



Scalable PLC AC500

# AC500

# Communication via Modbus RTU

3ADR020053N0202

# Communication via Modbus RTU

## Content

- Modbus – International Standard Bus
- Modbus RTU via COM1 and COM2
- Data Transmission
- Reference table
- Example: Modbus master/slave configuration
- Diagnostics

# Communication via Modbus RTU

## Coming up

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# Modbus – International Standard Bus

## Modbus RTU



### Description of the Modbus® protocol:

Supported standard	EIA RS-232 / RS-485 (PM55x and PM56x only support RS-485)
Number of connection points	1 master max. 1 slave with RS 232 interface max. 31 slaves with RS 485
Protocol	Modbus® (Master/Slave)
Data transmission control	CRC16
Data transmission speed	up to 187500 baud
Encoding	1 start bit 8 data bits 1 parity bit, even or odd (optional) 1 or 2 stop bits
Max. cable length	for RS 485: 1200 m at 19200 baud

Both serial interfaces of the AC500 CPUs can be operated simultaneously as Modbus interfaces and can operate as Modbus master as well as Modbus slave.

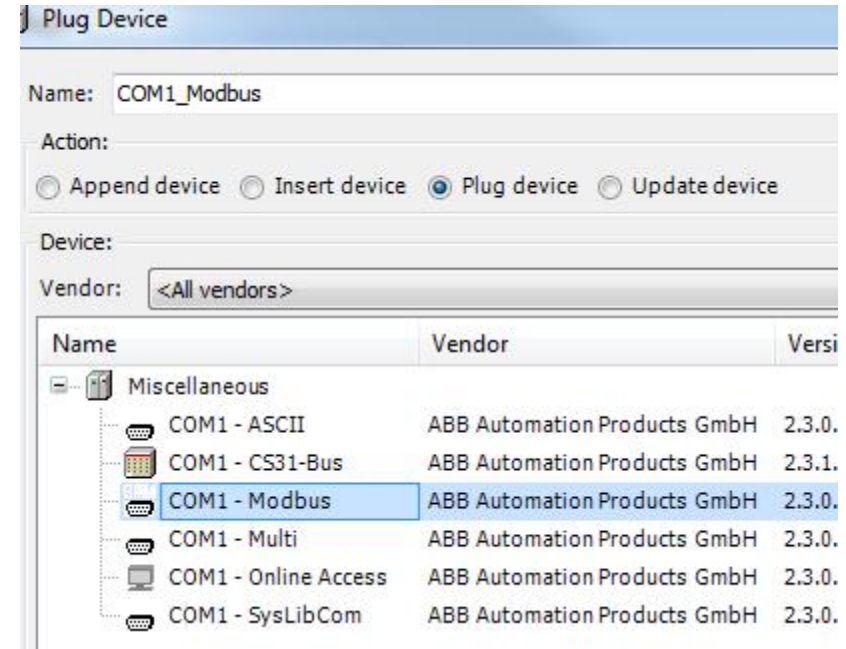
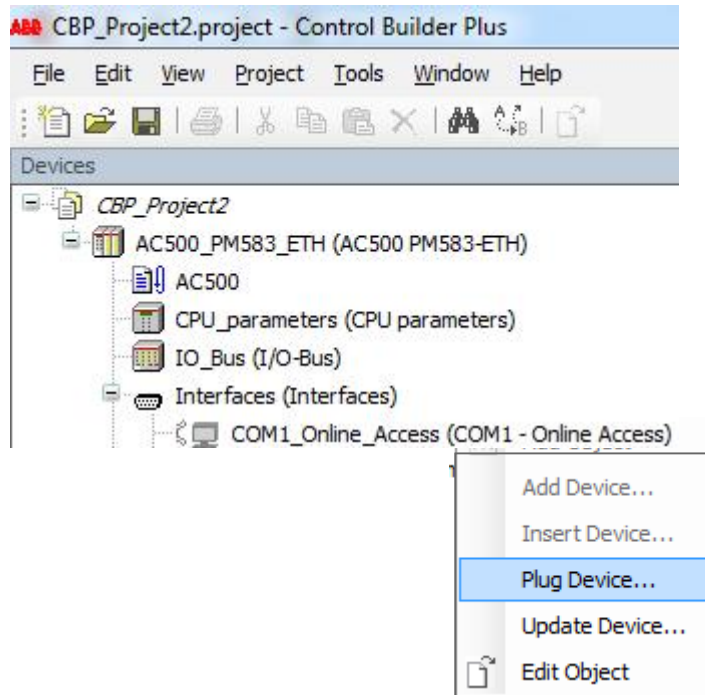
The Modbus operating mode and the interface parameters are set in the PLC configuration.

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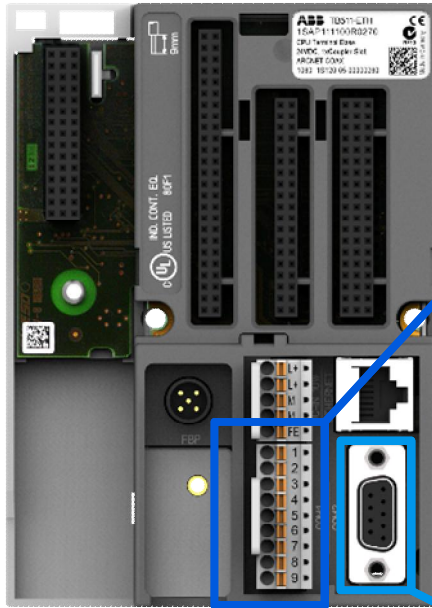
# Modbus RTU via COM1 and COM2 Configuration



COM1 / COM2 have to be set in ABB Control Builder Plus.

Note: "Telegram" is to be selected for RTS control parameter if RS485 is used.

