

User Manual

Connection to Siemens S7 MPI

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1	14.07.2005	First edition
2	02.12.2005	Validation extended, chapter "Important Notes" added

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1 Important Notes

1.1 Symbols

The symbols in this manual are used to draw your attention on notes and dangers.



Danger

This symbol is used to refer to instructions which, if ignored or not carefully followed could result in personal injury.



Note

This symbol indicates application tips or supplementary notes.



Reference to source of information

This symbol refers to detailed sources of information on the current topic.

1.2 Safety Notes

- Read this manual carefully before using the operating device. Keep this manual in a place where it is always accessible to all users.
- Proper transportation, handling and storage, placement and installation of this product are prerequisites for its subsequent flawless and safe operation.
- This user manual contains the most important information for the safe operation of the device.
- The user manual, in particular the safety notes, must be observed by all personnel working with the device.
- Observe the accident prevention rules and regulations that apply to the operating site.
- Installation and operation must only be carried out by qualified and trained personnel.

1.3 Intended Use

- The device is designed for use in the industry.
- The device is state-of-the-art and has been built to the latest standard safety requirements. However, dangerous situations or damage to the machine itself or other property can arise from the use of this device.
- The device fulfills the requirements of the EMC directives and harmonized European standards. Any modifications to the system can influence the EMC behavior.

1.4 Target Group

All configuration and programming work in connection with the automation system must be performed by trained personnel only (e.g. qualified electricians, electrical engineers).

The configuration and programming personnel must be familiar with the safety concepts of automation technology.

2 Siemens S7 MPI

The Siemens S7 MPI protocol offers random read and write access to almost all of the controller data.

This protocol supports a connection between one operating device and up to 16 MPI participants.

In this configuration, the operating device always functions as a client.

Use the MPI interface to connect the operating device to the MPI bus.



Make sure to follow the guidelines for setting up a MPI system!

2.1 Data Types

Direct access is possible to the following data types. Only part of the address space is available for operating devices with a Z80 or a 386 CPU.

Table 2-1 Siemens S7 MPI data types for operating devices with a Z80 and 386 CPU

Type	Mnemonic	From	Up To		From	Up To	Access
Input	E	0.0	16383.7				Read/Write
	EB	0	16383				
	EW	0	16382				
	ED	0	16380				
Output	A	0.0	16383.7				
	AB	0	16383				
	AW	0	16382				
	AD	0	16380				
Flag	M	0.0	16383.7				
	MB	0	16383				
	MW	0	16382				
	MD	0	16380				
Counter	Z	0	512				Read-only
Timer	T	0	512				Read-only
Data Block	DB	1	255	DBX	0.0	8191.7	Read/Write
				DBB	0	8191	
				DBW	0	8190	
				DBD	0	8188	

Table 2-2 Siemens S7 MPI data types for operating devices with a RISC CPU

Type	Mnemonic	From	Up to		From	Up to	Access
Input	E	0.0	16383.7				Read/Write
	EB	0	16383				
	EW	0	16382				
	ED	0	16380				
Output	A	0.0	16383.7				
	AB	0	16383				
	AW	0	16382				
	AD	0	16380				
Flag	M	0.0	16383.7				
	MB	0	16383				
	MW	0	16382				
	MD	0	16380				
Counter	Z	0	512				Read-only
Timer	T	0	512				Read-only
Data Block	DB	0	8192	DBX	0.0	65535.7	Read/Write
				DBB	0	65535	
				DBW	0	65534	
				DBD	0	65532	

2.2 Programming

2.2.1 Protocol parameters

2.2.1.1 Baud Rate

This parameter specifies the communication rate.

Table 2-3 Baud rate

Configurable Values (Baud)	Default Value
9600	
19200	
38400	
93750	
187500	X

Table 2-3 Baud rate

Configurable Values (Baud)	Default Value
500000	
750000	
1500000	



Set the baud rate to 187500 baud and modify the controller setting accordingly!

