Master-Slave Communication with Modbus RTU Protocol for S7-200 SMART

S7 - 200 SMART/ Version 2.3

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1 Introduction

1.1 Overview

Modbus is a public communication protocol, and its simplest serial communication part only specifies the basic data transmission format on the serial line. In the OSI seven-layer protocol model, only one or two layers are used.

Modbus has two serial transfer modes, ASCII and RTU. They define different ways in which data is packed and decoded. Devices that support the Modbus protocol generally support the RTU format.

Both parties to the communication must support one of the above modes.Modbus is a master/slave communication mode for a single master. There can only be one master station on the Modbus network. The master station has no address on the Modbus network. The slave address range is 0 - 247, where 0 is the broadcast address and the slave's actual address range is 1 - 247.

Modbus communication standard protocols can be transmitted by various transmission methods, such as RS232C, RS485, optical fiber, radio, etc. The RS485 half-duplex communication is implemented on the S7-200 CPU communication port, using the free port function of the S7-200 SMART.

For detailed protocols and specifications, please visit the Modbus organization's website: **http://www.modbus.org**

1.2 Mode of operation

The Modbus communication protocol is implemented in the free port mode of the S7-200 SMART CPU communication port, and can be transmitted through a slow communication device such as a wireless data station. This facilitates the formation of a simple wireless communication network between the S7-200 SMART.

Please refer to the S7-200 SMART System Manual for details.

1.3 Components used

This application example has been created with the following hardware and software components:

Table 1-1

Component	Number	Article number	Note
CPU ST60	3	6ES7-288-1ST60-0AA0	
CPU ST40	2	6ES7-288-1ST40-0AA0	
CPU ST30	2	6ES7-288-1ST30-0AA0	
CPU ST20	2	6ES7-288-1ST20-0AA0	
SB CM01	9	6SE7-288-5CM01-0AA0	
S7 MICROWIN SMART V2.4	1	6ES7 288-SW01-0AA0	

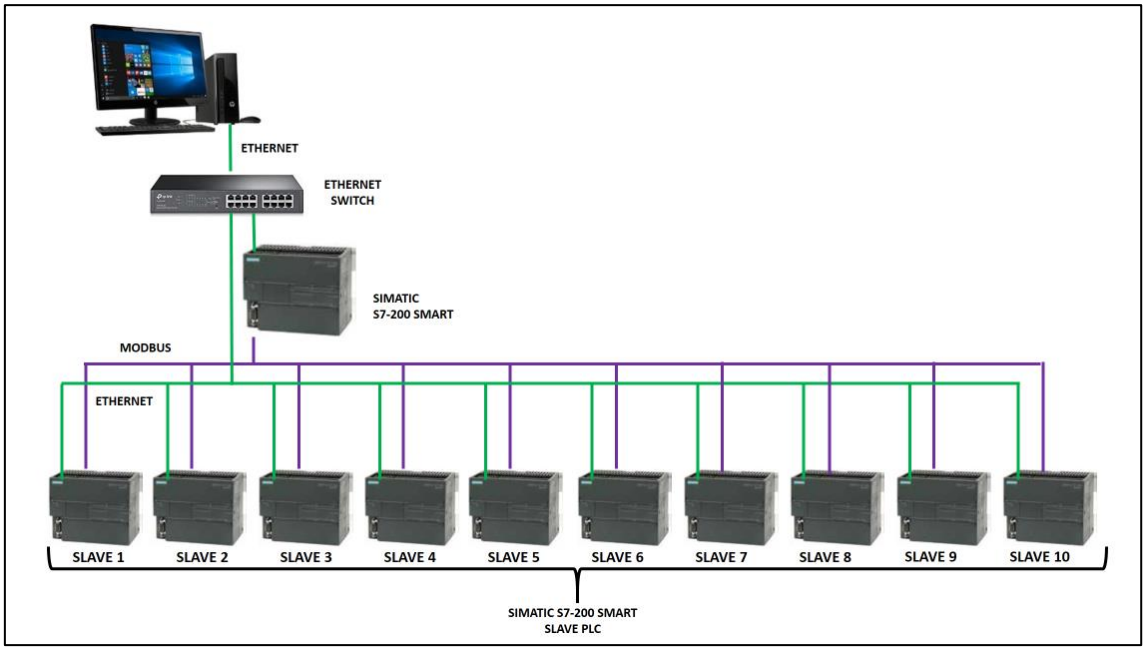
This application example consists of the following components:

Table 1-2

Component	File name	Note

2 Engineering

2.1 Hardware setup



2.2 Communication Port and Connection Method

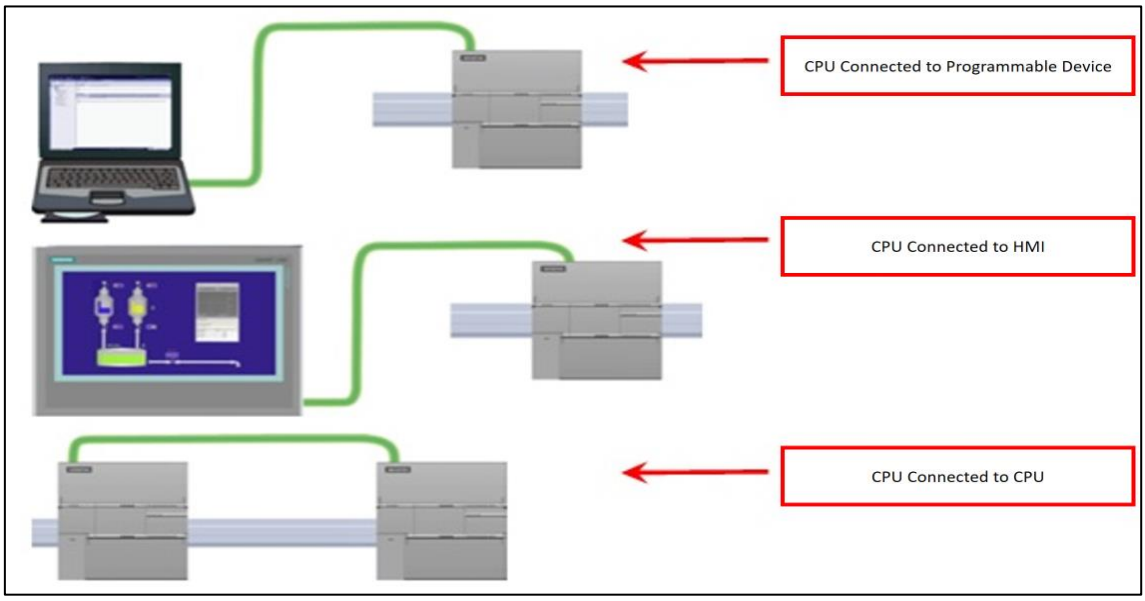
Standard type of S7-200 SMART CPU provides one Ethernet port and one RS485 port (port 0), the standard CPU additionally supports the SB CM01 signal board (port 1), and the signal board can be configured with STEP 7-Micro/WIN SMART software It is an RS232 communication port or an RS485 communication port.

2.2.1 Ethernet Port Connection

The Ethernet port of the S7-200 SMART CPU has two network connection methods: Direct connection and Indirect connection.

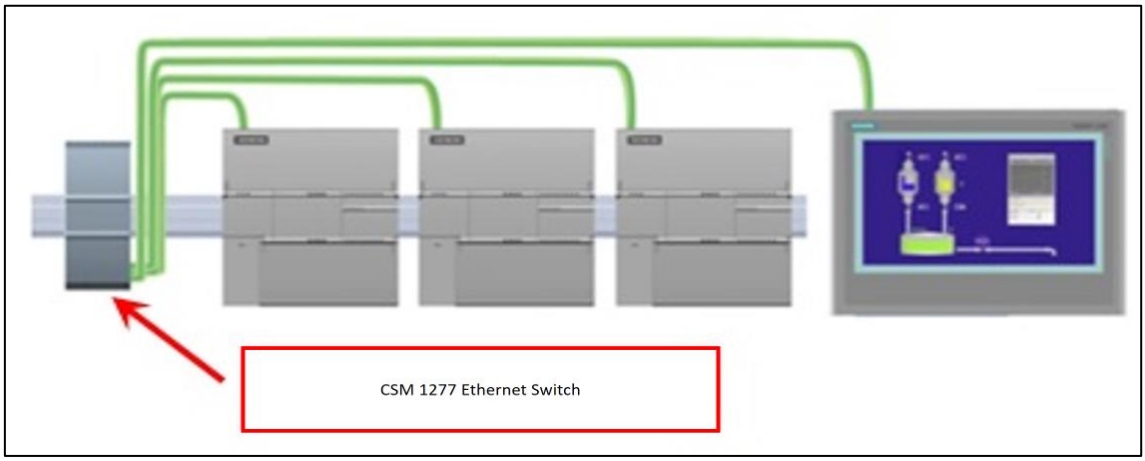
Direct Connection:

When an S7-200 SMART CPU communicates with a programming device, HMI or another S7-200 SMART CPU, a direct connection is achieved. Direct connection does not require the use of a switch, and the two devices can be directly connected using a network cable, as shown in Figure 2. Direct connection of the communication device.



