Siemens AG

SIMATIC S7 Ethernet

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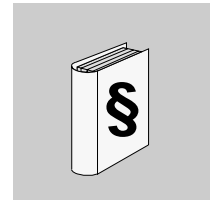# Safety Information

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, can result in death, serious injury, or equipment damage.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, can result in injury or equipment damage.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved.

About the Book
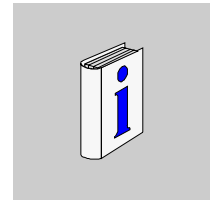
At a Glance

Document Scope

This manual describes the device driver communication settings in the Vijeo-Designer screen editing software. Vijeo-Designer enables you to design Magelis target machines that communicate with PLCs, drives, field devices, and other equipment.

For more information about Vijeo-Designer and Magelis target machines, please refer to Vijeo-Designer user documentation.

Validity Note

The data and illustrations found in this book are not binding. We reserve the right to modify our products in line with our policy of continuous product development. The information in this document is subject to change without notice and should not be construed as a commitment by Schneider Electric.

Documentation Conventions

Target Machine: Human-Machine Interface (HMI) that runs user applications designed in Vijeo-Designer screen editing software. A target machine is also known as a terminal.

Product Related Information

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.*
- Each implementation of a Magelis XBTGT, HMISTO, HMISTU, XBTGH, XBTGK, XBTGC, iPC, and XBTGTW must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

* For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control."

User Comments

We welcome your comments about this document. You can reach us by e-mail at techcomm@schneider-electric.com.

SIMATIC S7 Ethernet

1

Subject of this Chapter

This chapter explains the SIMATIC S7 Ethernet.

What's in this Chapter?

This chapter contains the following topics:

System Structure

Overview

The following table describes the basic system setup for connecting the target machine to Siemens S7-200/300/400 Series PLCs over a network.

Connection

Series	CPU	Ethernet Module
SIMATIC S7-200 Series	CPU222 CPU224 CPU224 XP CPU226	CP 243-1 IT CP 243-1
SIMATIC S7-300Series	CPU312IFM CPU313 CPU314 CPU314IFM CPU315 CPU315-2 DP CPU316 CPU316-2 DP CPU318-2 CPU 315-2 PN/DP CPU 317-2 PN/DP CPU 319-3 PN/DP	CP 343-1 IT CP 343-1[*1]
	CPU 315-2 PN/DP CPU 317-2 PN/DP CPU 319-3 PN/DP	Ethernet Interface on CPU[*3]
SIMATIC S7-400 Series	CPU412-1 CPU412-2 DP CPU413-1 CPU413-2 DP CPU414-1 CPU414-2 DP CPU414-3 DP CPU416-1 CPU416-2 DP CPU416-3 DP CPU417-4 CPU 414-3 PN/DP CPU 416-3 PN/DP	CP 443-1 IT CP 443-1
	CPU 414-3 PN/DP CPU 416-3 PN/DP	Ethernet Interface on CPU[*3]

*1 PLC supports a maximum of 16 connections. Because 2 connections are required for each target machine, one for Fetch and one for Write, the PLC can support up to 8 target machines.

*2 PLC supports a maximum of 64 connections. Because 2 connections are required for each target machine, one for Fetch and one for Write, the PLC can support up to 32 target machines.

*3 The direct connection to the Ethernet Interface on these CPUs only supports the "OP Communication" type. The FETCH/WRITE protocol will not work.

Note:

● Use a 100BASE-TX connection for iPC Series, XBTGTW Series, XBTGK Series, XBTGC2000 Series or higher, XBTGT2000 Series or higher, XBTGH2000 Series, XBTGT1005 Sereis, and HMISTU Series target machines.

Supported Device Addresses

Overview

⚠ **WARNING**

UNINTENDED EQUIPMENT OPERATION

Design your system to avoid conflicting write processes between the target
machine and PLC program. Values on the PLC and target machine will be
incorrect if:

- The target machine and PLC program attempt to simultaneously write to the
  same register.
- PLC programs or other devices write 16-bit word values to registers being
  accessed in a bitwise manner.

**Failure to follow these instructions can result in death, serious injury, or
equipment damage.**

The following tables list the device address ranges you can enter from the Device
Address keypad.