# Modbus RTU via COM1 and COM2 Wiring



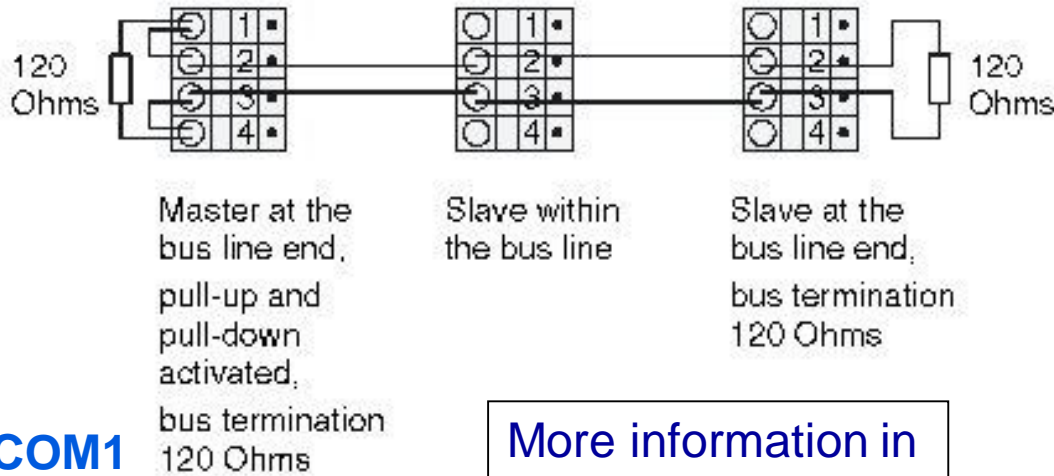
Terminal	Label	Protocol	Function
L+	+24 V DC	UP	
L+	+24 V DC	UP	
M	0 V	ZP	
M	0 V	ZP	
FE	FE	Functional Earth	
1	Terminator P	RS-485	Terminator P
2	RxD/TxD-P	RS-485	Receive/Transmit, positive
3	RxD/TxD-N	RS-485	Receive/Transmit, negative
4	Terminator N	RS-485	Terminator N
5	RTS	RS-232	Request to send (output)
6	TxD	RS-232	Transmit data (output)
7	SGND	Signal Ground	
8	RxD	RS-232	Receive data (input)
9	CTS	RS-232	Clear to send (input)

**COM1**

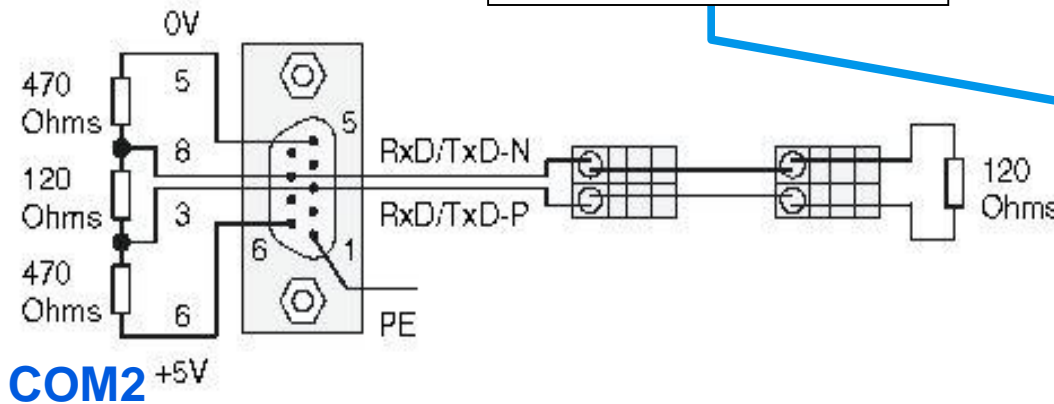
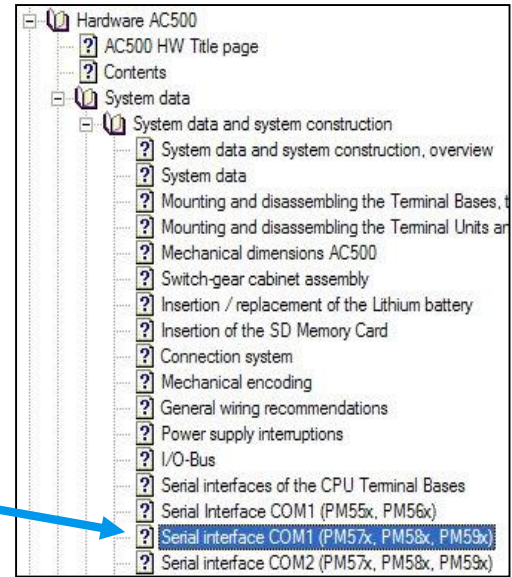
1	FE	Functional earth	
2	TxD	RS-232	Transmit Data output
3	RxD/TxD-P	RS-485	Receive/Transmit positive
4	RTS	RS-232	Request To Send output
5	SGND	Signal Ground	0 V supply out
6	+5 V		5 V supply out
7	RxD	RS-232	Receive Data input
8	RxD/TxD-N	RS-485	Receive/Transmit negative
9	CTS	RS-232	Clear to Send input
Shield	FE	Functional earth	

