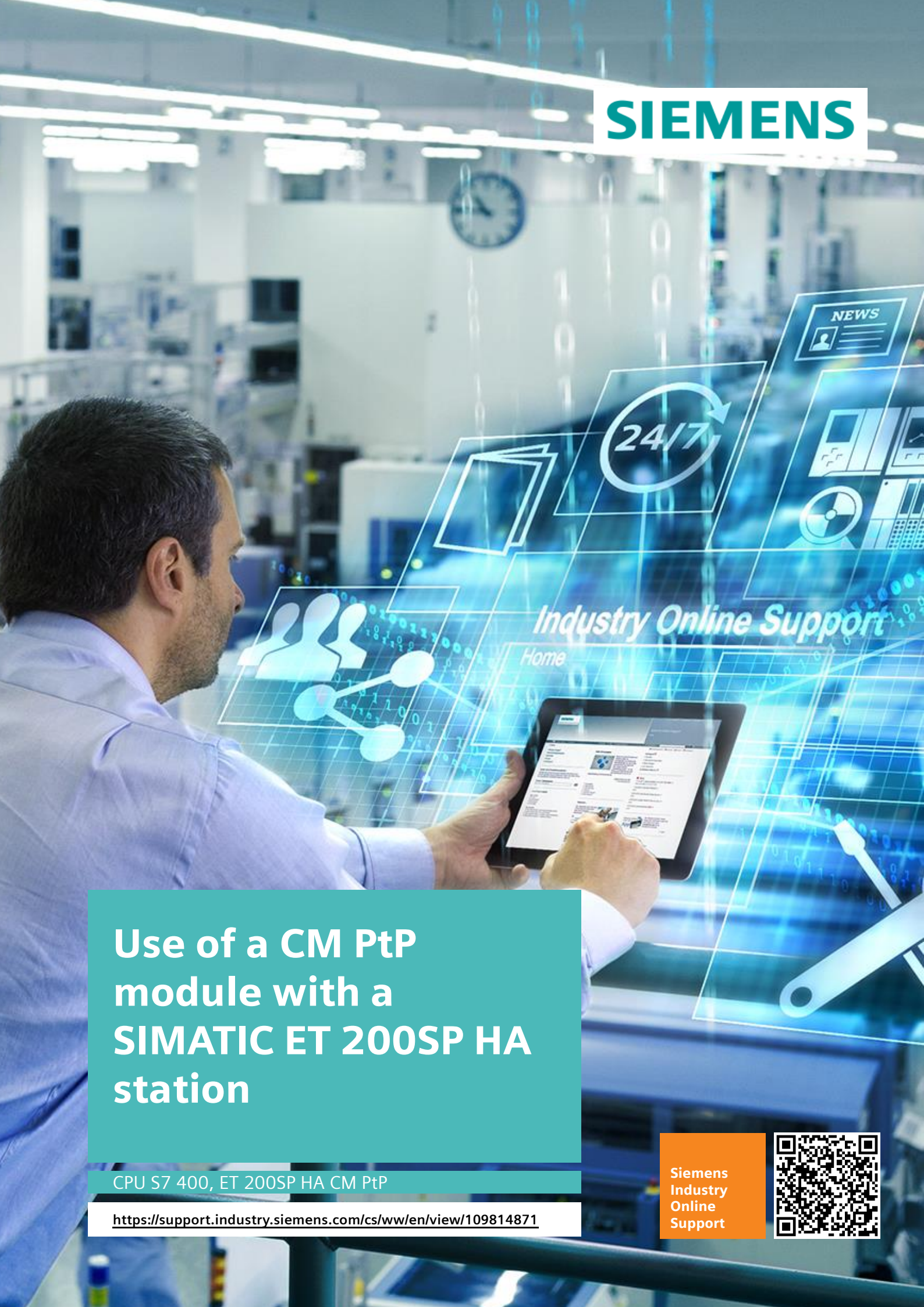

Use of a CM PtP module with a SIMATIC ET 200SP HA station

CPU S7 400, ET 200SP HA CM PtP

https://support.industry.siemens.com/cs/ww/en/view/109814871

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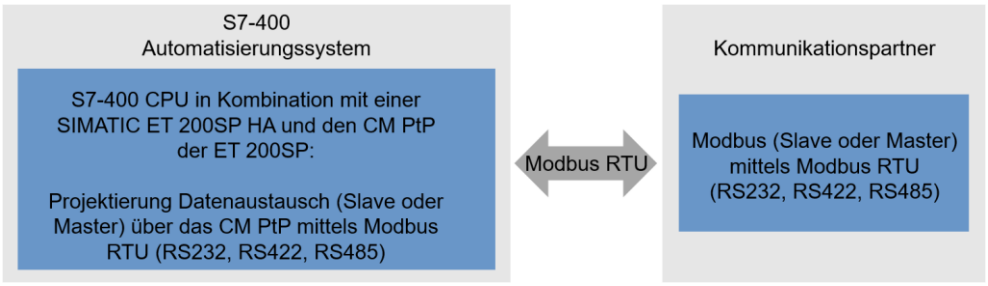
1 Task

Introduction

In the process industry there are often couplings between third-party devices or systems. This is implemented in some cases with the Modbus Remote Terminal Unit (RTU) through the use of the serial standards RS232, RS422 or RS485. In the past, the SIMATIC ET 200M was used for this in combination with a CP341 and a separate library. The recommended solution for the process industry today is a SIMATIC ET 200SP HA station with a CM PtP.

Overview of the automation task

Figure 1-1 Overview of the automation task



Description of the automation task

A device needs to be integrated into the process control system, either as slave or master, using Modbus RTU. PCS 7, a 400 series SIMATIC CPU and a SIMATIC ET 200SP HA with a CM PtP module are used.

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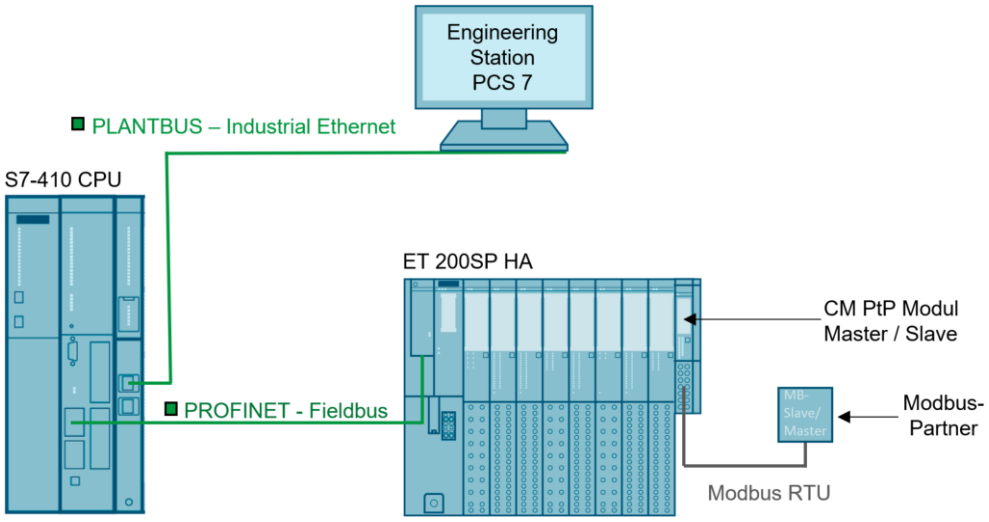
2 Solution

This application example demonstrates handling of a CM PtP (Point To Point) module of the ET 200SP model series in conjunction with an ET 200SP HA station.

Overview of the complete solution

Figure 2-1 Overview of the complete solution



Core contents of this application

This application example explains the use of the SIMATIC ET 200SP CM PtP module (Communication Module Point to Point) with a SIMATIC ET 200SP HA for Modbus RTU (Remote Terminal Unit) communication. In the process, we will address one particularity when using ET 200SP modules with an
ET 200SP HA, present the supported protocols with wiring examples, explain the configuration in PCS 7 and demonstrate module-specific features.

Core contents in summary:

- Basics of the Modbus RTU protocol, in particular PtP
- Supported protocols of the CM PtP module
- Necessary hardware and software
- Configuration of the hardware environment
- Overview of channel blocks used
- CFC engineering of Modbus communication
- Commissioning of Modbus communication
- Limitations and compatibility of the CM PtP module

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3 Information on Modbus RTU and the CM PtP module

3.1 Modbus RTU principle of operation

Overview

Modbus RTU (Remote Terminal Unit) is a standard protocol for a serial interface between master and slave.

Table 3-1 Maximum number of connection partners per interface

Interface	Maximum number of slaves
RS485 2-wire	32
RS422 4-wire	10
RS232 2- to 6-wire	1

Any Modbus participant must be uniquely addressed (address space 1-247).

Master-slave relationship

Modbus RTU uses a master-slave relationship in which all entire communication flows from a sole master device, while the slaves can only respond to the request by the master. The master sends a request to the slave address and only the slave with this slave address answers the request.

Special case: When using the Modbus slave address "0", the CM PtP sends a broadcast telegram to all slaves (without receiving a slave response).

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Readme

References

Master-slave communication via a CM PtP using the Modbus RTU protocol:

https://support.industry.siemens.com/cs/ww/en/view/68202723

3.2 Supported serial standards - CM PtP module

The CM PtP module supports the three serial standards RS232, RS422 and RS485 in a total of five different modes.

