

## SIMATIC NET S7-CPs for Industrial Ethernet Manual

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**Part A** – General Application

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**A**

**Part B** – CP Descriptions

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**CP 343-1**

Order no.: 6GK7 343-1EX11-0XE0  
(C79000-G8976-C158-03)

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**B1**

**CP 343-1 PN**

Order no.: 6GK7 343-1 HX00-0XE0  
(C79000-G8976-C159-04)

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**B2**

**CP 343-1 IT**

Order no.: 6GK7 343-1 GX11-0XE0  
(C79000-G8976-C145-02)

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**B3**

**CP 443-1**

Order no.: 6GK7 443-1EX11-0XE0  
(C79000-G8976-C152-04)

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**B4**

**CP 443-1 IT**

Order no.: 6GK7 443-1GX11-0XE0  
(C79000-G8976-C144-03)

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**B5**

04/2002

C79000-G8976-C155

Release 04

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## Classification of Safety-Related Notices

This manual contains notices which you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. These notices are highlighted in the manual by a warning triangle and are marked as follows according to the level of danger:



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### **Danger**

indicates that death or severe personal injury **will** result if proper precautions are not taken.

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### **Warning**

indicates that death or severe personal injury **can** result if proper precautions are not taken.

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### **Caution**

with warning triangle indicates that minor personal injury can result if proper precautions are not taken.

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### **Vorsicht**

without warning triangle indicates that damage to property can result if proper precautions are not taken.

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### **Notice**

indicates that an undesirable result or status can result if the relevant notice is ignored.

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### **Note**

highlights important information on the product, using the product, or part of the documentation that is of particular importance and that will be of benefit to the user.

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## Safety Instructions Regarding your Product:

Before you use the product described here, read the safety instructions below thoroughly.

## Qualified Personnel

Only **qualified personnel** should be allowed to install and work on this equipment. Qualified persons are defined as persons who are authorized to commission, to ground, and to tag circuits, equipment, and systems in accordance with established safety practices and standards.

## Correct Usage of Hardware Products

Note the following:



### Warning

This device and its components may only be used for the applications described in the catalog or the technical description, and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens.

This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

Before you use the supplied sample programs or programs you have written yourself, make certain that no injury to persons nor damage to equipment can result in your plant or process.

EU Directive: Do not start up until you have established that the machine on which you intend to run this component complies with the directive 89/392/EEC.

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## Correct Usage of Software Products

Note the following:



### Warning

This software may only be used for the applications described in the catalog or the technical description, and only in connection with software products, devices, or components from other manufacturers which have been approved or recommended by Siemens.

Before you use the supplied sample programs or programs you have written yourself, make certain that no injury to persons nor damage to equipment can result in your plant or process.

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## Prior to Startup

Prior to startup, note the following:

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### Caution

Prior to startup, note the information and follow the instructions in the latest documentation. You will find the ordering data for this documentation in the relevant catalogs or contact your local Siemens office.

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#### Disclaimer of Liability

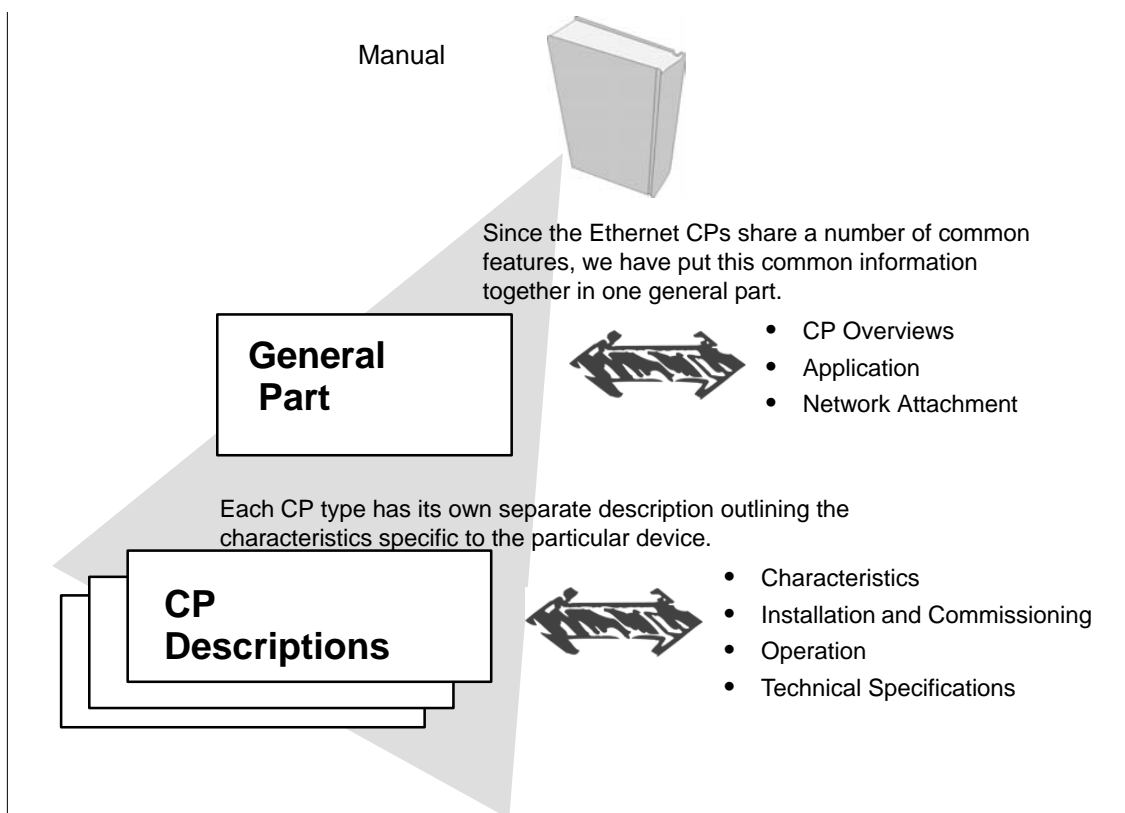
We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

Subject to technical change.

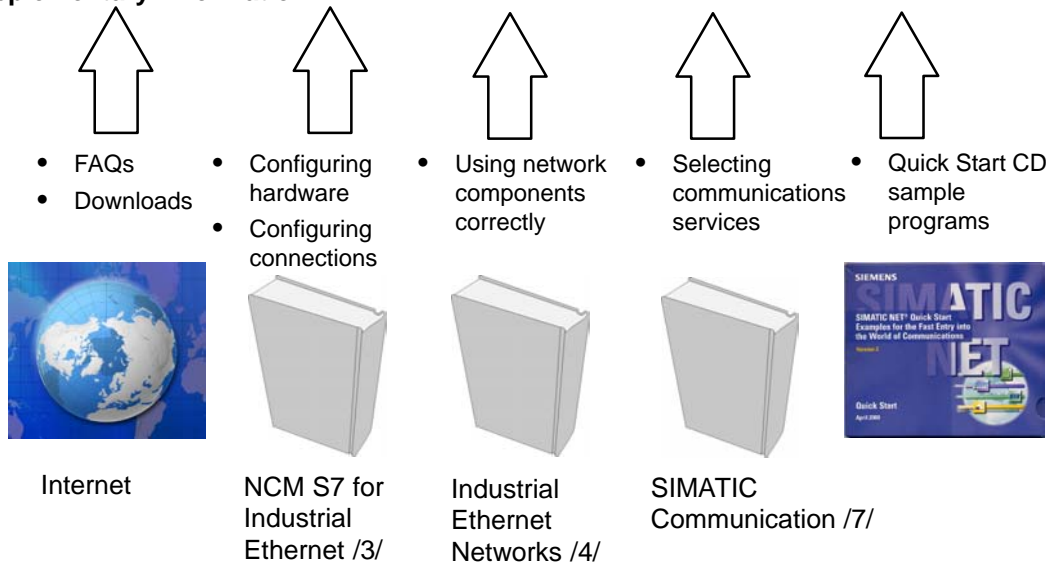
# This SIMATIC NET IE CP Manual ...

... helps you use the device in your SIMATIC S7 PLCs successfully and effectively.