**COM2**

# Modbus RTU via COM1 and COM2 Termination (RS485) (1)

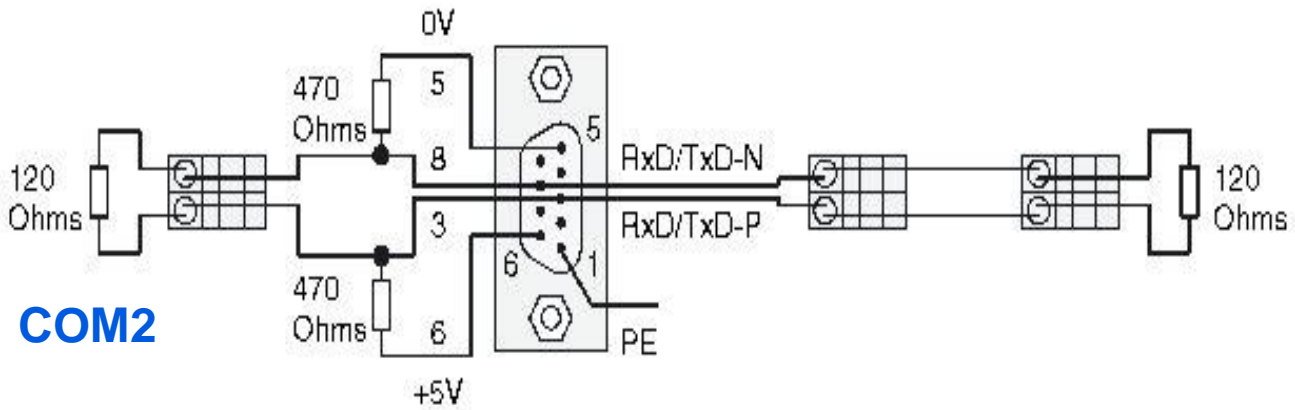
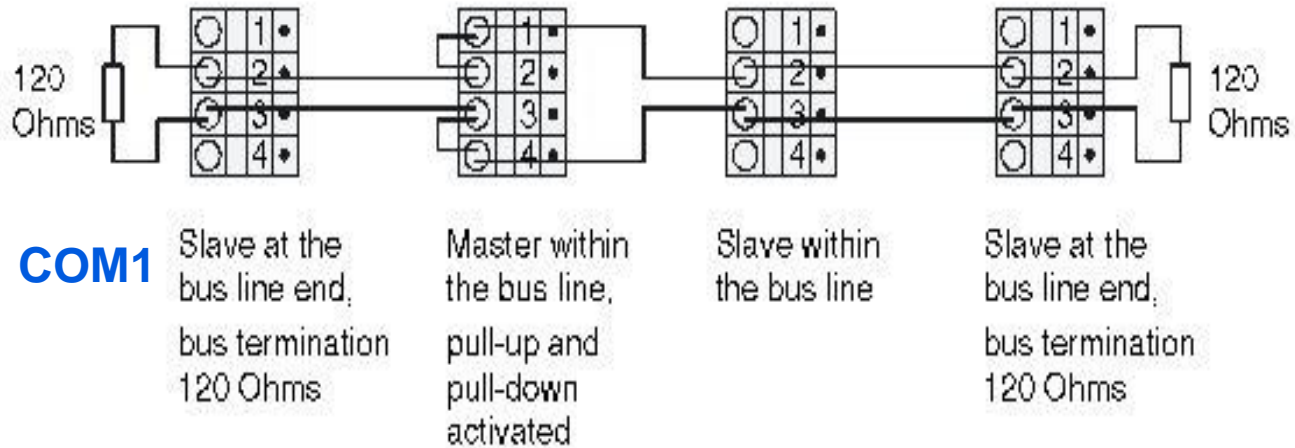


More information in CoDeSys Help





# Modbus RTU via COM1 and COM2 Termination (RS485) (2)



# Communication via Modbus RTU

## Coming up

- Modbus – International Standard Bus
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- **Data Transmission**
- Reference table
- Example: Modbus master/slave configuration
- Diagnostics

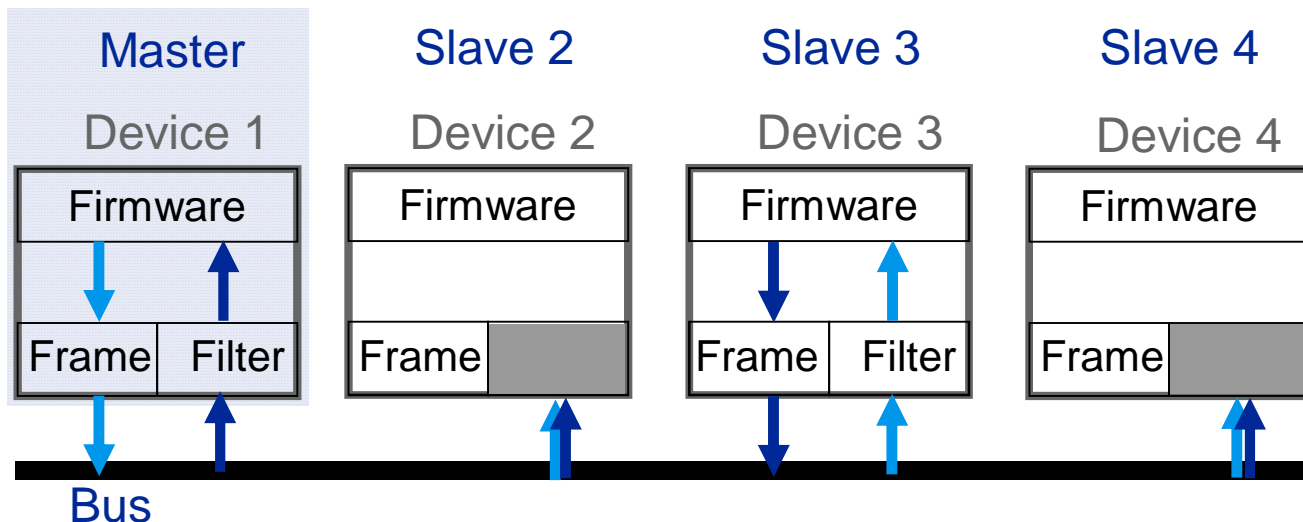
# Data Transmission

## Principle Master Slave

Master and slave addresses are to be defined.  
Master is always initiating data exchange.