Table 3-2 CM PtP module protocols

Mode	Direction	Wiring	Type	PhysicMode CFC
RS232	Full duplex	2- to 6-wire		0
RS422	Full duplex	4-wire	PtP	1
RS422	Full duplex	4-wire	Multipoint master	2
RS422	Full duplex	4-wire	Multipoint slave	3
RS485	Half duplex	2-wire		4

Explanation of terms

Terms from the table above will be explained in the following. Further details can be found in the manual (link).

Readme

References

Manual: CM PtP - Configurations for Point-to-Point Coupling

https://support.industry.siemens.com/cs/ww/en/view/59057093

Register

Int values

Coil

Bool values

RS232 mode

In RS232 mode, data are transmitted via at least two wires. There is one line each for the send direction and the receive direction. It is possible to send and receive simultaneously (full duplex).

RS422 mode

In RS422 mode, the data are transmitted via two pairs of wires (four-wire mode). There is one line pair each for the send direction and the receive direction. It is possible to send and receive simultaneously (full duplex). Every communication partner must be able to operate a send and a receive facility simultaneously. Data can be exchanged between two or more communication partners at the same time. With RS422 multipoint mode, only one slave may transmit at a time.

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RS485 mode

In RS485 mode, the data is transmitted via a pair of wires (two-wire operation). The cable pair is alternately available for the transmission direction and the reception direction. It can either be sent or received (half duplex). After a send process, the system immediately switches to receive mode (ready to receive). Once a new send request is received, it switches back to Send.

Half-duplex mode

Data are exchanged between the communication partners in both directions in alternation. Half-duplex operation means that one communication partner is transmitting at one time and the other communication partner is receiving. In this case, a wire is used alternately for sending and receiving.

Full duplex operation

Data are exchanged between one or more communication partners in both directions simultaneously; both sending and receiving can take place at the same time. This requires a line for transmission and a line for reception.

PtP (Point to Point)

In this operating mode, both participants are equal.

Multipoint slave

The communication module can be used as a multipoint slave.

Multipoint master

The communication module can be used as a multipoint master.

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4 Implementation

PCS 7 enables configuration of Modbus RTU communication for the CM PtP module of the ET 200SP in conjunction with the ET 200SP HA by means of channel blocks in the CFC chart. This chapter will show you which settings should be adjusted for this in the hardware configuration, in CFC engineering and during commissioning.

To this end, a CM PtP module will be configured as master (for recording third-party data) and a CM PtP module as slave (for provision of data from a third-party system). The communication partner in each case in production operations is a Modbus sensor in the slave role or a third-party station as either the master or slave, for example, which use the Modbus RTU.

4.1 Hardware and software components used

The application was created with the following components:

Hardware components

Table 4-1 Hardware components used

Component	Qty.	Item number	Note
IM 155-6 PN	1	6DL1155-6AU00-0PM0	FW V1.2
BA 2xRJ45	1	6DL1193-6AR00-0AA0	
Carrier module (Single)	1	6DL1193-6BH00-0SM0	
Server module	1	6DL1193-6PA00-0AA0	
Base Unit	2	6ES7193-6BP00-0DA1	
CM PtP Communication Module	2	6ES7137-6AA01-0BA0	
CPU 410-5H	1	6ES7410-5HX08-0AB0	

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Note

If you use other hardware than that used in the example project, such as a redundant setup, you must make the corresponding changes in the hardware configuration. In this case, note the modules approved for use with PCS 7.

Standard software components

Table 4-2 Software components used

Component	Note
PCS7 V9.1 SP2	
PCS 7 Basic Library	Version 9.1 SP2
PCS 7 APL (Advanced Process Library)	Version 9.1 SP2

4.2 Hardware setup

The SIMATIC ET 200SP HA is connected to an IO controller via PROFINET. Depending on the requirements, the IO station can connected to the IO controller either singularly (S1, S2) or redundantly (R1). When installing the CM PtP, note the setup rules of the SIMATIC ET 200SP HA:

Readme

References

FAQ: Which additional modules can be used on the SIMATIC ET 200SP HA and what do you have to watch out for in the slotting sequence?

https://support.industry.siemens.com/cs/ww/en/view/109811985

Wiring

The Base Unit of the CM PtP module is wired differently depending on the desired protocol type, as shown in the tables below.

RS 485

Table 4-3 RS 485 wiring

CM Master		CM Slave	
Description	**Pin**	**Pin**	**Description**
T(A)/R(A)	12	12	T(A)/R(A)
T(B)/R(B)	14	14	T(B)/R(B)
GND	15	15	GND
GND	16	16	GND

RS 422

Table 4-4 RS 422 wiring

CM Master		CM Slave	
Description	**Pin**	**Pin**	**Description**
T(A)-	11	12	R(A)-
R(A)-	12	11	T(A)-
T(B)+	13	14	R(B)+
R(B)+	14	13	T(B)+
GND	15	15	GND
GND	16	16	GND

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RS 232

Here, at least the pins for RXD, TXD and GND must be used.

Table 4-5 RS 232 wiring

CM Master		CM Slave	
Description	**Pin**	**Pin**	**Description**
RXD	2	1	TXD
TXD	1	2	RXD
RTS	3	4	CTS
CTS	4	3	RTS
CSR/DSR	6	5	DTR
DTR	5	6	CSR/DSR
GND	10	9	GND
GND	9	10	GND

Readme

References

CM PtP interface names:

https://support.industry.siemens.com/cs/ww/en/view/59057093

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4.3 Hardware configuration

The hardware configuration described below builds on an existing PCS 7 project with an already configured SIMATIC ET 200SP HA station.

By selecting the ET 200SP HA station, the station's individual slots can be displayed together with any already configured modules, if applicable.

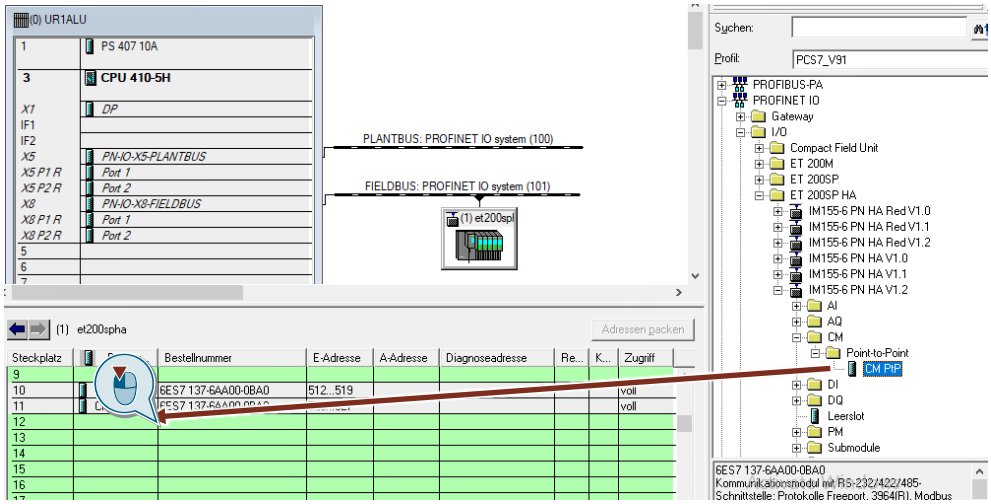
The CM PtP module is located in the PCS 7 catalog in the "CM" subfolder → "Point-to-Point" under the name "CM PtP" of the configured ET 200SP HA station.

Note

The configured version of the ET 200SP HA must be at least version 1.2.

The CM PtP module is dragged onto the slot corresponding to the wiring.

Figure 4-1 Hardware configuration: Adding CM PtP modules to ET 200SP HA



Note

The hardware catalog only contains the CM PtP module (MLFB 6ES7137-6AA00-0BA0).

The CM PtP V2 module (6ES7137-6AA01-0BA0) is the spare-part-compatible successor and can be inserted in this configuration.

