1 SOFTNET for Industrial Ethernet: Overview
2 Required Previous Knowledge and Documentation
3 Description of Architecture
4 Where to Get Help

Glossary

Technische Änderungen vorbehalten.


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Note

We would point out that the contents of this product documentation shall not become a part of or modify any prior or existing agreement, commitment or legal relationship. The Purchase Agreement contains the complete and exclusive obligations of Siemens. Any statements contained in this documentation do not create new warranties or restrict the existing warranty.

We would further point out that, for reasons of clarity, these operating instructions cannot deal with every possible problem arising from the use of this device. Should you require further information or if any special problems arise which are not sufficiently dealt with in the operating instructions, please contact your local Siemens representative.

General

This device is electrically operated. In operation, certain parts of this device carry a dangerously high voltage.

**WARNING!**

Failure to heed warnings may result in serious physical injury and/or material damage.

Only appropriately qualified personnel may operate this equipment or work in its vicinity. Personnel must be thoroughly familiar with all warnings and maintenance measures in accordance with these operating instructions.

Correct and safe operation of this equipment requires proper transport, storage and assembly as well as careful operator control and maintenance.

Personnel qualification requirements

Qualified personnel as referred to in the operating instructions or in the warning notes are defined as persons who are familiar with the installation, assembly, startup and operation of this product and who possess the relevant qualifications for their work, e.g.:

- Training in or authorization for connecting up, grounding or labeling circuits and devices or systems in accordance with current standards in safety technology
- Training in or authorization for the maintenance and use of suitable safety equipment in accordance with current standards in safety technology
- First Aid qualification
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User Notes

Documentation Guide

The "SOFTNET Industrial Ethernet" manual consists of 4 volumes with the following titles:

➤ Volume 1
  "Introducing SOFTNET for Industrial Ethernet"

➤ Volume 2
  "SEND/RECEIVE Programming Interface"

➤ Volume 3
  "S7 Programming Interface"

➤ Volume 4
  "Configuring S7 Operation with COML S7"

Character in the Text

The following character occurs in the text.

⚠️

This symbol draws your attention to special features and to hazards.
1 SOFTNET for Industrial Ethernet: Overview

SOFTNET for Industrial Ethernet is integrated into any software and handles communications there.

SOFTNET for Industrial Ethernet is used in SIMATIC programming devices (PGs), personal computers (PCs), workstations, notebooks and SIMATIC-M7 computers.

For the first time, low-cost network interface cards (NICs) can be used without their own processors. In contrast to intelligent high-end CPs/NICs, SOFTNET relocates communications handling to the CPU of the computer used.

SOFTNET supports both the ISO Transport protocol in accordance with ISO 8073 as well as the TCP/IP protocol with the RFC 1006 supplement. The user interface remains unaffected.

This manual gives an overview of the following topics:

➢ Basic communications principles
➢ Required previous knowledge and guide to the documentation for each user group
➢ Introduction to the SEND/RECEIVE interface and the S7 programming interface
1.1 What is SOFTNET Industrial Ethernet?

**Function**

With the SOFTNET Industrial Ethernet communications software, you can connect programming devices, PCs or workstations to SIMATIC-S5/S7/M7 systems via the **Industrial Ethernet** (SINEC H1) communications network.

**SOFTNET Packages**

SOFTNET Industrial Ethernet is offered in various software packages according to the application:

- SOFTNET-S5 (PC to SIMATIC S5 communications)*
- SOFTNET-S7 (PC to SIMATIC S5/S7 communications)
- SOFTNET-PG (communications between programming devices and SIMATIC S5 or S7 programmable controllers)

**Operating Systems**

SOFTNET Industrial Ethernet runs under the following operating systems:

- MS-DOS ≥ 6.0*
- Microsoft Windows 98
- Microsoft Windows NT from Version 4.0 and Windows 2000 Professional

**Network Interface Cards**

SOFTNET Industrial Ethernet can be used with network interface cards for Industrial Ethernet.

- SIMATIC NET CP 1411
- SIMATIC NET CP 1511
- SIMATIC NET CP 1401

*Simultaneous operation of several network interface cards is possible with the relevant software and hardware equipment.*

*ISO Transport only, not TCP/IP
1.1.1 Network Interface Cards (NICs) for SOFTNET Industrial Ethernet

**CP 1511**
The CP 1511 communications processor is a PCMCIA card for the PG 720/PG 740 and all other PCs/notebooks with a PCMCIA type II slot. In conjunction with the SOFTNET-S5/S7 and SOFTNET-PG software packages, the CP 1511 enables connection to Industrial Ethernet.

**CP 1411**
The CP 1411 communications processor is a low-cost Ethernet network interface card (NIC) for AT-compatible PCs/programming devices. It fully supports "plug 'n play" functions. In conjunction with the SOFTNET-S5/S7 and SOFTNET-PG software packages, the CP 1411 enables connection to Industrial Ethernet.

**CP 1401**
The CP 1401 is a flat plug-in module for SIMATIC-M7 computers. In conjunction with the SOFTNET-S5/S7 and SOFTNET-PG software packages, the CP 1401 enables connection to Industrial Ethernet.