1. Master request: Data read from Slave 3 or Data send to slave 3

2. Slave 3 response: Data from Slave 3 /or positive response /or error message



# Data Transmission Function Codes

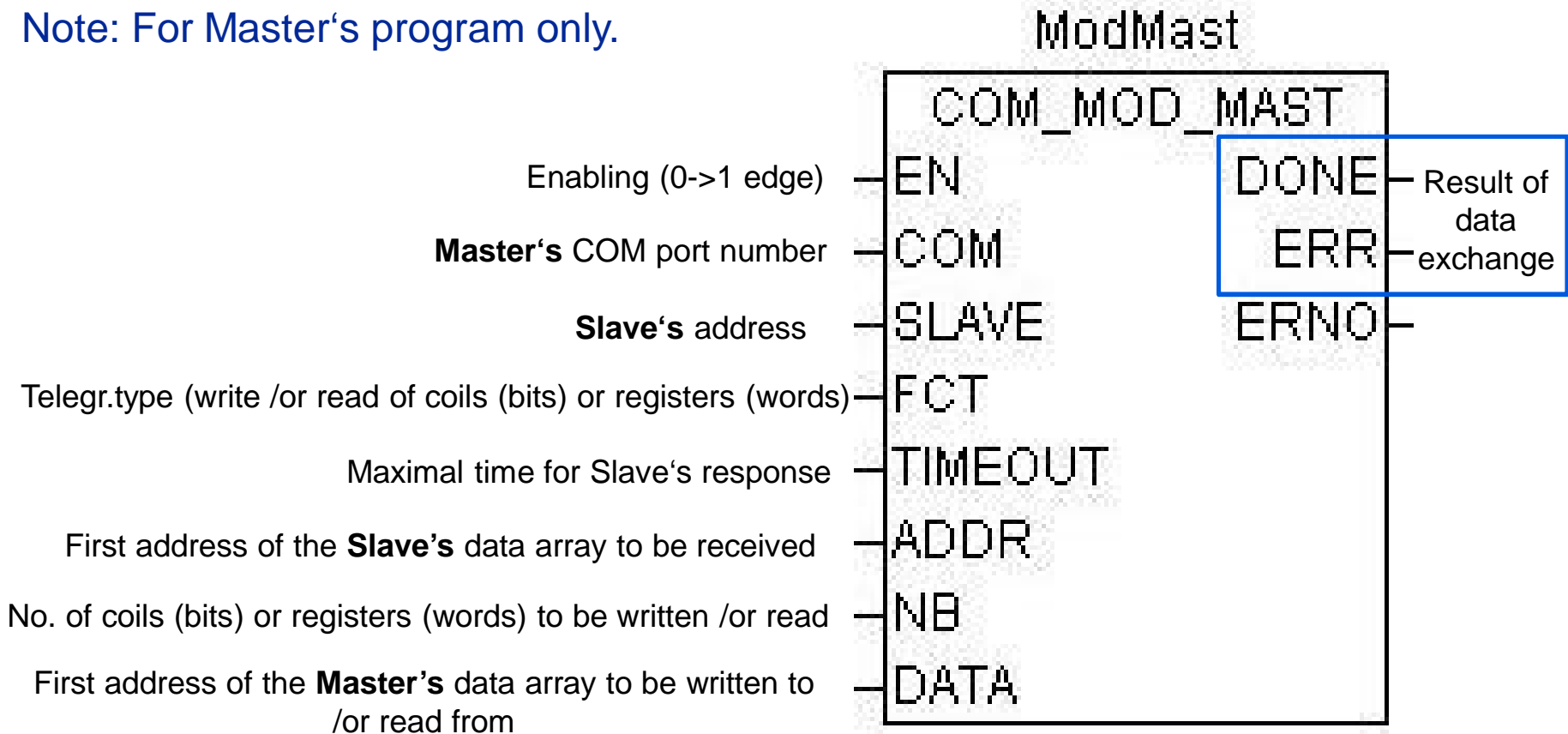
AC500 supports following Modbus function codes :

(\*) as of CBP and FW V2.2.0

Function code		Max. length		Function code
DEC	HEX	Serial	Modbus on TCP/IP	DEC
01 or 02	01 or 02	2000 bits	255 bits (up to Communication Module FW V01.033) 1800 bits (as of Communication Module FW V01.041)	01 or 02
03 or 04	03 or 04	125 words / 62 double words	100 words / 50 double words	03 or 04
05	05	1 bit	1 bit	05
06	06	1 word	1 word	06
07	07	8 bits	8 bits	07
15	0F	1968 bits	255 bits (up to Communication Module FW V01.033) 1800 bits (as of Communication Module FW V01.041)	15
16	10	123 words / 61 double words	100 words / 50 double words	16
22	16	Write: 1 word	Write: 1 word	22
23	17	Read: 125 words / 62 double words Write: 123 words / 61 double words	Read: 125 words / 62 double words Write: 123 words / 61 double words	23

# Data Transmission Function Block

Note: For Master's program only.



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# Reference table

## Modbus Buffer (1)

Modbus protocol buffer is configured in the %M (default) or %R area:

- Use %M area
- Use %R area

The segments 0 and 1 of the addressable flag area %M resp. %R can be accessed by Modbus.

Segment	Operands	Size, cumulative [kB]	CPU PM55x CPU PM56x	CPU PM57x	CPU PM58x	CPU PM59x
0	%MB0.0...%MB0.65535	64	2 kB	4 kB	+	+
1	%MB1.0...%MB1.65535	128	-	-	+	+
2	%MB2.0...%MB2.65535	192	-	-	-	+
3	%MB3.0...%MB3.65535	256	-	-	-	+
4	%MB4.0...%MB4.65535	320	-	-	-	+
5	%MB5.0...%MB5.65535	284	-	-	-	+
6	%MB6.0...%MB6.65535	448	-	-	-	+
7	%MB7.0...%MB7.65535	512	-	-	-	+