Indirect Connection:

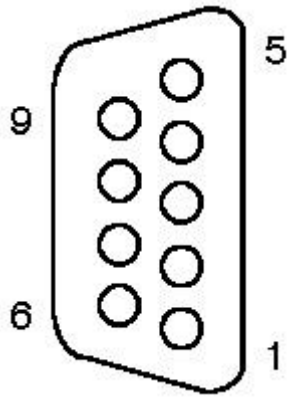
When more than two communication devices are communicating, a switch is required to implement the network connection. You can connect multiple CPUs and HMI devices using the rail-mounted Siemens CSM1277 4-port switch, as shown in Figure 3. Network connections for multiple communication devices.



2.2.2 RS485 Network Connection

The S7-200 SMART CPU's integrated RS485 communication port (port 0) is an RS485 compatible 9-pin D-type connector. The pin assignments for the CPU-integrated RS485 communication port.

Table 1. Pin Assignments for the Integrated RS485 Port of the S7-200 SMART CPU

Connector	Pin label	signal	Pin definition
	1	shield	Chassis ground
	2	24V back	Logical common
	3	RS-485 signal B	RS-485 signal B
	4	Send request	RTS (TTL)
	5	5V back	Logical common
	6	+ 5V	+5 V, 100 Ω series resistor
	7	+24V	+24 V
	8	RS-485 signal A	RS-485 signal A
	9	Not applicable	10-bit protocol selection (input)
	shell	shield	Chassis ground

Biasing and terminating the network cable

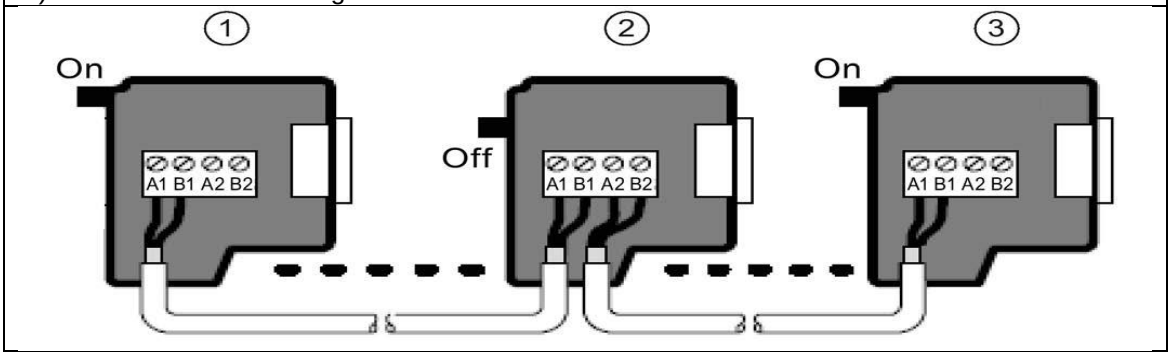
Siemens provides two types of network connectors that you can use to easily connect multiple devices to a network:

- Standard network connector.
- Connector that includes a port which allows you to connect an HMI device to the network without disturbing any existing network connections.

The programming port connector passes all signals (including the power pins) from the S7-200 SMART CPU through to the programming port, which is especially useful for connecting devices that draw power from the S7-200 SMART CPU (such as a TD 400C).

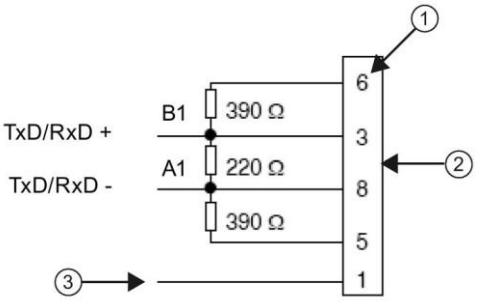
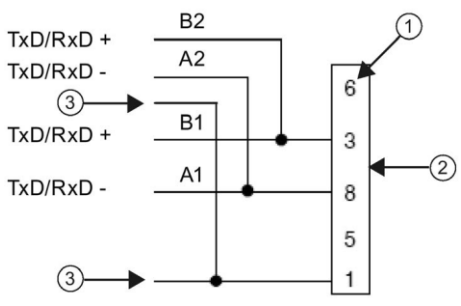
Both connectors have two sets of terminal screws to allow you to attach the incoming and outgoing network cables. Both connectors also have switches to bias and terminate the network selectively. The following shows typical biasing and termination for the cable connectors.

Table: Biasing and termination for cable connectors

Cable must be terminated and biased at both ends. Bare shielding: Approximately 12 mm (1/2 in) must contact the metal guides of all locations.


1. Switch position = On: Terminated and biased
2. Switch position = Off: No termination or bias
3. Switch position = On: Terminated and biased

Table: Termination and bias switch positions

Switch position = On: Termination and biased	Switch position = Off: No termination or bias
	

1. Pin number
2. Network connector
3. Cable shield

2.2.3 SB CM01 Signal Board Connection

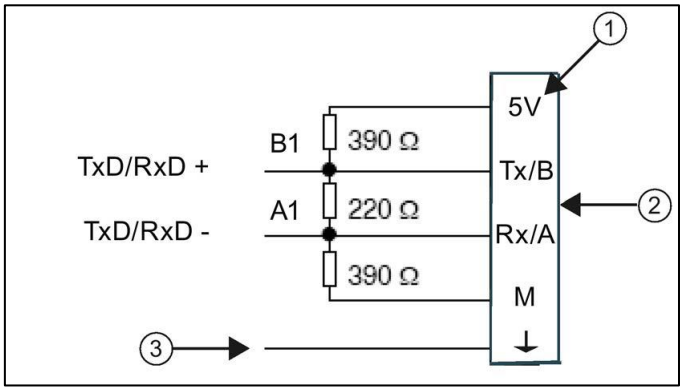
The standard CPU additionally supports the SB CM01 signal board, which can be configured as an RS485 communication port or an RS232 communication port with STEP 7-Micro/WIN SMART software.

Table 2. Pin Assignment Table for S7-200 SMART SB CM01 Signal Board Port (Port 1)

Connector	Pin label	signal	Pin definition
	1	Ground	Chassis ground
	2	Tx/B	RS232-Tx/RS485-B
	3	send request	RTS (TTL)
	4	M ground	Logical common
	5	Rx/A	RS232-Rx/RS485-A
	6	+ 5V	+5 V, 100 Ω series resistor

Biasing and terminating the CM01 signal board

You can use the CM01 signal board to easily connect multiple devices to a network. The signal board passes all signals (including the power pins) from the S7-200 SMART CPU through to the programming port, which is especially useful for connecting devices that draw power from the S7-200 SMART CPU (such as a TD 400C).



1. Terminal name
2. Terminal block
3. Cable shield

3 Engineering

3.1 Description of interface

The Modbus communication protocol is implemented in the free port mode of the S7-200 SMART CPU communication port, and can be transmitted through a slow communication device. This facilitates the formation of a simple communication network between the S7-200 SMART.

Siemens officially launched the Modbus RTU Master Base Protocol Library (Siemens Standard Library Instructions) in STEP 7-Micro/WIN SMART.

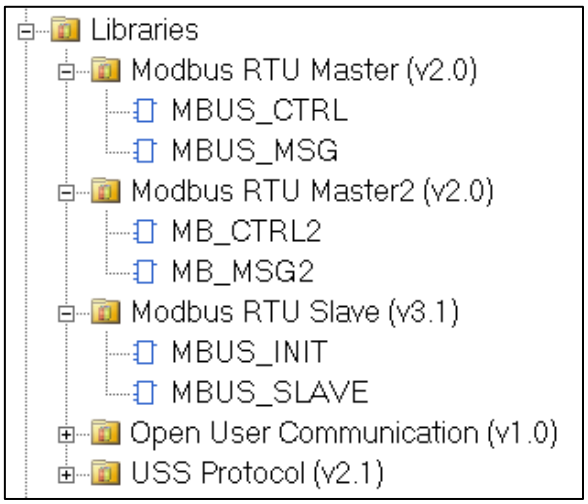
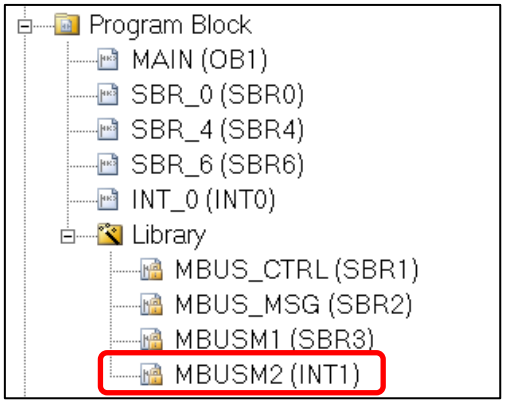


Figure 1. Siemens Standard Instruction Library (STEP 7-Micro/WIN SMART)

Note :

1. The function of the Modbus RTU master station library is realized by calling the pre-programmed program function block in the user program. The library is valid for the **CPU** integrated RS 485 communication port and **CM 01** signal board. The library will set the communication port to work in free port mode.