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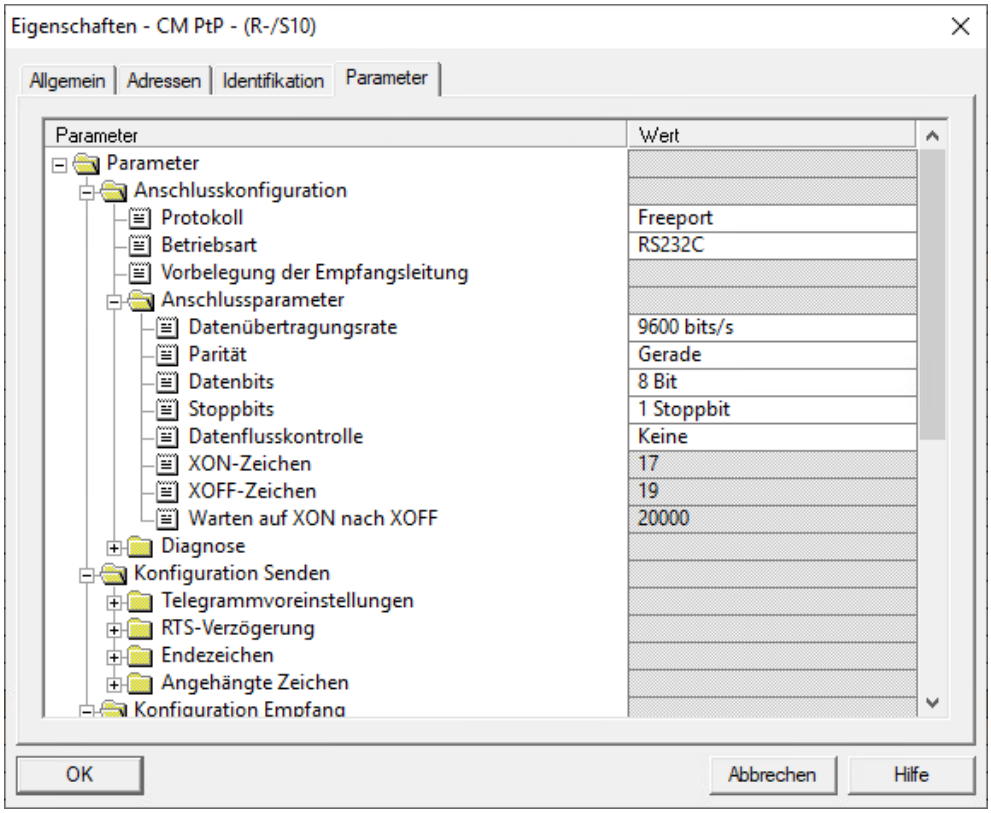
Right-clicking on the added module, then clicking on the "Object properties..." option opens the module settings menu. In the "Parameters" section, you can change typical settings for modules, such as the type of the potential module. Specific parameters for the CM PtP module such as the protocol or mode can be adjusted in the "Connection configuration" tab. With this module, the settings in the "Connection configuration" tab and "Connection parameters" tab will be overwritten by the channel blocks in the CFC chart, configured later. However, it is recommended to set these parameters to be identical to the ones in the CFC charts.
This prevents a malfunction of the CM PtP modules and an interruption of communication during H-CiR download, which among other things is required when adding another hardware module to the SIMATIC ET 200SP HA.

Figure 4-2 Hardware configuration: CM PtP module parameter settings



Note

Parameter settings of the CM PtP, which can be made both in the hardware configuration as well as in the CFC chart, should be identical in order to better ensure reliable communication after carrying out the H-CiR functionality.

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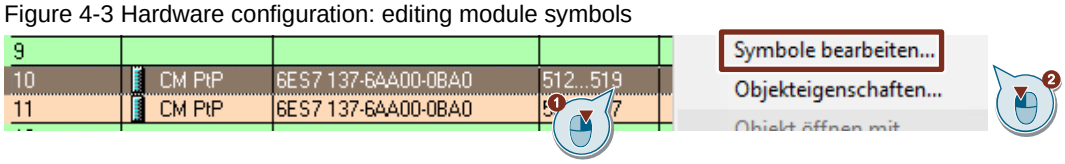
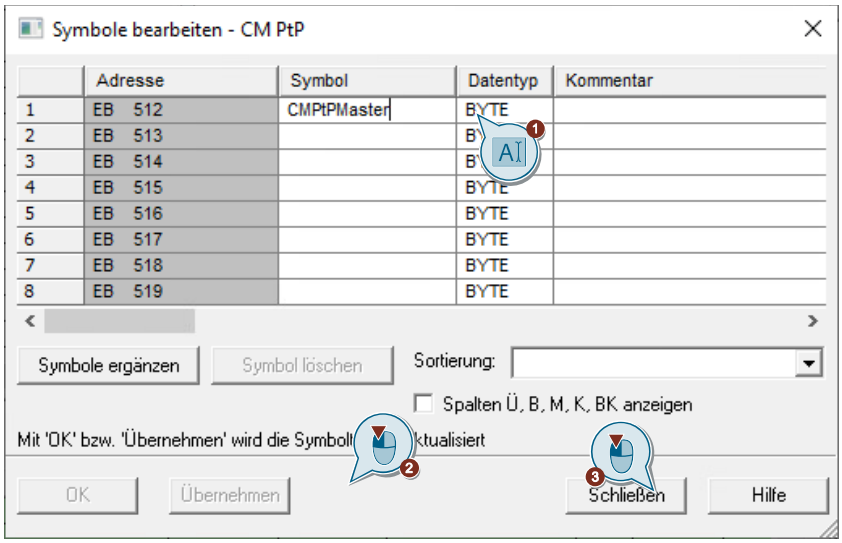
For later CFC engineering, a symbol must be created for the first input byte of a CM PtP: Select module → right-click on "E address" → "Edit symbols...".

Figure 4-3 Hardware configuration: editing module symbols



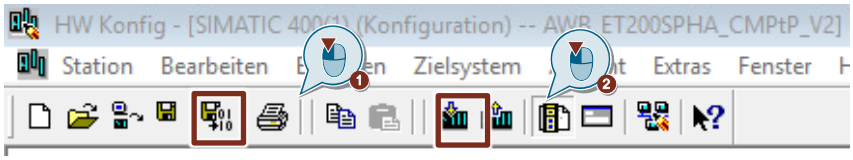
Under "Symbol", assign the first input byte (EB) of the module an appropriate name and confirm your entry → "Apply" → "Close".

Figure 4-4 Hardware configuration: symbol editing dialog



Afterwards, the hardware configuration is compiled by clicking "Save and compile" (1), then downloaded to the CPU with "Download target system" (2).

Figure 4-5 Hardware configuration: save, compile and download



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4.4 CFC engineering

4.4.1 Function blocks used

Note PCS 7 V9.1 SP2 or later is a prerequisite for use.

Channel blocks

The program blocks required for communication are located in the PCS 7 AP Library V9.1 → Block+Templates\ → Comm.

Table 4-6 Overview of channel blocks

Channel block	Description	FB number
MBComm	Global communication block	FB 1941
MBRdCoil	Reads slave coils as Modbus master	FB 1942
MBRdReg	Reads slave registers as Modbus master	FB 1943
MBWrCoil	Writes slave coils as Modbus master	FB 1944
MBWrReg	Writes slave registers as Modbus master	FB 1945
MBRcvReg	Receives register values from the Modbus master as slave	FB 1946
MBPdReg	Provides registers for a Modbus master as slave	FB 1947

The function blocks call the following system functions in the background:

Channel block	FB number
Send_Config	FB1991
Receive_Config	FB1992
Send_P2P	FB1993
Receive_P2P	FB1994
Receive_Reset	FB1995
Modbus_Comm_ Load	FB1996
Modbus_Master	FB1997
Modbus_Slave	FB1998

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Diagnostic block

For each configured CM PtP module, a diagnostic block is created and interconnected in the @charts during compilation of the CFC charts with driver generator.

Table: Diagnostic block

Table 4-7 Diagnostics module for Modbus communication

Channel block	Description	FB number
MOD_CM	Diagnostics module for Modbus communication	FB 221

The block issues messages about failures, wire breaks, power supply faults, incorrectly inserted modules or timeout.

Inputs and outputs of the channel blocks

The following contains a brief description of the parameters of the channel blocks used in the application example. The step-by-step instructions later on will go into the most relevant parameters in more detail.

MBComm

MBComm represents the basis for connecting additional channel blocks. One such block must be created for every CM PtP module. A maximum of ten channel blocks may be connected to MBComm.

Table 4-8 MBComm parameters

Parameter	Data type	Declaration	Available options
BAUD	DInt	IN	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200 in Bit/s
STOP_BITS	Byte	IN	Stop bits: • 1 = 1 stop bit • 2 = 2 stop bits
PARITY	Int	IN	Parity of the port: • 0 = No parity • 1 = Odd parity • 2 = Even
FLOW_CTRL	Int	IN	Flow control: • 0 = No flow control • 1 = Hardware RTS always ON • 2 = Hardware RTS switched
RTS_ON_DLY	Int	IN	Number of milliseconds to wait after activating RTS before starting transmission of send data. This parameter is only valid if the hardware flow control is activated. The valid range is 0 to 65535 ms. The value 0 deactivates the function.
RTS_OFF_DLY	Int	IN	IN Number of milliseconds to wait after transmitting send data before turning off RTS: This parameter is only valid if the hardware flow control is activated. The valid range is 0 to 65535 ms. The value 0 deactivates the function.
RESP_TO	USInt	IN	Time interval during which the master waits for an answer. The valid range is 5 to 65535 ms.
RETRIES	Int	IN	The number of repeat communication attempts made by the master before an error is issued.
ICHAR_GAP	WORD	IN	Delay for the character spacing between the characters. This parameter is specified in milliseconds and is used to increase the expected time between received characters. The appropriate number of bit

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Parameter	Data type	Declaration	Available options
			times for this parameter is added to the Modbus default of 35 bit times (3.5 character times).
LINE_PRE	Byte	IN	Receive wire default: Permissible default states are: • 0 = "No" default • 1 = Signal R(A)=5V, Signal R(B)=0 V (break detection): This default state allows for break detection. Only selectable with: "Full duplex (RS422) four-wire operation (point-to-point connection)" and "full duplex (RS422) four-wire operation (multipoint slave)". • 2 = Signal R(A)=0 V, Signal R(B)=5 V: This default state corresponds to the idle state (no transmission active). With this default, no break detection is possible.
Physic Mode	Byte	IN	• 0 = Full duplex (RS232) • 1 = Full duplex (RS422) four-wire mode (Point-to-Point) • 2 = full-duplex (RS422) four-wire mode (multipoint master) • 3 = full duplex (RS422) four-wire mode (multipoint slave) • 4 = half duplex (RS485) two-wire mode
IsMaster	Bool	IN	• 0 = Slave •1 = Master
ConOut	Struct	OUT	Connections to channel blocks
TagCount	Int	OUT	Number of blocks registered on MBComm
ConfInit	Bool	OUT	• 1 Configuration successfully applied
ConfError	Bool	OUT	• 1 Configuration could not be applied successfully
ConfStat	Word	OUT	Status word of the configuration

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Readme

References

Table taken from chapter 3.2.2 and adapted for the CM PtP module:

https://support.industry.siemens.com/cs/ww/en/view/69124220

MBPdReg

With the "Modbus Provide Registers" block, the slave provides register values (Int) for a master.

