Job List, Data Collector and Marshalling Blocks for the Modbus/TCP Library

"Additional Modbus Blocks" for SIMATIC S7 and PCS 7

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1 Library Overview

What you get

This document describes the "Additional Modbus Blocks" block library. The block library provides you with tested code with clearly defined interfaces. The blocks of the library can be used as a basis for your implementation.

A key concern of this document is to describe

- all blocks of the block library
- the functionality implemented in these blocks

Furthermore, this documentation shows possible fields of application and helps you integrate the library into your STEP 7 project using step-by-step instructions.

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1.1 Different User Scenarios

Possible applications for the "Additional Modbus Blocks" library

SIMATIC Modbus/TCP blocks can be used in S7-300, S7-400 and ET200S CPUs.

1.1.1 Job list blocks in "Job List"

The Modbus/TCP block is edge triggered. A positive edge at the input "ENQ" of the Modbus block triggers one Modbus request.

You can use the block "Job_List" for a cyclical execution of several Modbus jobs.

1.1.2 Data Collectors in "Data Collector blocks for CFC"

The data transferred by the Modbus/TCP block are usually stored in global data blocks.

The Data Collector blocks provide a comfortable way to use the Modbus/TCP block and its data handling in CFC. By storing the transferred data in the instance DB of a Data Collector block, you can realize the supply and the handling of the data easily and comfortable with drag and drop in the CFC chart.

There are 8 function blocks provided, 4 for the connection of inputs and 4 for the connection of outputs.

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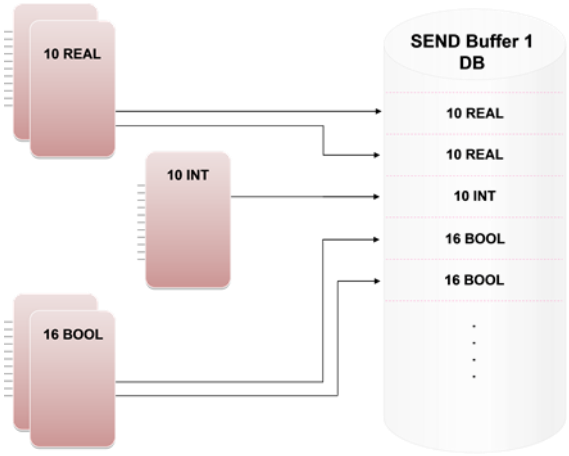
1.1.3 Marshalling blocks in "Marshalling Blocks"

The usage of the marshalling blocks is a further possibility to process the send and receive data. The marshalling blocks are the interface to the user program. They enable the access to the global data blocks with the data, which should be sent or which were received by means of the Modbus/TCP block.

Send Marshalling Blocks

There are blocks for marshalling 10 real-, 10 integer- and 16 bool values into the "send buffer" in the global data block available.

Figure 1-1

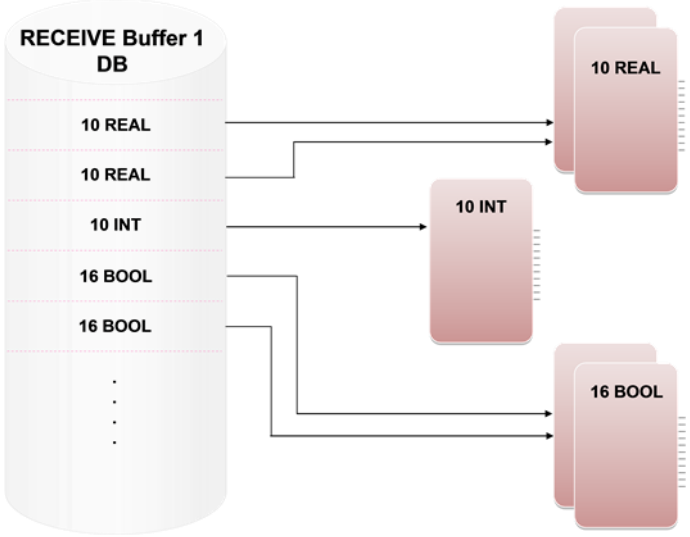


Receive Marshalling Blocks

The receive marshalling blocks act controlled. Only if the input "new data received" is set to TRUE, the marshalling blocks show the data. In addition in case of errors (e. g. a connection interrupt) it is possible to use substitute values. The receive marshalling blocks contain PCS7 quality codes.

There are blocks available for the output of 10 real, 10 integer and 16 bool values from the "receive buffer" of the global data block.

Figure 1-2



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1.2 Hardware and Software Requirements

Requirements for this library

To be able to use the functionality of the library described in this document, the following hardware and software requirements must be met:

Hardware

Table 1-1

No.	Component	For example	Quantity	Alternative
1	SIMATIC S7-CPU	CPU 414-2DP	1	any S7-300/400/ET200S CPU

Software

Table 1-2

No.	Component	For example	Quantity
1	Programming software Step7 V5.x	Step7 V5.5	1
2	For the Data Collector blocks: CFC V7 or V8	CFC V7.1	1
3	Modbus/TCP blocks	Modbus/TCP Red V2.1	1

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1.3 Resources of the Library

What will you find in this section?

Please find below an overview of the used work memory which the blocks of the library "Additional Modbus Blocks" allocate.

Used memory of the single blocks

Table 1-3

Block	Symbol	Used work memory
Job List		
FB 912	Job_List_SCL	754 Byte
FB 913	Job_List_STL	452 Byte
Data Collectors for CFC		
FB 900	MB_IN_R	44 Byte
FB 901	MB_OUT_R	44 Byte
FB 902	MB_IN_W	44 Byte
FB 903	MB_OUT_W	44 Byte
FB 904	MB_IN_B	44 Byte
FB 905	MB_OUT_B	44 Byte
FB 910	MB_IN_I	44 Byte
FB 911	MB_OUT_I	44 Byte
Marshalling Blocks		
FB 600	RCV_BIT	1418 Byte
FB 601	SND_BIT	632 Byte
FB 602	RCV_INT	1110 Byte
FB 603	SND_INT	584 Byte
FB 604	RCV_REAL	1118 Byte
FB 605	SND_REAL	584 Byte

NOTE The blocks listed in Table 1-3 are available as open source code. The block numbers can be changed according to the project.

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2 Blocks of the Library

What will you find in this section?

This chapter lists and explains all blocks of "Additional Modbus Blocks" library.

2.1 List of the Blocks

The following table lists all blocks of the "Additional Modbus Blocks" library.

Table 2-1

Block	Symbol	Description
Job List		
FB 912	Job_List_SCL	Job list programmed in SCL
FB 913	Job_List_STL	Job list programmed in STL
Data Collectors for CFC		
FB 900	MB_IN_R	Data block for input real values
FB 901	MB_OUT_R	Data block for output real values
FB 902	MB_IN_W	Data block for input word values
FB 903	MB_OUT_W	Data block for output word values
FB 904	MB_IN_B	Data block for input boolean values
FB 905	MB_OUT_B	Data block for output boolean values
FB 910	MB_IN_I	Data block for input integer values
FB 911	MB_OUT_I	Data block for output integer values
Marshalling Blocks		
FB 600	RCV_BIT	Receive marshalling block for boolean values
FB 601	SND_BIT	Send marshalling block for boolean values
FB 602	RCV_INT	Receive marshalling block for integer values
FB 603	SND_INT	Send marshalling block for integer values
FB 604	RCV_REAL	Receive marshalling block for real values
FB 605	SND_REAL	Send marshalling block for real values

NOTE The blocks listed in Table 2-1 are available as open source code. The block numbers can be changed according to the project.