2. The Modbus RTU master station instruction library uses some user interrupt functions which are locked. It is not allowed to disable interrupts in the user program when programming other programs.



3.2 Project integration

1. Call the Modbus RTU master initialization and control subroutine.

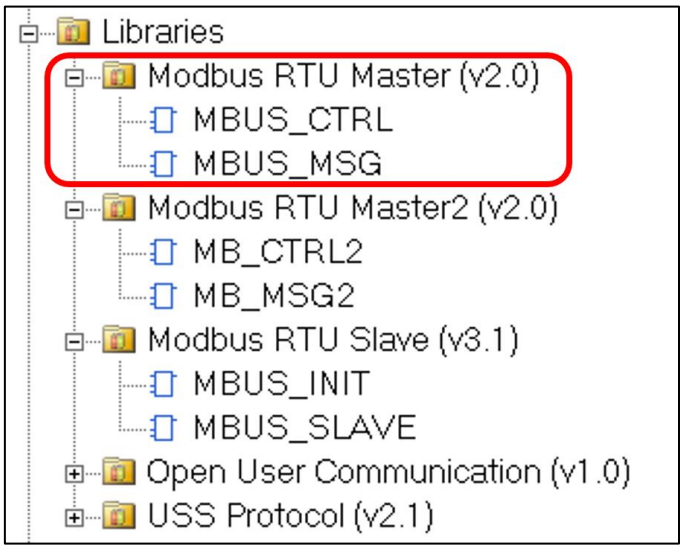


Figure 2. Siemens Standard Instruction Library (STEP 7-Micro/WIN SMART)

Use SM0.0(ALWAYS_ON) to call MBUS_CTRL to complete the initialization of the master and start its function control:

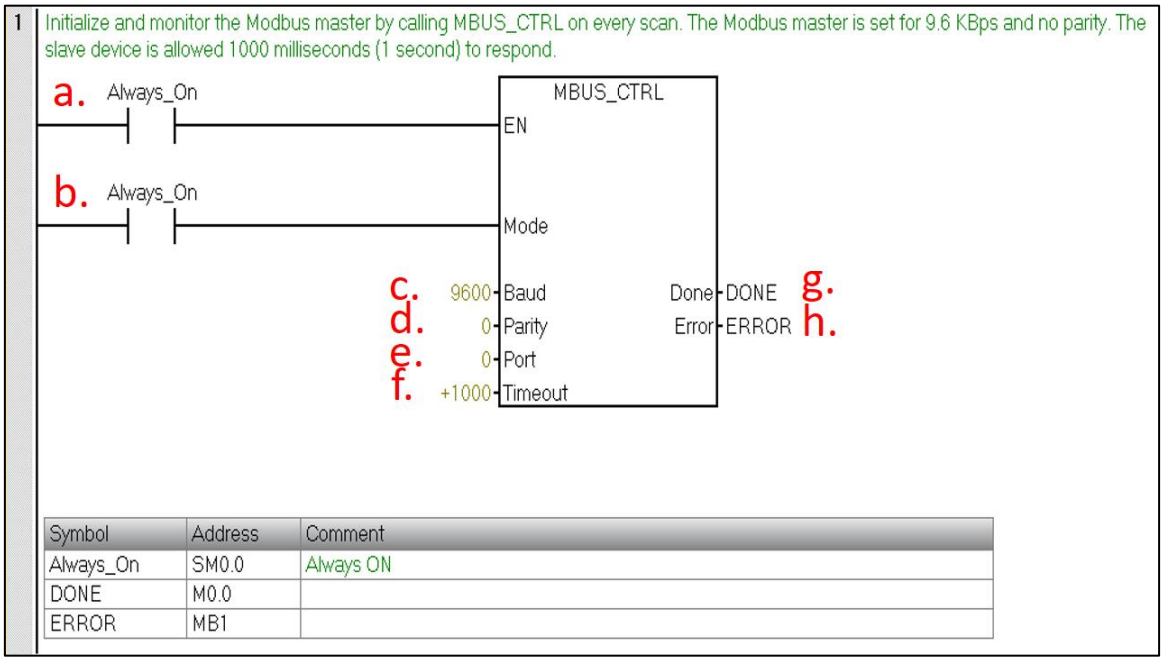


Figure 3. Calling Modbus RTU master initialization and control subroutine with SM0.0(ALWAYS_ON)

The meaning of each parameter is as follows:

a.	**EN**	Enable:	Must ensure that each scan cycle is enabled (using SM0.0(ALWAYS_ON))
b.	**Mode**	mode:	When 1 is enabled, the Modbus protocol function is enabled; when 0, the system is restored to the system PPI protocol.
c.	**Baud**	Baud rate:	The supported communication baud rates are 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200.
d.	**Parity**	check:	Calibration method selection
			0=no parity
			1= odd test
			2 = even test
e.	**Port**	The port number:	0 = **CPU** integrated RS 485 communication port; 1 = Optional **CM 01** signal board.
f.	**Timeout**	time out:	The time the master waits for a response from the slave, in milliseconds. A typical setting is 1000 milliseconds (1 second), and the allowed range is 1 - 32767.
			Note: This value must be set large enough to ensure that the slave has a time response.
g.	**Done**	Completion bit:	This bit is automatically set to 1 when initialization is complete. This bit can be used to initiate MBUS_MSG read and write operations (see the routine)
h.	**Error**		Initialization error code (valid only when the Done bit is 1):

2. Call the Modbus RTU master read/write subroutine MBUS_MSG to send a Modbus request.

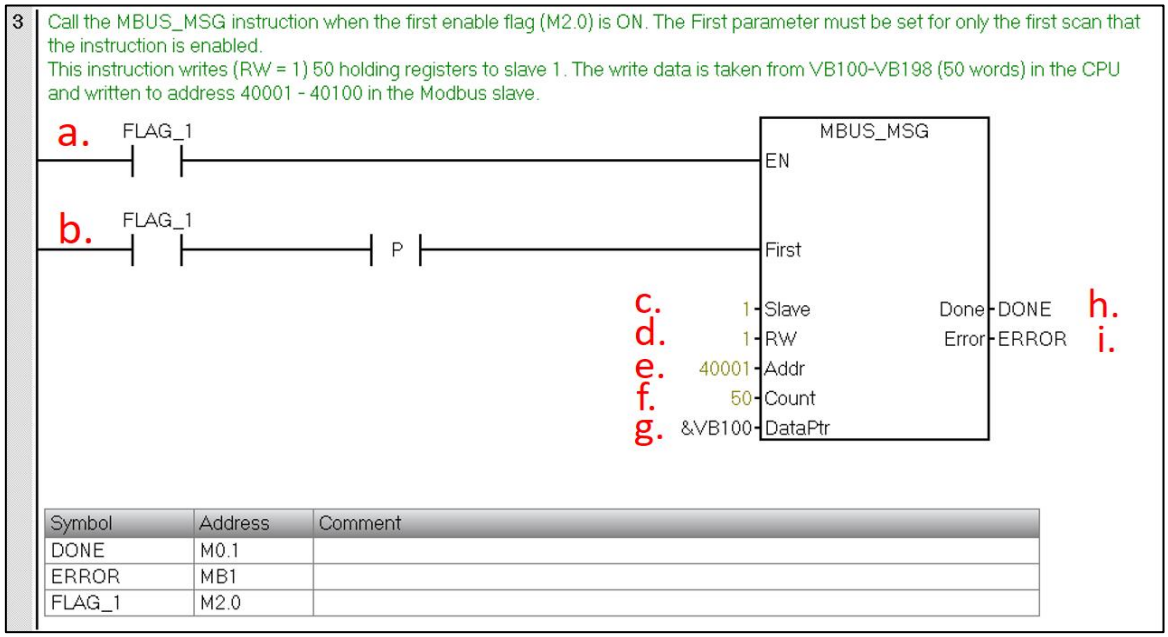


Figure 4. Calling the Modbus RTU master read and write subroutine

The meaning of each parameter is as follows:

a.	**EN**	Enable:	Only one read/write function (ie MBUS_MSG) can be enabled at a time.
			Note: It is recommended that each read/write function (ie MBUS_MSG) be activated with the Done Completion bit of the previous MBUS_MSG instruction to ensure that all read and write instructions are looped (see routine).
b.	**First**	Read & write request bits:	Each new read and write request must use a **pulse** trigger
c.	**Slave**	Slave address:	Selectable range 1 - 247
d.	**RW**	Read & write requests:	0 = read, 1 = write
			note:
			1. The digital output and holding registers support read and write functions.
			2. The digital input and analog input only support the read function.
e.	**Addr**	Read & write slave	Select the type of data to read and write
		Data address:	00001 to 0xxxx - digital output
			10001 to 1xxxx - digital input
			30001 to 3xxxx - analog input
			40001 to 4xxxx - holding registers
f.	**Count**	Number of data	Number of data to be communicated (number of bits or words)
			Note: The maximum amount of data that can be read/written by the Modbus master is 120 words (refer to each MBUS_MSG instruction)
g.	**DataPtr**	Data pointer:	1. If it is a read command, the read data is placed in this data area.
			2. If it is a write command, the data to be written is placed in this data area.
h.	**Done**	Completion bit	Read and write function completion bit
i.	**Error**	Error code:	The error code is valid only when the Done bit is 1.