To provide you with a clear overview and quick access to the information you require on our Ethernet CPs, we have structured the manual as shown below:



## Supplementary information:



## Additional Information

This manual is also part of the NCM S7 for Industrial Ethernet documentation package. The following table provides you with an overview.

| Title                                 | Topic  |
|---------------------------------------|--|
| NCM S7 for Industrial Ethernet Primer | This primer helps to familiarize you with the topic "Attaching and networking SIMATIC S7 stations with CPs on Industrial Ethernet" based on simple examples. You will see how the communication calls in the user program should appear to make optimum use of the services via the SEND/RECEIVE interface.<br><br>You will learn how simple it is to create a configuration for standard applications using STEP 7 and the NCM S7 optional package. |
| NCM S7 for Industrial Ethernet Manual | This manual serves both as an instruction manual and a reference work for configuring and programming Ethernet CPs.<br><br>When working with the configuration software, you can also call up the online help in specific situations.  |



### Tip:

You should also refer to the recommended reading on the topics of the Web, HTML etc. in the appendix of this manual.

This symbol appears in the margin to draw your attention to useful tips.

## Additional Information on SIMATIC S7 and STEP 7

The following documentation contains additional information about the STEP 7 standard software of the SIMATIC programmable controllers and can be obtained from your local Siemens office.

| Topic  | Document  |
|--|---|
| Basic information for technical personnel using the STEP 7 standard software for control tasks with S7-300/400 programmable controllers.                         | STEP 7 basics with <ul style="list-style-type: none"> <li>• User manual</li> <li>• Programming manual</li> <li>• Manual for converting from S5 to S7</li> <li>• Primer for a quick start</li> </ul> |
| The reference works describing the programming languages LAD/FBD and STL as well as the standard and system functions in addition to the STEP 7 basic knowledge. | STEP 7 reference manuals with <ul style="list-style-type: none"> <li>• Manuals for LAD/FBD/STL</li> <li>• Standard and System Functions for S7-300/400</li> </ul>                                   |

You will also find information on the SIMATIC programmable controllers on the Quick Start CD and in the Customer Support online services at:

<http://www.siemens.de/simatic-net> general information

or

<http://www.ad.siemens.de/csi/net> product information and downloads

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## Contents – Part A

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## Contents – Part B

– see CP-specific description –

on Manual Collection CD

or via Internet:

**CP 343–1:** <http://www4.ad.siemens.de/view/cs/de/8777308>

**CP 343–1 PN:** <http://www4.ad.siemens.de/view/cs/de/8776538>

**CP 343–1 IT:** <http://www4.ad.siemens.de/view/cs/de/8776544>



**CP 443–1 :** <http://www4.ad.siemens.de/view/cs/de/8776219>

**CP 443–1 IT :** <http://www4.ad.siemens.de/view/cs/de/8776322>

# 1 Introduction

## 1.1 The Communication Services of Ethernet CPs

Depending on the module type, the S7-CPs support the following communication options:

| Programmable Controller   | Module      | Functions Supported |    |               |    |          |
|---|-------------|---------------------|----|---------------|----|----------|
|   |             | PG/OP               | S7 | S5-compatible | IT | PROFINet |
| S7/C7-300<br>      | CP 343-1    | ●                   | ●  | ●             | –  | –        |
|   | CP 343-1 IT | ●                   | ●  | ●             | ●  | –        |
|   | CP 343-1 PN | ●                   | ●  | ●             | –  | ●        |
| S7-400/S7-400H<br> | CP 443-1    | ●                   | ●  | ●             | –  | –        |
|   | CP 443-1 IT | ●                   | ●  | ●             | ●  | –        |

- **PG/OP Communication**

PG/OP communication is used to download programs and configuration data, to run test and diagnostic functions, and to monitor and control a plant/process at an OP.

- **S7 Communication**

S7 communication forms a simple and efficient interface between SIMATIC S7 stations and PGs/PCs using communication function blocks.

- **S5-Compatible Communication (SEND/RECEIVE-interface)**

The SEND/RECEIVE interface allows program-controlled communication on a configured connection from a SIMATIC S7 PLC to another SIMATIC S7 PLC, a SIMATIC S5 PLC and to a SIMATIC PC station.

- **IT Functions**

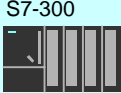


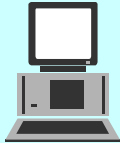


Sending E-mail, monitoring device and process data (HTML process monitoring) and FTP functions (File Transfer Protocol) for file management and access to data blocks on the CPU (client and server functions).

- **PROFINet**

PROFINet is a standard of the PROFIBUS Users Organization (PNO) that defines a heterogeneous communications and engineering model. An S7–300 station equipped with a PROFINet–compliant CP can be interconnected as a PROFINet component in SIMATIC iMap.

## Communication Options

The following table shows the communication options between the device types with the various types of communication:

|   | <br>S7-300 | <br>S7-400 | <br>S5-115U to -155U/H<br>S5-95U<br>S5-95U/DP Master<br>S5-95U/DP Slave | <br>PC   |
|---|---|---|---|---|
| <br>S7-300   | S7 communication<br>SEND/RECEIVE  | S7 communication<br>SEND/RECEIVE  | SEND/RECEIVE<br>FETCH / WRITE   | PG/OP communication <sup>1)</sup><br>S7 communication <sup>1)</sup><br>SEND/RECEIVE<br>FETCH / WRITE<br>HTML process monitoring                 |
| <br>S7-400 | S7 communication<br>SEND/RECEIVE  | S7 communication<br>SEND/RECEIVE<br>FTP services  | SEND/RECEIVE<br>FETCH / WRITE   | PG/OP communication <sup>1)</sup><br>S7 communication <sup>1)</sup><br>SEND/RECEIVE<br>FETCH / WRITE<br>FTP services<br>HTML process monitoring |

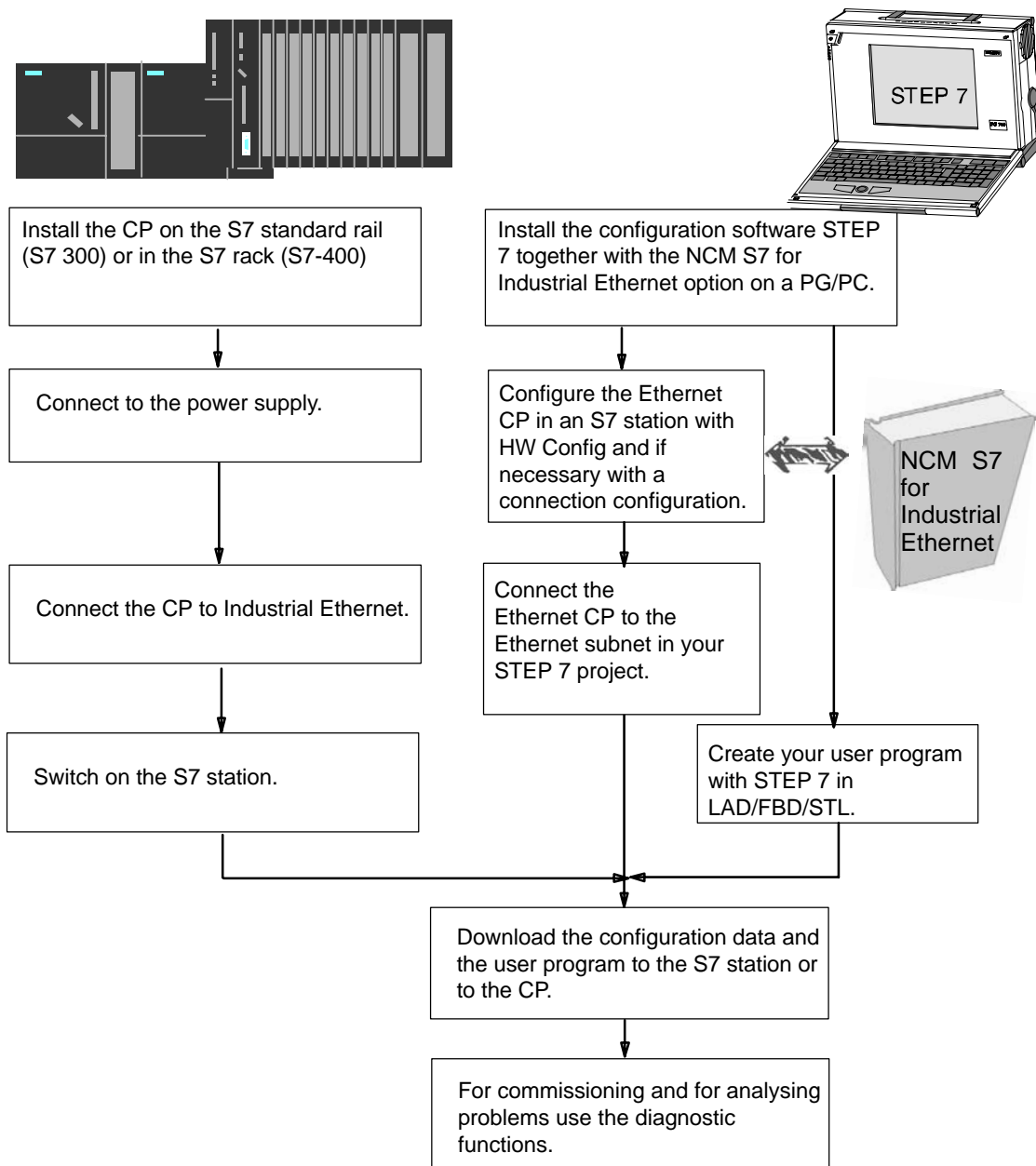
1) PC only as client

## 1.2 How to Commission an Ethernet CP

The following overview shows the essential steps when commissioning a Ethernet CP:

### Notice

The following diagram shows the basic procedure. Follow the instructions for your specific device in "Installation and Commissioning" in the description of your CP.