For actual device address ranges supported by the PLC, refer to the corresponding
PLC manual.

Fetch/Write

Device	Bit Address[1]	Word Address	16 bit	32 bit
Input[2]	I00000.0-I65535.7	IW00000-IW65534[7]	H/L[8]	H/L[8]
Output[2]	Q00000.0-Q65535.7	QW00000-QW65534[7]		
Marker[2]	M00000.0-M65535.7	MW00000-MW65534[7]		
Data Block[2][6]	DB00001.DBX00000.0 - DB00255.DBX16383.7	DB00001.DBW00000 - DB00255.DBW16382[7]		
Timer Word[3][4][5]	—	T00000-T65535		
Counter Word[3][4][5]	—	C00000-C65535		

[1] Read-modify-write. When you write to one of these bit addresses, the target
machine reads the entire word address, sets the defined bit, then returns the new
value to the PLC. If the ladder program writes data to this word address during
the bit read/write process, the resulting data may be incorrect.

[2] Device size is 1 byte.

[3] Device size is 2 bytes, or 1 word.

[4] Valid range in BCD is 0000 to 0999.

[5] Read-only.

*6 Data blocks are created by the user. Available addresses depend on what the user has created.

*7 PLC word addresses defined for integer, float, and string variables must be even-numbered. i.e., IW5 is not a valid device address for an integer variable. Must be either IW4 or IW6.

*8 16-bit and 32-bit data, High and Low, refer to data as defined in the following examples.

	16 bit					32 bit			
Byte					Word				
0	7	...	0	L (Low)	0	15	...	0	L (Low)
1	15	...	8	H (High)	1	31	...	16	H (High)

S7-300/400 Series

Device	Bit Address[*1]	Word Address	bit	bit
Input	I00000.0-I00127.7 or E00000.0-E00127.7[*2]	IW00000-IW00126[*7] or EW00000-EW00126[*2][*7]	H/L[*8]	H/L[*8]
Output	Q00000.0-Q00127.7 or A00000.0-A00127.7[*2]	QW00000-QW00126[*7] or AW00000-AW00126[*2][*7]		
Marker	M00000.0-M00255.7	MW00000-MW00254[*7]		
Data Block[*6]	DB00001.DBX00000.0 - DB00255.DBX65535.7	DB00001.DBW00000 - DB00255.DBW65534[*7]		
Timer[*3][*4][*5]	—	T00000-T00255		
Counter[*3][*4][*5]	—	C00000-C00255 or Z00000-Z00255[*2]		

*1 Read-modify-write. When you write to one of these bit addresses, the target machine reads the entire word address, sets the defined bit, then returns the new value to the PLC. If the ladder program writes data to this word address during the bit read/write process, the resulting data may be incorrect.

*2 German variable name.

*3 Timers and Counters (T&C Devices) store special information in the top 4 bits (time base, counter up/down status etc...). The actual timer current value is stored in the lower 12 bits. Depending on which "Connection Type" is used the data returned by the PLC is in a different format. For "FETCH/WRITE" mode, the current timer/counter value is returned as Binary encoded data, but for "OP Communication" the current timer/counter value is returned as BCD encoded data.

*4 Valid range in BCD is 0000 to 0999.

*5 Read-only.

*6 Data blocks are created by the user. Available addresses depend on what the user has created.

*7 PLC word addresses defined for integer, float, and string variables must be even-numbered. i.e., IW5 is not a valid device address for an integer variable. Must be either IW4 or IW6.

*8 16-bit and 32-bit data, High and Low, refer to data as defined in the following examples.

S7-200 Series

Device	Bit Address[1]	Word Address	bit	bit
Variable[2]	V00000.0-V10239.7	VW00000-VW10238	H/L[5]	H/L[5]
Input[3][2]	I00000.0-I00015.7 or E00000.0-E00015.7[6]	IW00000-IW00014 or EW00000-EW0000014[6]		
Output[2][4]	Q00000.0-Q00015.7 or A00000.0-A00015.7[6]	QW00000-QW00014 or AW00000-AW00014[6]		
Marker	M00000.0-M00031.7	MW00000-MW00030		
Timer Word[7]	—	T00000-T00255		
Counter Word[7]	—	C00000-C00255 or Z00000-Z00255[6]		

*1 Read-modify-write. When you write to one of these bit addresses, the target machine reads the entire word address, sets the defined bit, then returns the new value to the PLC. If the ladder program writes data to this word address during the bit read/write process, the resulting data may be incorrect.