3. Open New Microwin Smart project for Slave programming.
Check the Micro/WIN SMART Modbus RTU slave instruction library .The library should include two subroutines MBUS_INIT and MBUS_SLAVE.

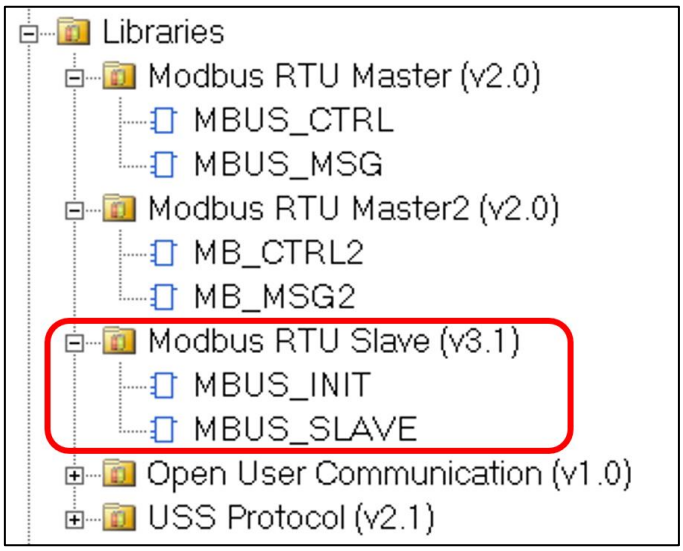


Figure 5. Library instructions in the instruction tree

4. When programming, use SM0.1 to call the subroutine MBUS_INIT for initialization, use SM0.0(ALWAYS_ON) to call MBUS_SLAVE, and specify the corresponding parameters. Detail description can be found in local variable table of the subroutine.

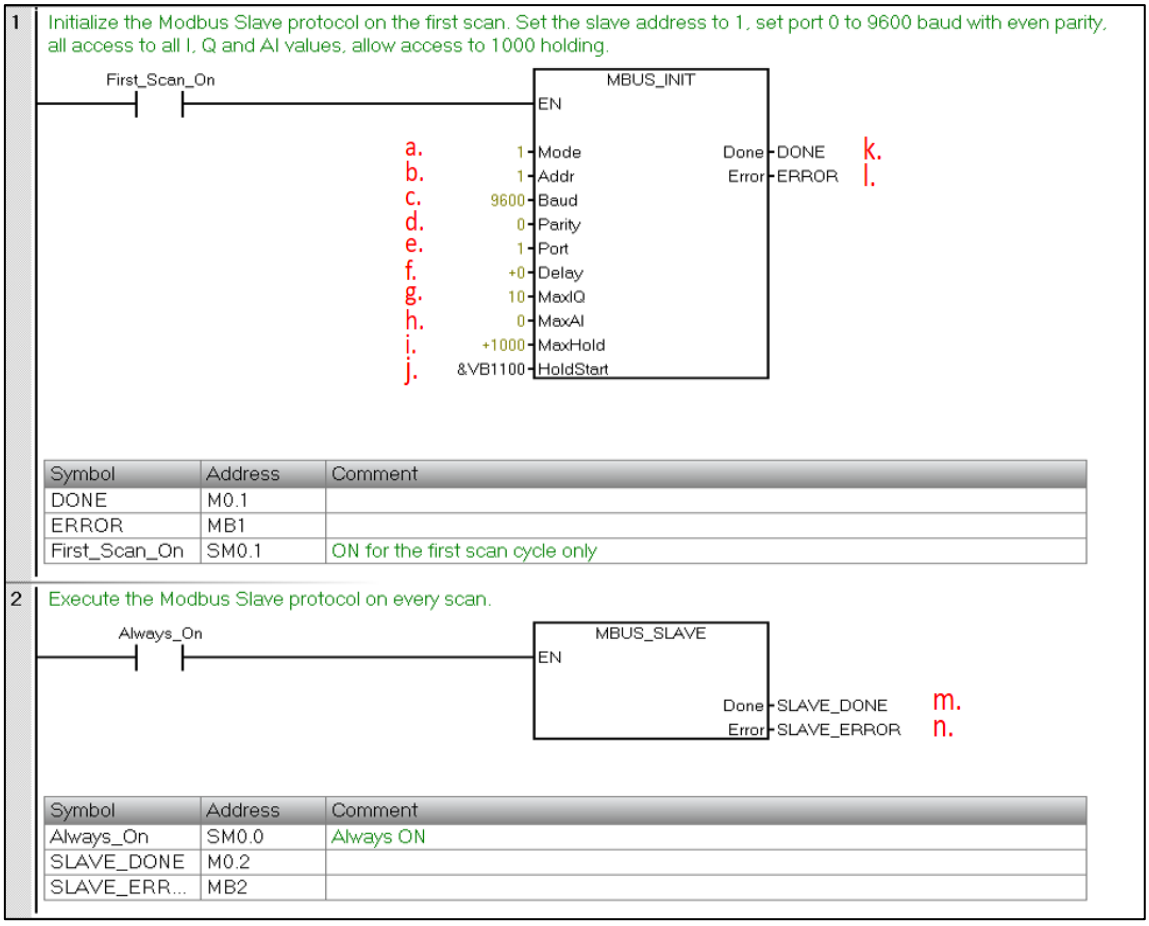


Figure 6. Call Modbus RTU communication command library

The meaning of each parameter is as follows:

a.	**Mode**	Mode:	When 1 is enabled, the Modbus protocol function is enabled; when 0, the system is restored to the system PPI protocol.
b.	**Slave Address**	Address	Modbus slave address, value 1~247
c.	**Baud**	Baud rate:	The supported communication baud rates are 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200.
d.	**Parity**	check:	Calibration method selection
			0=no parity
			1= odd test
			2 = even test
e.	**Port**	The port number:	0 = **CPU** integrated RS 485 communication port; 1 = Optional **CM 01** signal board.
f.	**Delay**	Delay:	Additional inter-character delay, default is 0
g.	**Max AQ**	Maximum I/Q bit:	The maximum number of I/O points to participate in communication. The I/O image area of the S7-200 SMART is 256/256 (but currently only up to 4 expansion modules can be connected, so the maximum number of I/O points is 188 at present) /188)
h.	**MAX AI**	Maximum AI words:	The maximum number of AI channels participating in communication, up to 56
i.	**MaxHold**	Maximum holding register area:	The time the master waits for a response from the slave, in milliseconds. A typical setting is 1000 milliseconds (1 second), and the allowed range is 1 - 32767.
j.	**HoldStart**	Keep register area start address:	Specified by “&VBx“ (indirect addressing mode)
k.	**Done**	Completion bit:	Set after successful initialization
l.	**Error**		Initialization error code
m.	**Done**	Completion bit:	This bit is automatically set to 1 when initialization is complete. This bit can be used to initiate MBUS_MSG read and write operations (see the routine)
n.	**Error**		Initialization error code (valid only when the Done bit is 1)

5. Library Allocation

Allocating Library Instruction Data Areas in the V Data Area of the CPU. The Modbus Slave instruction library requires a 781 byte global V memory area. Calling the STEP 7 - Micro/WIN SMART Instruction Library requires the allocation of the library instruction data area (Library Memory). The library instruction data area is the variable storage space used by the subroutine and interrupt program of the corresponding library.If the library instruction data area is not allocated during programming, many identical errors are generated at compile time.

Library Allocation Steps:

1) In the Project tree of the command tree, right-click on the Program Block and select Library Memory from the shortcut menu that pops up.