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2.2 Explanation of the Blocks

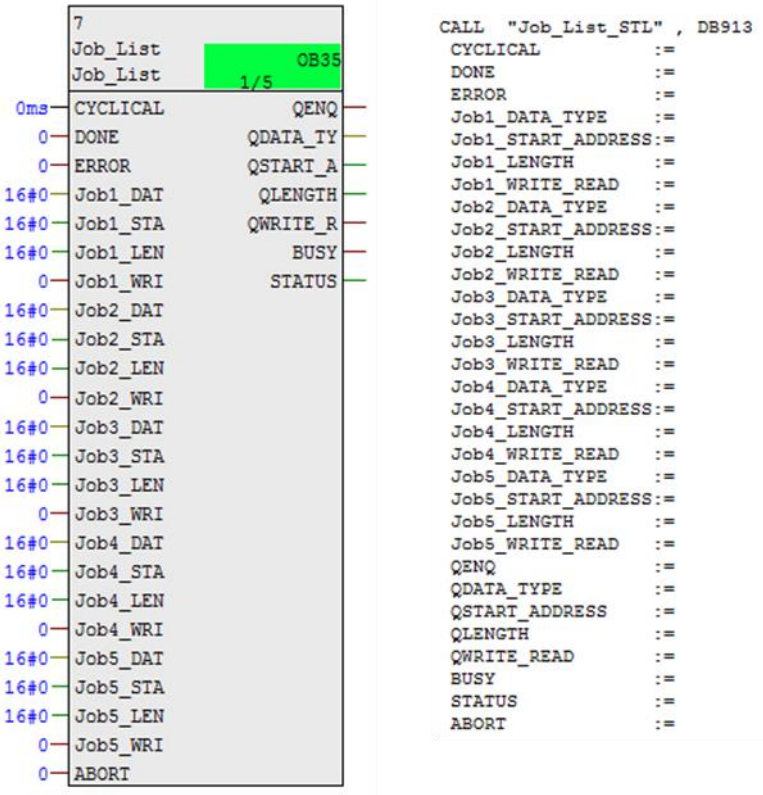
2.2.1 "Job List": FB Job_List_SCL and FB Job_List_STL

General

Two job list blocks are available, one is written in SCL and one is written in STL. The functionality of both blocks is the same.

Block interface

Figure 2-1



Principle of operation

By means of the block "Job_List" a job list for the Modbus/TCP block is realizable. It provides the possibility to start different Modbus jobs cyclically.

The outputs QENQ, QDATA_TYPE, QSTART_ADDRESS, QLENGTH and QWRITE_READ have to be connected to the corresponding inputs of the Modbus/TCP block. The outputs DONE and ERROR of the Modbus/TCP block have to be connected to the "Job_List" block as well.

The different jobs resp. requests are parameterized at the inputs Job1_x to Job5_x.

The time at the input CYCLICAL defines after how many milliseconds the job list is executed. When the time CYCLICAL elapses, the jobs parameterized at Job_x are executed sequentially.

If the time CYCLICAL elapses while the job list is executed, the information A089 is displayed at the output STATUS. The execution of the jobs already running is

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carried on. As soon as the last job is finished, the job list is started immediately with the first job.

With CYCLICAL = 0ms the job list is not executed. When the time CYCLICAL is set to 0ms during runtime, the actual executed job list will be completed. After the last job is finished the execution of the job list is stopped.

By setting Jobx_DATA_TYPE = 0 a job can be skipped.

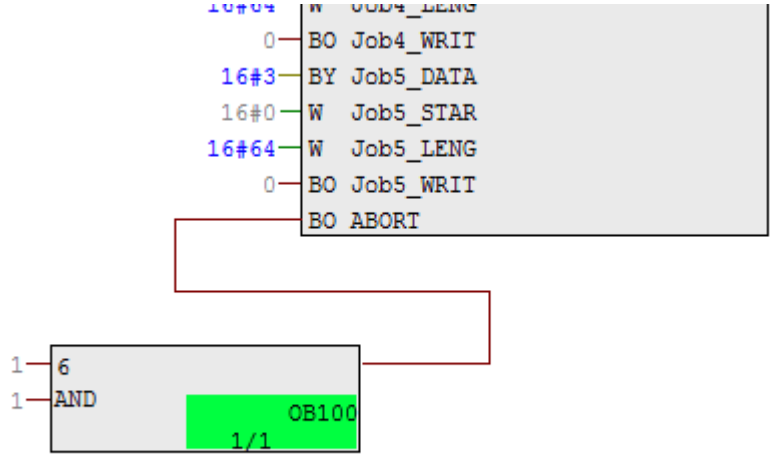
With ABORT = TRUE the job list is cancelled. The running job will be completed. No further jobs are started until the time CYCLICAL elapses. Then the job list starts with the first job.

The function block provides 5 jobs by default. The number of jobs can be increased if necessary. To achieve this, the following changes are mandatory:

- Open the source of the job list block.
- Copy the inputs Job5_DATA_TYPE, Job5_START_ADDRESS, Job5_LENGTH and Job5_WRITE_READ and insert them below job5.
- Rename the inputs to Job6_DATA_TYPE, Job6_START_ADDRESS, Job6_LENGTH and Job6_WRITE_READ etc.
- Adjust the static variable Count_of_Jobs according to your changes.

Note: If a restart (warm restart) of the CPU is carried out during program execution of the Job List, the Job List will not be reset. Therefore the input Abort should be set to TRUE in OB100 in order to reset the Job List. This way the first job will be executed after a restart.

Figure 2-2 Abort of Job List in CFC



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Input parameters

Table 2-2

Parameter	Data type	Description
CYCLICAL	TIME	> 0ms: Cyclical execution of the job list
DONE	BOOL	Positive acknowledgement of the Modbus/TCP block
ERROR	BOOL	Negative acknowledgement of the Modbus/TCP block
Job1_DATA_TYPE	BYTE	1. Job: Data type, 0 = not carried out
Job1_START_ADDRESS	WORD	1. Job: Start address
Job1_LENGTH	WORD	1. Job: Length
Job1_WRITE_READ	BOOL	1. Job: Write/read
Job2_DATA_TYPE	BYTE	2. Job: Data type, 0 = not carried out
Job2_START_ADDRESS	WORD	2. Job: Start address
Job2_LENGTH	WORD	2. Job: Length
Job2_WRITE_READ	BOOL	2. Job: Write/read
Job3_DATA_TYPE	BYTE	3. Job: Data type, 0 = not carried out
Job3_START_ADDRESS	WORD	3. Job: Start address
Job3_LENGTH	WORD	3. Job: Length
Job3_WRITE_READ	BOOL	3. Job: Write/read
Job4_DATA_TYPE	BYTE	4. Job: Data type, 0 = not carried out
Job4_START_ADDRESS	WORD	4. Job: Start address
Job4_LENGTH	WORD	4. Job: Length
Job4_WRITE_READ	BOOL	4. Job: Write/read
Job5_DATA_TYPE	BYTE	5. Job: Data type, 0 = not carried out
Job5_START_ADDRESS	WORD	5. Job: Start address
Job5_LENGTH	WORD	5. Job: Length
Job5_WRITE_READ	BOOL	5. Job: Write/read
ABORT	BOOL	TRUE: Cancel the running job list

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Output parameters

Table 2-3

Parameter	Data type	Description
QENQ	BOOL	Start the execution of the Modbus/TCP block
QDATA_TYPE	BYTE	DATA_TYPE of the current job
QSTART_ADDRESS	WORD	START_ADDRESS of the current job
QLENGTH	WORD	LENGTH of the current job
QWRITE_READ	BOOL	WRITE_READ of the current job
BUSY	BOOL	Job list is running
STATUS	WORD	Status information of the block

Status and error displays

Table 2-4

Status	Meaning	Remedy / notes
16#A089	The parameterized cycle time has elapsed and the job list is still in work.	The job list starts immediately after the last job of the previous list was finished.