*2 PLC word addresses defined for integer, float, and string variables must be even-numbered. i.e., IW5 is not a valid device address for an integer variable. Must be either IW4 or IW6.

*3 Depending on the CPU type, it may not be possible to write to addresses IW0-IW2. These addresses are reserved for onboard I/O.

*4 It is possible to write to the QW / Q device only while the PLC is in RUN mode. Outputs will be reset if the PLC is switched into stop mode.

*5 16-bit and 32-bit data, High and Low, refer to data as defined in the following examples.

*5 German variable name.

*6 These devices are read-only.

Consecutive Equipment Addresses

Overview

The following table lists the maximum number of consecutive addresses that can be read by each PLC. Refer to this table when using block transfers.

Note:

- To speed up data communication, use consecutive variable addresses on the same panel screen.
- The following situations increase the number of times that the equipment is read, which reduces the data communication speed between the target machine and the equipment:
  - when the number of consecutive addresses exceeds the maximum
  - when different device types are used.

| Device	Max. Consecutive Addresses		Gap Span
	Read	Write	
Input (I)			
Output (Q)			
Internal Bit (M)			
Data Block (DBX)	218 bytes	212 bytes	218 bytes
Input (IW)			
Output (QW)			
Internal Bit (MW)			
Data Block (DBW)			
Timer Word (T)		1 word	—
Counter Word (C)			

I/O Manager Configuration

Overview

The driver and equipment, which enable communication between the target machine and the PLC, depends on the PLC type.

Note:

● For information on how to display the [New Driver] dialog box, see the online help.

Screen example of I/O Manager Configuration
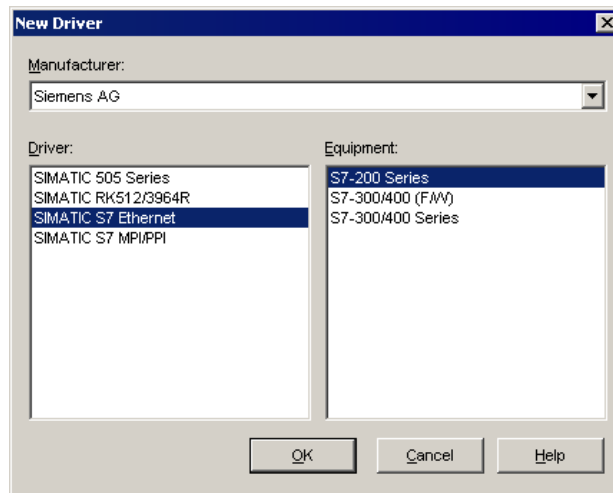
Equipment Configuration

Overview

> # ⚠️WARNING
>
> **UNINTENDED EQUIPMENT OPERATION**
>
> Read and understand the instructions in this section to ensure data is properly transferred. If you do not follow these instructions, incorrect data could be written to the PLC and the target machine.
>
> **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

To set up details about the communication process between the target machine and the PLC, use the [Equipment Configuration] dialog box.

For an overview of the driver and equipment settings, see *Equipment Configuration*.

Note:

● For information on how to display the [Equipment Configuration] dialog box, see the online help.

S7-200 Series
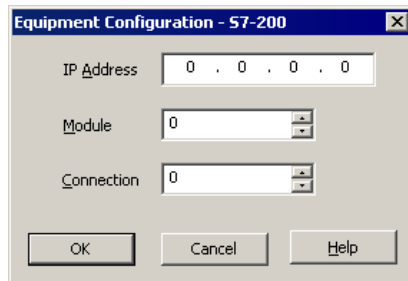
Screen Description

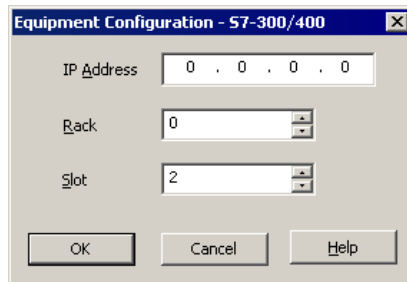| Area	Description
IP Address	Enter the PLC unit's IP address.
Module	Enter the module number to match the PLC configuration software.
Connection	Enter the connection number to match the PLC configuration software.