### **Configuration and Diagnostics with STEP 7 and NCM S7 for Industrial Ethernet**

To attach the Ethernet CP to the network and to configure it, you require the STEP 7 configuration software and the SIMATIC NET NCM S7 for Industrial Ethernet option.

NCM S7 for Industrial Ethernet is installed as a STEP 7 option and is therefore integrated in STEP 7.

NCM S7 for Industrial Ethernet also provides a wide range of diagnostic functions for the various types of communication.

### **Operation with Fast Ethernet – Automatic Recognition and Switchover**

The Ethernet CPs operate at 10/100 Mbps full duplex with “Autonegotiation” for automatic switchover.

After startup, the diagnostic buffer of the CP contains an entry that provides information on the medium that the CP expects based on the configuration or following autonegotiation.

## 1.3 Diagnostics During Commissioning and Operation

### Diagnostic Options in STEP 7

STEP 7 provides you with a graded concept allowing you to query information about the status of your SIMATIC S7 components and functions and to sort out problems in a variety of different situations. These options cover the following:

- **Communication Diagnostics with NCM S7 Diagnostics**

The NCM S7 Diagnostics described here provides dynamic information on the status of the communication functions of online CPs.

- **Hardware Diagnostics and Troubleshooting with STEP 7**

Hardware diagnostics provides dynamic information on the status of modules including CPs when the S7 station is online.

You can recognize the existence of diagnostic information for a module by the diagnostics icon in the project window of the SIMATIC Manager. Diagnostics icons show the status of the corresponding module and also the operating mode of CPUs.

Detailed diagnostic information is displayed in the “module information” that you can open by double-clicking a diagnostics icon in the quick view or the diagnostic view.

- **HW Config Provides Static Information**

Static information means the configured communication properties of an online or offline CP and you can display this at any time using the hardware configuration shown by HW Config.

## Functions of NCM S7 Diagnostics

The diagnostic functions can be grouped as follows:

- General diagnostic and statistical functions
- Type and mode-dependent diagnostic functions

### General diagnostic and statistical functions

Regardless of the configured mode of the Ethernet CP, the following diagnostic functions are possible:

- Querying the operational status on Industrial Ethernet.
- Querying the event messages recorded on the Ethernet CP (diagnostic buffer)

### Mode-Dependent Diagnostic Functions

Depending on the configured mode of the Ethernet CP, the following diagnostic functions are possible:

- Diagnostics of the ISO transport connections.
- Diagnostics of the ISO-on-TCP transport connections.
- Diagnostics of TCP connections
- Diagnostics of UDP connections
- Diagnostics of the E-mail connections
- Diagnostics of the TCP for PROFINet connections.

## 2 Structure

### 2.1 Communications Processors for S7-300

The modules are designed to match the components of the S7-300/C7-300 programmable logic controller and have the following features:

- Compact modules (double-width) for simple installation on the S7 standard rail
- Can be used in central or expansion racks
- The operator controls and displays are all located on the front panel
- No fan necessary
- Direct backplane bus connection via the supplied bus connector
- 8-pin RJ-45 jack for attachment of the CP to twisted pair Ethernet
- 15-pin sub-D female connector with slide locking mechanism for attachment of the CP to Industrial Ethernet (automatic switchover between AUI interface and Industrial Twisted Pair interface when the cable, AUI or ITP, is connected).
- The CP can be configured over MPI or LAN/Industrial Ethernet. You require STEP 7 with NCM S7 for Industrial Ethernet (abbreviated below to “NCM IE”) Version 5.0 + SP3 and higher.



Figure 2-1 Front View of the CP 343-1

## 2.2 Communications Processors for S7-400

The modules are designed to match the components of the S7-400 / S7-400H programmable logic controller and have the following features:

- Single-width modules for simple installation in the S7-400 / S7-400H rack
- Can be used in central or expansion racks
- The operator controls and displays are all located on the front panel
- No fan necessary
- 8-pin RJ-45 jack for attachment of the CP to twisted pair Ethernet
- 15-pin sub-D female connector with slide locking mechanism for attachment of the CP to Industrial Ethernet (automatic switchover between AUI interface and Industrial Twisted Pair interface when the cable, AUI or ITP, is connected).
- The CP can be configured over MPI or LAN/Industrial Ethernet. You require the following version of STEP 7 with NCM S7 for Industrial Ethernet (abbreviated below to “NCM IE”):

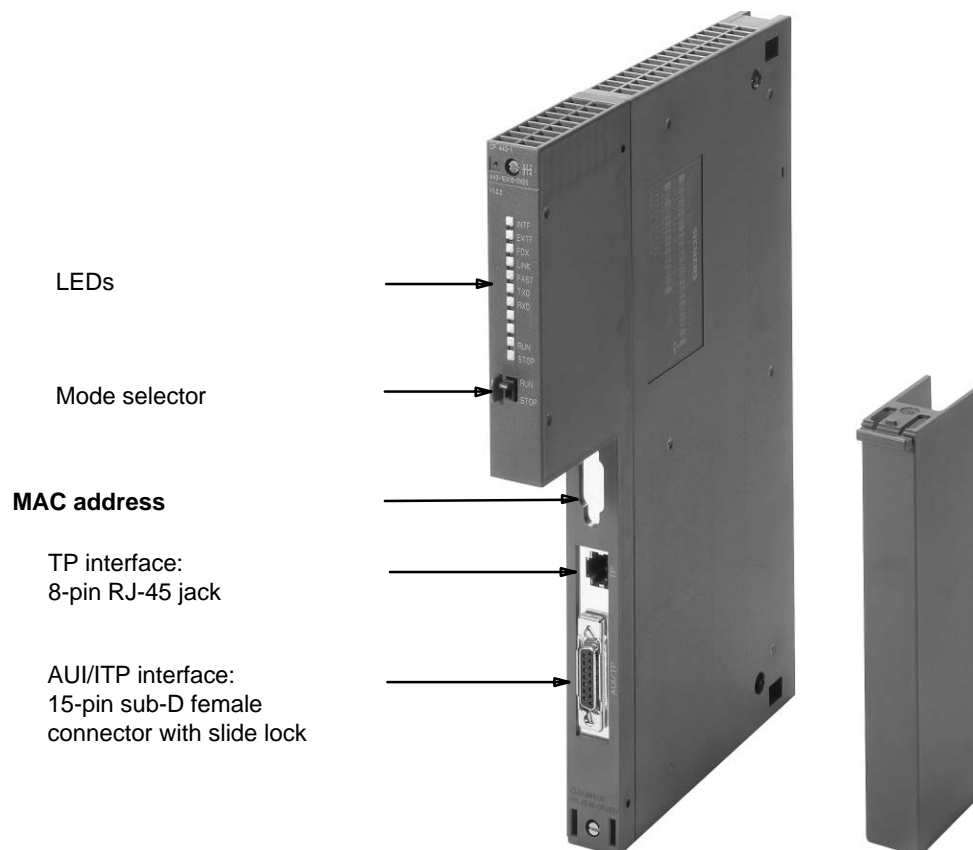


Figure 2-2 Front View of the CP 443-1 / CP 443-1 IT

## 3 Attaching to Ethernet

Below, you will see several typical possible attachments.

