


Fig. 86: Load drivers

After the driver is loaded, STEP7 will prompt "Driver already exists" if you load it another time. After configuration completes, click  button to save and compile the hardware configuration and confirm that it has no error.

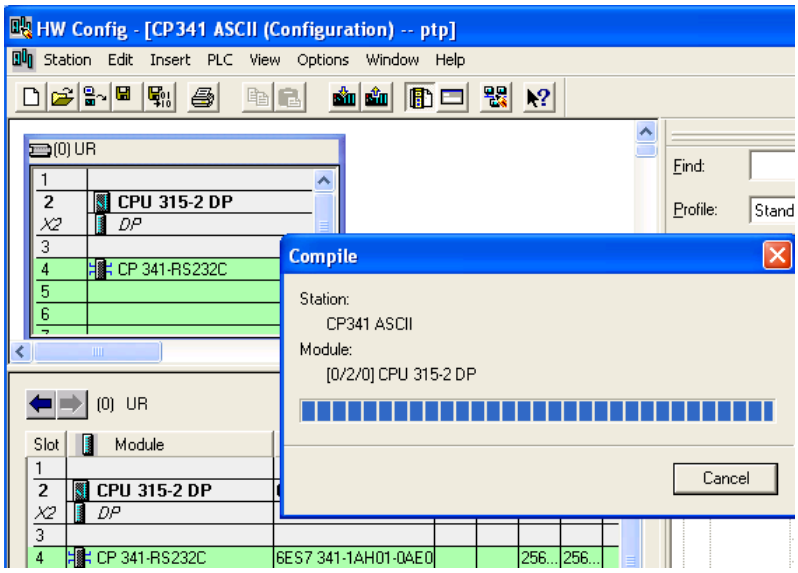


Fig. 87: Compile and save hardware configuration

5.2.3 Write communication program

1. Double-click OB1 to open OB1 programming screen. Invoke send program block FB8 P_SND_RK from Libraries -> CP PtP -> CP341 and distribute instance data block DB8 to it. Set the parameter LADDR as the input start logic address 256 in hardware configuration.

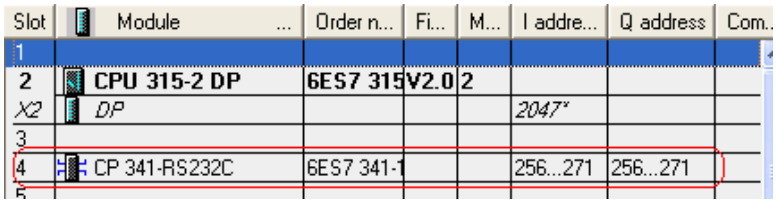


Fig. 88: Logic address of CP341

2. Create send data block DB1, in which the slave address is 2, the function code is 3 and start address is 0. Read 4 register data. For use of the function code 3, see Modbus Master Manual - 5.3: Function Code 03 - Read Output Registers.

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	slave_address	BYTE	B#16#2	
+1.0	function_code	BYTE	B#16#3	
+2.0	reg_startadr	WORD	W#16#0	
+4.0	reg_num	WORD	W#16#4	
=6.0		END_STRUCT		

Fig. 89: Send Data block DB1

3. Invoke Send Function block

The FB8 P_SND_RK parameter setting may be seen in the table below:

SF	"S" means send, which must be in capital form here.
LADDR	Start logic address in hardware configuration, which is 256 in this

	example
REQ	trigger bit of Send Data, rising edge trigger, which is M0.0 in this example
DB_NO	Send Data block number, which is 1(DB1) in this example
DBB_NO	Start address of Send Data, which is 0(DB1.DBB0) in this example
LEN	Length of send data, which is 6 in this example
R_TYP	"X" refers to extended data block, which must be in capital form here.
R	Cancel communication, which is not available in this example
DONE	send complete bit, which is TRUE if Send completes and has no error
ERROR	error bit, TRUE indicating that it has an error
STATUS	Status word, ID error code. See Modbus Master Manual - Chapter 7 for related description.
Other parameters	Not applicable in this example.

Table 13: Parameter definition of FB8 P_SND_RK

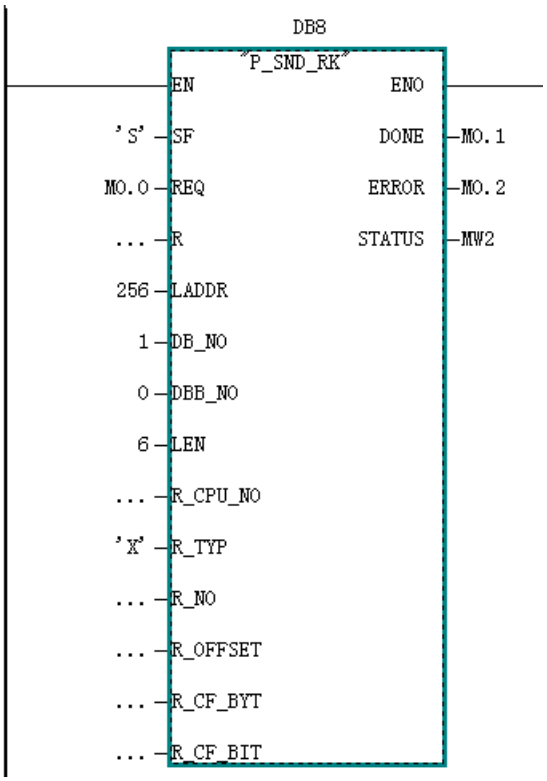
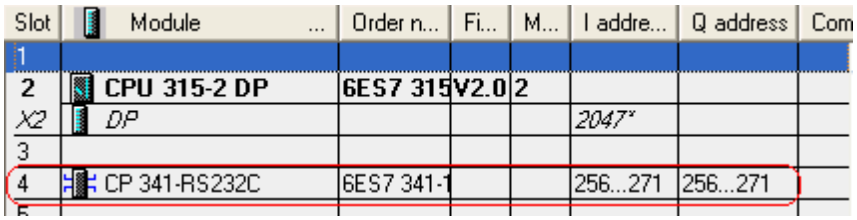


Fig. 90: Invoke FB8 P_SND_RK from OB1

4. Invoke Receive Function Block FB7 P_RCV_RK from Libraries -> CP PtP -> CP341 and distribute instance data block DB7 to it. Set LADDR as the input start logic address 256 in hardware configuration.



Slot	Module	...	Order n...	Fi...	M...	I addre...	Q address	Com
1								
2	CPU 315-2 DP		6ES7 315	V2.0	2			
X2	DP					2047*		
3								
4	CP 341-RS232C		6ES7 341-1			256...271	256...271	

Fig. 91: Logic address of CP341

5. Create receive data block DB2

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	Receive_Data	ARRAY[1..50]		Temporary
*1.0		BYTE		
=50.0		END_STRUCT		

Fig. 92:Receive data block DB2

6. Invoke receive function block

The FB7 P_RCV_RK parameter setting may be seen in the table below:

LADDR	Start logic address in hardware configuration, which is 256 in this example
DB_NO	Send Data block number, which is 2(DB2) in this example
DBB_NO	Start address of Send Data, which is 0(DB2.DBB0) in this example
LEN	Length of receive data, which is MW4 in this example.This value is not 0 only in the current cycle when data are received. The length of received data may be determined by checking the MW8 value.
EN_R	Enable receive bit, which is M0.3 in this example.
R	Cancel communication, which is not applicable in this example
NDR	Receive complete bit, which is TRUE if Receive completes and has no error
ERROR	error bit, TRUE indicating that it has an error
STATUS	Status word, ID error code. See Modbus Master Manual - Chapter 7 for related description.
Other parameters	Not applicable in this example.