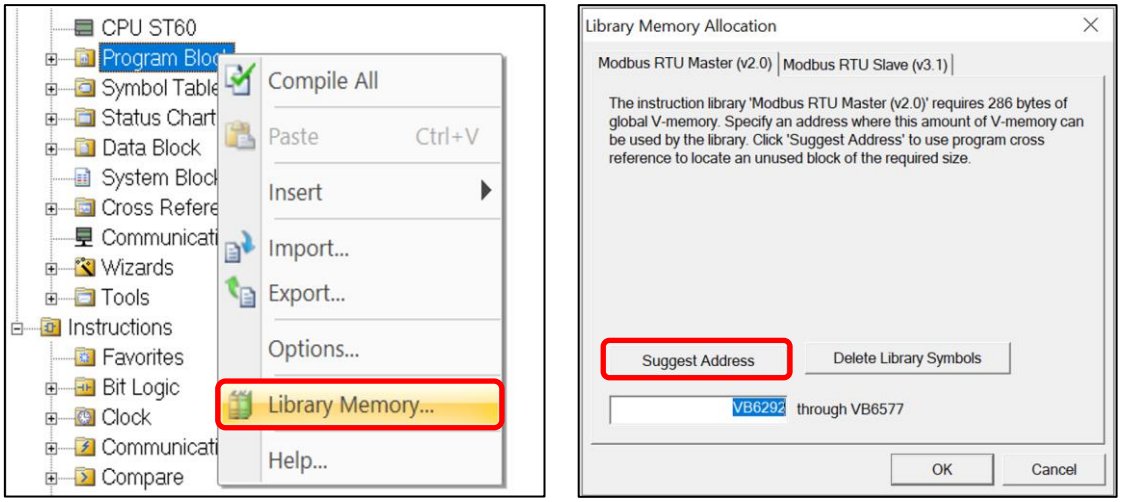


Figure 7. The “Library Memory” button

Note:

By default, start with VB0, but make sure that the memory uses the address range and other The addresses used by the program cannot overlap. Press the "Suggested Address" button to also assign it automatically. The holding register area specified by the subroutine parameters HoldStart and MaxHold is allocated in the V data storage area of the S7-200 SMART CPU. This data area cannot overlap with the library instruction data area. Otherwise, an error will occur during operation. Can't communicate properly. Note that the holding register area in Modbus is addressed by "word",ie MaxHold specifies the number of VWs instead of VBs.

In the example of Figure 6, the Modbus holding register area is specified starting from VB1100 (HoldStart = VB1100), and the holding register is 1000 words (MaxHold = 1000), since the holding register is in words (two bytes), actually This communication buffer occupies 2000 bytes of VB1100~VB3100. Therefore, the allocation library instruction should at least avoid the VB1100~VB3100 interval when retaining the data area.

The Modbus RTU slave address corresponds to the address of the S7-200 SMART. Modbus addresses always appear in the form of 00001, 30004. The correspondence between the data storage area inside the S7-200 SMART CPU and the four types of addresses of Modbus 0, 1, 3, and 4 are as follows:

Table 1. Modbus Address Correspondence Table

Modbus address	**S7-200 SMART data area**
00001 ~ 00256	Q0.0 ~ Q31.7
10001 ~ 10256	I0.0 ~ I31.7
30001 ~ 30056	AIW0 ~ AIW110
4yyyy ~ 4zzzzz	Vx+2(yyyy-1) or Vx+2(zzzzz-1)

Where V is the buffer start address in the S7-200 SMART CPU, which is HoldStart.
If the V memory area address in the S7-200 SMART CPU is known, the formula for calculating the Modbus address is as follows:

Modbus address = 40000 + (Vx/2+1) ; V is even

Modbus function code supported by the Modbus RTU slave instruction library

The Modbus RTU slave instruction library supports specific Modbus functions. Access to the master using this library must follow the requirements of this library.

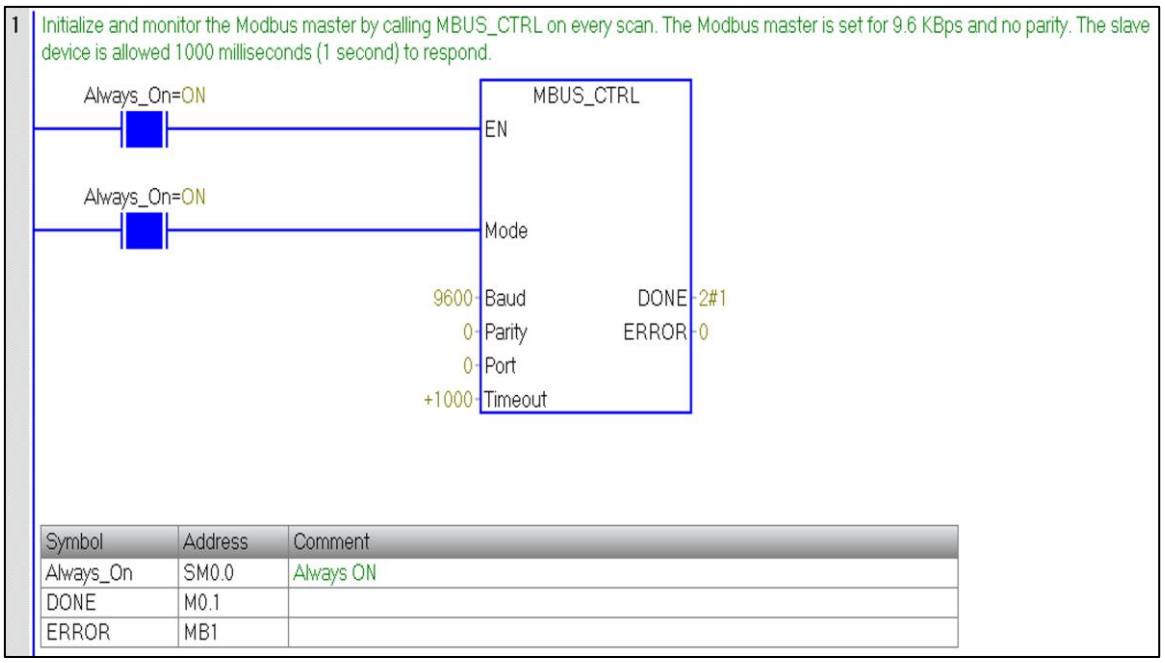
Table 2. Modbus RTU Slave Function Codes

Function code	**The utility of the master station using the corresponding function code for this slave station**
1	Read single/multiple coil (discrete output point) states. Function 1 returns the ON/OFF status of any number of output points (Q).
2	Read single/multiple contact (discrete input point) status. Function 2 returns the ON/OFF status of any number of input points (I).
3	Read single/multiple holding registers. Function 3 returns the contents of the V memory area. In the Modbus protocol, the holding registers are all "word" values, and up to 120 words of data can be read in one request .
4	Read single/multiple input registers. Function 4 returns the analog data value of the S7-200 SMART CPU.
5	Write a single coil (discrete output point). Function 5 is used to set the discrete output point to the specified value. This point is not mandatory and the user program can override the value written by the Modbus communication request.
6	Write a single holding register. Function 6 Write a value to the holding register of the V memory area of the S7-200 SMART.

15	Write multiple coils (discrete output points). Function 15 Writes the values of several discrete output points to the output image register (Q area) of the S7-200 SMART CPU. The address of the output point must start with a byte boundary (such as Q0.0 or Q2.0), and the number of output points must be an integer multiple of 8. This is a limitation of this Modbus RTU slave instruction library. Some points are not mandatory and the user program can override the value written by the Modbus communication request.
16	Several multiple holding registers. Function 16 writes multiple values to the holding registers of the V memory area of the S7-200 SMART CPU. Up to 120 words of data can be written in one request.

3.3 Operation

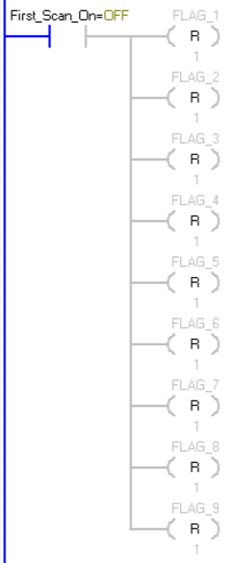
Step 1: Initialize and monitor the Modbus Master by calling MBUS_CTRL on every scan. The Modbus Master is set 9.6KBps and no parity. The Slave Device is allowed 1000 milliseconds (1 Second) to respond.



Symbol	Address	Comment
Always_On	SM0.0	Always ON
DONE	M0.1	
ERROR	MB1	

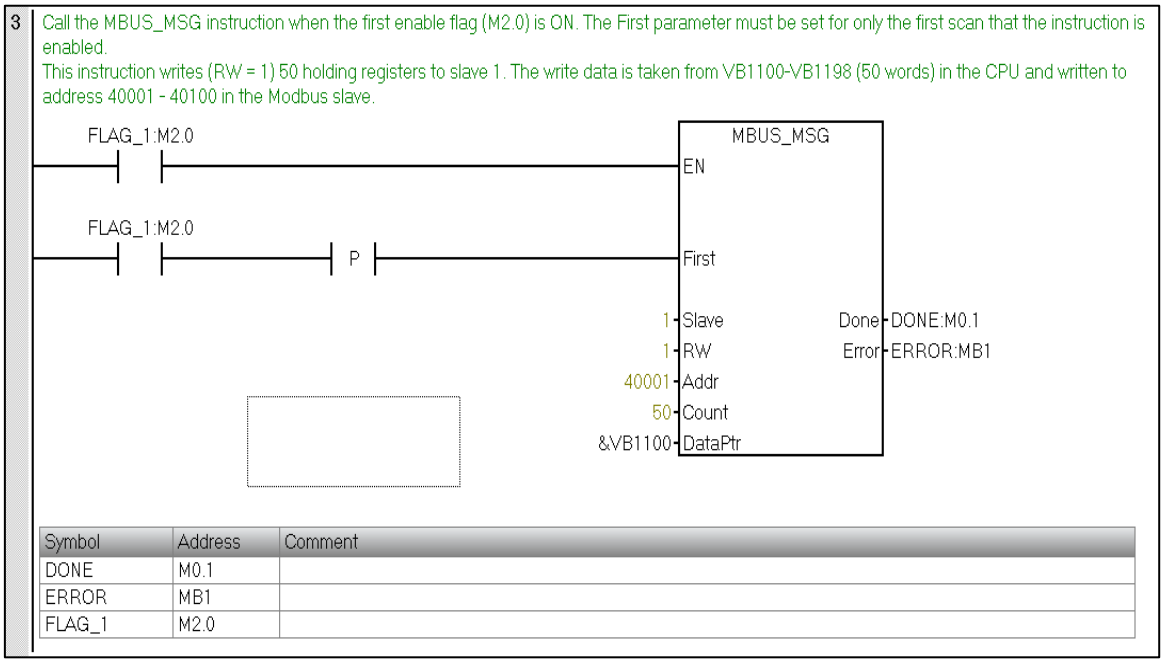
Step 2: On the First Scan, reset the enable flags (M2.0 to M3.0) used for more than one MBUS_MSG instruction.