Segment	Operands	Size, cumulative [kB]	CPU PM55x CPU PM56x	CPU PM57x	CPU PM58x	CPU PM59x
0	%RB0.0...%RB0.65535	64	1 kB	4 kB	+	+
1	%RB1.0...%RB1.65535	128	-	-	+	+
2	%RB2.0...%RB2.65535	192	-	-	-	+
3	%RB3.0...%RB3.65535	256	-	-	-	+
4	%RB4.0...%RB4.65535	320	-	-	-	+
5	%RB5.0...%RB5.65535	284	-	-	-	+
6	%RB6.0...%RB6.65535	448	-	-	-	+
7	%RB7.0...%RB7.65535	512	-	-	-	+

More information in CODESYS Help

- ? Programming and test
- ? **Communication with Modbus RTU**
- ? Index - System Technology CPUs

# Reference table

## Read / Write Addresses

- The address assignment for word and double word accesses is done according to the following table:

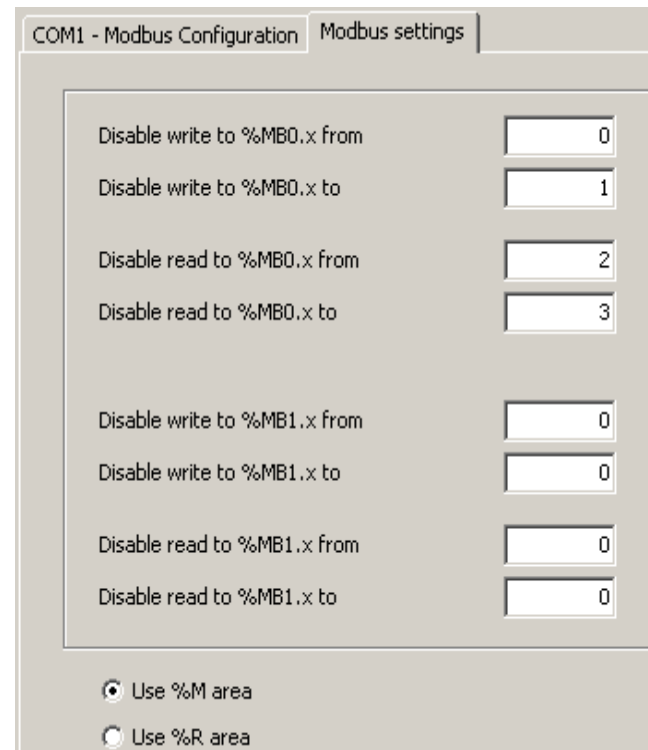
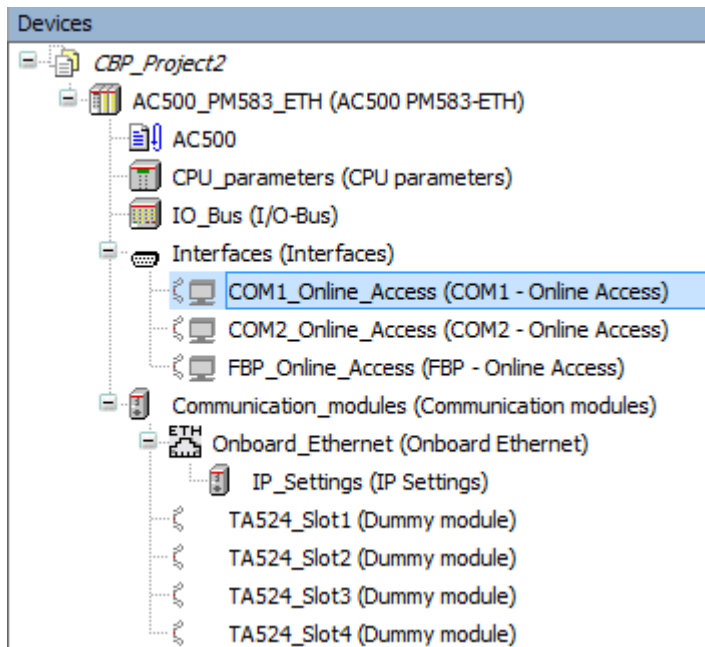
Modbus address		Byte BYTE	Bit (byte-oriented) BOOL	Word WORD	Double word DWORD
HEX	DEC				
<b>Line 0</b>					
0000	0	%MB0.0	%MX0.0.0...%MX0.0.7	%MW0.0	%MD0.0
		%MB0.1	%MX0.1.0...%MX0.1.7		
0001	1	%MB0.2	%MX0.2.0...%MX0.2.7	%MW0.1	
		%MB0.3	%MX0.3.0...%MX0.3.7		
0002	2	%MB0.4	%MX0.4.0...%MX0.4.7	%MW0.2	%MD0.1
		%MB0.5	%MX0.5.0...%MX0.5.7		
0003	3	%MB0.6	%MX0.6.0...%MX0.6.7	%MW0.3	
		%MB0.7	%MX0.7.0...%MX0.7.7		

- Address range Line 0: %MW0.0 to %MW0.32767
- Address range Line 1: %MW1.0 to %MW1.32767
- For PM55x\_ETH, PM56x\_ETH and PM57x\_ETH **only Line 0 partially** available.



# Reference table

## Data protection in Modbus Slave



For **Modbus Slave operation**, an area without read and/or write access can be set in the segments %MB0.x and %MB1.x. (the same for %R area if used). Reading/writing is disabled beginning at the set address and is valid up to the set end address (inclusive).