Table 14: Parameter definition of FB7 P_RCV_RK

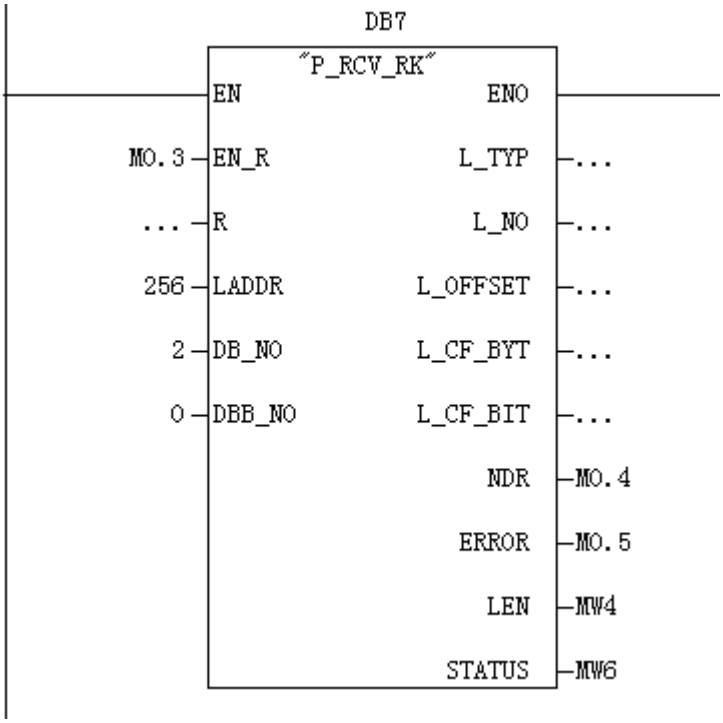


Fig. 93: Invoke FB7 P_RCV_RK from OB1

5.2.4 Equipment connection

Use standard RS232C cable to connect serial ports of CP341 and computer. The detailed cable connecting method may be seen in CP341 Manual - Chapter B: Connecting cables.

5.2.5 Communication test

1. Install Modbus Slave test software. After installing, an icon 

will be generated on the desktop. Double-click this icon to open Modbus Slave test software, as shown in the Fig. below:

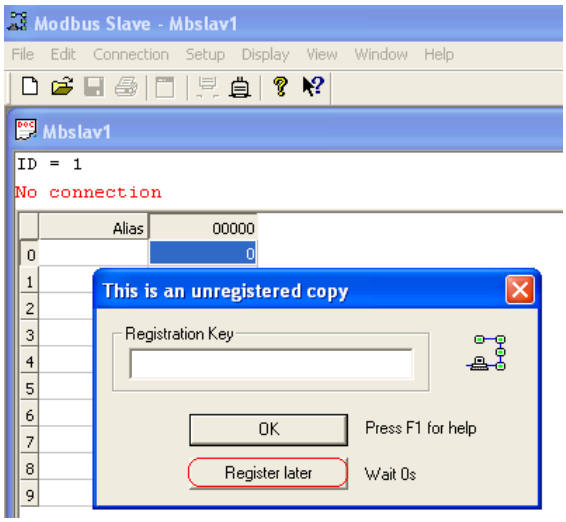


Fig. 94: Open Modbus Slave test software

2. Click the button Register Later. This software may be used for 30 days without registration, but each time it may only be used for 15min. The software downloaded from the Internet has no registration code. Then click the menu Connection->connect to configure the serial parameters, which shall be the same as the CP341 parameters.

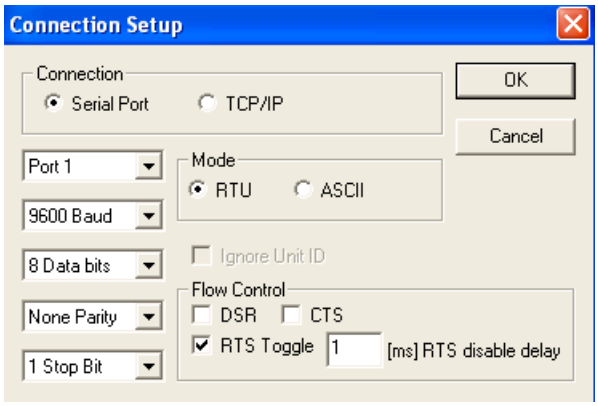


Fig. 95: Setting communication parameters

3. Click OK, and then select the menu Setup->Slave Definition... to set the communication data. As CP341 uses function code 3,03 Holding Register shall be used. The address of the slave accessed by CP341 is 2, and Slave ID is set as 2. The start address starts from 1. See the screen below:

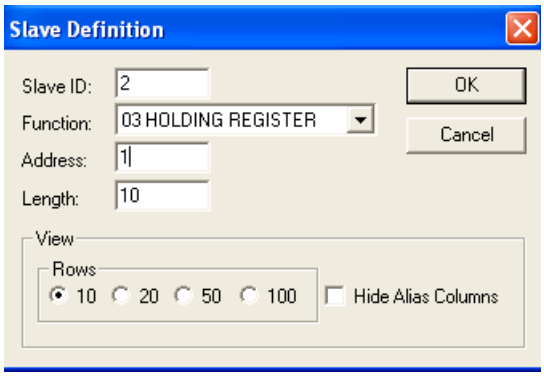


Fig. 96: Setting communication parameters

4. Then set the address 1 to 4 as 111 to 444 respectively, set M0.3 as TRUE in Step7 Variable table to enable receiving. Then set M0.0 as TRUE (rising edge trigger. If it is necessary to re-send, set M0.0 from TRUE to FALSE, and then set it back to TRUE again). It may be monitored that the values from DB1.DBW0 to DB1.DBW4 are 111 to 444, as shown in the Fig. below.

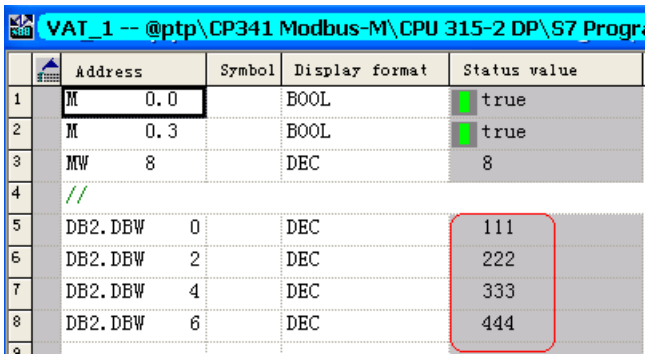


Fig. 97: Monitoring of receive data

5. If it is necessary to read the floating point number, it must be set in data format. Click the menu Display->Float Inverse.

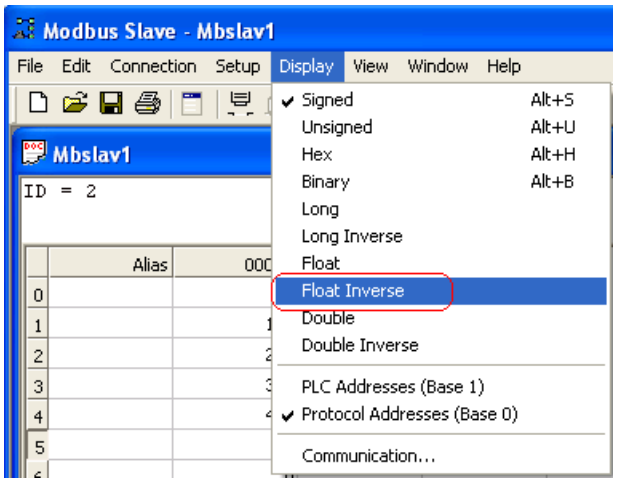


Fig. 98: Setting of floating point number data format

6. Set the values of address 1 and 3 as 1.234 and 5.678 respectively, and trigger M0.0 to send. You may see that the received data are 1.234 and 5.678, as shown in the Fig. below:

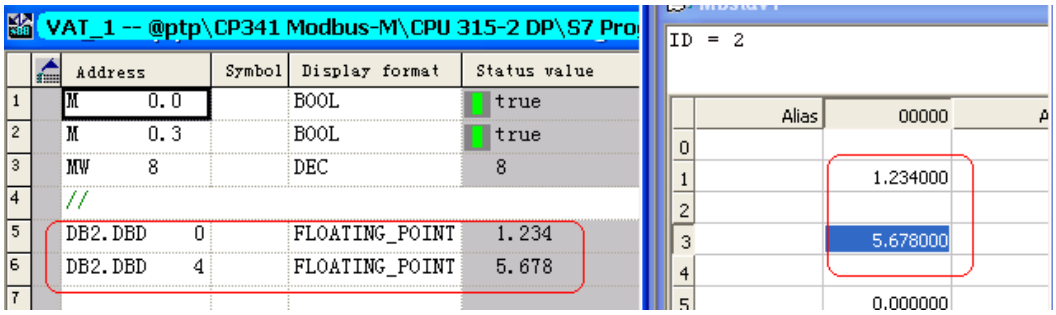


Fig. 99: Monitoring of receive data3

5.3 MODBUS Master protocol communication of CP441-2

5.3.1 Hardware catalog

RACK-400	6ES7400-1JA01-0AA0
PS407	6ES7407-0KA02-0AA0
CPU414-3	6ES7414-3XJ04-0AB0
CP441-2	6ES7441-2AA03-0AE0
Dongle	6ES7870-1AA01-0YA0

Dongle is installed in the same positions as S7-300 and CP341, and both are behind the module. Refer to the pictures above.

5.3.2 Configuration

1. Open the created project ptp and insert a new SIMATIC 400 Station, and change the station name to CP441-2 modbus Master. Double-click Hardware to enter the hardware configuration screen, and insert RACK, PS, CPU and CP441-2. The specific steps may be seen in the text above.

2. In the CP441-2 module, click Parameter to configure CP441-2 parameters, and select MODBUS Master in Protocol options.

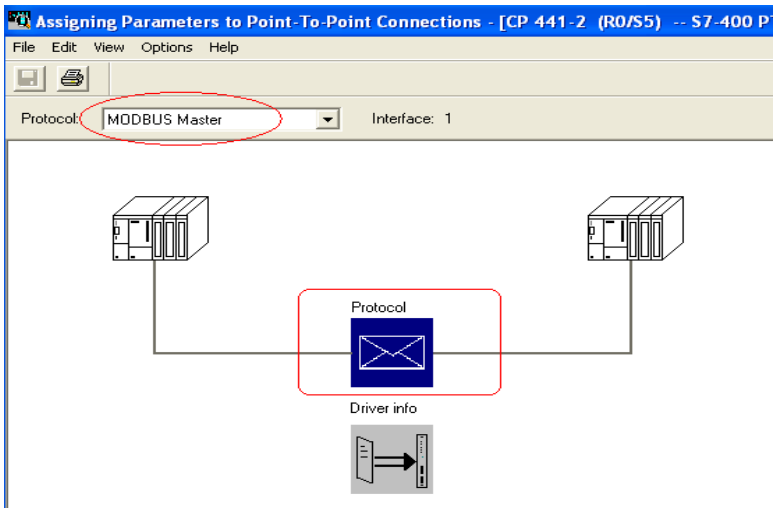


Fig. 100: Selecting communication protocol

3. Double-click the envelop icon under Protocol to configure Modbus Master parameter, and click Modbus-master button to set the basic parameters such as communication rate and message details, etc., and other parameters may be in default settings.

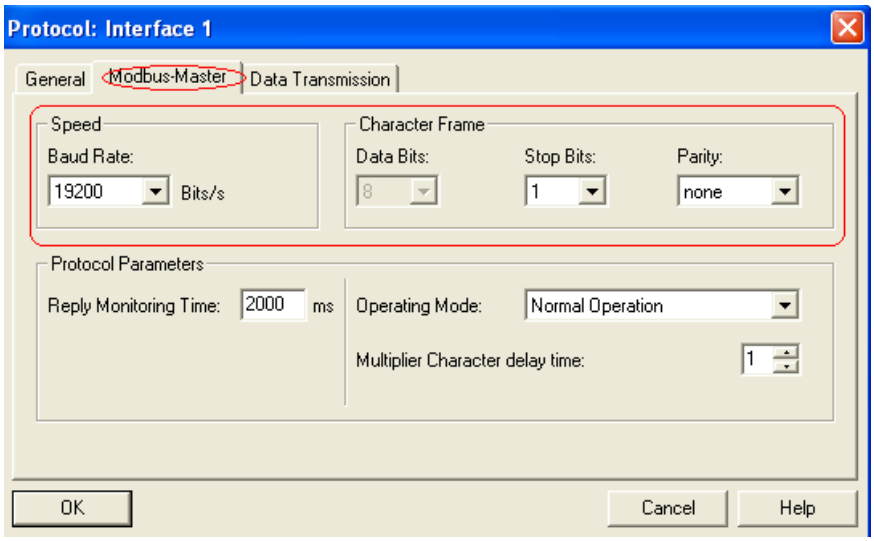


Fig. 101: Configure MODBUS Master communication parameter

4. After completing configuration, click OK and save it, and close the dialog box. Just as ASCII communication with CP441-2, create PtP connection for the used interface, and record the Local ID (Hex) connection number.

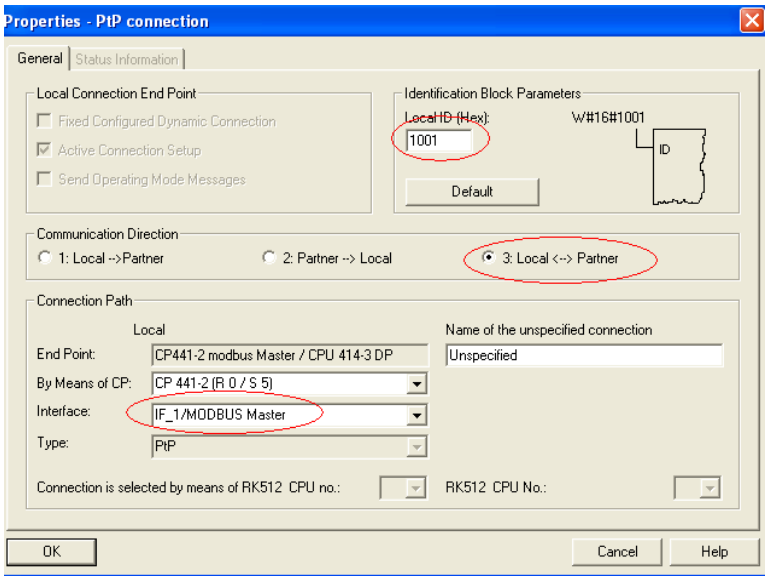
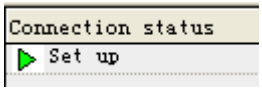


Fig. 102: Configuration connection

5. Click  to save and compile the configuration information. If there is no error, select CPU to download the configuration information as a whole, and use  to check the connection status online till the displayed icon of "connection status" is: *  to indicate correct connection.