Example

Figure 2-3 Example with ModbusTCP CP Red

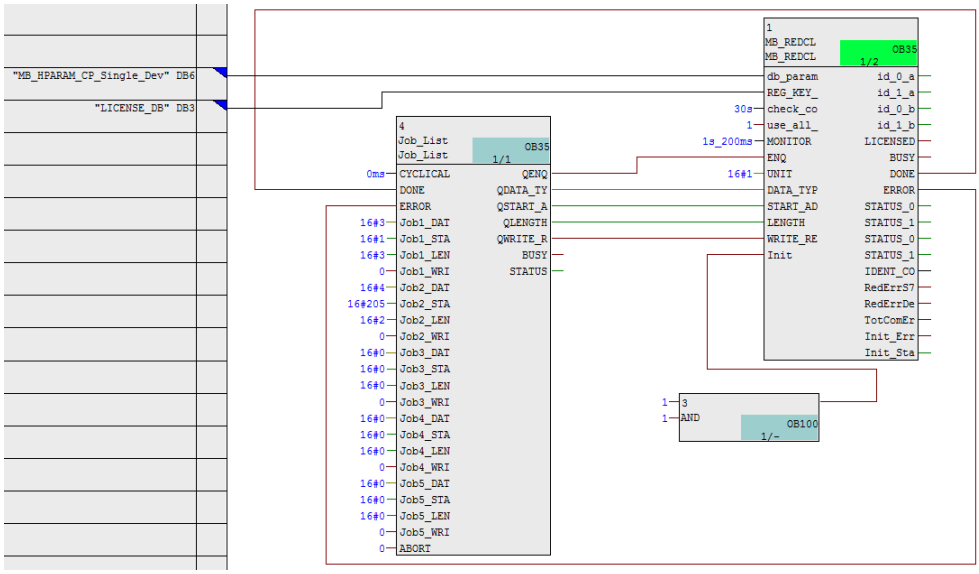

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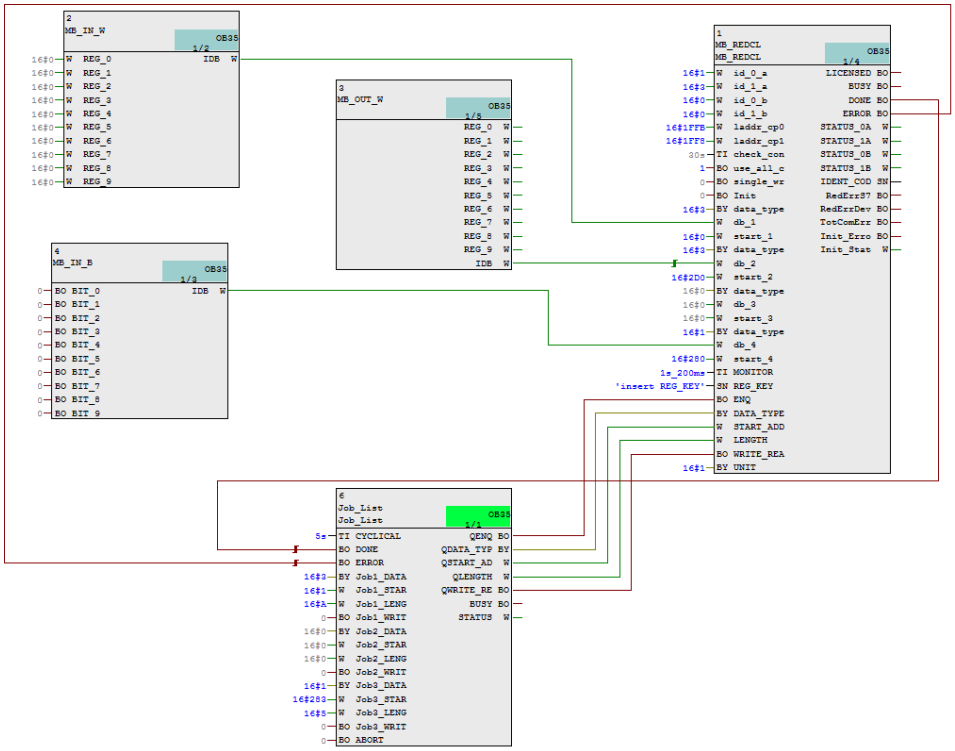
Figure 2-4 Example with ModbusTCP Red V2



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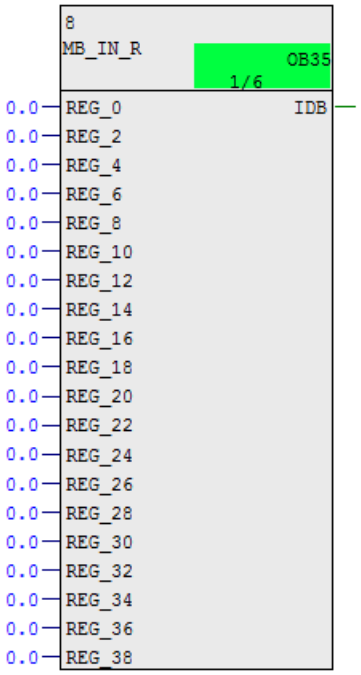
2.2.2 "Data Collectors for CFC": FB MB_IN_R

Block interface

Figure 2-5



Principle of operation

The function block MB_IN_R provides the feature to supply real values for the Modbus communication directly in CFC.

The output IDB is connected to the corresponding input "db_x" of the Modbus/TCP block.

The function block is open source. It provides 63 inputs; only 20 of them have got the property "visible". The number of inputs can be decreased or increased due to your requirements.

Input parameters

Table 2-5

Parameter	Data type	Description
REG_0	REAL	1st real value
REG_2	REAL	2nd real value
REG_4	REAL	3rd real value
…		…
REG_122	REAL	62nd real vaule
REG_124	REAL	63rd real value

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Output parameter

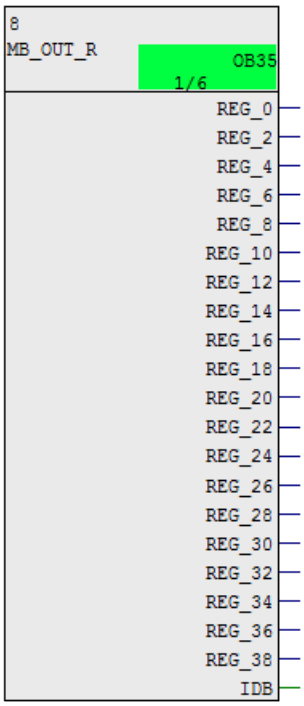
Table 2-6

Parameter	Data type	Description
IDB	WORD	Number of the FB's instance data block

2.2.3 "Data Collectors for CFC": FB MB_OUT_R

Block interface

Figure 2-6



Principle of operation

The function block MB_OUT_R provides the feature to supply real values for further operation directly in CFC.

The output IDB is connected to the corresponding input "db_x" of the Modbus/TCP block.

The function block is open source. It provides 63 inputs; only 20 of them have got the property "visible". The number of inputs can be decreased or increased due to your requirements.