Table 4-9 MBPdReg parameters

Parameter	Data type	Declaration	Available options
Enable	Bool	IN	• 0 Block is deactivated • 1 block registered with MBComm
ConIn	Struct	IN	Connected with output parameter ConOut of MBComm
ModbAdr	Int	IN	Modbus slave address
DataAddr	DInt	IN	Start memory address
PV_In_1 – PV_In_8	Int	IN	Input values of register (INT variables)
Bad	Struct	OUT	• 1 Error in the configuration, Enable or ConIn deactivated
Status	DWord	OUT	Status word about the status of the block
Initialized	Bool	OUT	• 1 Block initialized with MBComm

MBRcvReg

The slave receives register values (Int) from a master with the block "Modbus Receive Registers".

Table 4-10 MBRcvReg parameters

Parameter	Data type	Declaration	Available options
Enable	Bool	IN	• 0 Block is deactivated • 1 Block registered with MBComm
ConIn	Struct	IN	Connected with output parameter ConOut of MBComm
ModbAdr	Int	IN	Modbus slave address
DataAddr	DInt	IN	Start address in Modbus slave
SimOn	Struct	IN	• 0 Simulation deactivated • 1 simulation activated
SimPV_In_1	Struct	IN	Simulation value PV_In_1
SubsPV_In_1	Int	IN	Replacement value for PV_In_1
Bad	Bool	OUT	• 1 Error in the configuration
Status	DWord	OUT	Status word about the status of the block
Initialized	Bool	OUT	• 1 Block initialized with MBComm
PV_Out_1 – PV_Out_8	INT	OUT	Register data received
NewData	Bool	OUT	• 1 New data received in this cycle

MBWrCoil

The master writes coil values (Bool) to a slave with the "Modbus Write Coil" block.

Table 4-11 MBWrCoil parameters

Parameter	Data type	Declaration	Available options
Enable	DInt	IN	• 0 Block is deactivated • 1 Block registered with MBComm
EnCom	Bool	IN	• 1 Modbus communication of the block is activated
ConIn	Struct	IN	Connected with output parameter ConOut of MBComm
ModbAdr	Int	IN	Modbus slave address
DataAddr	DInt	IN	Start memory address
Num	Int	IN	Number of coils to be written
PV_IN_1 – PV_Out_8	Bool	OUT	Coil input data to be written to the slave
CycMin	Int	IN	Minimum number of cycles until next data transfer
CycMax	Int	IN	Maximum number of cycles until next data transfer
Timeout	DInt	IN	Time in ms when "Bad" is "1" after no send
Bad	Struct	OUT	• 1 Error in the configuration
Status	DWord	OUT	Status word about the status of the block
Initialized	Bool	OUT	• 1 Block initialized with MBComm

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MBRdCoil

The master reads coil values (Bool) from a slave with the "Modbus Read Coil" block.

Table 4-12 MBRdCoil parameters

Parameter	Data type	Declaration	Available options
Enable	Int	IN	• 0 Block is deactivated • 1 block registered with MBComm
EnComm	Bool	IN	• 1 Modbus communication of the block is activated
ConIn	Struct	IN	Connected with output parameter ConOut of MBComm
ModbAdr	Int	IN	Modbus slave address
DataAddr	DInt	IN	Start memory address
Num	Int	IN	Number of coils to be read
SimOn	Struct	IN	• 0 Simulation deactivated • 1 Simulation activated • 0 Simulation deactivated • 1 Simulation activated
SimPV_In_1	Struct	IN	Simulation value PV_In_1
Subs_PV_In_1	Bool	IN	Replacement value for PV_IN_1
Timeout	DInt	IN	Time in ms when "Bad" is "1" after no receive
Bad	Struct	OUT	• 1 Error in the configuration
Status	DWord	OUT	Status word about the status of the block
Initialized	Bool	OUT	• 1 initialized
PV_Out_1 – PV_Out_8	Struct	OUT	Output data of read coils
NewData	Bool	OUT	• 1 New data received in this cycle

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MBWrReg

The master writes register values (Int) to a slave with the "Modbus Write Registers" block.

Table 4-13 MBWrReg parameters

Parameter	Data type	Declaration	Available options
Enable	Bool	IN	• 0 Block is deactivated • 1 block registered with MBComm
EnComm	Bool	IN	• 1 Modbus communication of the block is activated
ConIn	Struct	IN	Connected with output parameter ConOut of MBComm
ModbAdr	Int	IN	Modbus slave address
DataAddr	DInt	IN	Start memory address
Num	Int	IN	Number of the block's registers to be written
PV_In_1 – PV_In_8	Int	IN	Input values to be written to the slave
CycMin	Int	IN	Minimum number of cycles until next data transfer
CycMax	Int	IN	Maximum number of cycles until next data transfer
Timeout	DInt	IN	Time in ms when "Bad" is "1" after no send
Bad	Struct	OUT	• 1 Error in the configuration
Status	DWord	OUT	Status word about the status of the block
Initialized	Bool	OUT	• 1 Block initialized with MBComm

MBRdReg

The master reads register values (Int) from a slave with the "Modbus Read Registers" block.

Table 4-14 MBRdReg parameters

Parameter	Data type	Declaration	Available options
Enable	Bool	IN	• 0 Block is deactivated • 1 block registered with MBComm
EnComm	Bool	IN	• 1 Modbus communication of the block is activated
ConIn	Struct	IN	Connected with output parameter ConOut of MBComm
ModbAdr	Int	IN	Modbus slave address
DataAddr	DInt	IN	Start memory address
Num	Int	IN	Number of the block's registers to be received
SimOn	Struct	IN	• 0 Simulation deactivated • 1 simulation activated
SimPV_In_1	Struct	IN	Simulation value PV_In_1
SubsPV_In_1	Int	IN	Replacement value for PV_IN_1
Timeout	DInt	IN	Time in ms when "Bad" is "1" after no receive
Bad	Struct	OUT	• 1 Error in the configuration
Status	DWord	OUT	Status word about the status of the block
Initialized	Bool	OUT	• 0 not initialized • 1 initialized
PV_Out_1 – PV_Out_8	Struct	OUT	Input values, received register data
NewData	Bool	OUT	• 1 Error in the configuration

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4.4.2 CFC instructions

This chapter explains all the steps to commission the CM PtP, either as master or as slave. This application example uses the serial standard RS 232. Only the settings required for commissioning will be addressed in this chapter.
Optional changes will be mentioned or can be found in the previous chapter 4.4.1.

The CFC charts for Modbus communication must be created or extended in the Plant View in the hierarchy folder of the CPU that is connected with the ET 200SP HA.

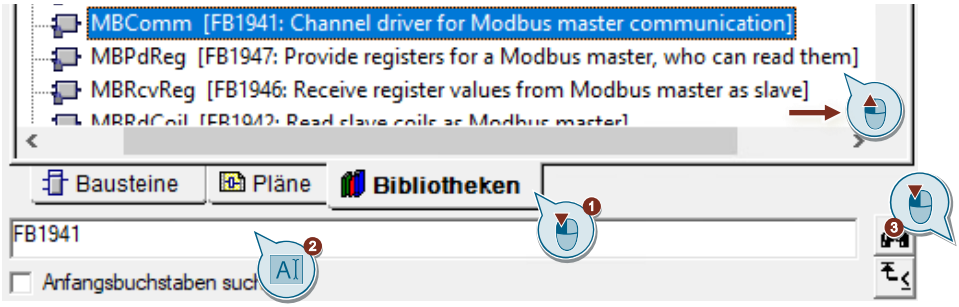
MBComm

An "MBComm" channel block must be created for each CM PtP module. The channel blocks can be found under "Libraries". You can search for them with the navigation or by entering the function block number or name. A function block is added to the CFC by dragging and dropping.

Note

A maximum of 10 channel blocks can be connected to an MBComm. Exactly one MBComm can be connected to a CM PtP module.

Figure 4-6 Adding MBComm



The input "CM_Start" must be linked with the first input byte of the CM PtP module. To do this, a symbol is created in the hardware configuration for the corresponding address (see 4.3 Hardware configuration), then the address is linked in the CFC chart:
Right-click on "CM_Start" → "Text interconnect..." → select desired symbol.