6. When CP441 makes MODBUS communication, the "Startup" parameter in CPU properties shall also be changed.

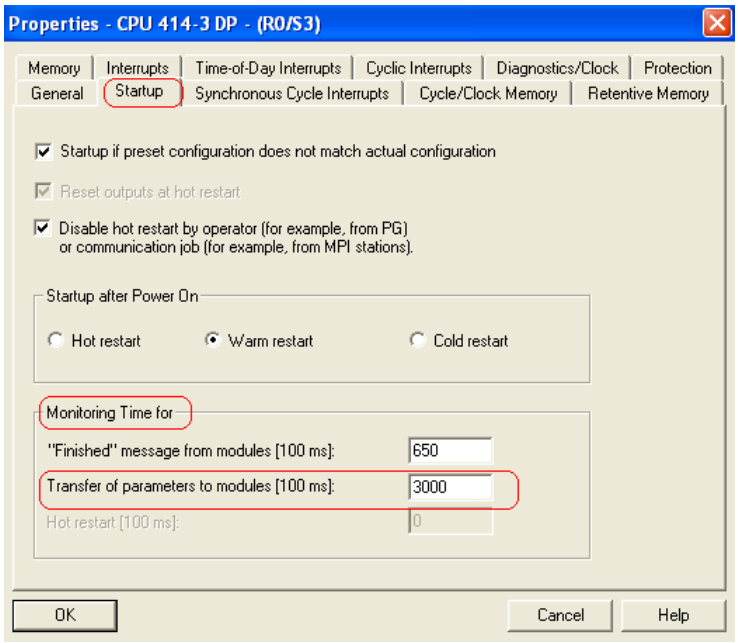


Fig. 103: Change "Startup" parameter in CPU properties

Set “Monitoring Time for” → “Transfer of parameters to modules(100ms)” to a value as small as 3000 (=300s), by which an adequately long time may be guaranteed to download the used load protocol driver into the CP card.

5.3.3 Write communication program

1. Open OB1. Just as ASCII communication, invoke SFB12 and SFB13 from the library, and distribute the instance data blocks. The instance data block for SFB12 is DB12, and the data block for send data is DB1.

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	Slaveaddress	BYTE	B#16#5	Temporary p
+1.0	functionnumber	BYTE	B#16#1	
+2.0	bitstart	WORD	W#16#0	
+4.0	bitquan	WORD	W#16#10	
=6.0		END_STRUCT		

Fig. 104: Send Data block DB1

2. Invoke Send Function block. The used slave address is 5, the function code is FC01, the start address is 0, and the statuses of 16 output bits are read. When using different function code for communication, the definition of the request telegram may be seen in the related description in MODBUS MASTER Manual - Chapter 5: Function code.

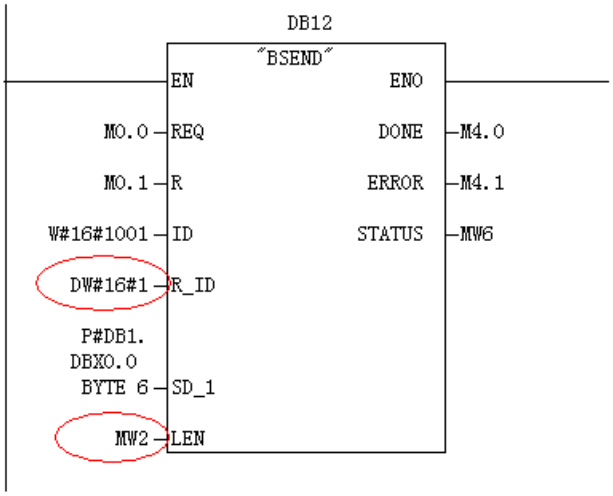


Fig. 105: Invoke SFB12 in OB1

3. The supplementary instruction for SFB12 used in Modbus RTU communication is seen below, and other parameters are defined similarly to those in CP441 ASCII communication, for which the forgoing chapters may be referred to.

Name	comments
R_ID	For distinguishing of different blocks in a same connection, the value range in Modbus RTU communication is 0-255, and DW#16#1 is used in this example.
LEN	The value range depends on the used function code. Please refer to the table below.

Function code	Length (in bytes)
01	6
02	6
03	6
04	6
05	6
06	6
07	2
08	6
11	2
12	2
15	>6
16	>6

4. The instance data block of FB13 is DB13, and the receive data DB block DB2 is created.

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	rcv	ARRAY[0..50]		Temporary
*1.0		BYTE		
=52.0		END_STRUCT		

Fig. 106: Receive data block DB2

5. Invoke receive function block

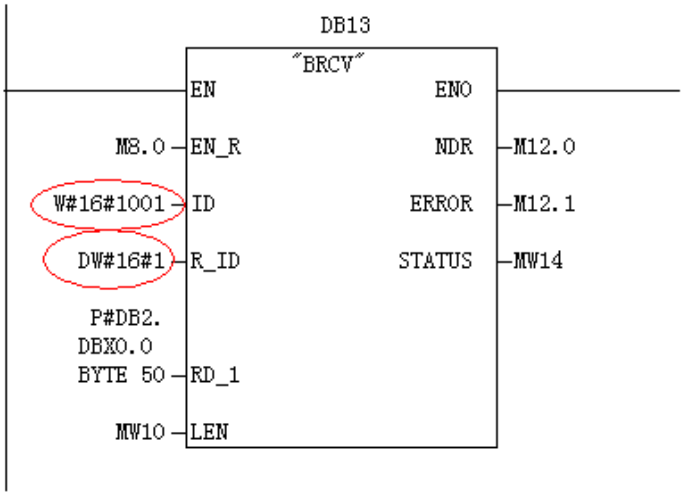


Fig. 107: Invoke SFB13 in OB1

The "R_ID" in SFB13 must be set in consistence with the "R_ID" in SFB12 that is invoked in pair in order to activate the receive information program, so it must be set as DW#16#1 here. The information on Receive Data length may be seen in MW20.

5.3.4 Equipment connection

Use standard RS232C cable to connect serial ports of CP441-2 interface1 and computer. The detailed cable connecting method may be seen in CP441 Manual - Appendix B: Connecting cables.

5.3.5 Communication test

1. Modbus slave test software is also used. Please refer to the above-stated operation steps for CP341 test. The slave is set as shown in the Fig. below:

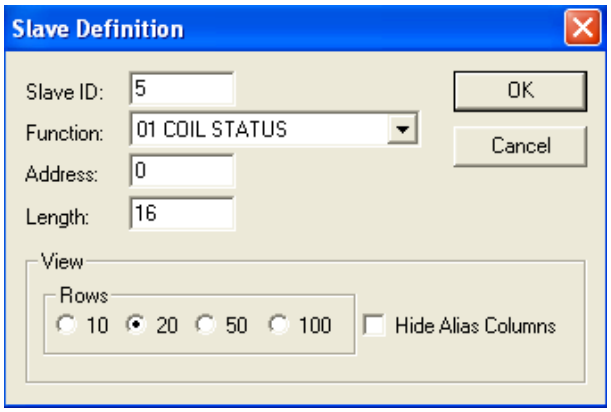


Fig. 108: Setting of Modbus Slave test software

2. Set M8.0 as TRUE in Step7 Variable table to enable receive, and trigger M0.0 in manual way to produce rising edge to enable send. The data communication results may be shown as in the Fig. below.