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Output parameters

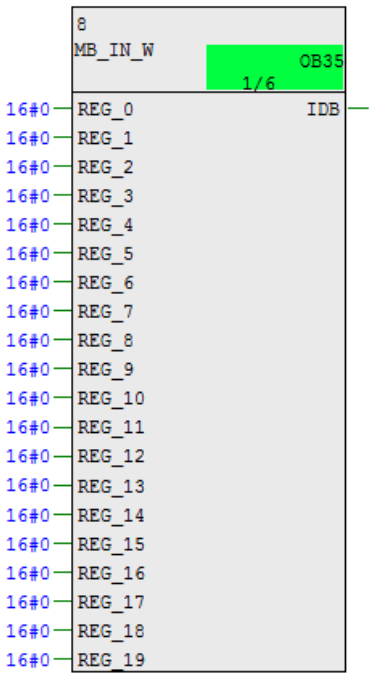
Table 2-7

Parameter	Data type	Description
REG_0	REAL	1. real value
REG_2	REAL	2. real value
REG_4	REAL	3. real value
…		…
REG_122	REAL	62. real value
REG_124	REAL	63. real value
IDB	WORD	Number of the FB's instance data block

2.2.4 "Data Collectors for CFC": FB MB_IN_W

Block interface

Figure 2-7



Principle of operation

The function block MB_IN_W provides the feature to supply word values for the Modbus communication directly in CFC.

The output IDB is connected to the corresponding input "db_x" of the Modbus/TCP block.

The function block is open source. It provides 125 inputs; only 20 of them have got the property "visible". The number of inputs can be decreased or increased due to your requirements.

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Input parameters

Table 2-8

Parameter	Data type	Description
REG_0	WORD	1. word value
REG_1	WORD	2. word value
REG_2	WORD	3. word value
…		…
REG_123	WORD	124. word value
REG_124	WORD	125. word value

Output parameters

Table 2-9

Parameter	Data type	Description
IDB	WORD	Number of the FB's instance data block

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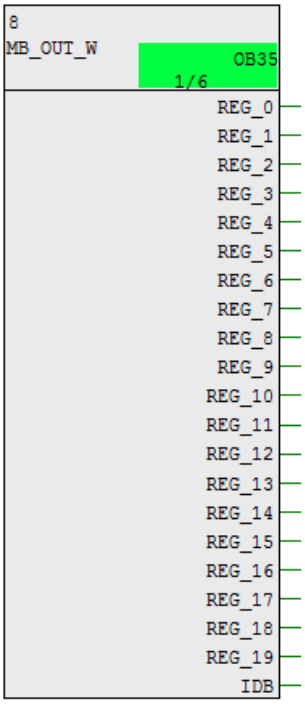
2.2.5 "Data Collectors for CFC": FB MB_OUT_W

Block interface

Figure 2-8



Principle of operation

The function block MB_OUT_W provides the feature to supply word values for further operation directly in CFC.

The output IDB is connected to the corresponding input "db_x" of the Modbus/TCP-block.

The function block is open source. It provides 125 outputs; only 20 of them have got the property "visible". The number of outputs can be decreased or increased due to your requirements.

Output parameters

Table 2-10

Parameter	Data type	Description
REG_0	WORD	1. word value
REG_1	WORD	2. word value
REG_2	WORD	3. word value
…		…
REG_123	WORD	124. word value
REG_124	WORD	125. word value
IDB	WORD	Number of the FB's instance data block

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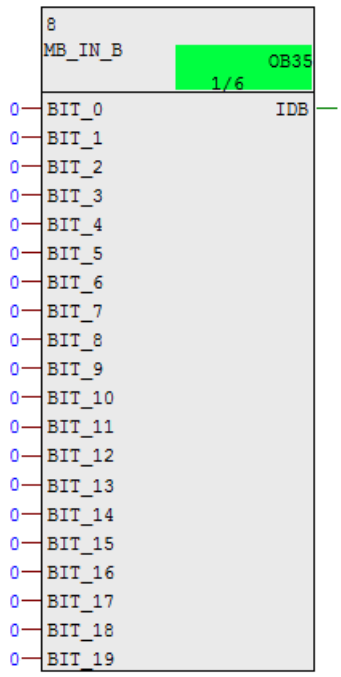
2.2.6 "Data Collectors for CFC": FB MB_IN_B

Block interface

Figure 2-9



Principle of operation

The function block MB_IN_B provides the feature to supply boolean values for the Modbus communication directly in CFC.

The output IDB is connected to the corresponding input "db_x" of the Modbus/TCP-block.

The function block is open source. It provides 80 inputs; only 20 of them have got the property "visible". The number of inputs can be decreased or increased due to your requirements.

Input parameters

Table 2-11

Parameter	Data type	Description
BIT_0	BOOL	1. boolean value
BIT _1	BOOL	2. boolean value
BIT _2	BOOL	3. boolean value
…		…
BIT _78	BOOL	79. boolean value
BIT _79	BOOL	80. boolean value

Output parameters

Table 2-12

Parameter	Data type	Description
IDB	WORD	Number of the FB's instance data block

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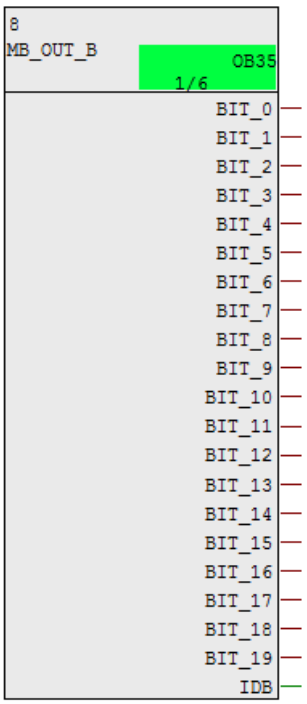
2.2.7 "Data Collectors for CFC": FB MB_OUT_B

Block interface

Figure 2-10



Principle of operation

The function block MB_OUT_B provides the feature to supply boolean values for further operation directly in CFC.

The output IDB is connected to the corresponding input "db_x" of the Modbus/TCP-block.

The function block is an open one. It provides 80 outputs; only 20 of them have got the property "visible". The number of outputs can be decreased or increased due to your requirements.

Output parameters

Table 2-13

Parameter	Data type	Description
BIT_0	BOOL	1. boolean value
BIT _1	BOOL	2. boolean value
BIT _2	BOOL	3. boolean value
…		…
BIT _78	BOOL	79. boolean value
BIT _79	BOOL	80. boolean value
IDB	WORD	Number of the FB's instance data block

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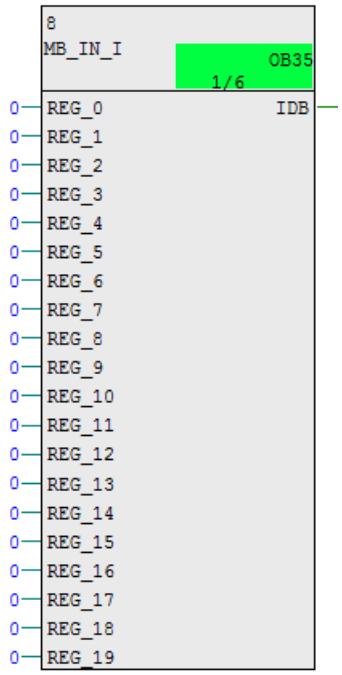
2.2.8 "Data Collectors for CFC": FB MB_IN_I

Block interfaces

Figure 2-11



Principle of operation

The function block MB_IN_I provides the feature to supply integer values for the Modbus communication directly in CFC.