2.2.1.2 Delay until Connection Set-Up

This parameter specifies the waiting time after which the operating device starts the communication.

Table 2-4 Delay until connection set-up

Configurable Values	Default Value
5 s to 255 s	5 s

2.2.1.3 Participant Address of Terminal

This parameter specifies the MPI address of the operating device.

Table 2-5 Participant address of terminal

Configurable Values	Default Value
3 to 126	3



The station number of the operating device can be changed during operation. This requires that you set up the system variable **ComSlaveNr** in a mask. After changing the value of the system variable on the operating device, reinitialize the operating device. You can do this by:

- powering the device down and up again or
- using the system variable **Boot**.

Change the value of the system variable **Boot** to "1" to reinitialize the operating device immediately. The value of the system variable **ComSlaveNr** is overwritten when the project is downloaded again.

2.2.1.4 Highest Participant Address

This parameter specifies the highest station number that can be used within the MPI bus structure. This value must be the same for every participant on the bus.

Table 2-6 Highest participant address

Configurable Values	Default Value
15	
31	X
63	
126	

2.2.1.5 Offline Operation

This parameter prevents the operating device from displaying the system message COMMUNICATION ERROR when a communication connection fails. Zeroes (0) are displayed in a mask for the variable values of the controller affected by the communication failure.

Table 2-7 Offline operation

Configurable Values	Default Value
OFF	X
ON	



Create error messages with the message numbers 9901 to 9916 if you wish to be notified when a connection fails. Message number 9901 corresponds to the failure of connection 1, message number 9902 to the failure of connection 2, and so on.

2.2.1.6 Connections

The operating device is capable of maintaining 16 simultaneous connections with communication-capable modules on the MPI bus.

The connection list consists of 16 rows for the connection data and 4 columns for the connection parameters.

For a direct connection (without subnet), you only need to specify the participant address. For all other settings, you can keep the preset default values.

Table 2-8 Connection list for Siemens S7 MPI

Column	Meaning	Default Value
Connection	Connection Number	1 to 16
Participant Address	Address of the Communication Module	
Segment ID	Subnet in a S7-300/400 Controller	1
Slot	Slot Number of the Module	0
Rack Number	Rack Number of the Controller	0

2.2.2 Input Syntax

The following image illustrates the structure of the input syntax for variables in the programming software.