2 On the first scan, reset the enable flags (M2.0 to M3.0) used for more than one MBUS_MSG instructions.



Symbol	Address	Comment
First_Scan_On	SM0.1	ON for the first scan cycle only
FLAG_1	M2.0	
FLAG_2	M2.1	
FLAG_3	M2.2	
FLAG_4	M2.3	
FLAG_5	M2.4	
FLAG_6	M2.5	
FLAG_7	M2.6	
FLAG_8	M2.7	
FLAG_9	M3.0	

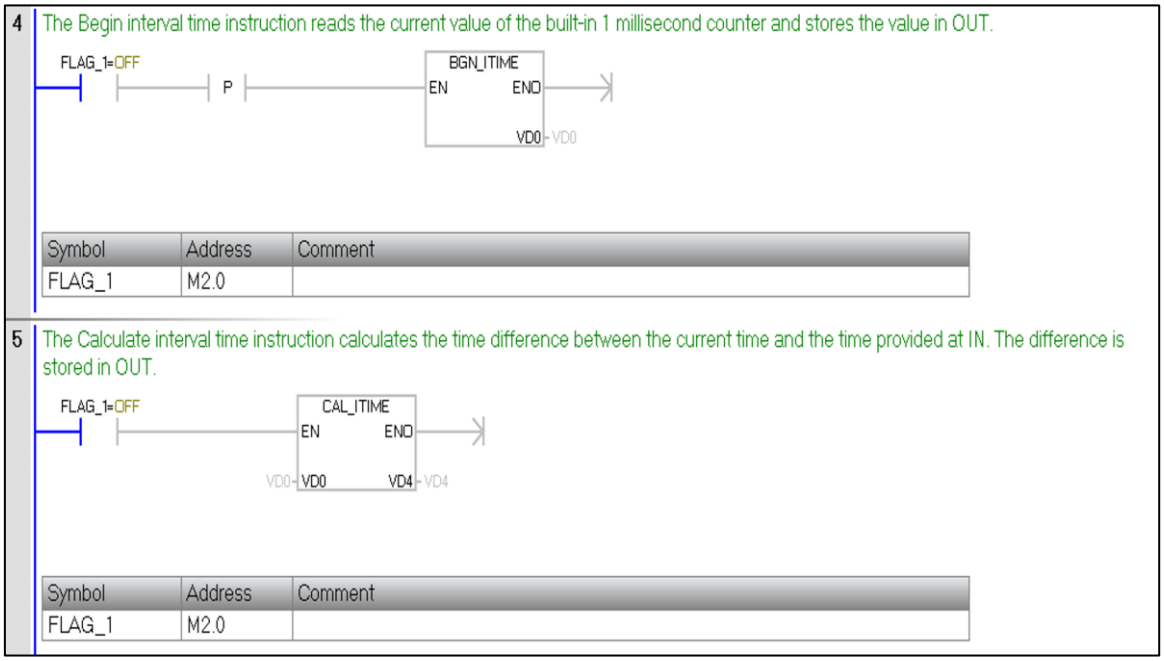
Step 3: Call the MBUS_MSG instruction when the first enable flag (M2.0) is ON. The First parameter must be set for only the first scan that the instruction is enabled. This instruction writes (RW = 1) 50 holding registers to slave 1. The write data is taken from VB1100-VB1198 (50 words) in the CPU and written to address 40001 - 40100 in the Modbus slave.



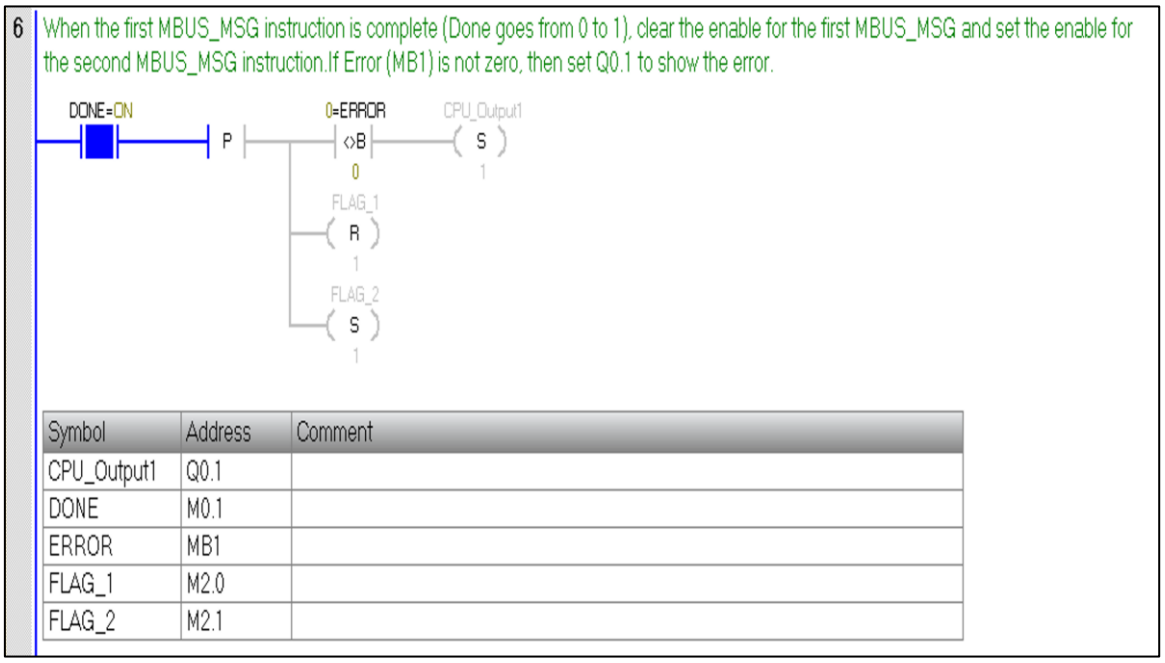
Step 4: Time calculation sending Data

The Begin interval time instruction reads the current value of the built-in 1 millisecond counter and stores the value in OUT.

Step 5: The Calculate interval time instruction calculates the time difference between the current time and the time provided at IN. The difference is stored in OUT.

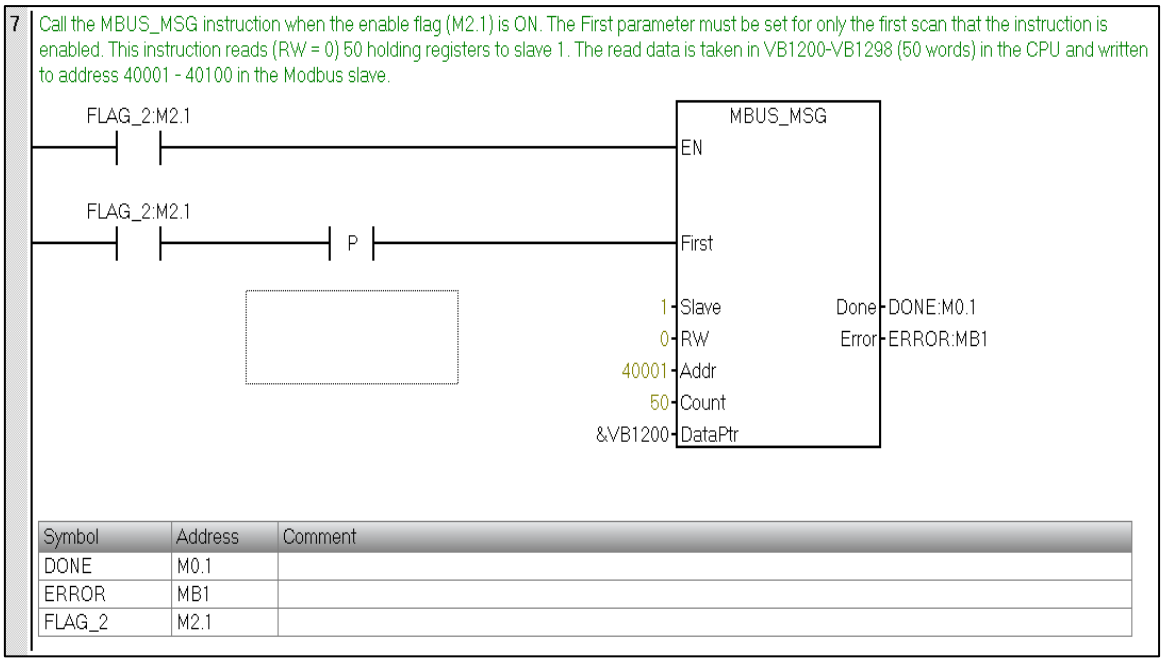


Step 6: When the first MBUS_MSG instruction is complete (Done goes from 0 to 1), clear the enable for the first MBUS_MSG and set the enable for the second MBUS_MSG instruction. If Error (MB1) is not zero, then set Q0.1 to show the error.