The output IDB is connected to the corresponding input "db_x" of the Modbus/TCP-block.

The function block is open source. It provides 125 inputs; only 20 of them have got the property "visible". The number of inputs can be decreased or increased due to your requirements.

Input parameters

Table 2-14

Parameter	Data type	Description
REG_0	INT	1. integer value
REG_1	INT	2. integer value
REG_2	INT	3. integer value
…		…
REG_123	INT	124. integer value
REG_124	INT	125. integer value

Output parameters

Table 2-15

Parameter	Data type	Description
IDB	WORD	Number of the FB's instance data block

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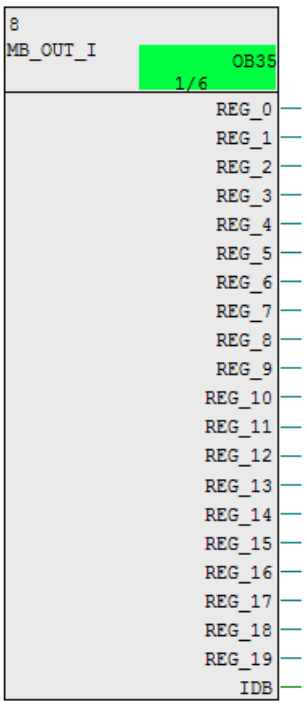
2.2.9 "Data Collectors for CFC": FB MB_OUT_I

Block interface

Figure 2-12



Principle of operation

The function block MB_OUT_I provides the feature to supply integer values for further operation directly in CFC.

The output IDB is connected to the corresponding input "db_x" of the Modbus/TCP-block.

The function block is open source. It provides 125 outputs; only 20 of them have got the property "visible". The number of outputs can be decreased or increased due to your requirements.

Output parameters

Table 2-16

Parameter	Data type	Description
REG_0	INT	1. integer value
REG_1	INT	2. integer value
REG_2	INT	3. integer value
…		…
REG_123	INT	124. integer value
REG_124	INT	125. integer value
IDB	WORD	Number of the FB's instance data block

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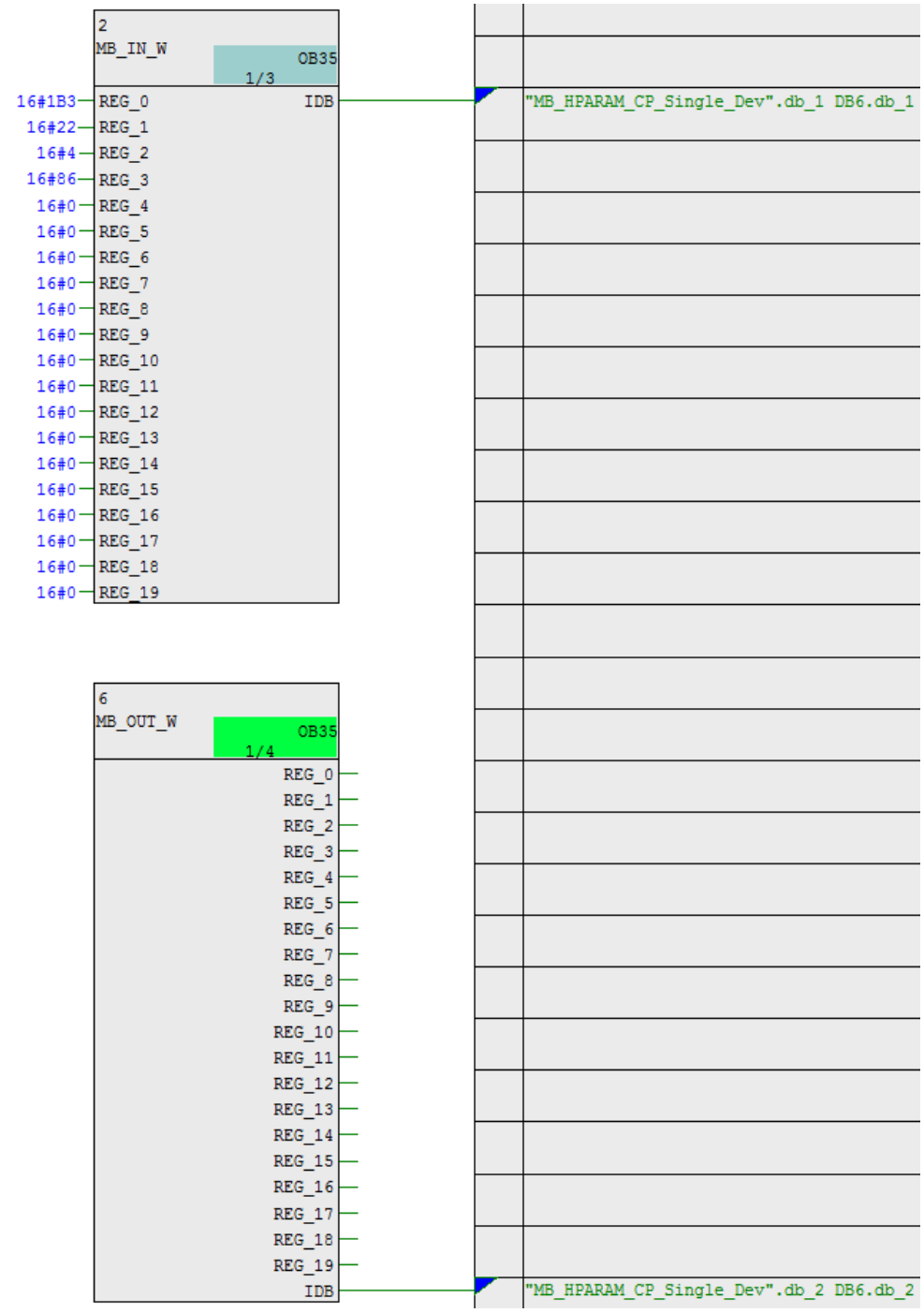
Example

Figure 2-13



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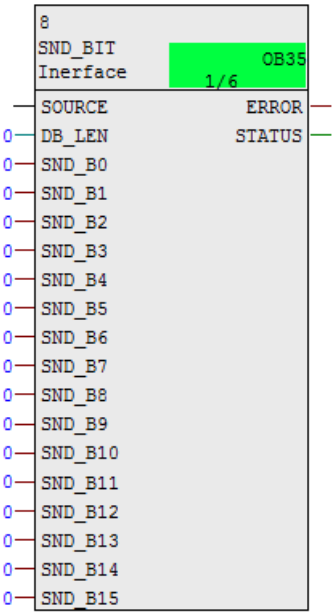
2.2.10 "Marshalling Blocks": FB SND_BIT

Block interface

Figure 2-14



Principle of operation

The marshalling block "SND_BIT" provides the possibility to connect boolean values in CFC and to copy them into the global data block, which is used for the Modbus/TCP communication.

The pointer to the destination area in the global data block, in which the boolean values should be stored, is entered at the input "SOURCE". The total length of the data block is entered at the input "DB_LEN" in byte.

The inputs "SND_B0" to "SND_B15" provide the boolean values to be sent. The function block copies these values into the destination area in the global data block.

The outputs "ERROR" and "STATUS" show the status of the marshalling block.