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Figure 4-7 Interconnecting CM_Start with symbol (1/2)

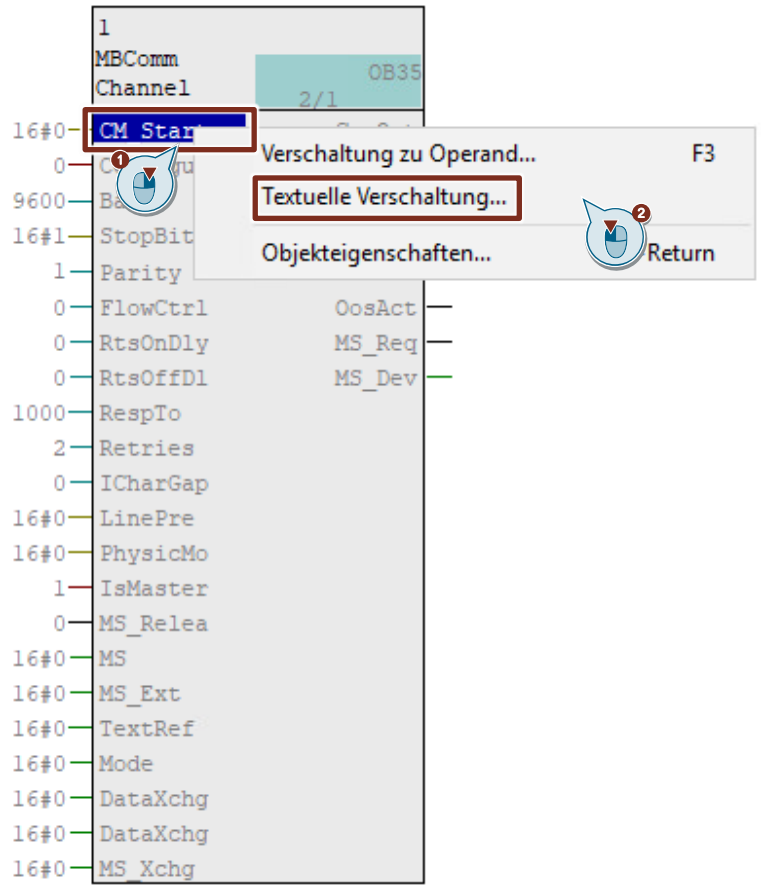
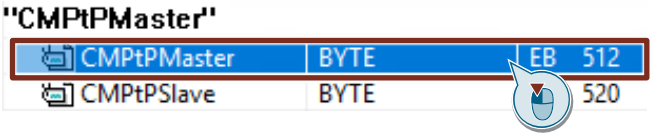
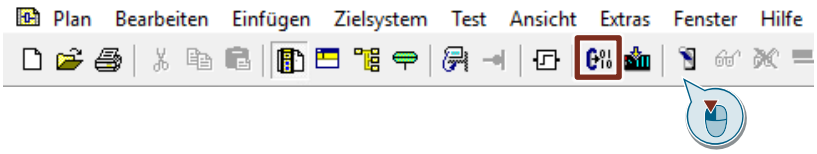


Figure 4-8 Interconnecting CM_Start with symbol (2/2)



Clicking on "Compile" will open the dialog with compilation settings.

Figure 4-9 CFC chart compile button



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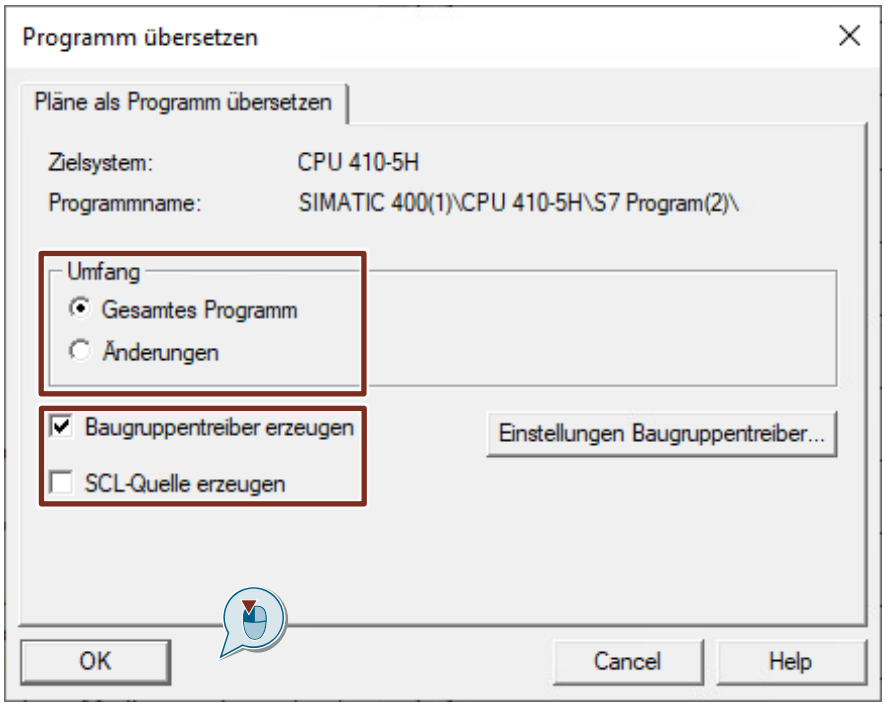
Here you should make the following settings and confirm with "OK".

- **Scope** → "Entire program"
- **Generate module drivers** → "checked"

Figure 4-10 CFC compile dialog



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Then a name must be assigned for the "MBComm" block.

Right-click on an empty area of MBComm → "Object Properties..." → enter desired name under "Name" → confirm with "OK".

Figure 4-11 Opening MBComm Object Properties

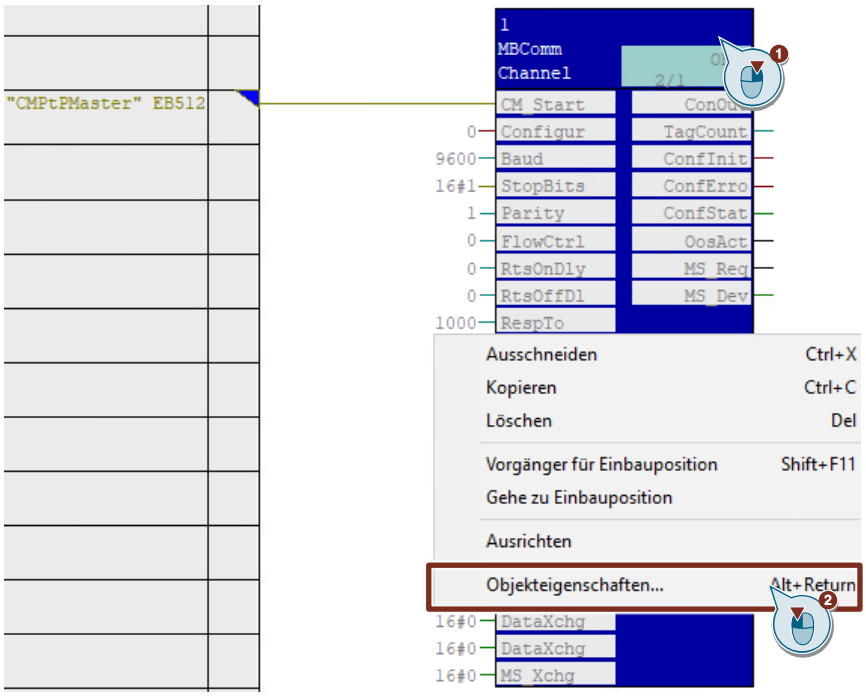
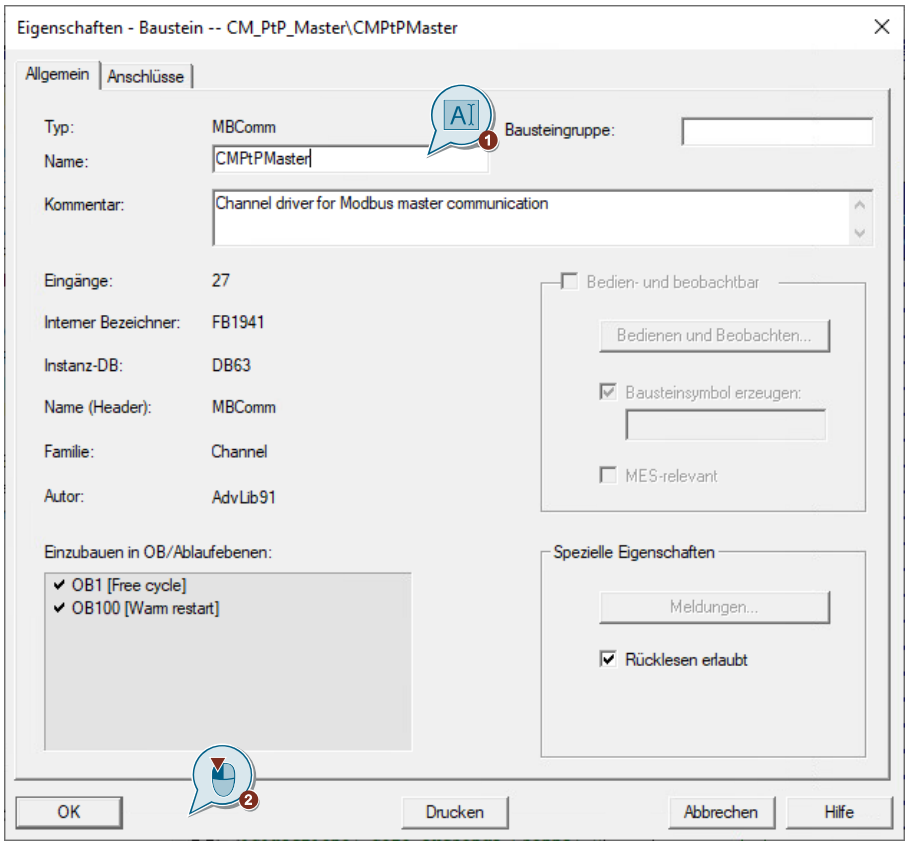


Figure 4-12 Naming MBComm block



The name change and previous compilation of the CFC chart displays the system interconnections to the @charts.