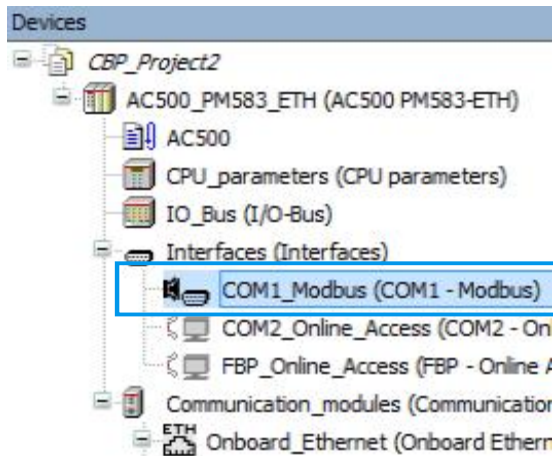
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# Example: Modbus master/slave configuration

## Master Configuration

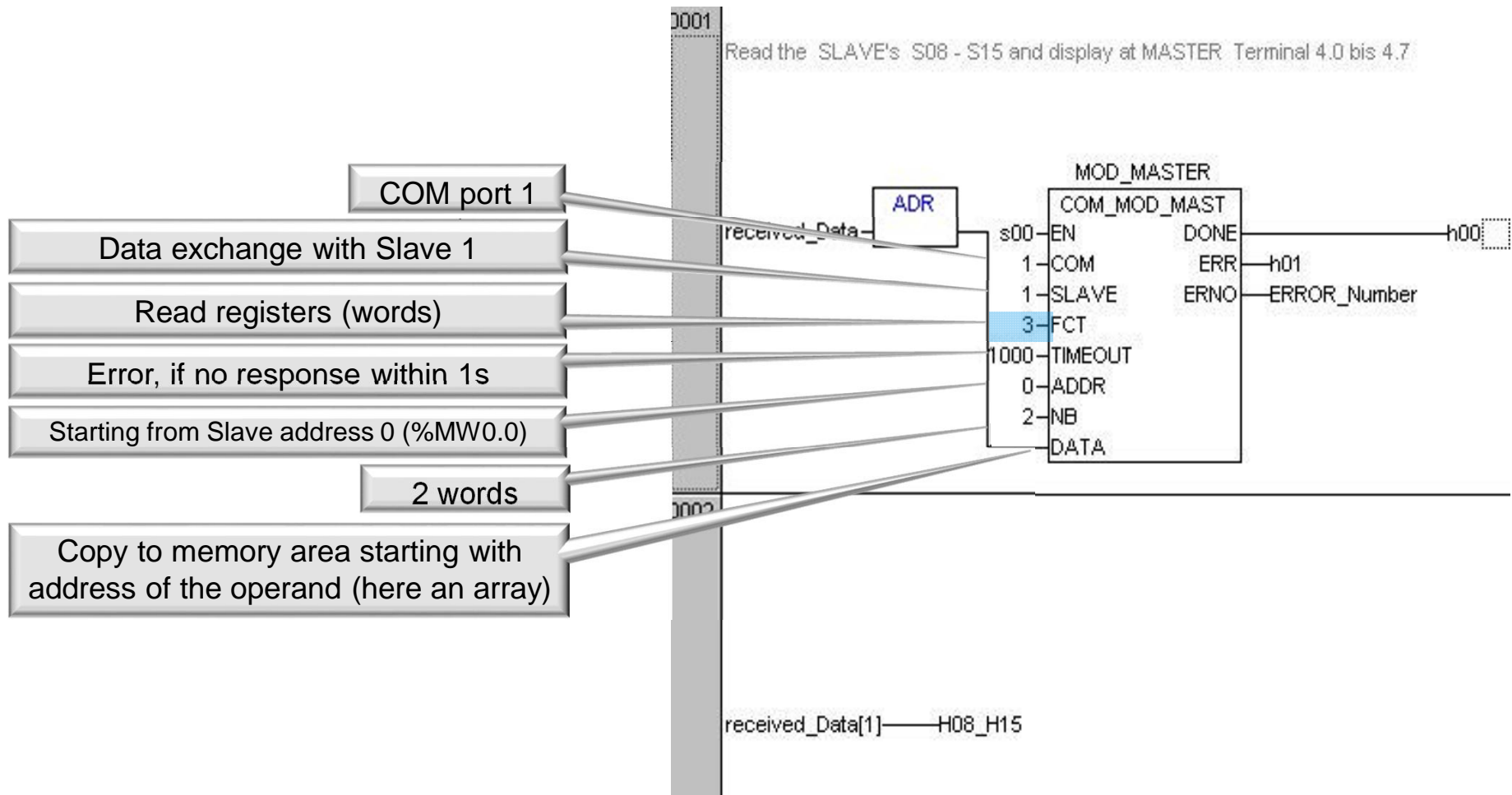


COM1 - Modbus Configuration		
Modbus Server Settings		
Parameter	Type	Value
Enable login	Enumeration of BYTE	Disabled
RTS control	Enumeration of BYTE	None
Telegram ending value	WORD(0..65535)	3
Baudrate	Enumeration of DWORD	19200
Parity	Enumeration of BYTE	even
Data bits	Enumeration of BYTE	8
Stop bits	Enumeration of BYTE	1
Run on config fault	Enumeration of BYTE	No
Operation mode	Enumeration of BYTE	Client
Address	BYTE(0..255)	0