For further information on attachment options and Ethernet structures, refer to the Ethernet network manual /4/. For ordering data and information on further components, please refer to the IK PI catalog or the CA01 electronic ordering catalog on CD, and on the Internet at:

<http://www3.ad.siemens.de/ca01online/index.asp?SiteID=DE>

### 3.1 Electrical Attachment

The CP can be attached to Industrial Ethernet as follows:

- **Transceiver with AUI attachment**

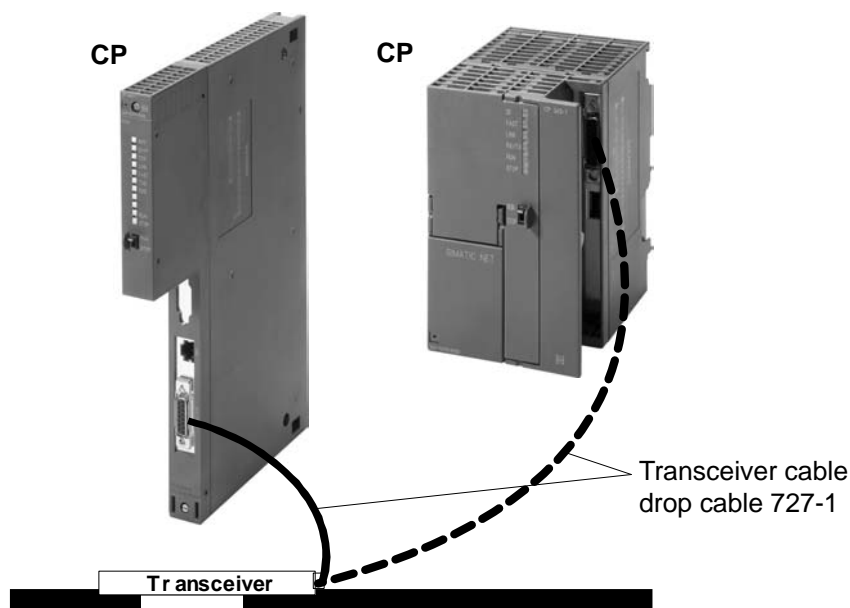


Figure 3-1

The CP provides the power supply required for the transceiver.

- Industrial Twisted Pair attachment, for example, using an OSM

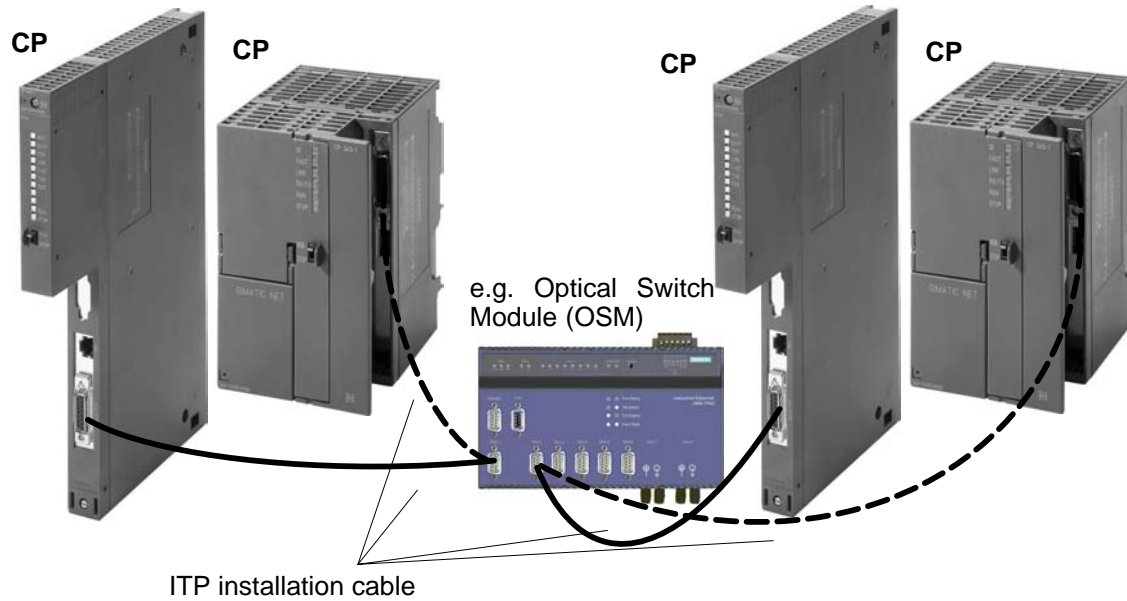


Figure 3-2

If the Industrial Ethernet twisted pair installation cable is used as shown in Figure 3-2, the CP automatically detects the medium and switches over to twisted pair.

- **Twisted pair attachment using RJ-45 jack**

In areas with little EMI such as in offices and wiring closets, the CP can be attached to Ethernet using twisted pair and the RJ-45 jack.

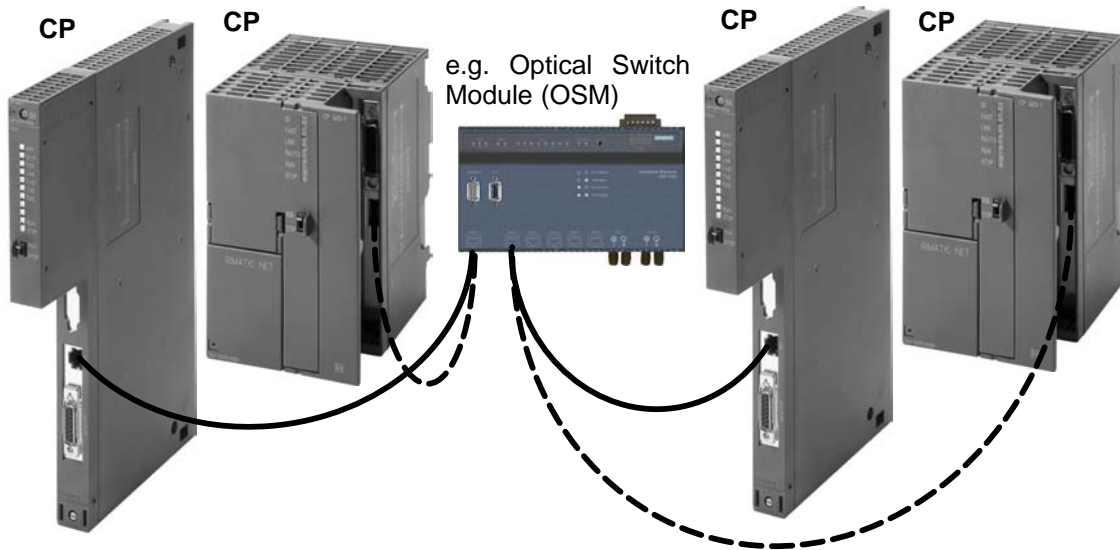


Figure 3-3

## 3.2 Optical Ind. Ethernet with AUI Attachment

The CP can also be attached to Industrial Ethernet using an optical transceiver and the AUI port.

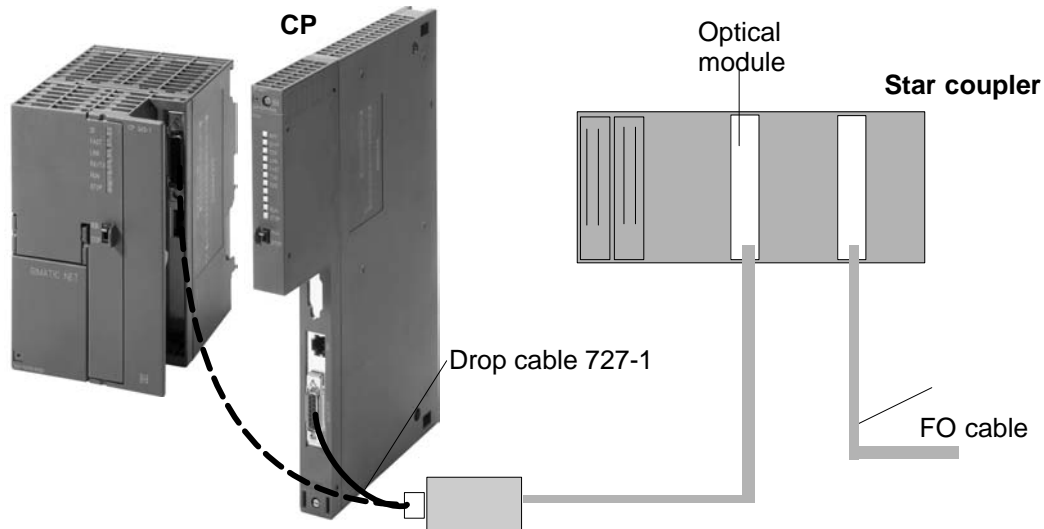


Figure 3-4

### Further Information

You can order additional components from the SIMATIC NET range of cables according to the information in the IK PI catalog.