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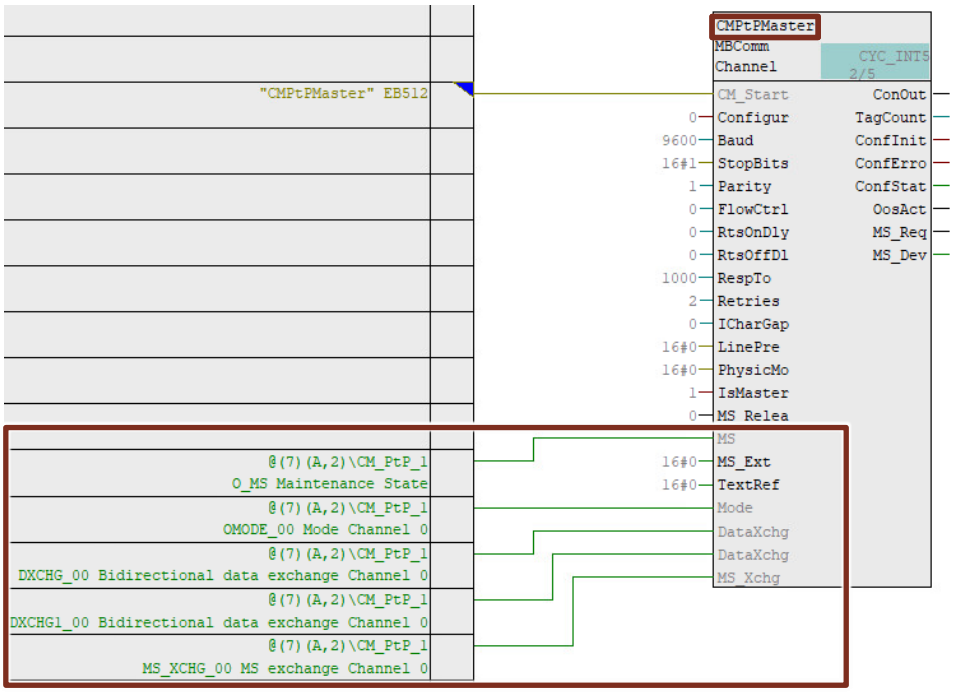
Figure 4-13 MBComm, interconnected parameters after initial compilation



Afterward, the various input parameters can be modified as needed.

In this example, the CM PtP serves as the master in RS 232 mode. All parameters for this have already been set by default.

- **IsMaster** (Bool; setting of CM PtP module as master or slave) → **"1"** for master
- **PhysicMode** (Byte; communication protocol) → "**16#0**" for RS 232

The "Configure" parameter is needed later during commissioning to set the Modbus communication settings (with an edge).

Note

The other input parameters must be adapted to suit the communication partner. In this application example, the communication partner has the same parameters as the default input parameters of MBComm.

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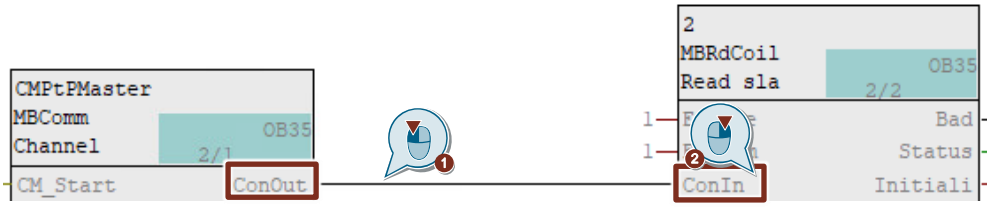
The other desired channel blocks are used on MBComm and are connected with the associated input parameter "ConIn" via the output parameter "ConOut" of "MBComm" Here, remember to always use MBComm in the same cyclic organization block as all the connected blocks.

The **"MBRdCoil"** block is configured in this example to read the coils of a slave:

Add "MBRdCoil" block → click on "ConOut" output parameter of MBComm → click on "ConIn" input parameter of "MBRdCoil".

Figure 4-14 Connecting MBComm with MBRdCoil



After this, the following parameters must be modified:

- **ModbAdr** (Int; Modbus slave address of the partner) → **"2"**
- **DataAddr** -> (DInt; start of the desired memory range 1-19999 from which you wish to *read*) → "**9"**
- **Num** (Int; number of coils that you wish to *receive* 1-8) → "**8"**
- **PV_Out_[1-8]** (STRUCT of 1 Bool (value) and 1 byte (signal status); output values, that the master read from the slave)

Coils (Bool variables) are written from the master to a slave with the **"MBWrCoil"** block. Here, like with "MBRdCoil", the three parameters described above are likewise required and complement the values to be written:

- **ModbAddr** (Int; Modbus slave address of the partner) → **"2"**
- **DataAdr** (DInt; start of the desired memory range 1-9999 to which you wish to *write*) → "**1"**
- **Num** (Int; number of coils that you wish to *send* 1-8) → "**8"**
- **PV_In_[1-8]** (Bool; input values that must be written to the slave)

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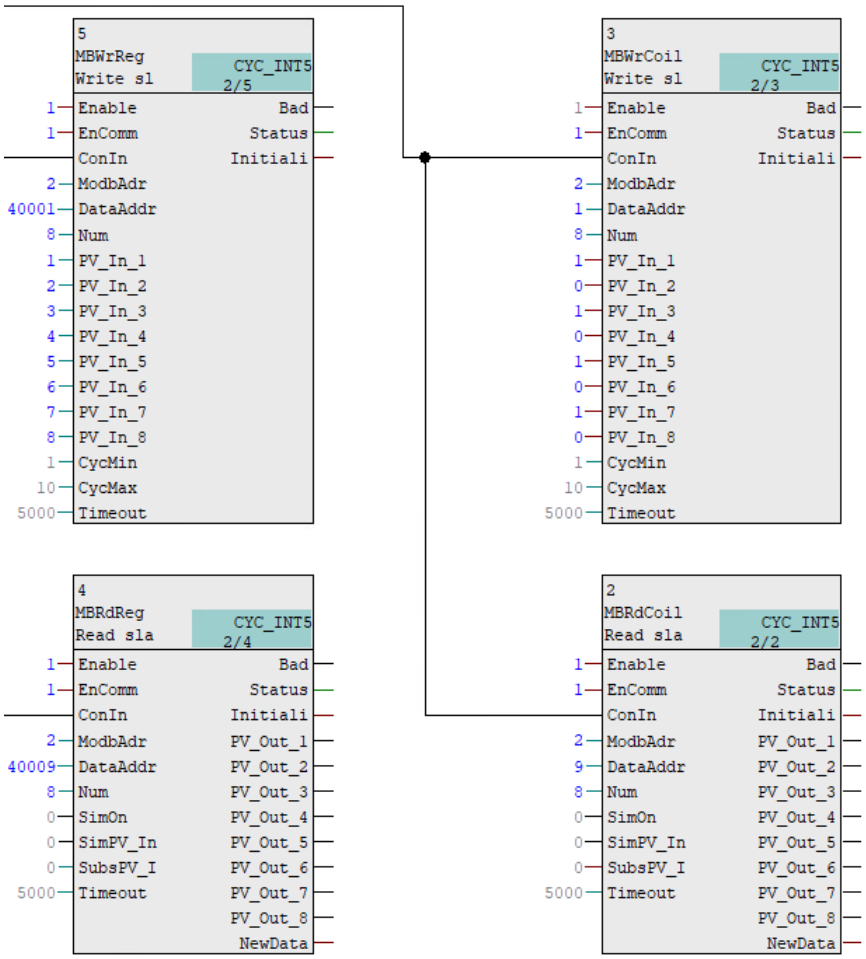
The blocks **"MBRdReg"** and "**MBWrReg"** are structured like "MBRdCoil" and "MBWrCoil". Here, however, the PV variables are Int values and the parameter DataAdr has a different memory range:

- **DataAdr** MBRdReg (DInt; start of the desired memory range 40001-49999) → "**40009"**
- **DataAdr** MBWrReg (DInt; start of the desired memory range 30001-49999) → "**40001"**

Figure 4-15 CFC master example



If the CM PtP module is acting as a slave, a "MBComm" block still has to be created and the parameter inputs must be interconnected with the same settings (identical Baud rate, etc.) as with a master. Here you must not forget to run the block in slave mode:

- **IsMaster** (Bool; setting of CM PtP module as master or slave) → "**0"** for slave

Note If the CM PtP module is used as a slave, then no coils can be written or read, only registers.