Input parameters

Table 2-17

Parameter	Data type	Description
SOURCE	ANY	Pointer to the area of boolean values in the global data block
DB_LEN	INT	Length of the global data block in BYTE
SND_B0	BOOL	1. boolean value
SND_B1	BOOL	2. boolean value
SND_B2	BOOL	3. boolean value
…		…
SND_B14	BOOL	15. boolean value
SND_B15	BOOL	16. boolean value

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Output parameters

Table 2-18

Parameter	Data type	Description
ERROR	BOOL	TRUE: An error has occurred.
STATUS	WORD	Status of the block

Status and error displays

Table 2-19

Status	Meaning	Remedy / notes
16#AAAA	Data are valid	--
16#00FF	Data block length is incorrect	Check and correct the data block length (**in BYTE**)
16#0100	Data are invalid	Check the data transmission
16#80B1	Data block does not exist	Create and download data block

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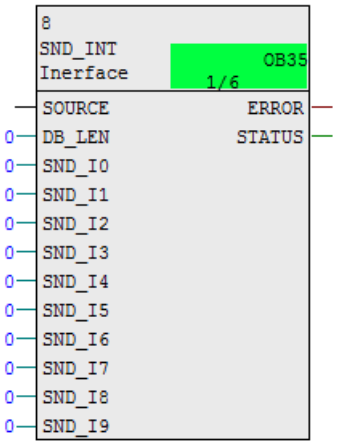
2.2.11 "Marshalling Blocks": FB SND_INT

Block interface

Figure 2-15



Principle of operation

The marshalling block "SND_INT" provides the possibilities to connect integer values in CFC and to copy it into the global data block, which is used of the Modbus/TCP communication.

The pointer to the destination area in the global data block, in which the integer values should be stored, is entered at the input "SOURCE". The total length of the data block is entered at the input "DB_LEN" in byte.

The inputs "SND_I0" to "SND_I9" provide the integer values to be sent. The function block copies these values into the destination area in the global data block.

The outputs "ERROR" and "STATUS" show the status of the marshalling block.

Input parameters

Table 2-20

Parameter	Data type	Description
SOURCE	ANY	Pointer to the area of integer values in the global data block
DB_LEN	INT	Length of the global data block in BYTE
SND_I0	INT	1. integer value
SND_I1	INT	2. integer value
SND_I2	INT	3. integer value
…		…
SND_I8	INT	9. integer value
SND_I9	INT	10. integer value

Output parameters

Table 2-21

Parameter	Data type	Description
ERROR	BOOL	TRUE: An error has occurred.
STATUS	WORD	Status of the block

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Status and error displays

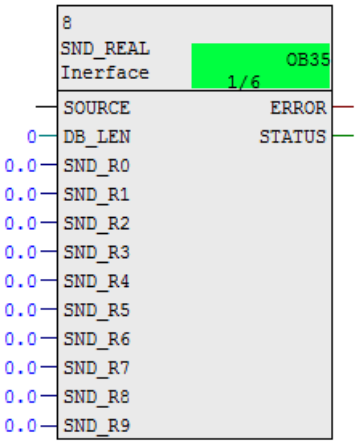
Table 2-22

Status	Meaning	Remedy / notes
16#AAAA	Data are valid	--
16#00FF	Data block length is incorrect	Check and correct the data block length (**in BYTE**)
16#0100	Data are invalid	Check the data transmission
16#80B1	Data block does not exist	Create and download data block

2.2.12 "Marshalling Blocks": FB SND_REAL

Block interface

Figure 2-16



Principle of operation

The marshalling block "SND_REAL" provides the possibilities to connect real values in CFC and to copy them into the global data block, which is used for the Modbus/TCP communication.

The pointer to the destination area in the global data block, in which the real values should be stored, is entered at the input "SOURCE". The total length of the data block is entered at the input "DB_LEN" in byte.

The inputs "SND_R0" to "SND_R9" provide the real values to be sent. The function block copies these values into the destination area in the global data block.

The outputs "ERROR" and "STATUS" show the status of the marshalling block.

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Input parameters

Table 2-23

Parameter	Data type	Description
SOURCE	ANY	Pointer to the area of real values in the global data block
DB_LEN	INT	Length of the global data block in BYTE
SND_R0	REAL	1. real value
SND_R1	REAL	2. real value
SND_R2	REAL	3. real value
…		…
SND_R8	REAL	9. real value
SND_R9	REAL	10. real value

Output parameters

Table 2-24

Parameter	Data type	Description
ERROR	BOOL	TRUE: An error has occurred.
STATUS	WORD	Status of the block

Status and error displays

Table 2-25

Status	Meaning	Remedy / notes
16#AAAA	Data are valid	--
16#00FF	Data block length is incorrect	Check and correct the data block length (**in BYTE**)
16#0100	Data are invalid	Check the data transmission
16#80B1	Data block does not exist	Create and download data block

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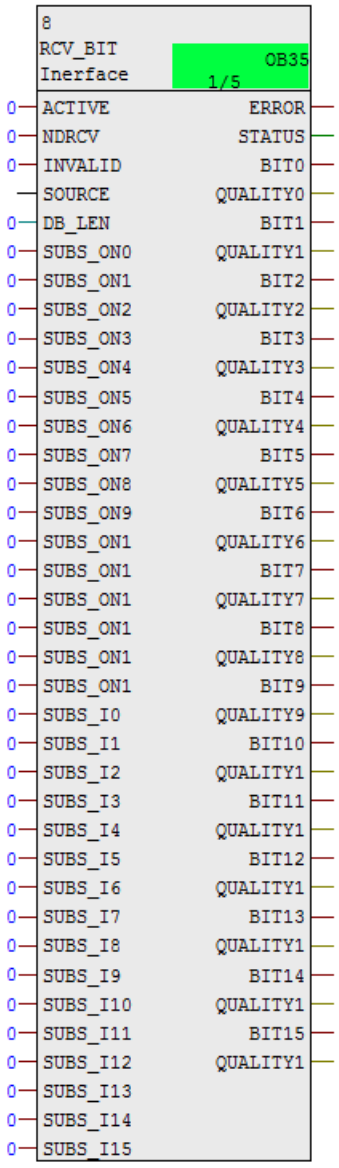
2.2.13 "Marshalling Blocks": FB RCV_BIT

Block interface

Figure 2-17



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Principle of operation

The marshalling block "RCV_BIT" provides the possibility to copy the boolean values, which are received in a global data block by the Modbus/TCP communication, into this function block for further operation directly in CFC.

The pointer to the source area in the global data block, in which the boolean values are stored, is entered at the input "SOURCE". The total length of the data block is entered at the input "DB_LEN" in byte.

By setting the input "ACTIVE" the function is activated. A detected error during the transmission of the Modbus values can be provided to the function block with the input "INVALID". In this case it is possible to use substitute values supplied by the inputs "SUBS_I0" to "SUBS_I15". These substitute values are activated by setting the inputs "SUBS_ON0" to "SUBS_ON15".

The outputs "BIT0" to "BIT15" supply the received boolean values, which are copied from the global data block. The outputs "QUALITY0" to "QUALITY15" show the status of the boolean values.

The outputs "ERROR" and "STATUS" show the status of the marshalling block.