#### Note

Please note, that problem-free operation is possible only when **either** the AUI/ITP plug **or** the TP plug is inserted.

If you change from one interface to the other during operation, the hardware may not detect the change. You should therefore only change the interface when the device is turned off!

## 4 Slot Rules and Configurations

### 4.1 SIMATIC S7-300

#### 4.1.1 Permissible Slots

In the SIMATIC S7/M7-300 there is no set slot assignment for the SIMATIC NET CPs. Slots 4 to 11 are permissible (1, 2 and 3 cannot be used for CPs).

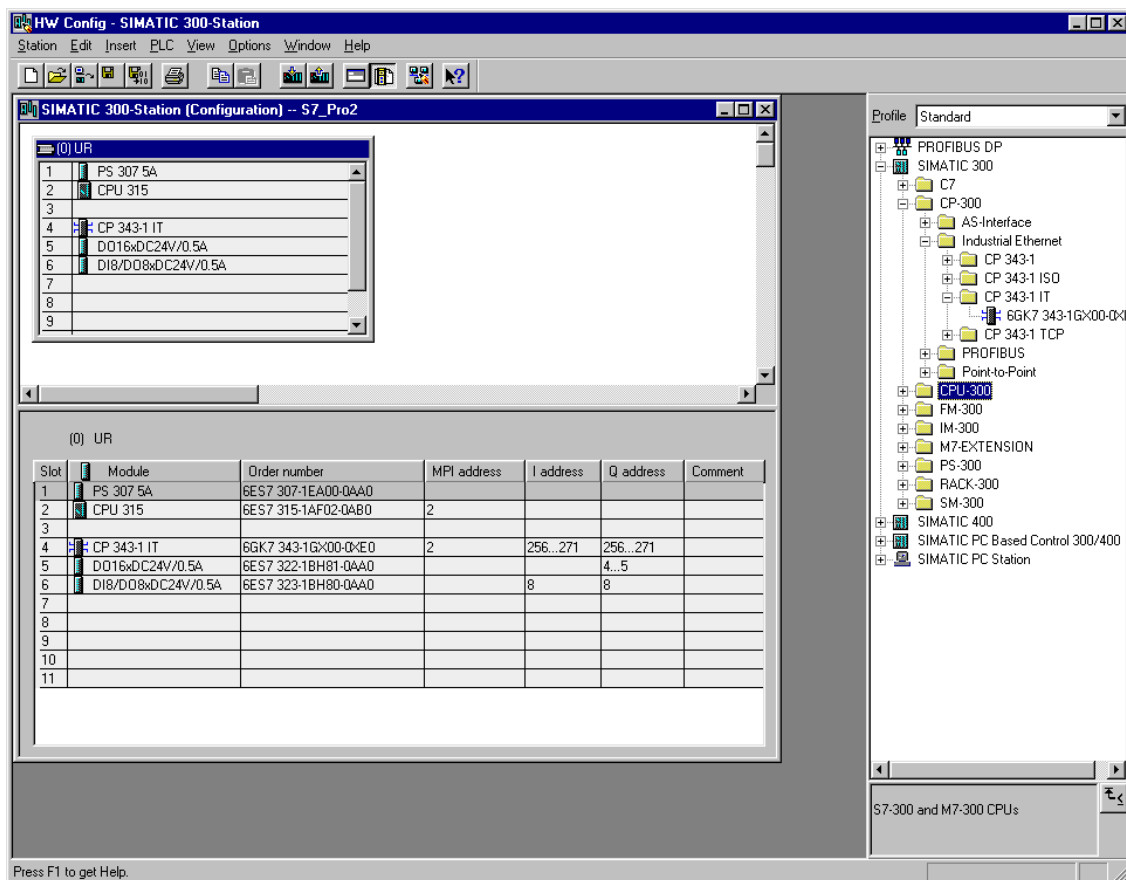


Figure 4-1 Example: Hardware Configuration S7-300 with SIMATIC NET CPs in the Central Rack

The SIMATIC NET CPs can be installed both in the central rack and in an expansion rack, linked to the central rack via an IM 360/IM 361 (K-bus connection).

### 4.1.2 Number of SIMATIC NET CPs

The number of SIMATIC NET CPs that can be operated is not limited by the system (for example S7-300 CPU, slot rules etc.), but by the application (maximum cycle time of the application). The following components must be added into the calculation of the cycle time on top of the existing S7 user program:

- Execution time of the FCs:

For communication between the S7-300 CPU and SIMATIC NET CPs, blocks (FCs/FBs) are necessary. How often these blocks are called depends on the number of connections or the number of SIMATIC NET CPs. Depending on the amount of data transmitted, every block call extends the time required by the user program.

- Data conversion:

It may also be necessary for the information to be converted before transmission or after reception.

### 4.1.3 Multicomputing

This functionality is not supported by the SIMATIC S7/M7-300.

### 4.1.4 Removing / Inserting (Replacing Modules)

Removing and inserting the SIMATIC NET CPs for the SIMATIC S7-300 while the power is on is possible without damaging the modules.

If the CP supports the option of saving the configuration data on the CPU, it is also possible to replace a module without a PG (see CP-specific description).

---

#### Note

With **older CPs** removing and inserting is **not** supported by the S7-300 system. Note that by removing a module from the rack, all modules on the other side of it will be disconnected from the CPU.

In this case, a PG is required to download the configuration after replacing a module.

---

#### 4.1.5 **Note on the S7-300 CPU: Connection Resources**

Note that when using older S7-300 CPUs ( $\leq$  CPU 316), a maximum of four S7 type connections for CP communication are supported. Of these four connections, one is reserved for a PG and another for an OP (HMI = Human Machine Interface). The newer CPUs (from 10/99 onwards) support twelve and the CPU 318-2DP supports sixteen S7 connections.

As a result, the older S7-300 CPUs have only two “free” S7 connections available. These two connections can be used for S7 communication, for PROFIBUS-FMS, for longer data, or FETCH, WRITE and TCP connections with Industrial Ethernet.

---

#### **Notice**

Depending on the CP type installed and the services being used, there may be other restrictions (see CP-specific description in this manual).

---

## 4.2 SIMATIC S7-400

### 4.2.1 Permissible Slots

An S7-400 CP can be inserted both in the central rack and in the expansion rack with a K bus interface. For the total number of CPs you can install, please refer to the information on the relevant CP in the “Properties” chapter.