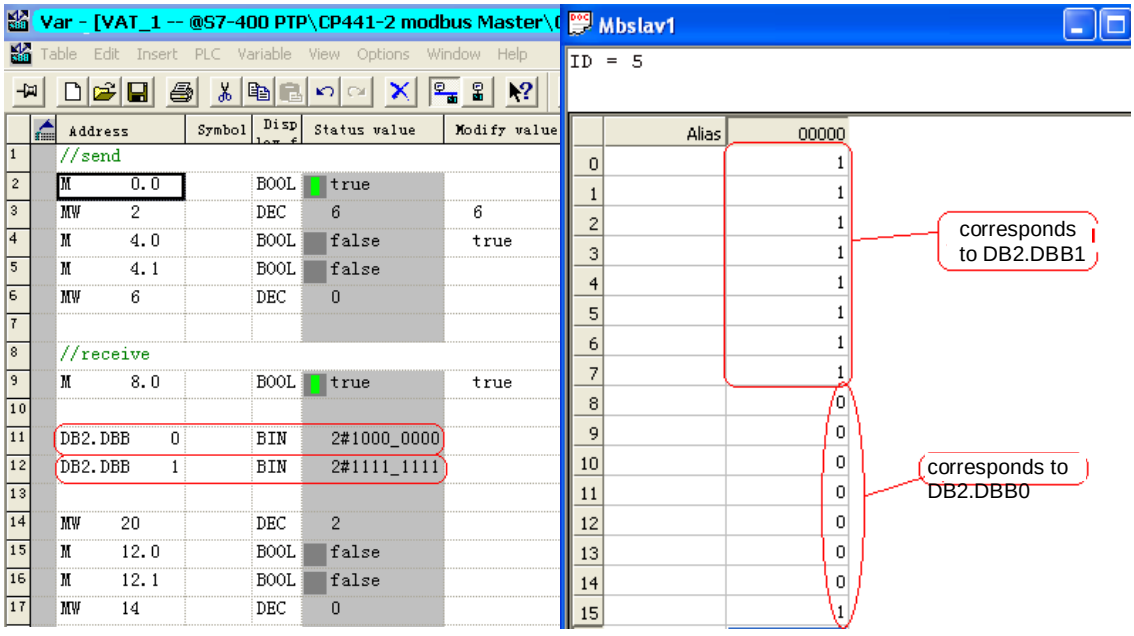


Fig. 109: Online monitoring of communication status

3. When testing different function codes, just modify the data request telegram sent by the master.

Address	Name	Type	Initial value	Actual value
0.0	Slaveaddress	BYTE	B#16#5	B#16#05
1.0	functionnumber	BYTE	B#16#3	B#16#03
2.0	bitstart	WORD	W#16#0	W#16#0000
4.0	bitquan	WORD	W#16#3	W#16#0003

Fig. 110: Create send data frame

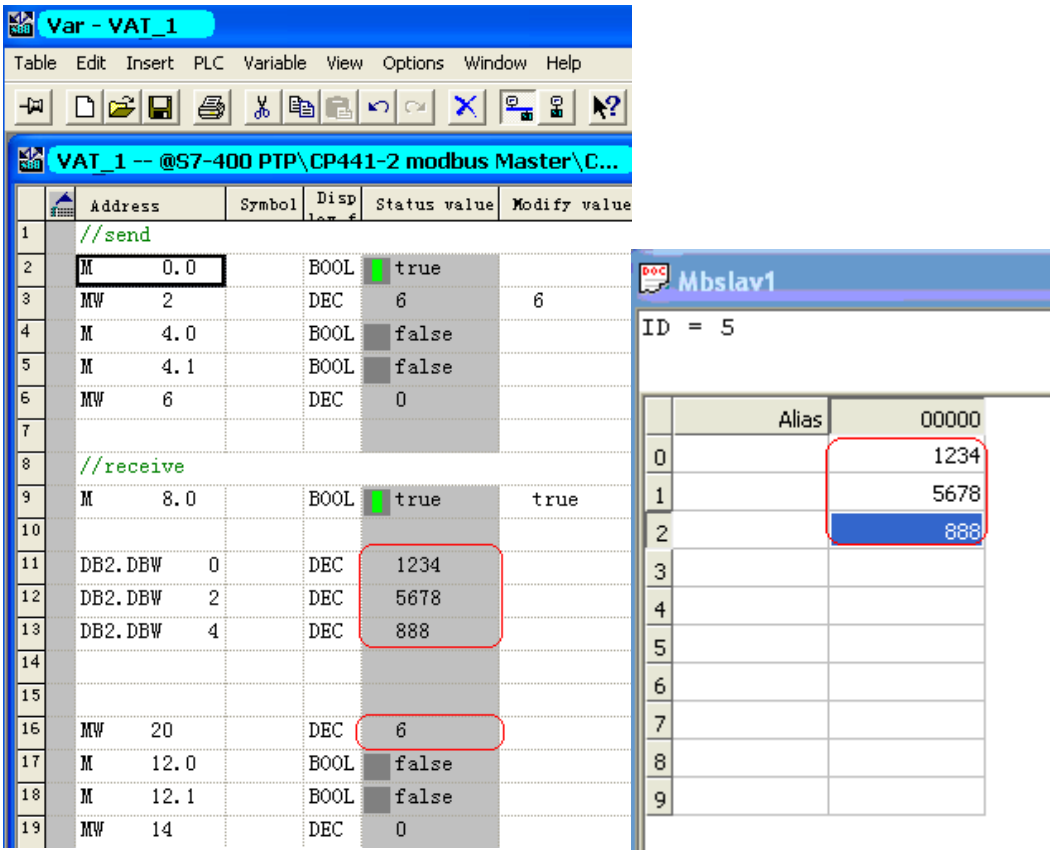


Fig. 111: Invoke SFB13 in OB1

5.4 MODBUS Slave protocol communication of CP441-2

5.4.1 Hardware catalog

RACK-400	6ES7400-1JA01-0AA0
PS407	6ES7407-0KA02-0AA0
CPU414-3	6ES7414-3XJ04-0AB0
CP441-2	6ES7441-2AA03-0AE0
Dongle	6ES7870-1AB01-0YA0

5.4.2 Configuration

1. Open the project ptp that has been created, insert a new SIMATIC 400 Station, and change the station name to CP441-2 modbus Slave.

2. Double-click Hardware to enter the hardware configuration interface, and insert RACK, PS, CPU, and CP441-2. Please refer to the forgoing chapters for specific steps.

3. In the CP441-2 module, click Parameter to configure CP441-2 parameters, and select MODBUS Slave in Protocol options.

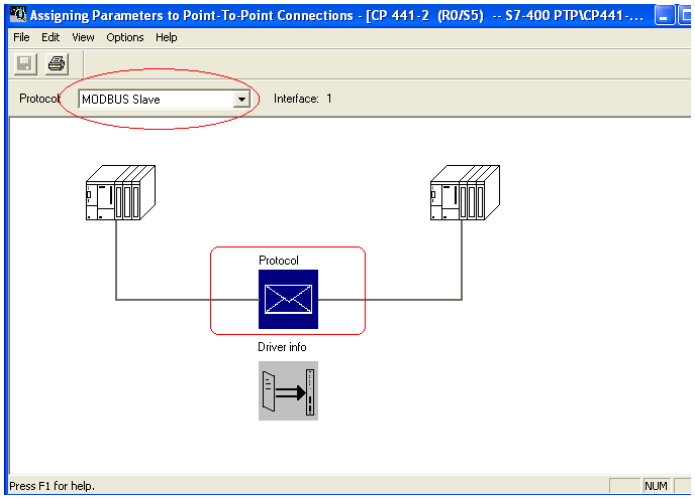


Fig. 112: Selecting communication protocol

4. Double-click the envelop icon under Protocol to configure MODBUS Slave parameter:

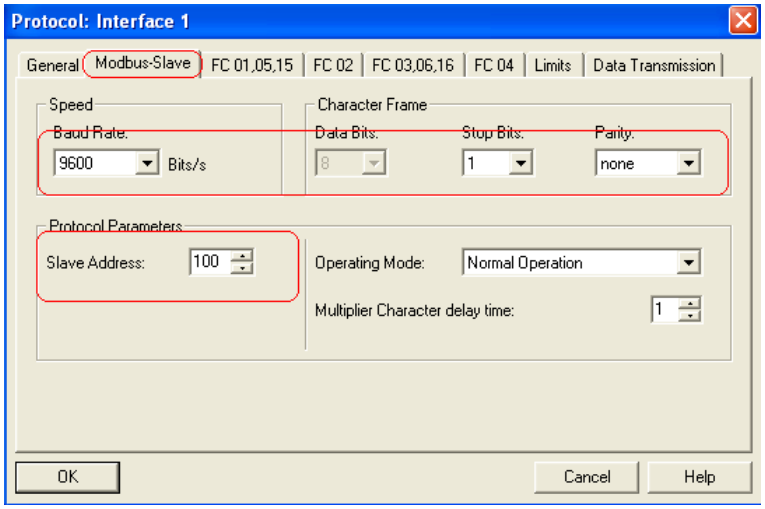


Fig. 113: Configure MODBUS Slave communication parameter

5. Set the basic parameters such as communication rate and message details, etc. In this example, the slave address is set as 100 (the default setting is 222, with value range from 1 to 255). Then enter the slave function code configuration interface. The detailed information is seen below:

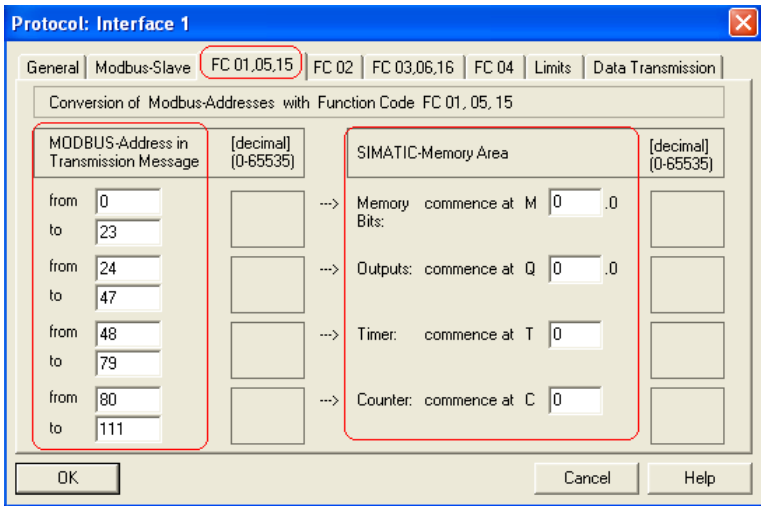


Fig. 114: Distribution of MODBUS Slave addresses

6. FC01, 05, 15: status of read and forced output bit. The left side is info transfer address, and the right side is corresponding PLC address area, viz. the left addresses from 0 to 23 match MODBUS address area 00001 to 00024, and the corresponding Siemens data area is M0.0-M2.7.24 to 47 match the MODBUS Address area 00025 to 00048, and the corresponding Siemens data area is Q0.0 to Q2.7.Slave addresses 48 to 79 and 80 to 111 match the Modbus address areas 00049 to 00080 and 00081 to 00112, and the corresponding Siemens data area is Timer, Counter. FC02 reads input data status, and the address matching is as stated above.

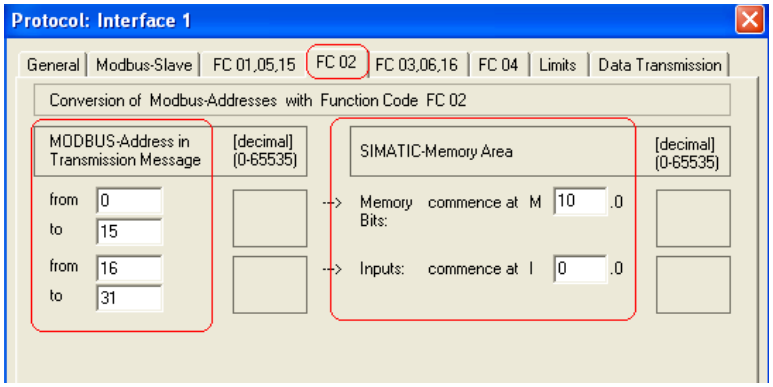


Fig. 115: Distribution of MODBUS Slave addresses

7. FC03,06,16 configuration output register data area corresponds to Siemens data area DB block.

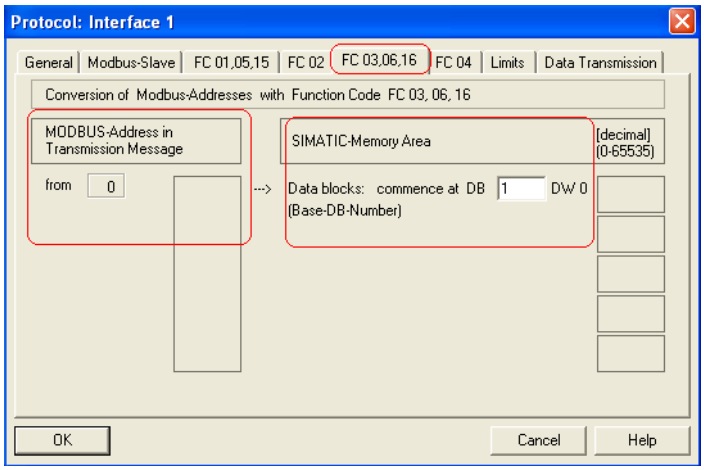


Fig. 116: Distribution of MODBUS Slave addresses

8. FC04 configuration output register data area also corresponds to Siemens data area DB block.

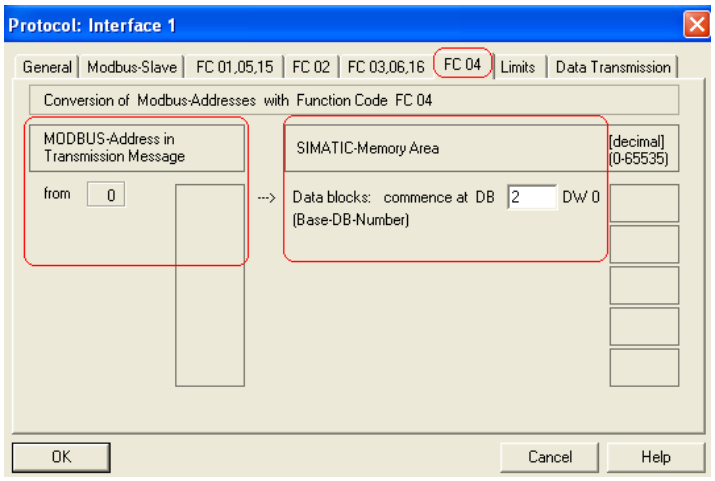


Fig. 117: Distribution of MODBUS Slave addresses

9. Set write parameter limit values of FC05 , 06 , 15 , 16 :

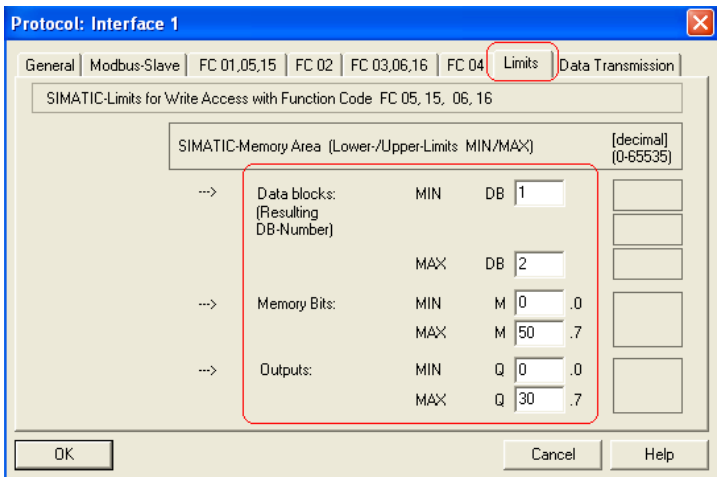


Fig. 118: Distribution of MODBUS Slave addresses

10.After completing configuration, click OK and save it, and close the dialog box. Just like ASCII-2 as stated above, create PtP connection for the used interface, and record the Local ID (Hex) connection number.