Input parameters

Table 2-26

Parameter	Data type	Description
ACTIVE	BOOL	TRUE: Transmission of data from global data block is activated
INVALID	BOOL	TRUE: data are invalid
SOURCE	ANY	Pointer to source area of boolean values in the global data block
DB_LEN	INT	Length of the global data block in BYTE
SUBS_ON0	BOOL	TRUE = substitute value for 1. boolean value is activated
SUBS_ON1	BOOL	TRUE = substitute value for 2. boolean value is activated
SUBS_ON2	BOOL	TRUE = substitute value for 3. boolean value is activated
…		
SUBS_ON14	BOOL	TRUE = substitute value for 15. boolean value is activated
SUBS_ON15	BOOL	TRUE = substitute value for 16. boolean value is activated
SUBS_I0	BOOL	Substitute value for 1. boolean value
SUBS_I1	BOOL	Substitute value for 2. boolean value
SUBS_I2	BOOL	Substitute value for 3. boolean value
…		
SUBS_I14	BOOL	Substitute value for 15. boolean value
SUBS_I15	BOOL	Substitute value for 16. boolean value

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Output parameters

Table 2-27

Parameter	Data type	Description
ERROR	BOOL	TRUE: An error has occurred.
STATUS	WORD	Status of the block
BIT0	BOOL	Received 1. boolean value
QUALITY0	BYTE	Quality code of the 1. boolean value
BIT1	BOOL	Received 2. boolean value
QUALITY1	BYTE	Quality code of the 2. boolean value
BIT2	BOOL	Received 3. boolean value
QUALITY2	BYTE	Quality code of the 3. boolean value
…		
…		
BIT14	BOOL	Received 15. boolean value
QUALITY14	BYTE	Quality code of the 15. boolean value
BIT15	BOOL	Received 16. boolean value
QUALITY15	BYTE	Quality code of the 16. boolean value

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Status and error displays

Table 2-28

Status	Meaning	Remedy / notes
16#AAAA	Data are valid	--
16#00FF	Data block length is incorrect	Check and correct the data block length (**in BYTE**)
16#0100	Data are invalid	Check the data transmission
16#80B1	Data block does not exist	Create and download data block

Status at output QUALITYx

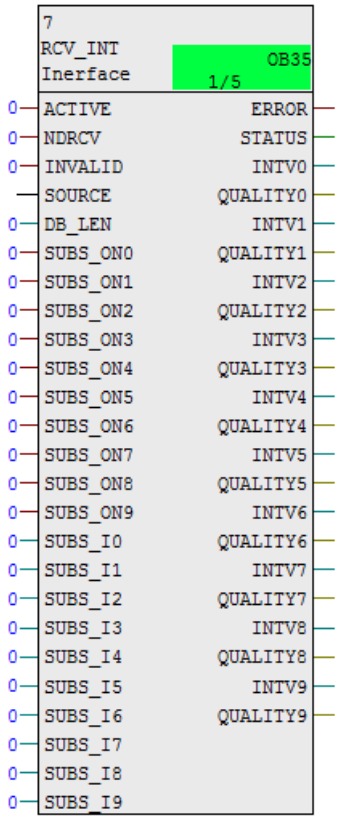
Table 2-29

Code	Description
16#80	Value is valid
16#48	Substitute value is active
16#00	Value is invalid

2.2.14 "Marshalling Blocks": FB RCV_INT

Block interface

Figure 2-18



Principle of operation

The marshalling block "RCV_INT" provides the possibility to copy the integer values, which are received in a global data block by the Modbus/TCP communication, into this function block for further operation directly in CFC.

The pointer to the source area in the global data block, in which the integer values are stored, is entered at the input "SOURCE". The total length of the data block is entered at the input "DB_LEN" in byte.

By setting the input "ACTIVE" the function is activated. A detected error during the transmission of the Modbus values can be provided to the function block with the input "INVALID". In this case it is possible to use substitute values supplied by the inputs "SUBS_I0" to "SUBS_I9". These substitute values are activated by setting the inputs "SUBS_ON0" to "SUBS_ON9".

The outputs "INTV0" to "INTV9" supply the received integer values, which are copied from the global data block. The outputs "QUALITY0" to "QUALITY9" show the status of the integer values.

The outputs "ERROR" and "STATUS" show the status of the marshalling block.

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Input parameters

Table 2-30

Parameter	Data type	Description
ACTIVE	BOOL	TRUE: Transmission of data from global data block is activated
INVALID	BOOL	TRUE: data are invalid
SOURCE	ANY	Pointer to source area of integer values in the global data block
DB_LEN	INT	Length of the global data block in BYTE
SUBS_ON0	BOOL	TRUE = substitute value for 1. integer value is activated
SUBS_ON1	BOOL	TRUE = substitute value for 2. integer value is activated
SUBS_ON2	BOOL	TRUE = substitute value for 3. integer value is activated
…		
SUBS_ON8	BOOL	TRUE = substitute value for 9. integer value is activated
SUBS_ON9	BOOL	TRUE = substitute value for 10. integer value is activated
SUBS_I0	INT	Substitute value for 1. integer value
SUBS_I1	INT	Substitute value for 2. integer value
SUBS_I2	INT	Substitute value for 3. integer value
…		
SUBS_I8	INT	Substitute value for 9. integer value
SUBS_I9	INT	Substitute value for 10. integer value

Output parameters

Table 2-31

Parameter	Data type	Description
ERROR	BOOL	TRUE: An error has occurred.
STATUS	WORD	Status of the block
INTV0	INT	Received 1. integer value
QUALITY0	BYTE	Quality code of the 1. integer value
INTV1	INT	Received 2. integer value
QUALITY1	BYTE	Quality code of the 2. integer value
INTV2	INT	Received 3. integer value
QUALITY2	BYTE	Quality code of the 3. integer value
…		
…		
INTV8	INT	Received 9. integer value
QUALITY8	BYTE	Quality code of the 9. integer value
INTV9	INT	Received 10. integer value
QUALITY9	BYTE	Quality code of the 10. integer value

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Status and error displays

Table 2-32

Status	Meaning	Remedy / notes
16#AAAA	Data are valid	--
16#00FF	Data block length is incorrect	Check and correct the data block length (**in BYTE**)
16#0100	Data are invalid	Check the data transmission
16#80B1	Data block does not exist	Create and download data block

Status at output QUALITYx

Table 2-33

Code	Description
16#80	Value is valid
16#48	Substitute value is active
16#00	Value is invalid

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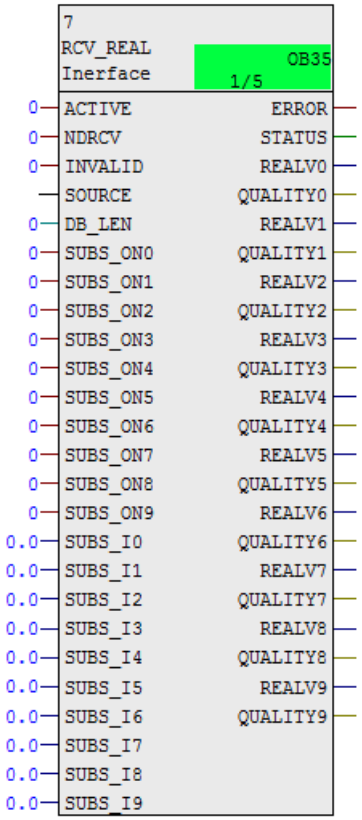
2.2.15 "Marshalling Blocks": FB RCV_REAL

Block interface

Figure 2-19



Principle of operation

The marshalling block "RCV_REAL" provides the possibility to copy the real values, which are received in a global data block by the Modbus/TCP communication, into this function block for further operation directly in CFC.

The pointer to the source area in the global data block, in which the real values are stored, is entered at the input "SOURCE". The total length of the data block is entered at the input "DB_LEN" in byte.

By setting the input "ACTIVE" the function is activated. A detected error during the transmission of the Modbus values can be provided to the function block with the input "INVALID". In this case it is possible to use substitute values supplied by the inputs "SUBS_I0" to "SUBS_I9". These substitute values are activated by setting the inputs "SUBS_ON0" to "SUBS_ON9".