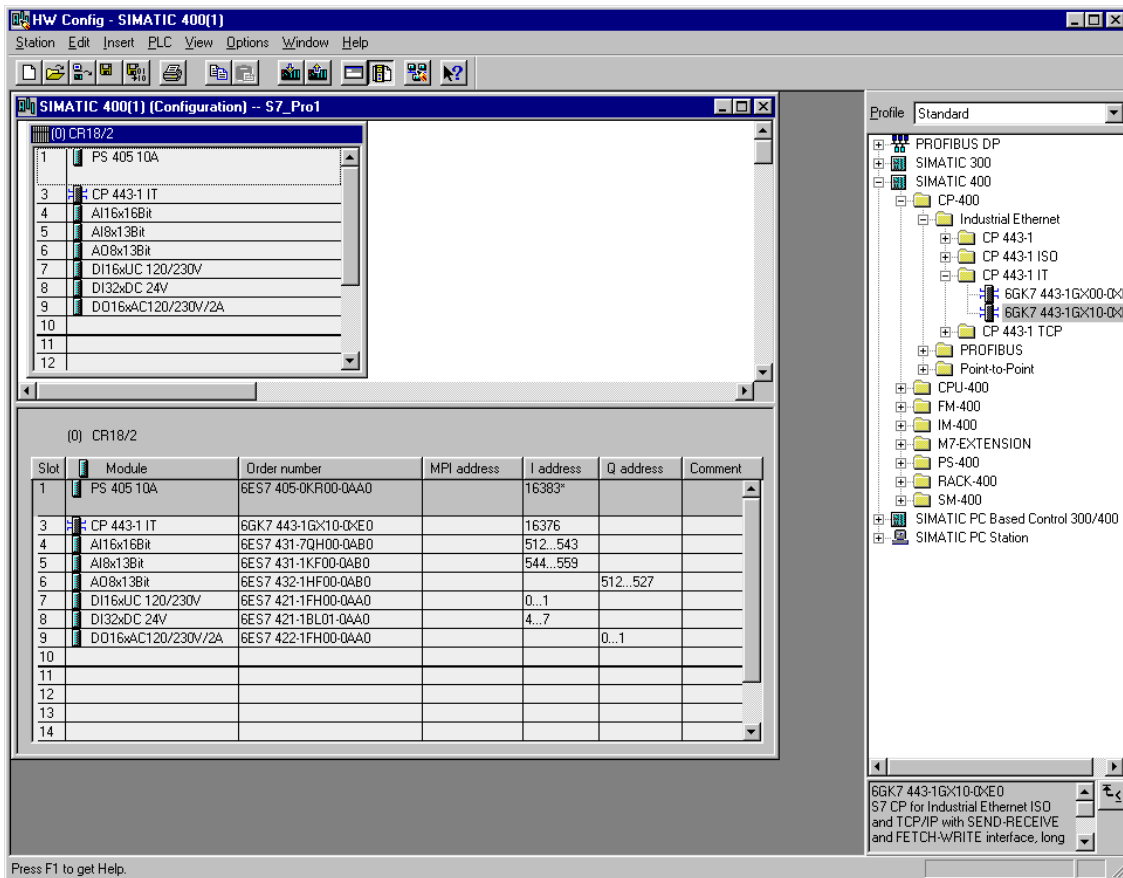


Figure 4-2 Example: Hardware Configuration S7-300 with SIMATIC NET CPs in the Central Rack

In the SIMATIC S7/M7-400 there is no set slot assignment for the SIMATIC NET CPs. Slots 2 to 18 are permissible. Note, however, that depending on the power supply module installed, slot 1 may also occupy slots 2-3 (4 during redundant operation).

#### **4.2.2 Number of SIMATIC NET CPs**

The number of SIMATIC NET CPs that can be operated simultaneously is limited by the specific characteristics of the CPU. The exact number can be found in the CP-specific section of this manual.

#### **4.2.3 Multicomputing**

The communication load can be distributed by installing several SIMATIC NET CPs (distribution of load). If, however, you want to increase the number of available connection resources, you can insert several CPUs in a rack (multicomputing). All S7-400 CPUs in a rack can communicate via one or more SIMATIC NET CPs.

The following communication services support multicomputing:

- ISO transport connections
- ISO-on-TCP connections
- S7 functions
- TCP connections
- UDP connections
- E-mail connections

#### **4.2.4 Removing / Inserting (Replacing Modules)**

Removing and inserting the SIMATIC NET CPs for the S7-400 while the power is on is possible without damaging the modules.

If a CP is replaced with a new CP with the same order number, the configuration data simply needs to be downloaded again if it is not stored on the CPU (see also CP-specific sections of this manual).

#### 4.2.5 Note on the S7-400 CPU: Connection Resources

Note that in the S7-400 CPU, one S7 connection is reserved for a PG and a further one for an OP (HMI = Human Machine Interface).

- Attaching the PG over MPI:

To execute ONLINE functions (for example module diagnostics) from a PG on an S7-400 CP via the MPI interface, two connection resources (addressing of the interface and the K-bus) are necessary on the S7-400 CPU. These two connection resources should be taken into account in the number of S7 connections.

Example: The CPU 412-1 has sixteen free resources for S7 functions available. If a PG is to be used for diagnostics on the S7-400 CP and is connected to the MPI interface, two connection resources are required on the S7-400 CPU, so that 14 connection resources remain available.

- PG connection via PROFIBUS or Industrial Ethernet

If the PG is connected to the LAN (PROFIBUS or Industrial Ethernet), in order to execute PG functions on the S7-400 CPU and diagnostics on an S7-400 CP, only **one** connection resource on the S7-400 CPU is necessary.

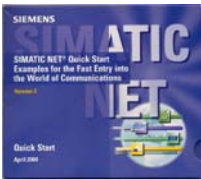
## 5 Services – Additional Information

This chapter provides an overview and additional information on the services that the Ethernet CPs support.

Please note that these services are explained in greater detail in the following sources:

- Communication with SIMATIC ...
- NCM S7 for Industrial Ethernet Manual
- STEP 7 Help ...
- Automation with STEP 7 in STL and SCL /8/

### Quick Start CD: Samples on all aspects of communication



The Quick Start CD can be ordered separately and is a treasure-trove of sample programs and configurations.

You can also order this directly on the Internet.

[http://www.ad.siemens.de/net/html\\_00/service/cdbestell.htm](http://www.ad.siemens.de/net/html_00/service/cdbestell.htm)

## 5.1 Overview

### Definition

A SIMATIC S7 communication service describes communication functions with defined characteristics such as data exchange, controlling devices, monitoring devices, and downloading programs.

### Communication Services

With Industrial Ethernet, the following communication services are available with SIMATIC NET CPs:

- S5-compatible communication – SEND/RECEIVE interface
- S7 communication
- IT functions (with the CP 343-1 IT / CP 443-1 IT)
- PROFINet functionality

## 5.2 S5–Compatible Communication – SEND/RECEIVE Interface

### Overview

These functions transfer data between SIMATIC S7 and SIMATIC S5 stations.

The SEND/RECEIVE interface originated in the SIMATIC S5 world and is continued in “S5–compatible communication” in the SIMATIC S7 world.

Data blocks can be exchanged on a bidirectional communication connection via the SEND/RECEIVE interface. The main features are listed below:

- The user interface to PROFIBUS and Industrial Ethernet has an identical structure.
- The S7 user program can be used for PROFIBUS and for Industrial Ethernet without program changes (except with long data packets in Industrial Ethernet – up to a maximum of 8 Kbytes).
- Although different modules are used for the S7–300 and S7–400, the user interface is identical.
- Sending and receiving frames is possible on one connection (full duplex).
- The maximum data length with PROFIBUS is 240 bytes and 8 Kbytes with Industrial Ethernet.

### Configuring

NCM S7 for PROFIBUS/Industrial Ethernet is used to configure the SEND/RECEIVE interface of the SIMATIC NET CPs.

Function calls (FC: Function Call) are integrated in the STEP 7 user program in the SIMATIC S7 CPU for triggering data transmission and are supplied with the NCM S7 for PROFIBUS/Industrial Ethernet configuration software.

Sample programs for using the SEND/RECEIVE interface on SIMATIC S7 PLCs are included in the NCM S7 for PROFIBUS/Industrial Ethernet package.

## 5.3 S7 Communication

### Overview

S7 communication provides the user with functions for data exchange between S7 controllers and SIMATIC PC stations. S7 communication is integrated in every SIMATIC S7 device.

Note the following features:

- From the user's point of view, S7 communication appears to be identical on PROFIBUS and Industrial Ethernet.
- The S7-300/400 CPU or FM is the endpoint for S7 connections. This means that performance data of the S7-300/400 modules apply in S7 communication.  
Exception:  
When running diagnostic functions on an active K-bus module, a SIMATIC NET CP for example, this becomes the endpoint of the S7 connection.

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### Notice

The written or read information is transferred from the S7 user program to the operating system, or copied from the operating system into the S7 user program in blocks of 8 or 32 bytes (depending on the firmware version).

If information in the word or double-word format is stored so that it crosses such a boundary, data inconsistencies may occur during transmission with S7 communication.

---

### Configuring

Configuration of S7 communication with an S7-300 station is only necessary if it is operating as a client (FB calls).

### **Notes on Operating the S7–300 as Server (non–configured connection)**

The connection partner establishes the connection to the S7/M7–300. In this case, note that with an S7 connection via a SIMATIC NET CP, it is the S7/M7–300 CPU that must be addressed and not the SIMATIC NET CP, as all S7 communication is handled by the S7/M7–300 CPU.

The SIMATIC NET CP only passes on the communication protocol (communications relay).

When reading or writing in the S7/M7–300 CPU, the partner must give the S7/M7 address of the data area it wants to access on the S7/M7 CPU.

Addressing using a name is not possible.

## 6 Pinout

### 6.1 RJ-45 Jack for Twisted Pair Ethernet

| Pin No. | Signal Name | Function         |
|---------|-------------|------------------|
| 1       | TD          | TP- / Transmit + |
| 2       | TD_N        | TP- / Transmit - |
| 3       | RD          | TP- / Receive +  |
| 4       | -           | -                |
| 5       | -           | -                |
| 6       | RD_N        | TP- / Receive +  |
| 7       | -           | -                |
| 8       | -           | -                |

The pinning of the RJ-45 jack corresponds to the IEEE802.3 twisted pair interface.