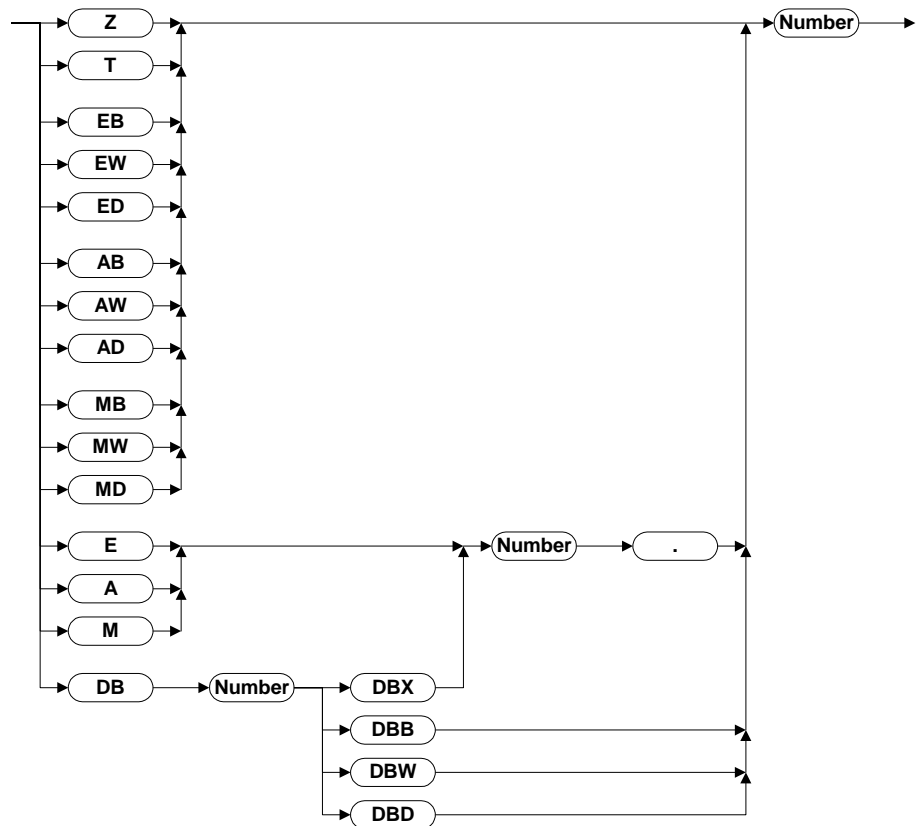


Figure 2-1 Syntax diagram

2.2.3 Status Messages

For the address of the parallel message system, you need to specify a byte address or a word address in either the flag area or in a data block (MB, MW, DBB or DBW).

For example:

Table 2-9 Parallel message system for Siemens S7 MPI

Word Address	Reference	High Byte	Low Byte
Word Address + 0	MW 10	Messages 9 to 15	Messages 0 to 8
Word Address + 1	MW 12	Messages 24 to 31	Messages 16 to 23
Word Address + 2	MW 14	Messages 40 to 47	Messages 32 to 39

2.2.4 Polling Area

For the address of the poll area, you need to specify a byte address or a word address in either the flag area or in a data block.

Table 2-10 Byte-oriented poll area for Siemens S7 MPI

Word Address	Reference	High Byte
Byte Address + 0	MB 12	Write Coordination Byte
Byte Address + 1	MB 13	Message Channel Low-Byte
Byte Address + 2	MB 14	Message Channel High-Byte
Byte Address + 3	MB 15	Function Key LEDs 1 to 4
Byte Address + 4	MB 16	Function Key LEDs 5 to 8
Byte Address + 5	MB 17	Function Key LEDs 9 to 12
Byte Address + 6	MB 18	Function Key LEDs 13 to 16
Byte Address + 7	MB 19	Function Key LEDs 17 to 20
Byte Address + 8	MB 20	Function Key LEDs 21 to 24
Byte Address + 9	MB 21	Function Key LEDs 25 to 28
Byte Address +10	MB 22	Function Key LEDs 29 to 32

Table 2-11 Word-oriented poll area for Siemens S7 MPI

Word Address	Reference	High Byte	Low Byte
Word Address + 0	MW 20	Write Coordination Byte	Reserved
Word Address + 2	MW 22	Message Channel High-Byte	Message Channel Low-Byte
Word Address + 4	MW 24	Function Key LEDs 1 to 4	Function Key LEDs 5 to 8
Word Address + 6	MW 26	Function Key LEDs 9 to 12	Function Key LEDs 13 to 16
Word Address + 8	MW 28	Function Key LEDs 17 to 20	Function Key LEDs 21 to 24
Word Address + 10	MW 30	Function Key LEDs 25 to 28	Function Key LEDs 29 to 32

2.3 Physical Connection

A special MPI interface is used to connect the operating devices to the MPI bus. Make sure to follow the guidelines for setting up a MPI bus system.



The operating device does not provide any means for termination. The termination must therefore be connected externally.

2.3.1 Pin Assignment

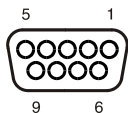


Figure 2-2 9 pin D-SUB female connector strip

Connector in the terminal: 9 pin D-SUB female connector strip.