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The **MBPdReg** block is required for provision of data to the master by the slave. After this, the following parameters must be modified:

- **ModbAdr** (Int; Modbus slave address of the partner) → **"2"**
- **DataAddr** → (DInt; start of the desire memory range with start addresses 40001 - 40073 from which you wish to *read*) → "**40009"**
- **PV_In_[1-8]** (STRUCT of 1 Int (value) and 1 byte (signal status), input values provided by the slave)

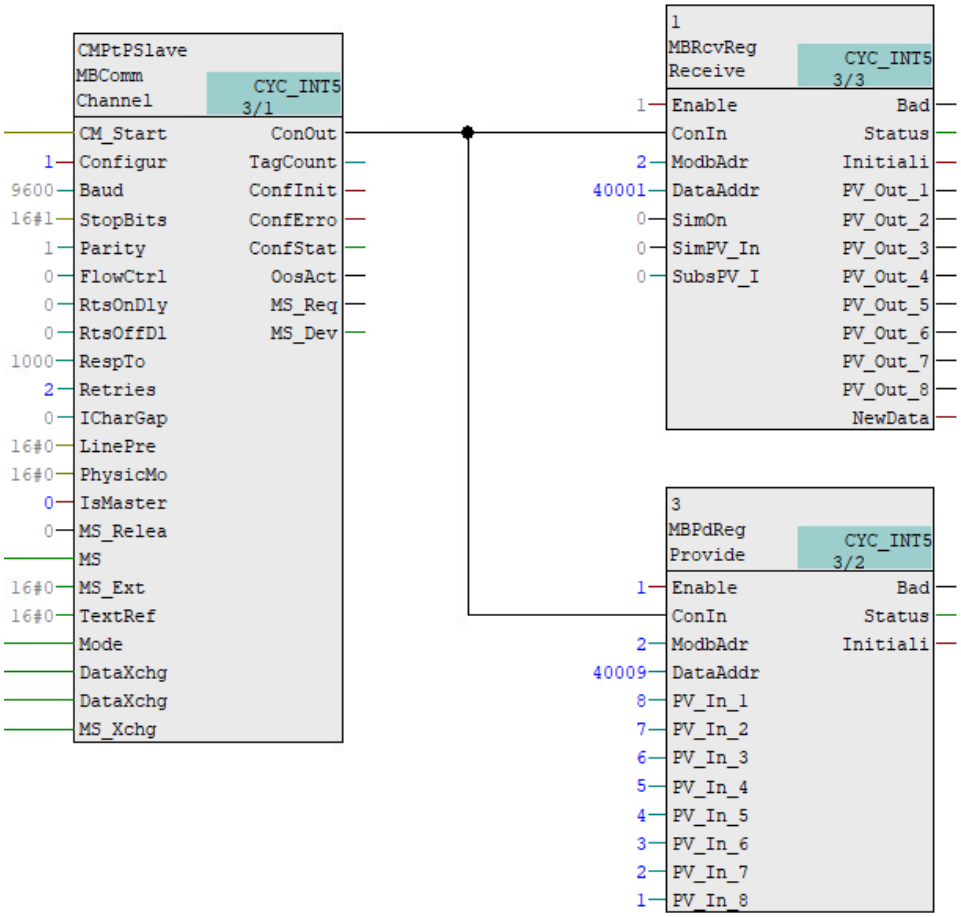
Note

The following start addresses for DataAddr are typical when using Integers (8 bytes): 40001, 40009, 40017, 40025, 40033, 40041, 40049, 40057, 40065, 40073

MBRcvReg for receiving data provided by the master is configured like MBPdReg, but in this case the process values are output:

- **ModbAdr** (Int; Modbus slave address of the partner) → **"2"**
- **DataAddr** → (DInt; start of the desired memory range with start addresses 40001 - 40073 to which you wish to *write* → **"40009"**
- **PV_Out_[1-8]** (STRUCT of 1 Int (value) and 1 byte (signal status), output values that the master previously wrote to the slave)

Figure 4-16 Slave CFC example



Once all desired CFC objects have been created, the program must be recompiled and then downloaded to the CPU. This completes the preliminary configurations for commissioning.

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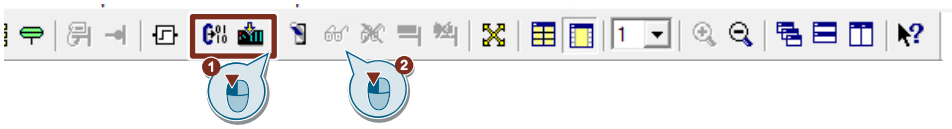
Figure 4-17 CFC chart compile button



Final note

The PV parameters can be interconnected with additional blocks or tags in data blocks. When doing so, pay attention to the structure of the outputs, since in this case for each PV output, a status value is also transmitted alongside with coil/register value.

Figure 4-18 Data block structure, register and coil input & output values

Adresse	Name	Typ	Anfangswert
0.0		STRUCT	
+0.0	MBWrCoil_PV_In_1	BOOL	FALSE
+2.0	MBRdCoil_PV_Out_1	STRUCT	
+0.0	Value	BOOL	FALSE
+1.0	ST	BYTE	B#16#0
=2.0		END_STRUCT	
+4.0	MBWrReg_PV_In_1	INT	0
+6.0	MBRdReg_PV_Out_1	STRUCT	
+0.0	Value	INT	0
+2.0	ST	BYTE	B#16#0
=4.0		END_STRUCT	
+10.0	MBPdReg_PV_In_1	INT	0
+12.0	MBRcvReg_PV_Out_1	STRUCT	
+0.0	Value	INT	0
+2.0	ST	BYTE	B#16#0
=4.0		END_STRUCT	
=16.0		END_STRUCT	

Note

To avoid overcomplication, the PV parameters of the blocks have not been interconnected with data blocks or other data block types in this application example.

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4.4.3 Commissioning

After successful compilation of the CFC charts, the program is downloaded to the CPU. Next, the CFC charts and the values pending at the parameters can be monitored:

1. Press the "Test mode (on/off)" switch.
2. Right-click on block "Watch On".
3. "Ctrl + left-click" keyboard combination on respective parameter you wish to monitor.

Figure 4-19 Activating Test Mode

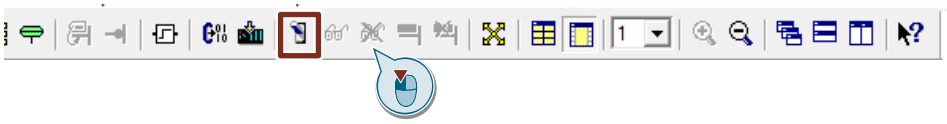
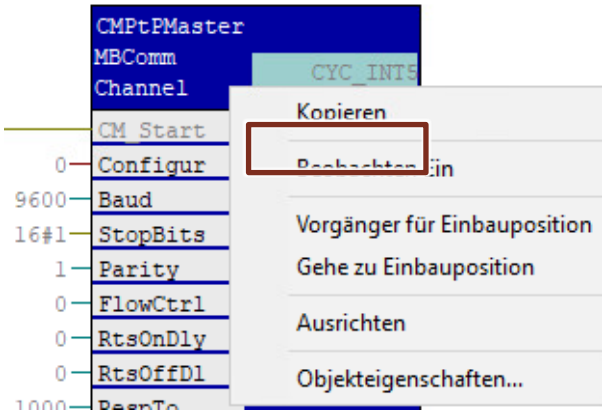
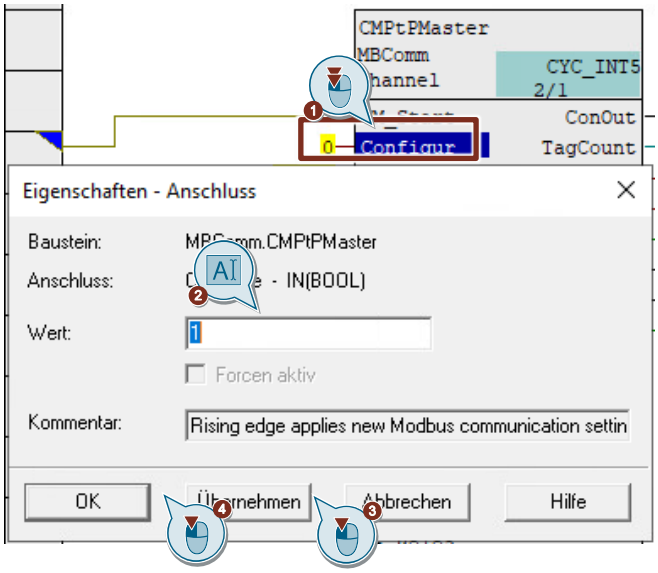


Figure 4-20 Activating Watch On



Communication is initialized with a rising edge at the input parameter "Configure" of the respective "MBComm" block.

Figure 4-21



After this, the following values should be present at the output parameters on "MBComm":

TagCount (Int; number of blocks connected with MBComm)

ConfInit (Bool; 1 if initialization successful) → **"1"**

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ConfError (Bool; 0 if no error pending) → **"0"**

ConfStatus (Word; 16#0 if status "error-free") → **"16#0"**

The following parameters are contained in all connected communication blocks:

- **Enable** (Bool; 1 if block registered with MBComm)
- **EnComm** (*only for master*; Bool; 1 if communication is activated)
- **Bad** (Bool; 0 if communication successful)
- **Status** (DWord; 16#A0000 if communication successful)
- **Initialized** (Bool; 1 if initialized successfully)

There is also an additional parameter for read/receive blocks, but because it appears in the CFC with a delay it is not suitable to Watch, although it can be interconnected with program logic.

- **NewData** (Bool; value 1 if new data were received in this cycle)

This completes commissioning. If the status deviates from the expected value and no data exchange is taking place, chapter 4.5, "Troubleshooting" can provide assistance.

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CFC examples

The following lists example images with Modbus communication from two CM PtP modules.

"Figure 4-22 Coil data transfer" shows how the CM PtP master modules writes coils to a slave and reads them from a slave, including the associated MBComm block.