### 6.2 Connector for Industrial Ethernet

#### Pinning – 15-Pin Sub-D Female Connector

| Pin No. | Signal Name        | Function                         |
|---------|--------------------|----------------------------------|
| 1       | MEXT               | External ground, shield          |
| 2       | CLSN               | Collision +                      |
| 3       | TRMT / TPETXD      | Transmit + / TPE Transmit Data + |
| 4       | Ground             | Ground 5 V                       |
| 5       | RCV / TPERXD       | Receive + / TPE Receive Data +   |
| 6       | M 15 V             | Ground 15 V                      |
| 7       | TPE_SEL            | Switchover AUI/ITP               |
| 8       | Ground             | Ground 5 V                       |
| 9       | CLSN_N             | Collision -                      |
| 10      | TRMT_N / TPEXTXD_N | Transmit - / TPE Transmit Data - |
| 11      | Ground             | Ground 5 V                       |
| 12      | RCV_N / TPERXD_N   | Receive - / TPE Receive Data -   |
| 13      | P15 V              | +15 V                            |
| 14      | Ground             | Ground 5 V                       |
| 15      | -                  | -                                |

## 7 Notes on the CE Mark of SIMATIC NET S7 CPs

### Product Name:

- |               |                                |
|---------------|--------------------------------|
| • CP 343-1    | Order no.: 6GK7 343-1EX11-0XE0 |
| • CP 343-1 IT | Order no.: 6GK7 343-1GX00-0XE0 |
| • CP 343-1 PN | Order no.: 6GK7 343-1HX00-0XE0 |
| • CP 443-1    | Order no.: 6GK7 443-1EX11-0XE0 |
| • CP 443-1 IT | Order no.: 6GK7 443-1GX11-0XE0 |

### EU Directive EMC 89/336/EEC



The SIMATIC NET products listed above meet the requirements of the EU directive 89/336/EEC "Electromagnetic Compatibility".

The EU conformity certificate is available for the relevant authorities according to the EU directives and is kept at the following address:

- Siemens Aktiengesellschaft  
Bereich A&D  
Industrielle Kommunikation SIMATIC NET  
Postfach 4848  
D-90327 Nuremberg  
Germany

### Notice for Australia



The products meet the requirements of the AS/NZS 2064 (class A) standard.

### Notice for Canada

This class A digital device meets the requirements of the Canadian ICES-003 standard.

### AVIS CANADIEN

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

### Area of Application

The product is designed for use in an industrial environment.

| Area of Application | Requirements      |                   |
|---------------------|-------------------|-------------------|
|                     | Noise emission    | Noise immunity    |
| Industrial          | EN 50081-2 : 1993 | EN 50082-2 : 1995 |

### Directive on Machines

The product remains a component in compliance with Article 4(2) of the EU directive on machines 89/392/EEC.

According to the directive on machines, we are obliged to point out that this product is intended solely for installation in a machine. Before the final product is started up, it must be established that it conforms to the directive 89/392EEC.

### Installation Guidelines

The product conforms to the requirements if the guidelines mentioned in this manual and in documents /1/, /3/ and /4/ are followed.

# A References

## Manuals and Other Information

The following documentation contains detailed information necessary for configuration and operation:

- /1/** For installing and commissioning the CP S7-300, Installation and Hardware Manual
- /2/** For installing and commissioning the CP S7-400, Installation and Hardware Manual
- /3/** For using and configuring the CP SIMATIC NET NCM S7 for PROFIBUS, manual Volume 1 and "Primer"
- /4/** For installing and operating an Industrial Ethernet network SIMATIC NET Industrial Twisted Pair für Industrial Ethernet
- /5/** For installing and operating an Industrial Ethernet network SIMATIC NET Manual for Triaxial Networks for Industrial Ethernet
- /6/** On the topic of configuring:  
STEP 7 User Manual
- /7/** On the topic of communication:  
Communication with SIMATIC Manual
- /8/** On the topic of programming:  
Automating with STEP 7 in STL und SCL  
User manual, Programming Manual  
Berger, H. / Publicis-MCD-Verlag, 2001
- /9/** SIMATIC S7-400H Programmable Controllers  
Fault-Tolerant Systems  
Manual

**/10/** For configuring PROFINET components and plants:  
Basic help system in the SIMATIC iMap engineering tool

**/11/** For configuring PROFINET components and plants:  
Component based Automation – Configuring Plants with SIMATIC iMap manual

### **Order Numbers**

The order numbers for the SIEMENS documentation listed above can be found in the catalogs “SIMATIC NET Industrial Communication, Catalog IK PI” and “SIMATIC Programmable Logic Controllers SIMATIC S7 / M7 / C7 – Components for Fully Integrated Automation, Catalog ST 70”.

These catalogs and additional information about the products and training courses can be obtained from your local SIEMENS office.

## B SIMATIC NET – Support and Training

### Automation and Drives, Service Support

Open round the clock, worldwide:



| Technical Support  | Authorization Hotline  |
|--|--|
| <b>Europe and Africa (Nuremberg)</b><br>Mo. to Fr. 7:00 to 17:00 (local time, GMT +1)<br>Tel: +49 – (0) 180 – 5050 – 222<br>Fax: +49 – (0) 180 – 5050 – 223<br>E-mail: techsupport@ad.siemens.de | <b>Europe and Africa (Nuremberg)</b><br>Mo. to Fr. 7:00 to 17:00 (local time, GMT +1)<br>Tel: +49 – (0) 911 – 895 – 7200<br>Fax: +49 – (0) 911 – 895 – 7201<br>E-mail: authorization@nbgm.siemens.de |
| <b>America (Johnson City)</b><br>Mo. to Fr. 8:00 to 19:00 (local time, GMT –5)<br>Tel: +1 – (0) 423 – 262 – 2522<br>Fax: +1 – (0) 423 – 262 – 2231<br>E-mail: simatic.hotline@sea.siemens.com    |  |
| <b>Asia and Australia (Singapore)</b><br>Mo. to Fr. 8:30 to 17:30 (local time, GMT +8)<br>Tel: +65 – (0) 740 – 7000<br>Fax: +65 – (0) 740 – 7001<br>E-mail: simatic.hotline@sae.siemens.com.sg   |  |
| SIMATIC Premium Hotline  |  |
| <b>Worldwide (Nuremberg)</b><br>Workdays<br>0:00 to 24:00 (local time, GMT +1)<br>Tel: +49 – (0) 911 – 895 – 7777<br>Fax: +49 – (0) 911 – 895 – 7001<br>E-mail: techsupport@ad.siemens.de        | Fast callback<br>guaranteed within a maximum of two hours<br>(charged, only with the SIMATIC Card)   |

## Technical Support Online Services

SIMATIC Customer Support provides you with a wide range of additional information on SIMATIC products in the online services:

- You can obtain general up-to-date information as follows:
  - on the Internet at  
<http://www.siemens.de/simatic-net>
  - at fax polling no. +49 (0) 8765-93 02 77 95 00
- Updated product information, FAQs, Tips and Tricks, and useful downloads are available from the following sources:
  - on the Internet at  
<http://www.siemens.de/automation/service&support>
  - From the bulletin board system (BBS) in Nuremberg (*SIMATIC Customer Support Mailbox*) at the number +49 (0) 911 895-7100.

To dial the mailbox, use a modem with up to V.34 (28.8 Kbaud), with the following parameters: 8, N, 1, ANSI, or dial on ISDN (x.75, 64 Kbits).

## Training Center

Courses are available to help you become familiar with the SIMATIC S7 automation system and programmable controllers. Please contact your regional training center or the central training center in D 90327 Nuremberg.

Tel. +49 (0) 911–895–3154

Infoline: Tel. +49 (0) 1805 23 56 11  
Fax. +49 (0) 1805 23 56 12

Internet: <http://www.sitrain.com>

E-mail: AD–Training@nbgm.siemens.de

The H/F Competence Center in Nuremberg offers a special workshop on the topic of fault-tolerant SIMATIC S7 programmable controllers. The H/F Competence Center also supports you during configuration, when putting your system into operation and if you have problems on site.

Tel. +49 – (0) 911 – 895 – 4759

Fax. +49 – (0) 911 – 895 – 5193

E-mail: hf–cc@nbgm.siemens.de  
CoC–SI@nbgm.siemens.de

## Further Support

If you have further questions about SIMATIC NET products, contact your local Siemens representative.