Fetch/Write

Screen Description

Area	Description
IP Address	Enter the PLC unit's IP address.
PLC Ports	**Fetch** Specify the PLC's TCP port number for the Fetch operation. Specify values between 1024~65535. **Write** Specify the PLC's TCP port number for the Write operation. Specify values between 1024~65535.
Host Port Override	Select the Host Port Override checkbox when: ● the PLC is configured to communicate with only specified host ports or ● the PLC is configured to accept any host ports but there is a port conflict with other applications on the target machine. **Fetch** Specify the TCP Fetch port number to be used on the target machine. If the PLC is configured to communicate with only specified host ports, then this setting must match the PLC connection configuration. **Write** Specify the TCP Write port number to be used on the target machine. If the PLC is configured to communicate with only specified host ports, then this setting must match the PLC connection configuration.

Note:

- The IP Address and PLC Ports fields should match the communication settings on the PLC unit.
- The connection configuration on the PLC can be configured to accept only specified host IP addresses and specified host ports.

S7-300/400 Series

Screen Description

Area	Description
IP Address	Enter the PLC unit's IP address.
Rack	Enter the rack number where the CPU is located.
Slot	Enter the slot number where the CPU is located.

Device Address Configuration

Overview

┌───┐
│   ⚠ **WARNING**   │
├───┤
│ **UNINTENDED EQUIPMENT OPERATION**   │
│   │
│ Read and understand the instructions in this section to ensure data is properly │
│ transferred. If you do not follow these instructions, incorrect data could be written │
│ to the PLC and the target machine.   │
│   │
│ **Failure to follow these instructions can result in death, serious injury, or** │
│ **equipment damage.**   │
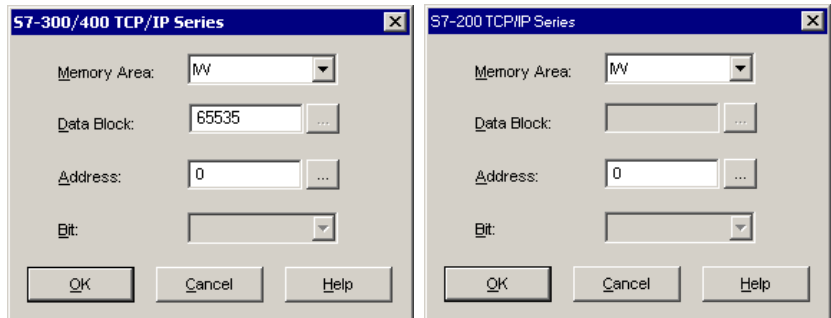└───┘

To set up a PLC variable in the Variable List, use the Device Address Keypad from the variable properties.
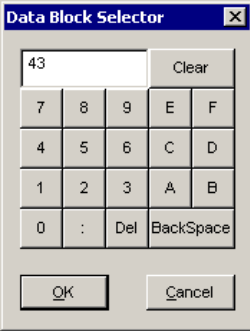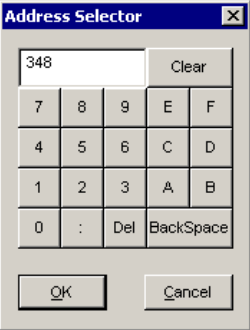
See *Supported Device Addresses*.

Note:

● For information on how to display the Device Address Keypad, see the online help.

Screen example of Device Address Configuration

Screen Description

Area	Description
Memory Area	Lists the device type.
Data Block	Defines a number for a valid data block. This field is available when DB is selected as theMemory Area. To enter a valid data block, click the Data Block field's ellipsis to display the[Data Block Selector] keypad.
Address	Enter the device address number here. When mapping an integer, float, or string variable to a PLC device, you can enter only even addresses. When mapping a discrete variable to a PLC device, you can enter both odd or even addresses. In the Address field, click the ellipsis [...] to display the [Address Selector] keypad, which assists you in entering a valid device address.
Bit	Available when mapping discrete variables to a PLC device. Lists the available bits (0-7).