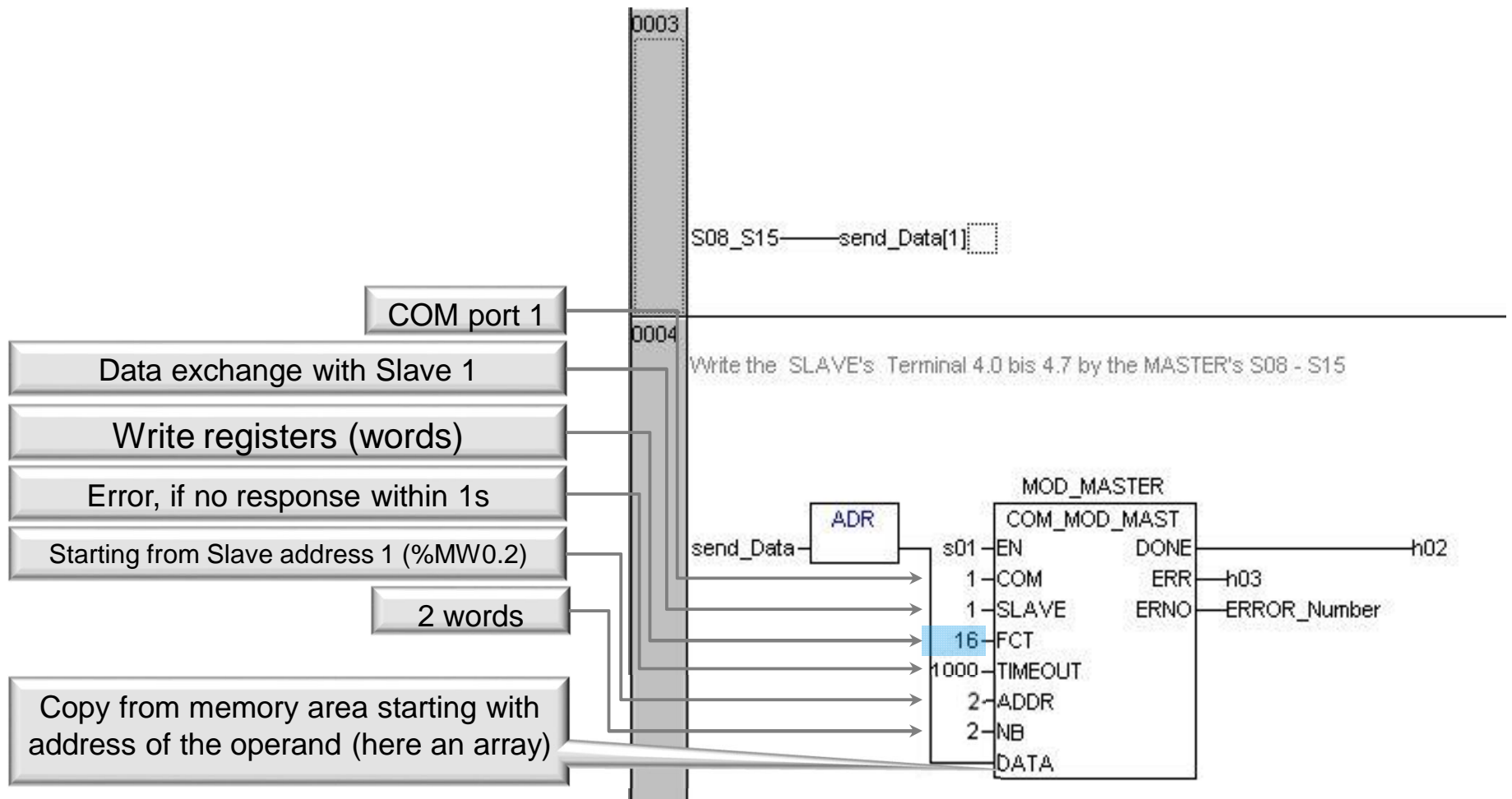
# Example: Modbus master/slave configuration

## Master: Program (1)



# Example: Modbus master/slave configuration

## Master: Program in (2)



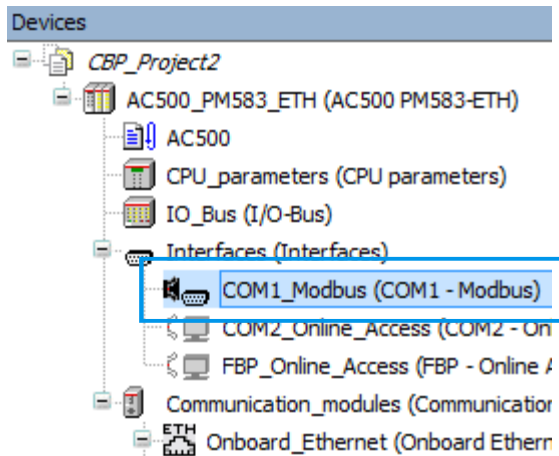
# Example: Modbus master/slave configuration

## Addresses used in this example

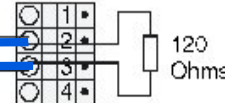
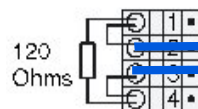
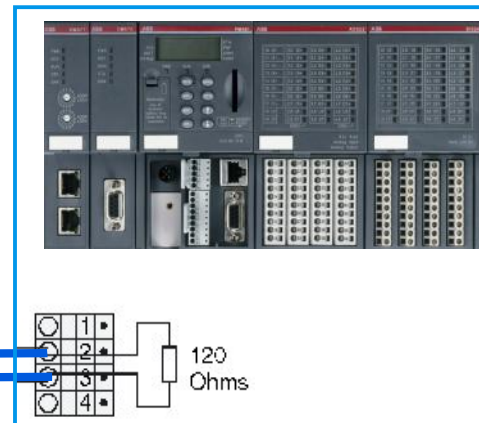
Modbus address		Byte BYTE	Bit (byte-oriented) BOOL	Word WORD	Double word DWORD
HEX	DEC				
<b>Line 0</b>					
0000	0	%MB0.0	%MX0.0.0...%MX0.0.7	%MW0.0	%MD0.0
		%MB0.1	%MX0.1.0...%MX0.1.7		
0001	1	%MB0.2	%MX0.2.0...%MX0.2.7	%MW0.1	
		%MB0.3	%MX0.3.0...%MX0.3.7		
0002	2	%MB0.4	%MX0.4.0...%MX0.4.7	%MW0.2	%MD0.1
		%MB0.5	%MX0.5.0...%MX0.5.7		
0003	3	%MB0.6	%MX0.6.0...%MX0.6.7	%MW0.3	
		%MB0.7	%MX0.7.0...%MX0.7.7		
...					
7FFE	32766	%MB0.65532	%MX0.65532.0 ...%MX0.65532.7	%MW0.32766	%MD0.16383
		%MB0.65533	%MX0.65533.0 ...%MX0.65533.7		
7FFF	32767	%MB0.65534	%MX0.65534.0 ...%MX0.65534.7	%MW0.32767	
		%MB0.65535	%MX0.65535.0 ...%MX0.65535.7		
<b>Line 1</b>					
8000	32768	%MB1.0	%MX1.0.0...%MX1.0.7	%MW1.0	