Symbol	Address	Comment
CPU_Output1	Q0.1	
DONE	M0.1	
ERROR	MB1	
FLAG_1	M2.0	
FLAG_2	M2.1	

Step 7: Call the MBUS_MSG instruction when the enable flag (M2.1) is ON. The First parameter must be set for only the first scan that the instruction is enabled. This instruction reads (RW = 0) 50 holding registers to slave 1. The read data is taken in VB1200-VB1298 (50 words) in the CPU and written to address 40001 - 40100 in the Modbus slave.

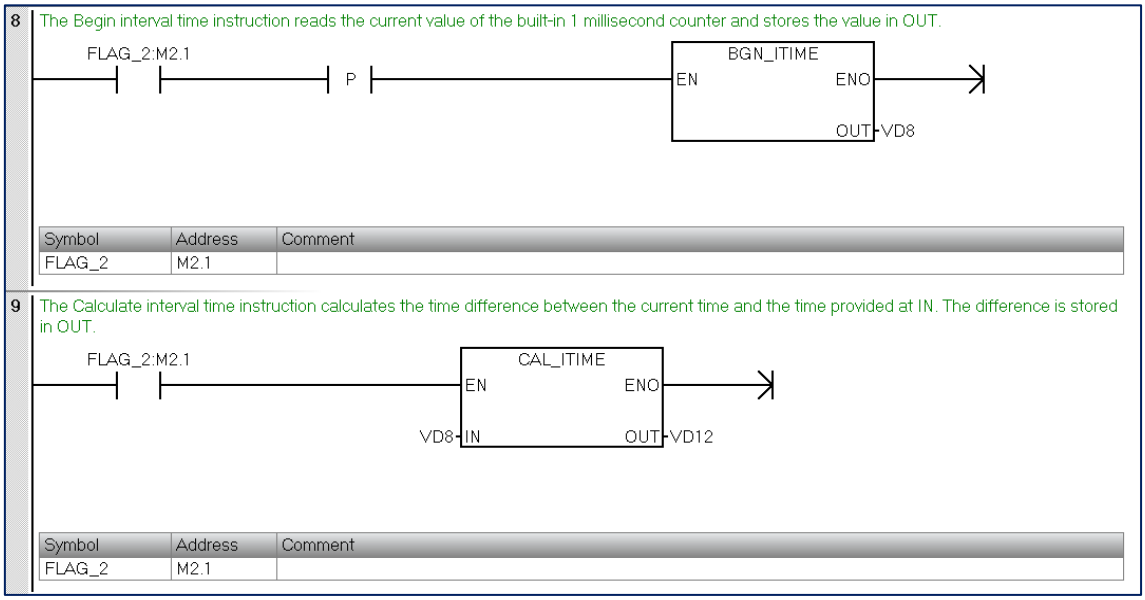


Symbol	Address	Comment
DONE	M0.1	
ERROR	MB1	
FLAG_2	M2.1	

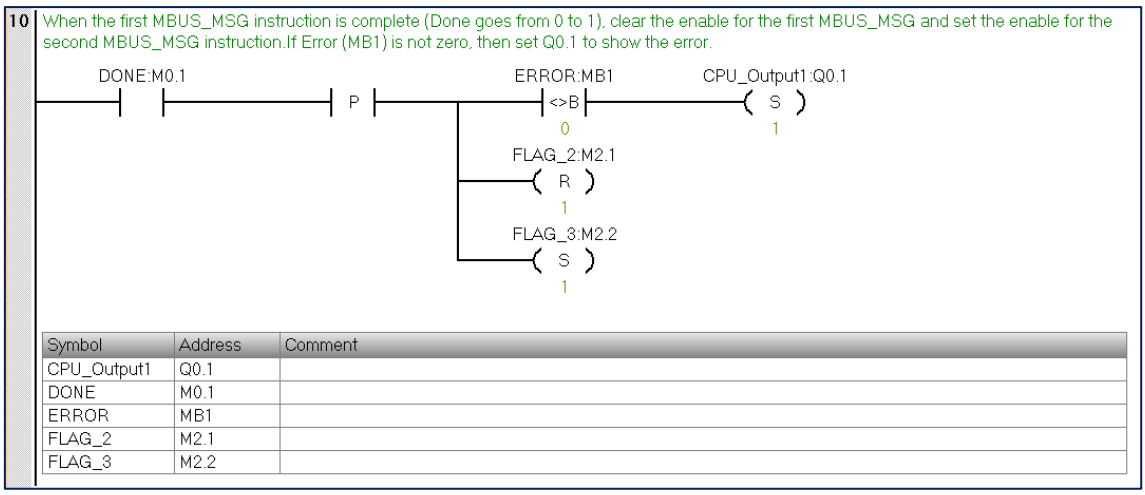
Step 8: Time calculation Reading Data

The Begin interval time instruction reads the current value of the built-in 1 millisecond counter and stores the value in OUT.

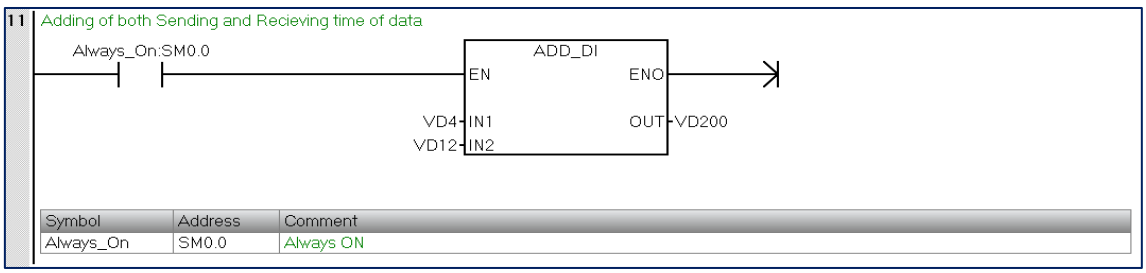
Step 9: The Calculate interval time instruction calculates the time difference between the current time and the time provided at IN. The difference is stored in OUT.



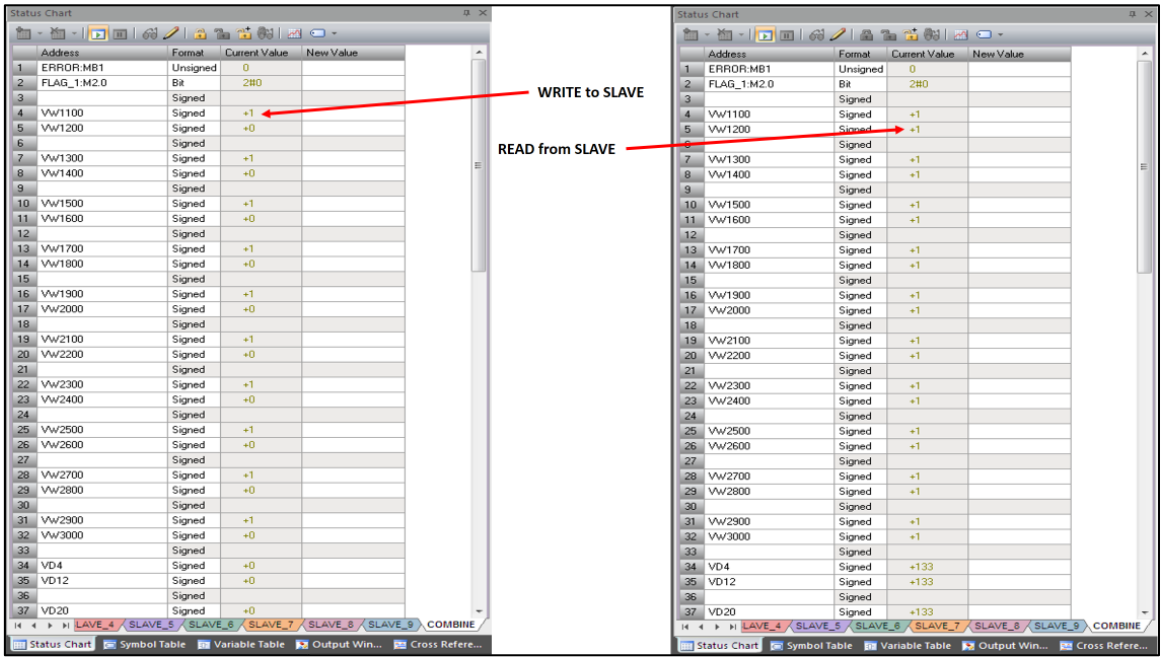
Step 10: When the first MBUS_MSG instruction is complete (Done goes from 0 to 1), clear the enable for the first MBUS_MSG and set the enable for the second MBUS_MSG instruction. If Error (MB1) is not zero, then set Q0.1 to show the error.