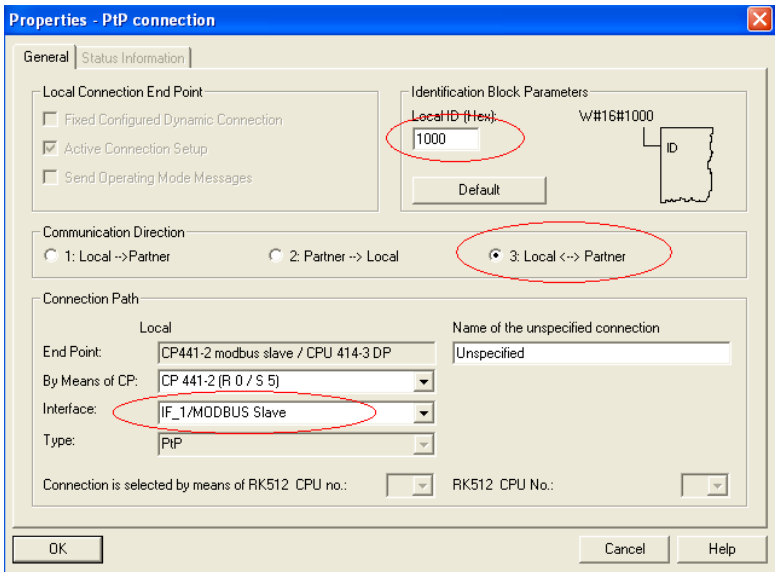
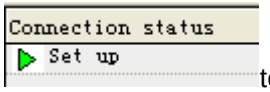


Fig. 119: Configuration connection

11.Click  to compile the configuration information. If no error exists, select CPU to download the configuration information as a whole, and use  to check the connection status online till "connection status" icon is displayed as:



to indicate correct connection. Just like MODBUS communication with CP441, the "Startup" parameter in CPU properties shall also be changed.

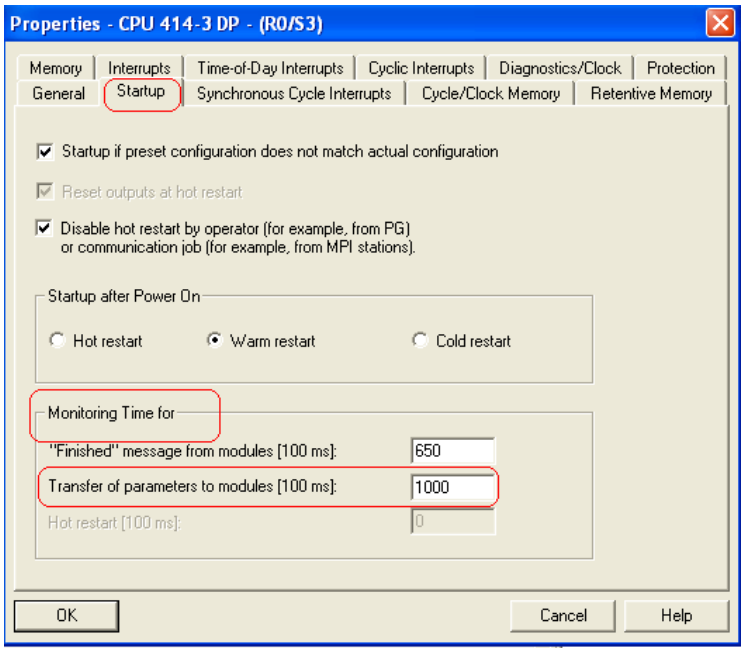


Fig. 120: Change "Startup" parameter in CPU properties

Set “Monitoring Time for” → “Transfer of parameters to modules(100ms)” to a value as small as 1000 (=100s), by which an adequately long time may be guaranteed to download the used load protocol driver into the CP card during the parameter assignment process.

5.4.3 Write communication program

1. Double-click OB1 to open the programming screen. Invoke FB180 in Libraries -> Modbus, and distribute instance data block DB180. The function code communication data DB1 and DB2 for the newly created data block FC03 06 16 and FC04 are both in 50-word array structure.

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	DB_VAR	ARRAY[0..50]		Temporary placeholder variable
*2.0		WORD		
=102.0		END_STRUCT		

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	DB_VAR	ARRAY[0..50]		Temporary placeholder variable
*2.0		WORD		
=102.0		END_STRUCT		

Fig. 121: Communication data block DB1 and DB2

2. The FB180 parameter setting is shown in the table below:

Name	Data type	comments
ID	INPUT/INT	Local ID number, which is obtained from the PtP connection properties and is hexadecimal.
START_TIMER	INPUT/TIMER	Initialization timeout timer, which is T5 in this example
START_TIME	INPUT/S5TIME	initialization timeout time value, which is 5s in this example
STATUS_TIMER	INPUT/TIMER	communication status read timer, which is T6 in this example
STATUS_TIME	INPUT/S5TIME	communication status read time value, which is 2S in this example
OB_MASK	INPUT/BOOL	IO access error mask bit, which is M20.0 in this example 0：Non-mask IO access error 1：Mask IO access error, and delaying the alarm
CP_START	INPUT/BOOL	FB initialization enable bit, which is M20.1 in this example
CP_START_FM	INPUT/BOOL	CP_START initialization rising edge bit, which is M20.2 in this example
CP_NDR	OUTPUT/BOOL	CP write operation bit, which is M20.3 in this example
CP_START_OK	OUTPUT/BOOL	initialization succeed complete bit, which is M20.4 in this example
CP_START_ERROR	OUTPUT/BOOL	initialization error flag, which is M20.5 in this example
ERROR_NR	OUTPUT/WORD	error number, which is MW22 in this example
ERROR_INFO	OUTPUT/WORD	Error message, which is MW24 in this example. Refer to the Manual for diagnosis information

Table 15: Parameter definition of FB180

3. Invoke FB180 function block .

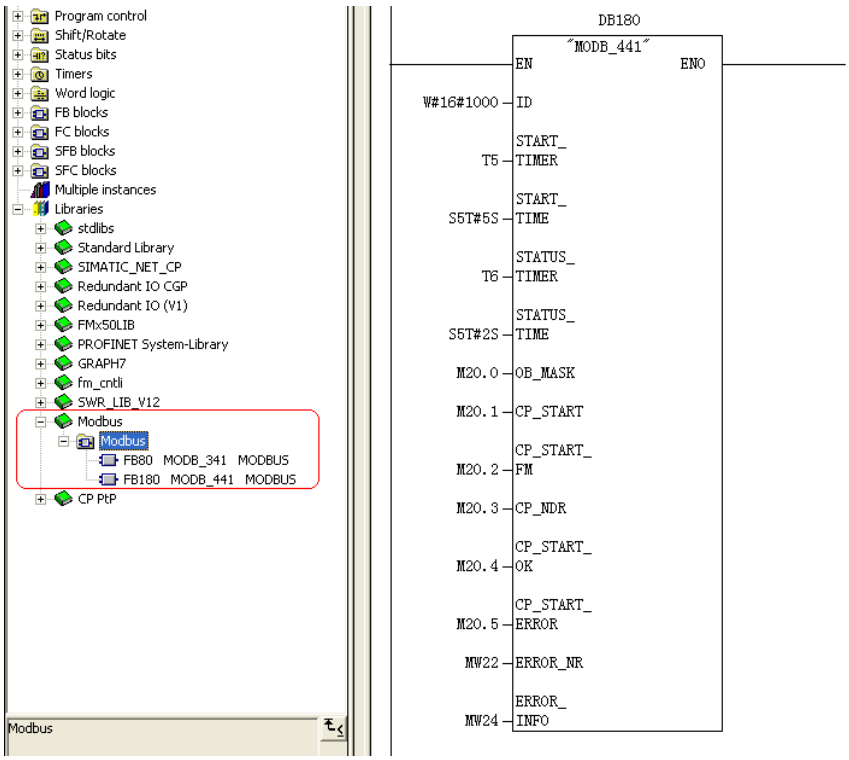


Fig. 122: Invoke FB180 function block

5.4.4 Equipment connection

Use standard RS232C cable to connect serial ports of CP341 and computer. The detailed cable connecting method may be seen in CP341 Manual - Chapter B: Connecting cables.

5.4.5 Communication test

Download the hardware configuration and program into CPU. Open the software Modscan32 in the computer, and click Connection—〉Connect in Modscan32 to display the following screen. Select the used serial port, and set Baud rate, data bit, stop bit and check mode, and select a communication protocol according to the applicable connection. After setting completes, click OK to display the monitor screen.