Table 2-12 Pin assignment MPI

Pin	Designation	Function
1	nc	Not Connected
2	nc	Not Connected
3	RxD/TxD-P	Received Data / Transmitted Data - Plus
4	CNTR-P	Control Signal for Repeater - Plus
5	DGND	Data Transmission Potential
6	VP	Supply Voltage of Terminating Resistors - Plus
7	nc	Not Connected
8	RxD/TxD-N	Received Data / Transmitted Data - Minus
9	CNTR-N	Control Signal for Repeater - Minus

2.3.2 Cable for Siemens S7 MPI

You can use any cables that comply with the following parameters.

Table 2-13 Parameters for MPI cables

Parameter	Value
Loop Impedance	110 Ohm/km
Working Capacitance	30 nF/km
Wave Impedance	150 Ohm

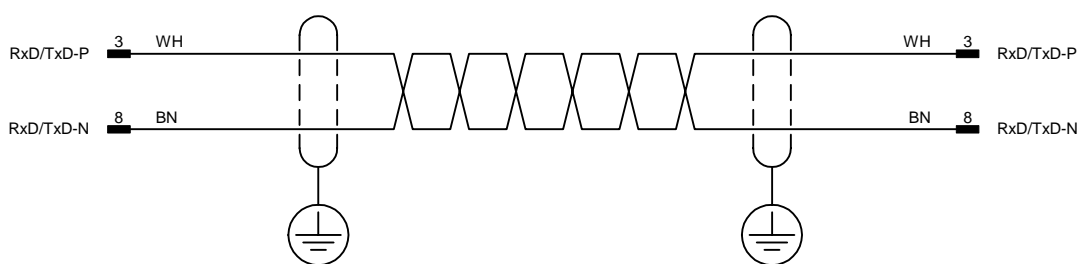
The maximum length of one segment is not allowed to exceed 50 m (164.042 feet).



For further installation information, refer to the Siemens **Manual on installing the S7-400 and M7-400**.

Operating Device

Siemens
PLC S7 MPI



D-SUB
Male Connector
9 Pin

D-SUB
Male Connector
9 Pin

2.4 Error Messages

Error messages are displayed on the operating device along with a code and sub-code. Error messages are composed as follows:

Communication Error
 Code XXXXX
 Subcode XXXXX
 Retries XXXXX

Table 2-14 Error messages for Siemens S7 MPI

Code	Subcode	Error Type	Possible Cause
Error messages occurring during connection setup.			
50	10	Addressed station is not on the bus.	
	20	No MPI hardware present	The operating device you are using is not equipped with a MPI interface.
Error messages occurring while sending the telegram.			
60	10	Queue full.	
	20	No credit.	
61	1/33/49	SAP is blocked.	Not all of the participants have the same highest participant address setting.
	2/34/50	No resource to send data.	
	3/35/51	No service activated.	
62	159	Access not possible.	
	175	Duplicate token detected.	
	191	Response buffer too small.	
70		Controller disconnected the connection.	
80		Interrupt error reported.	
	<256	Interrupt bit of low byte.	
	>255	Interrupt bit of high byte.	
90	10	During data transmission the addressed participant has not responded within 5 seconds.	
	20	Data are invalid.	
	30	During connection set-up the addressed participant has not answered within 5 seconds.	
100		PDU relation set-up Subcode contains error class and error code	
	xx	Error class in high byte, error code in low byte	

Table 2-14 Error messages for Siemens S7 MPI

Code	Subcode	Error Type	Possible Cause
110		Read PDU variable Subcode contains error class and error code	
	xx	Error class in high byte, error code in low byte	
111		Read PDU variable Subcode contains error class and error code	
	01	Hardware error.	
	03	Object access not allowed.	
	05	Invalid address.	
	06	Data type not supported.	
	07	Data type not consistent (type><data type)	
	10	Object does not exist or wrong range length.	
120		Write PDU variable Subcode contains error class and error code	
	xx	Error class in high byte, error code in low byte	
121		Write PDU variable	
	01	Hardware error.	
	03	Object access not allowed.	
	05	Invalid address.	
	06	Data type not supported.	
	07	Data type not consistent (type><data type)	
	10	Object does not exist or wrong range length.	

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