The outputs "REALV0" to "REALV9" supply the received real values, which are copied from the global data block. The outputs "QUALITY0" to "QUALITY9" show the status of the real values.

The outputs "ERROR" and "STATUS" show the status of the marshalling block.

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Input parameters

Table 2-34

Parameter	Data type	Description
ACTIVE	BOOL	TRUE: Transmission of data from global data block is activated
INVALID	BOOL	TRUE: data are invalid
SOURCE	ANY	Pointer to source area of real values in the global data block
DB_LEN	INT	Length of the global data block in BYTE
SUBS_ON0	BOOL	TRUE = substitute value for 1. real value is activated
SUBS_ON1	BOOL	TRUE = substitute value for 2. real value is activated
SUBS_ON2	BOOL	TRUE = substitute value for 3. real value is activated
…		
SUBS_ON8	BOOL	TRUE = substitute value for 9. real value is activated
SUBS_ON9	BOOL	TRUE = substitute value for 10. real value is activated
SUBS_I0	REAL	Substitute value for 1. real value
SUBS_I1	REAL	Substitute value for 2. real value
SUBS_I2	REAL	Substitute value for 3. real value
…		
SUBS_I8	REAL	Substitute value for 9. real value
SUBS_I9	REAL	Substitute value for 10. real value

Output parameters

Table 2-35

Parameter	Data type	Description
ERROR	BOOL	TRUE: An error has occurred.
STATUS	WORD	Status of the block
REALV0	REAL	Received 1. real value
QUALITY0	BYTE	Quality code of the 1. real value
REALV1	REAL	Received 2. real value
QUALITY1	BYTE	Quality code of the 2. real value
REALV2	REAL	Received 3. real value
QUALITY2	BYTE	Quality code of the 3. real value
…		
…		
REALV8	REAL	Received 9. real value
QUALITY8	BYTE	Quality code of the 9. real value
REALV9	REAL	Received 10. real value
QUALITY9	BYTE	Quality code of the 10. real value

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Status and error displays

Table 2-36

Status	Meaning	Remedy / notes
16#AAAA	Data are valid	--
16#00FF	Data block length is incorrect	Check and correct the data block length (**in BYTE**)
16#0100	Data are invalid	Check the data transmission
16#80B1	Data block does not exist	Create and download data block

Status at output QUALITYx

Table 2-37

Code	Description
16#80	Value is valid
16#48	Substitute value is active
16#00	Value is invalid

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3 Working with the Library

What will you find in this section?

This chapter consists of instructions for integrating the "Additional Modbus Blocks" library into your STEP 7 project and instructions for using the library blocks.

3.1 Integrating the Library into STEP 7

The table below lists the steps for integrating the "Additional Modbus Blocks" library into your STEP 7 project. Subsequently, you can use the blocks of the "Additional Modbus Blocks" library.

Note The following section assumes that a STEP 7 project exists.

Table 3-1

No.	Action
1	The library is available on the HTML page from which you downloaded this document. Save the library "Additional_Modbus_Blocks.zip" to your hard disk.
2	Open the SIMATIC Manager and retrieve the library. "File > Retrieve"
3	After retrieving the library open it in the SIMATIC Manger. "File > Open" > "Library" tab

3.2 Integrating the Library Blocks into STEP 7 / STL

The table below lists the steps for integrating the blocks of the "Additional Modbus Blocks" library into your STEP 7 program.

Table 3-2

No.	Action
1	After opening the "Additional Modbus Blocks" library, you open your STEP 7 project as well.
2	Copy the blocks of the "Additional Modbus Blocks" library into your STEP 7 project. Select all required blocks in the block folder of the library and insert them into the block folder of your STEP 7 project using drag & drop.
3	Open the block, in which the Modbus/TCP block is called. Insert the necessary Additional block.
4	Specify the respective instance data block. Generate the instance data block if it does not exist.
5	Assign values to all required formal parameters. Save and close the block.

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3.3 Integrating the Library Blocks into STEP 7 / CFC

The table below lists the steps for integrating the blocks of the "Additional Modbus Blocks" library into your STEP 7 program.

Table 3-3

No.	Action
1	Open your STEP 7 project.
2	Open the CFC chart, in which the Modbus/TCP block is called.
3	In the tab "Libraries" choose the library "Additional Modbus Blocks".
4	Select the necessary blocks in the library and place them in the chart using drag & drop.
5	Assign values to all required formal parameters and link the necessary parameters between the blocks. Close the chart.

3.4 Downloading the Blocks to the S7 CPU

The table below lists the steps for downloading all blocks of your user program to the S7 CPU.

Table 3-4

No.	Action
1	Ensure that your PC/PG and the S7 CPU are located in the same subnet.
2	In the SIMATIC Manager you set the PC interface to TCP/IP. "Options > Set PC/PG Interface"
3	Select the access path. Select the TCP/IP protocol for the used network card. Confirm with OK.
4	Then select the S7 station and load the entire project into your CPU.

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4 Notes and Support

What will you find in this section?

This chapter provides further support in handling the described "Additional Modbus Blocks" library.

The following table lists the steps that show you

- how to check whether the library is up to date and
- how to integrate a newer version of the "Additional Modbus Blocks" library into your STEP 7 project

4.1 Updating the Library in STL

Table 4-1

No.	Action
1	Perform the following steps for each block of the library. • Right-click the function or the data block and select the "Object Properties" option in the context menu. • In the displayed "Properties" window, select the "General - Part 2" tab. • Compare the current version number in the "Version" output field with the latest release from the Siemens Industry Online Support.
2	To update the blocks of the library in your STEP 7 project, integrate the latest version of library "Additional Modbus Blocks" into STEP 7 (see chapter 3.1).
3	Delete all blocks of the library in the "Blocks" folder of your STEP 7 project. Do **not** delete the function block call in OB1.
4	As described in chapter 3.2 up to step 3, add the latest version of the block from the "Additional Modbus Blocks" library into your STEP 7 project.
5	Check the accesses and update them. "File > Check and Update Accesses" All instance DBs are updated or are newly created.
6	The library update is now completed.

4.2 Updating the Library in CFC

Table 4-2

No.	Action
1	Perform the following steps for each block of the library. • Right-click the function or the data block and select the "Object Properties" option in the context menu. • In the displayed "Properties" window, select the "General - Part 2" tab. • Compare the current version number in the "Version" output field with the latest release from the Siemens Industry Online Support.
2	Open the CFC chart.
3	Open the dialog "Option" -> "Block Types".
4	Select the blocks in the plan folder and update them with "New Version…". All instance DBs are updated or are newly created.
5	The library update is now completed.

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5 References

5.1 References

This list is not complete and only represents a selection of relevant literature.

Table 5-1

	Subject	Title
/1/	STEP7 SIMATIC S7-300/400	Automating with STEP 7 in STL and SCL Author: Hans Berger ISBN: 978-3-89578-412-5
/2/	STEP7 SIMATIC S7-300/400	Automating with STEP 7 in LAD and FBD Author: Hans Berger ISBN: 978-3-89578-297-8

5.2 Internet Link Specifications

This list is not complete and only represents a selection of relevant information.

Table 5-2

	Subject	Title
\1\	Reference to the entry	https://support.industry.siemens.com/cs/ww/en/view/62830463
\2\	Siemens Industry Online Support	https://support.industry.siemens.com
\3\	SIMATIC Modbus/TCP Blocks	www.siemens.com/s7modbus

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6 History

Table 6-1

Version	Date	Modifications
V1.0	07/2014	First version
V1.1	07/2018	Updated MB_RED-Programblocks
V1.2	09/2018	Changed layout

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