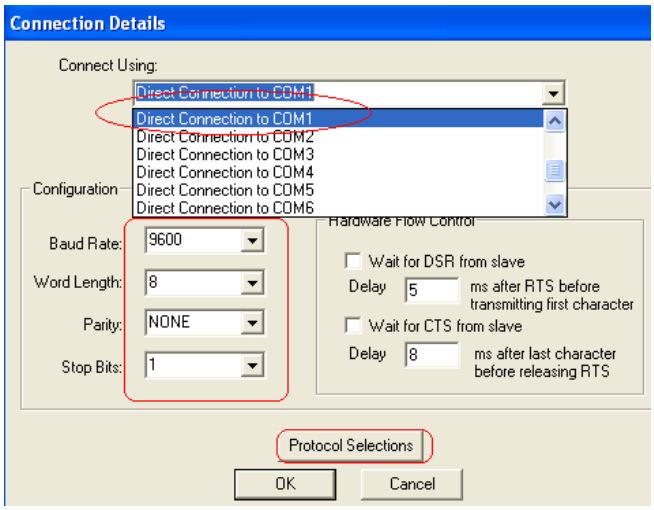


Fig. 123: Distribute communication parameters

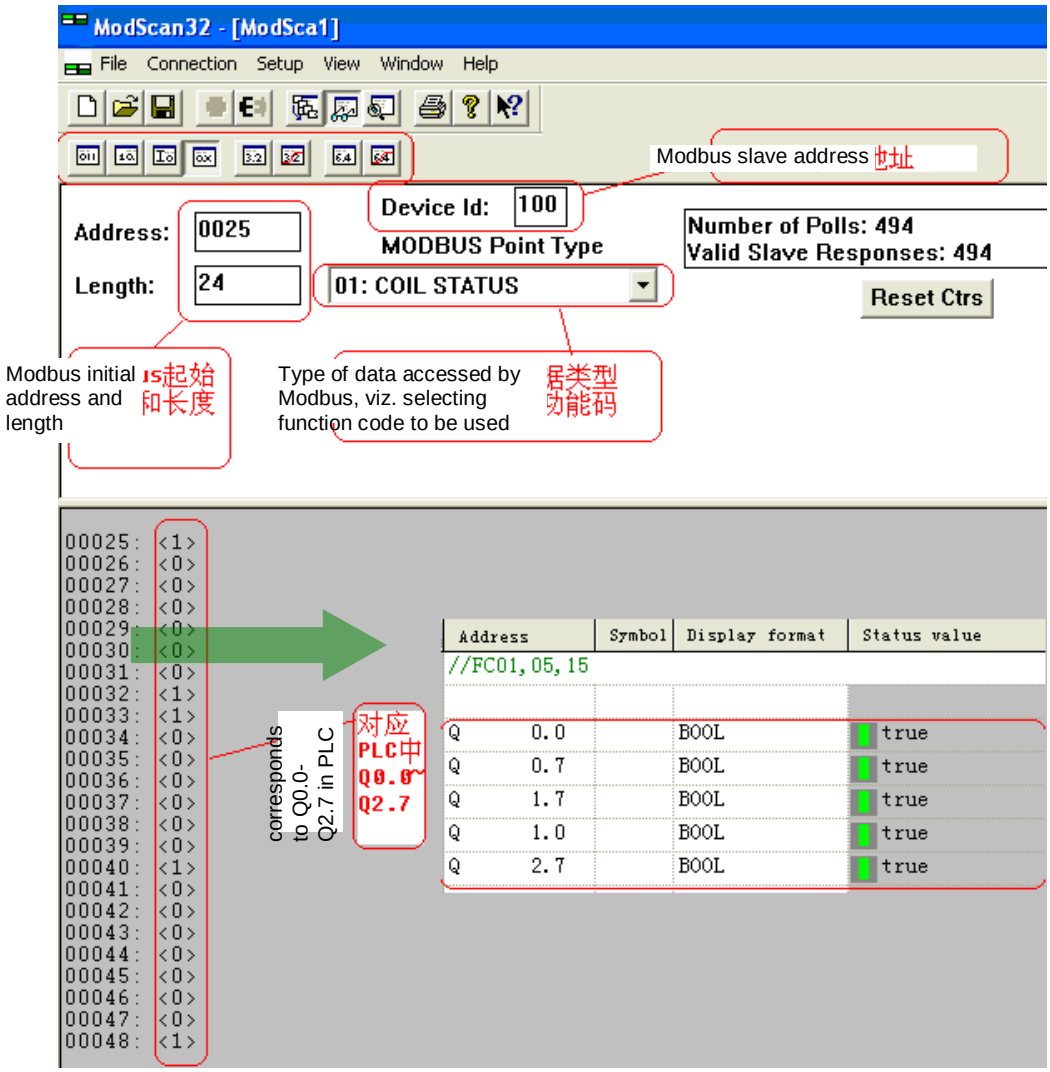


Fig. 124: Communication monitor interface

Shown in the Fig. below is the corresponding communication monitor screen when the function code FC04 is used. To read other data, just change the related access data type. For floating point number display, refer to the read method for Modbus Slave communication of CP341 as stated above.

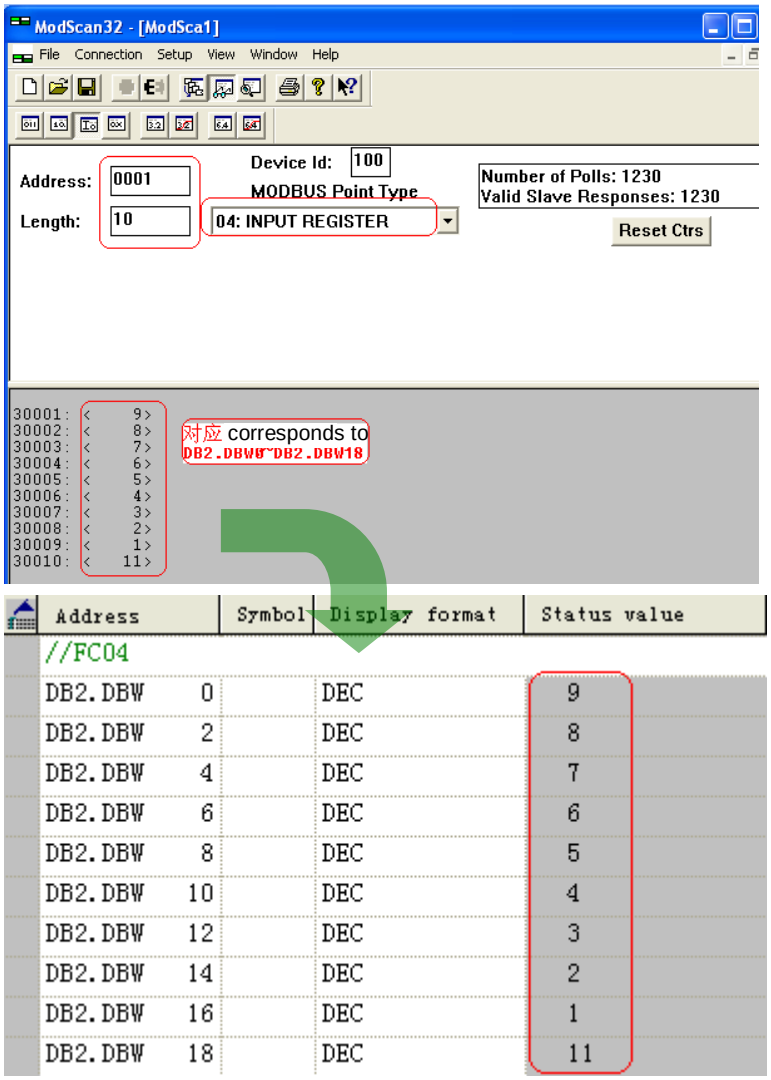


Fig. 125: Communication monitor interface