You will find the addresses:

- In our catalog IK PI
- on the Internet at  
<http://www.siemens.de/automation/partner>
- in the interactive catalog CA01  
<http://www.siemens.de/automation/ca01>
- on the Quick Start CD



## C Glossar

### C.1 General Section

**Baud rate**

→ transmission rate

**Bus Segment**

Part of a → subnet. Subnets can consist of bus segments and connectivity devices such as repeaters and bridges. Segments are transparent for addressing.

**Client**

A client is a device or, in general terms, an object that requests a service from a → server.

**Configuration Data**

Parameters that determine the modes and functions of a → CP. They are set and downloaded using the NCM S7 configuration tool.

**CP**

Communications processor. Module for communications tasks.

**CSMA/CD**

CSMA/CD (Carrier Sense Multiple Access with Collision Detection)

**FC**

STEP 7 logic block of the type "function".

**Frame**

A message from one PROFIBUS/Ethernet station/node to another.

**Frame Header**

A frame header consists of an identifier for the → frame and the source and destination address.

**Frame Trailer**

A frame trailer consists of a checksum and the end identifier of the → frame.

**Gateway**

Intelligent connectivity device that connects local area→ networks of different types at the ISO Layer 7 level.

**Industrial Ethernet**

A fieldbus complying with IEEE 802.3 (ISO 8802-2)

**NCM S7 for Industrial Ethernet**

Configuration software for configuration and diagnostic functions on an Ethernet CP.

**NCM S7 for PROFIBUS**

Configuration software for configuration and diagnostic functions on a PROFIBUS CP.

**Network**

A network consists of one or more interconnected → subnets with any number of → stations. Several networks can exist side by side.

**PG Mode**

A mode of the PROFIBUS/Ethernet CP in which the SIMATIC S7-CPU is programmed, configured or checked via PROFIBUS/Ethernet. This mode is handled by the S7 functions.

**Process Image**

The process image is a special memory area in the programmable logic controller. At the start of the cyclic program, the signal states of the input modules are transferred to the process input image. At the end of the cyclic program, the process output image is transferred as a signal state to the output modules.

**PROFINet**

PROFINet is a standard of the PROFIBUS Users Organization (PNO) that defines a heterogeneous communications and engineering model.

**Protocol**

A set of rules for transferring data. Using these rules, both the formats of the frames and the data flow are specified.

**Segment**

Synonym for → bus segment.

**Server**

A server is a device, or in general terms, an object that provides certain services. A service is started at the instigation of a → client.

**Services**

Services provided by a communication protocol.

**SIMATIC NET**

Siemens SIMATIC Network and Communication. Product name for → networks and network components from Siemens (previously SINEC).

**SIMATIC NET for Ind. Ethernet**

SIMATIC NET bus system for industrial applications based on Ethernet (previously SINEC H1)

**SINEC**

Previous product name for → networks and network components from Siemens. Now: SIMATIC NET

**Station**

A station is identified by a

- MAC address in the Ethernet network.
- PROFIBUS address in the PROFIBUS network.

**Subnet**

A subnet is part of a → network whose parameters (for example → PROFIBUS) must be matched. It includes the bus components and all attached stations. Subnets can, for example, be connected together by → gateways to form a network.

A → system consists of several subnets with unique → subnet numbers. A subnet consists of several → stations with unique → PROFIBUS or MAC addresses (Industrial Ethernet).

**System**

This means all the electrical equipment within a system. A system includes, among other things, programmable logic controllers, devices for operation and monitoring, bus systems, field devices, actuators, supply lines.

**Transmission Rate**

According to DIN 44302, this is the number of binary decisions transmitted per time unit. The set or selected transmission rate depends on various conditions, for example the distance across the network. In Ethernet, there is a fixed transmission rate of 10 Mbps.

**Transport Interface**

The transport interface of a SIMATIC S5 PLC is the access to the connection-oriented services of the transport layer on the CP. The transport interface presents itself to the control program in the form of handling blocks (HDBs).

**Transport Layer**

The transport layer is layer 4 of the ISO/OSI reference model for open system interconnection. The purpose of the transport layer is to transfer data reliably from device to device. Transport connections can be used for the transmission.

**TSAP**

Transport Service Access Point

**Watchdog**

Mechanism for monitoring operability.

## C.2 Industrial Ethernet

### Base Address

Logical address of a module in S7 systems.

- For PROFIBUS  
The PROFIBUS base address is the address starting at which all addresses that are calculated automatically in the project are assigned.
- For Industrial Ethernet  
The base MAC address is the address starting at which all addresses that are calculated automatically in the project are assigned.

### ISO-on-TCP

Transport layer connection (layer 4 communication complying with ISO) simulated on TCP.

On an ISO-on-TCP connection, messages can be exchanged in both directions. TCP provides the data flow communication without segmenting the data into messages. ISO, on the other hand, is message-oriented. With ISO-on-TCP, this mechanism is simulated on TCP. This is described in RFC1006 (Request For Comment).

ISO-on-TCP connections allow program/event-controlled communication via Ethernet from a SIMATIC S7 PLC to

- SIMATIC S7 PLC with Ethernet CP
- SIMATIC S5 PLC with Ethernet CP
- PC/PG with Ethernet CP
- any system

### ISO Transport Connection

Communication connection of the transport layer (with the CP/COM 143 previously S5S5 connection).

ISO transport connections allow program/event-controlled communication on Industrial Ethernet between SIMATIC S7 PLCs and

- SIMATIC S7 with an Ethernet CP
- SIMATIC S5 with an Ethernet CP (e.g. CP 143 or CP 1430)
- PC/PG with an Ethernet CP (e.g. CP 1413)
- Any system via the ISO transport protocol (ISO 8073)

The transfer of blocks of data on an ISO transport connection is bi-directional.

### MAC Address

Address to distinguish between different nodes connected to a common transmission medium (Ethernet).

**Media Access Control (MAC)**

Mechanisms for controlling access by a station to a common transmission medium shared with other stations.

**RFC 1006**

see ISO on TCP

**Station (Ind. Ethernet)**

A station is identified by a → MAC address in the → Ethernet (SINEC H1) network.

**Subnet Mask**

The subnet mask specifies which parts of an IP address are assigned to the network number (see ISO-on-TCP). The bits in the IP address whose corresponding bits in the subnet mask have the value 1 are assigned to the network number.

**Subnet Number**

A → system consists of several → subnets with unique subnet numbers.

**TCP/IP**

TCP = Transport Connection Protocol; IP = Internet Protocol

**UDP**

User Datagram Protocol: datagram service for simple internetwork transmission without acknowledgment.

## C.3 PROFINet

### Component based Automation

Concept for implementing modular, distributed automation applications based on open standards for data processing and data communications.

Component based Automation is an extension of Totally Integrated Automation (TIA).

### Device

In Component based Automation, this is part of the PROFINet component that contains the hardware-specific data for the PROFINet component. In SIMATIC iMap, a device is the software representation of the physical device for which the PROFINet component was created. It is represented as an object with one or more bus ports in the SIMATIC iMap network view. A distinction is made between → PROFINet devices and → PROFIBUS devices according to the communication functions performed.

### Interconnection

General: A logical data link between two objects. In SIMATIC iMap: A connection between two technological functions. An output is always connected to an input of the same data type. Interconnections are represented by lines in SIMATIC iMap.

### Network view

Representation of the devices and networks (Ethernet, PROFIBUS) in SIMATIC iMap.

### Plant view

Representation of the technological functions of the automation system and its interconnections in SIMATIC iMap. The plant view displays one chart.

### PROFIBUS device

In Component based Automation, a PROFIBUS device has just one PROFIBUS connection as a slave. It does not participate directly in PROFINet communication and is integrated via a proxy PROFINet device.

### PROFINet

Standard published by the Profibus User Organization (PNO) to define a cross-vendor communication and engineering model.

**PROFINet component**

Software representation of a technological module with defined functionality. An automation system is made up of several PROFINet components.  
A PROFINet component essentially consists of a technological function and the associated device.

**PROFINet device**

A device on Ethernet is a PROFINet device. A PROFINet device may also have a PROFIBUS connection as a master and a proxy PROFINet device for PROFIBUS devices.

**PROFINet device, proxy**

A PROFINet device that acts as the master for PROFIBUS devices. This allows PROFIBUS slaves to be integrated into PROFINet communication.

**SIMATIC IMap**

Engineering tool from Siemens for Component based Automation. This allows the configuration, commissioning, and monitoring of modular, distributed automation systems based on the PROFINet standard.

**SIMATIC iMap – STEP 7 AddOn**

Software for die SIMATIC iMap interfacing to STEP 7.