# Example: Modbus master/slave configuration

## Slave Configuration



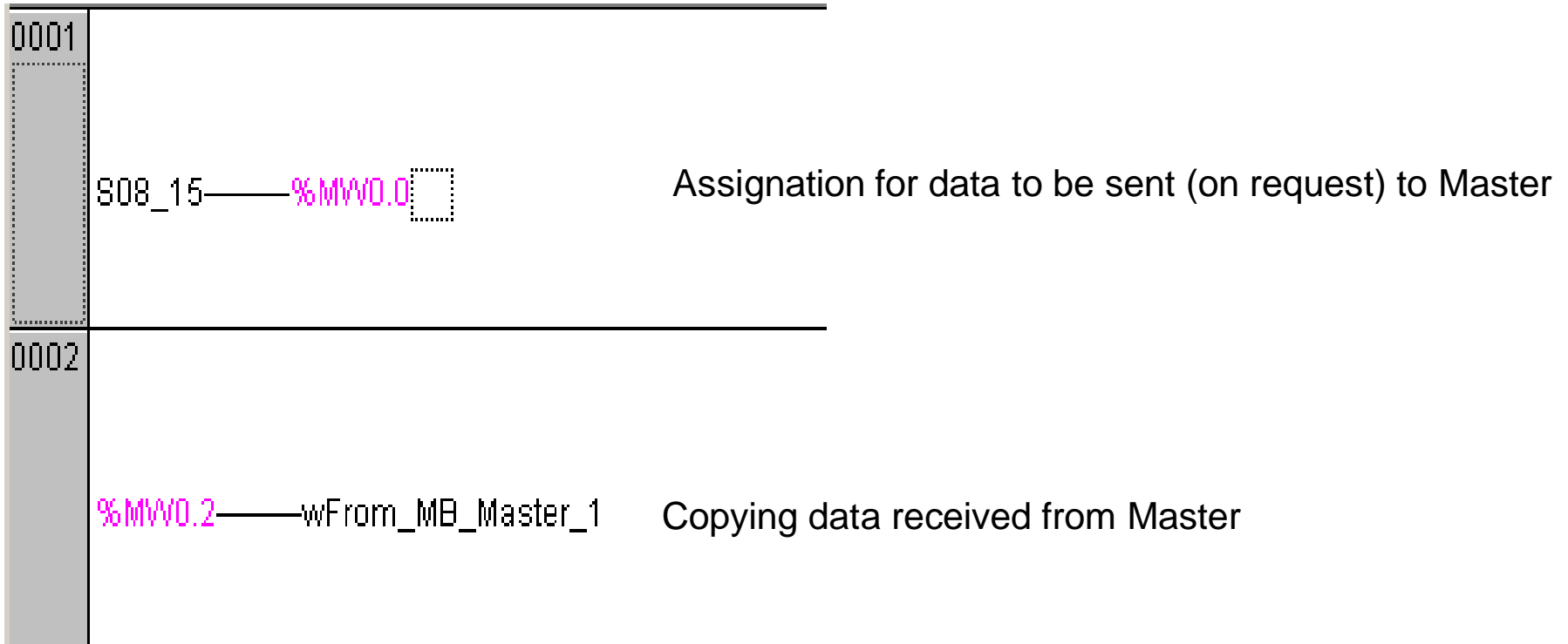
COM1 - Modbus Configuration		
Modbus Server Settings		
Parameter	Type	Value
Enable login	Enumeration of BYTE	Disabled
RTS control	Enumeration of BYTE	None
Telegram ending value	WORD(0..65535)	3
Baudrate	Enumeration of DWORD	19200
Parity	Enumeration of BYTE	even
Data bits	Enumeration of BYTE	8
Stop bits	Enumeration of BYTE	1
Run on config fault	Enumeration of BYTE	No
Operation mode	Enumeration of BYTE	Server
Address	BYTE(0..255)	1



# Example: Modbus master/slave configuration

## Slave: Program

No function Block is needed. The data are to be written to / read from Modbus buffer being (depending on configuration) in %M or %R area.





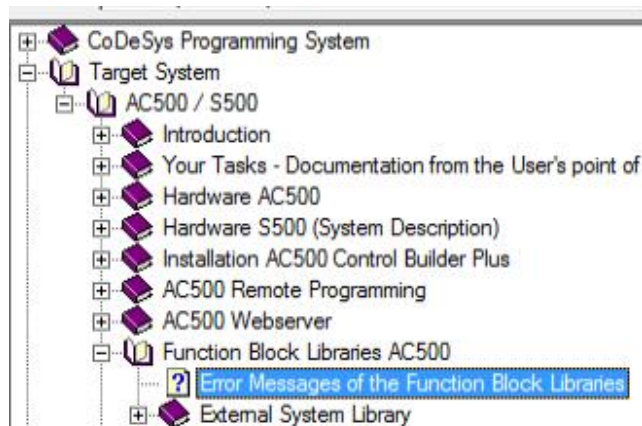
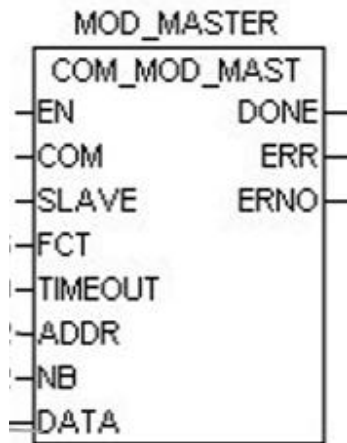
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# Diagnostics

## Analysis of FB's output parameters



- Output DONE indicates the state of the job processing.
- After completing or aborting the processing (due to an error), DONE is set to TRUE for one cycle.
- The output always has to be considered together with output ERR.
- If ERR is TRUE, an error occurred. In this case, the error number can be read at output ERNO.
- The error messages can be found in the Online Help.

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