Figure 4-22 Coil data transfer

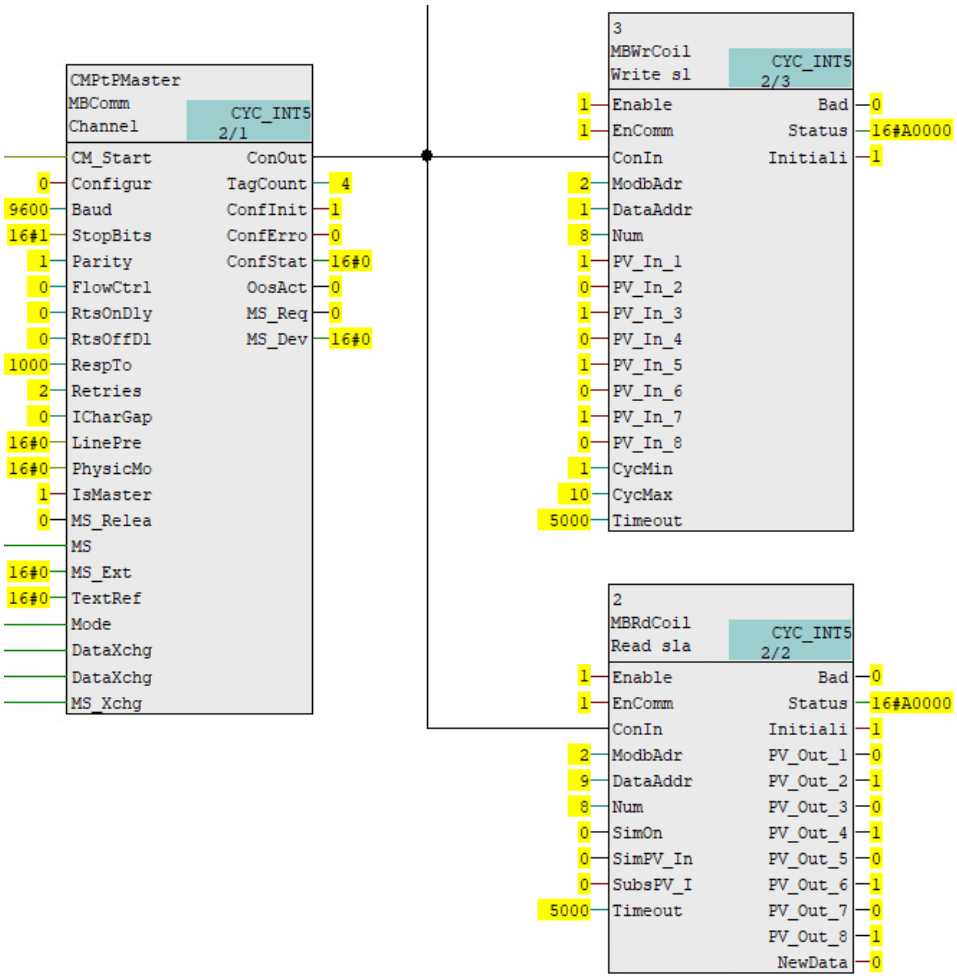

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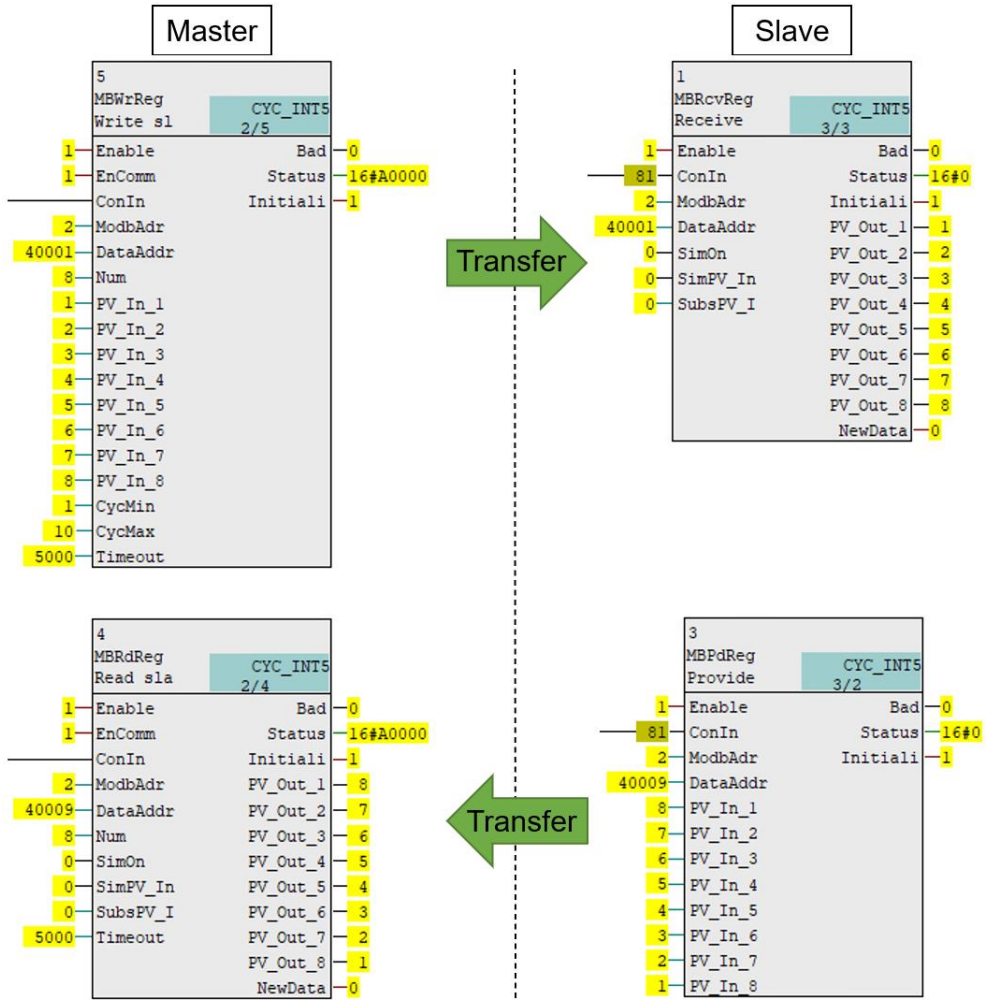
Figure 4-23 Register data transfer shows how the Modbus master provides registers to the slave and vice versa – how the Modbus slave provides registers to the Modbus master.

Figure 4-23 Register data transfer



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4.5 Troubleshooting

The table below lists state codes and error codes of the output parameter "Status" from the channel blocks interconnected at MBComm.

Table 4-15 Error codes

Code	Meaning
16#000A	No new data from MBComm; communication established; status good
16#000B	No new data from MBComm; time error in communication
16#000C	Block is deactivated
16#000D	Communication is disabled
16#000E	Error on higher level; channel/module/rack error
16#000F	Function block attempting to connect with MBComm
16#0010	DATA_ADDR modified, PV_Out valid if the master queries the slave
16#0020	MBComm is configured as slave and not as master, or vice versa

Note

If Enable or EnComm is deactivated on a block that is connected to MBComm, the parameters Bad and Status will show an error.

Readme

References

Chapter 4 of the manual provides verbose information about further error codes:

https://support.industry.siemens.com/cs/ww/en/view/69124220

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5 Restrictions

- The technical specifications of the CM PtP module (chapter 7) must be observed. See:
  https://support.industry.siemens.com/cs/ww/en/view/109793681

- What restrictions are there for active jobs when communicating with "WR_REC/"RD_REC" and "RDREC"/"WRREC" via PROFIBUS DP and PROFINET IO? - See:
  https://support.industry.siemens.com/cs/ww/en/view/15364459

- A maximum of 8 CM PtP modules can be configured in one PROFINET IO system.
  A CM PtP module can only be configured with one MBComm channel block, thus serving either as slave or master with the support of exactly one serial interface.

- No more than ten channel blocks can be connected to the MBComm channel block or have the parameter set to "Enabled". If this is not the case, communication will no longer work for the eleventh block on up. Scheduling can be a workaround for this.

- Parameter settings of the CM PtP module, which can be made both in the hardware configuration as well as in the CFC chart, should be identical in order to ensure more reliable communication after
  executing the H-CiR functionality.

- Approved for PCS 7 CM PtP V1 (6ES7137-6AA00-0BA0), V2 (6ES7137-6AA01-0BA0) can be purchased and used as a replacement part. For more, see the list of approved modules for PCS 7.
  https://support.industry.siemens.com/cs/ww/en/view/109812604

Table 5-1 Supported write and read access operations of the CM PtP

Role	Area	Support
Master	Coils	Yes
	Register	Yes
Slave	Coils	No
	Register	Yes

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6 Appendix

6.1 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.

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support.industry.siemens.com/cs/ww/en/sc/2067

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6.2 Industry Mall

The Siemens Industry Mall is the platform on which the entire siemens Industry product portfolio is accessible. From the selection of products to the order and the delivery tracking, the Industry Mall enables the complete purchasing processing – directly and independently of time and location:
mall.industry.siemens.com

6.3 Links and literature

Table 6-1

Nr.	Thema
\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/109814871
\3\	SIMATIC Process Control System PCS 7 Released modules (V9.1 SP2) https://support.industry.siemens.com/cs/ww/en/view/109812604
\4\	SIMATIC ET 200SP CM PtP https://support.industry.siemens.com/cs/ww/en/view/109793681
\5\	PtP communication instructions used on distributed I/O of an S7-300/400 https://support.industry.siemens.com/cs/ww/en/view/69124220
\6\	CM PtP - Configurations for point-to-point connections https://support.industry.siemens.com/cs/ww/en/view/59057093
\7\	Master-Slave Communication via a CM PtP using the Modbus RTU Protocol https://support.industry.siemens.com/cs/ww/en/view/68202723

6.4 Change documentation

Table 6-2

Version	Date	Modifications
V1.0	11/2022	First version

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