Step 11: Adding Of Both Send and Receiving Time of Data.



Result: Communication Result: Data transfer from Master to Slave



3.4 Error handling

The high numbered error codes (starting with 101) are errors that are returned by the Modbus slave device. These errors indicate that the slave does not support the requested function or that the requested address (either data type or range of addresses) is not supported by the Modbus slave device.

The low numbered error codes (1 through 12) are errors that are detected by the MBUS_MSG instruction. These error codes generally indicate a problem with the input parameters of the MBUS_MSG instruction, or a problem receiving the response from the slave. Parity and CRC errors indicate that there was a response but that the data was not received correctly. This is usually caused by an electrical problem such as a bad connection or electrical noise.

MBUS_CTRL Error Code	Description
0	No error
1	Invalid parity type
2	Invalid baud rate
3	Invalid timeout
4	Invalid mode
9	Invalid port number
10	Signal board port 1 missing or not configured

MBUS_MSG Error Code	Description
0	No error
1	Parity error in response: This is only possible if even or odd parity is used. The transmission was disturbed and possibly incorrect data was received. This error is usually caused by an electrical problem such as incorrect wiring or electrical noise affecting the communication.
2	Not used
3	Receive timeout: There was no response from the slave within the Timeout time. Some possible causes are bad electrical connections to the slave device, master and slave are set to a different baud rate / parity setting, and incorrect slave address.
4	Error in request parameter: One or more of the input parameters (Slave, RW, Address, or Count) is set to an illegal value. Check the documentation for allowed values for the input parameters.
5	Modbus master not enabled: Call MBUS_CTRL on every scan prior to calling MBUS_MSG.
6	Modbus is busy with another request: Only one MBUS_MSG instruction can be active at a time.
7	Error in response: The response received does not correspond to the request. This indicates some problem in the slave device or that the wrong slave device answered the request.
8	CRC error in response: The transmission was disturbed and possibly incorrect data was received. This error is usually caused by an electrical problem such as incorrect wiring or electrical noise affecting the communication.
11	Invalid port number

MBUS_MSG Error Code	Description
12	Signal board port 1 missing or not configured
101	Slave does not support the requested function at this address: See the required Modbus slave function support table in the "Using the Modbus master Instructions" help topic.
102	Slave does not support the data address: The requested address range of Address plus Count is outside the allowed address range of the slave.
103	Slave does not support the data type: The Address type is not supported by the slave device.
104	Slave device failure
105	Slave accepted the message but the response is delayed: This is an error for MBUS_MSG and the user program should resend the request at a later time.
106	Slave is busy and rejected the message: You can try the same request again to get a response.
107	Slave rejected the message for an unknown reason.
108	Slave memory parity error: There is an error in the slave device.

Common mistakes / Error :

- If multiple MBUS_MSG instructions are enabled at the same time, it will cause error number 6.
- If the slave delay parameter is set too long, the master station number 3 error will be caused.
- The slave station loses power or does not run, the network failure will cause the main station number 3 error.
- Allocate memory for library instructions in the V data area of the CPU (Library Memory). The Modbus Master instruction library requires a 286-byte global V memory area. Calling the STEP 7 - Micro/WIN SMART Instruction Library requires the allocation of the library instruction data area (Library Memory). The library instruction data area is the variable storage space used by the subroutine and interrupt program of the corresponding library. If the library instruction data area is not allocated during programming, many identical errors are generated at compile time.

MBUS_SLAVE Error Code	Description
0	No error
1	Memory range error
2	Invalid baud rate or parity
3	Illegal slave address
4	Illegal value for Modbus parameter
5	Holding registers overlap Modbus Slave symbols
6	Receive parity error
7	Receive CRC error
8	Illegal function request/function not supported
9	Illegal memory address in request
10	Slave function not enabled
11	Invalid port number
12	Signal board port 1 missing or not configured

4 Additional information

Additional notes on the Modbus RTU Master Protocol library
Modbus address

Usually the Modbus addresses are five-to-six digit numbers that indicate the data type as well as the address value. Modbus RTU master instructions map the address to the correct functions to send to the slave device. (The address corresponds to the Addr input parameter of the MBUS_MSG/MB_MSG2 instruction.) The Modbus address definitions are as follows:

- 00001 - 09999: Digital output (coil)
- 10001 - 19999: Digital input (contact)
- 30001 - 39999: Input data register (usually analog input)
- (40001 to 49999) and (400001 to 465535) are holding registers

Features supported by the Modbus Master protocol library

In order to support reading and writing of the above Modbus address, the Modbus Master protocol library requires the slave to support the following functions:
Table 1. Features that require slave support

Modbus address	Read/write	Functions to be supported by Modbus slaves
00001 - 09999 digital output	read	Function 1
	write	Function 5: Write single output point Function 15: Write multiple output points
10001 - 19999 digital input	read	Function 2
	write	-
30001 - 39999 input register	read	Function 4
	write	-
40001 – 49999 holding registers 400001 - 465535	read	Function 3
	write	Function 6: Write Single Register Unit Function 16: Write Multiple Register Unit

Mapping of Modbus addresses and S7-200 SMART memory area addresses

When the S7-200 SMART communicates with the Slave protocol library via Modbus Master, the mapping relationship between the Modbus address and the storage area address in the S7-200 SMART CPU is similar.
Modbus keep register address mapping example:

Modbus holding register address

40001	12 34
40002	56 78
40003	9A BC

S7-200 SMART Memory Word Addressing

VW200	12 34
VW202	56 78
VW204	9A BC

S7-200 SMART Memory Byte Addressing

VB200	12
VB201	34
VB202	56
VB203	78
VB204	9A
VB205	BC

Modbus digital address mapping example:

The CPU reads and writes the bit data (addresses 0xxxx and 1xxxx) areas as packed bytes; that is, each byte consists of 8 bits of data. The least significant bit of the first data byte is the addressed bit number (the parameter Address). If you intend to write only a single bit then you must set the bit in the least significant bit (Vx.0) of the byte pointed to by DataPtr. As shown below:

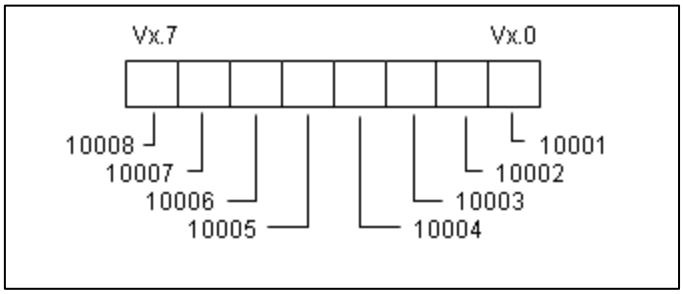


Figure 6. Format for Packed Bytes (Discrete Input Addresses)

5 Appendix

5.1 Service and support

Industry Online Support

Do you have any questions or need assistance?

Siemens Industry Online Support offers round the clock access to our entire service and support know-how and portfolio.

The Industry Online Support is the central address for information about our products, solutions and services.

Product information, manuals, downloads, FAQs, application examples and videos – all information is accessible with just a few mouse clicks:
support.industry.siemens.com

Technical Support

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- Plant data services
- Spare parts services
- Repair services
- On-site and maintenance services
- Retrofitting and modernization services
- Service programs and contracts

You can find detailed information on our range of services in the service catalog web page:
support.industry.siemens.com/cs/sc

Industry Online Support app

You will receive optimum support wherever you are with the "Siemens Industry Online Support" app. The app is available for Apple iOS, Android and Windows Phone:
support.industry.siemens.com/cs/ww/en/sc/2067

5.2 Support

Siemens Ltd

DI FA AS

Thane Belapur Road
Thane 400601, India

Application Center

SUP FA

Email: rginslpresales-fa.in@siemens.com

5.3 Links and literature

Table 5-1

No.	Topic
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	Link to this entry page of this application example https://support.industry.siemens.com/cs/ww/en/view/Entry ID
\3\	

5.4 Change documentation

Table 5-2

Version	Date	Modifications
V1.0	MM/YYYY	First version