**Other Ethernet Network Interface Cards**
Operation with other Ethernet NICs is also possible. The relevant NDIS driver must be Version 3.1 or higher.
## 1.2 Use of SOFTNET

<table>
<thead>
<tr>
<th>SOFTNET-S5/S7 for Industrial Ethernet</th>
<th>SOFTNET-S5/S7 for Industrial Ethernet is the communications basis for user programs with the following tasks:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>➢ Machine status recording and changing</td>
</tr>
<tr>
<td></td>
<td>➢ Maintaining production statistics</td>
</tr>
<tr>
<td></td>
<td>➢ Process data archiving</td>
</tr>
<tr>
<td></td>
<td>➢ Visualization of manufacturing and production processes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SOFTNET-PG for Industrial Ethernet</th>
<th>SOFTNET-PG for Industrial Ethernet enables programming of the SIMATIC S5 and S7 controllers via Industrial Ethernet in conjunction with STEP 5/STEP 7.</th>
</tr>
</thead>
</table>

**Operation with Industrial Ethernet**

For SOFTNET operation with Industrial Ethernet, the SIMATIC NET standard components can be used, for example:

➢ transceivers
➢ drop cable
➢ fan-out units, etc.
1.3  SOFTNET, The Communications Software

SOFTNET for Programming Device Functions

SOFTNET-PG for Industrial Ethernet implements the connection to the programmable controllers via Industrial Ethernet in the case of the STEP 5 and STEP 7 programs.

User programs for the S5 and S7 programmable controllers are developed with the STEP 5 and STEP 7 programs.

SOFTNET for the SAPI S7 Programming Interface

The SAPI S7 programming interface provides user programs in programming devices, PCs or workstations with access to SIMATIC S7 systems via Industrial Ethernet. The interface to the user program is called SAPI-S7. It has the following characteristics:

➢ SAPI-S7 is a simple C programming interface.
➢ SAPI-S7 provides access to S7 services on PC and programming device.
➢ SAPI-S7 is available as a C library and is used for Industrial Ethernet with SIMATIC NET Industrial Ethernet drivers and NICs.

SOFTNET for the SEND/RECEIVE-Programming Interface

The SEND/RECEIVE interface based on Layer 4 (ISO Transport or TCP/IP with RFC 1006) is used for communications between programming devices, PCs or workstations and SIMATIC S5/S7. The interface to the user program is called SEND/RECEIVE: It has the following characteristics:

➢ SEND/RECEIVE is a simple C programming interface.
➢ SEND/RECEIVE provides access to S7 services on PC and programming device.
➢ SEND/RECEIVE is available as a C library and is used for Industrial Ethernet with SIMATIC NET Industrial Ethernet drivers and NICs.
1.4 Communications Possibilities

With SIMATIC S5  Communications with SIMATIC S5 are possible with the following:
➢ STEP 5
➢ SOFTNET-PG for Industrial Ethernet
➢ SOFTNET-S5 or SOFTNET-S7 for Industrial Ethernet

With SIMATIC S7  Communications with SIMATIC S7 are possible with the following:
➢ STEP 7 package
➢ SOFTNET-PG for Industrial Ethernet
➢ SOFTNET-S7 for Industrial Ethernet

With Other Automation Systems  Communications with other automation systems are possible via the SEND/RECEIVE programming interface.

Industrial Ethernet Diagnostics Tool  SIMATIC NET, SCOPE for Industrial Ethernet records all message frames and is used for checking and troubleshooting during programming and plant startup.
2 Required Previous Knowledge and Documentation

The following are the main user groups for the SOFTNET Industrial Ethernet communications software package:

➢ Users
➢ Startup engineers
➢ Programmers

The different user groups understandably require different previous knowledge and documentation information.

The chapter presents the following information:

➢ Previous knowledge required by the individual user groups
➢ Documentation guide
2.1 User Groups

Different User Groups

The different SOFTNET Industrial Ethernet user groups have different previous knowledge. Accordingly, the information required from the documentation also varies.

Please select from the list below the user group which most closely describes your requirements. The "Documentation Guide" following this will then enable you to use SOFTNET Industrial Ethernet efficiently.

We have defined the following user groups:

➢ Users
➢ Startup engineers
➢ Programmers

Who are Users?

Users are characterized as follows:

➢ They use a ready-made user program. This communicates with partners via SOFTNET Industrial Ethernet.
➢ Program-internal processes are not significant for day-to-day work.

Who are Startup Engineers?

Startup engineers are characterized as follows:

➢ They parameterize and install software components to create an executable user program.
➢ Their task is to adapt the communications software to the customer's plant structure.

Who are Programmers?

Programmers are characterized as follows:

➢ They create a program, preferably in the C programming language, using the S7 or SEND/RECEIVE interface.
## 2.2 Required Previous Knowledge for Users

The table below shows the previous knowledge required by a user of software packages with SOFTNET Industrial Ethernet.

<table>
<thead>
<tr>
<th>If you use the following software packages with SOFTNET...</th>
<th>... you require the following</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOFTNET-S5/MS-DOS for Industrial Ethernet</td>
<td>Knowledge of the structure of the user program in question</td>
</tr>
<tr>
<td>SOFTNET-S7/Windows 98, NT 4.0, Windows 2000 Pro for Industrial Ethernet</td>
<td>Knowledge of the structure of the user program in question</td>
</tr>
<tr>
<td>SOFTNET-PG for Industrial Ethernet</td>
<td>• Knowledge of PCs</td>
</tr>
<tr>
<td></td>
<td>• SIMATIC-S5/S7 system knowledge</td>
</tr>
</tbody>
</table>
### 2.3 Documentation Guide for Users

**Guide to the Documentation**

The table below shows the software packages with SOFTNET Industrial Ethernet and the relevant user documentation provided:

<table>
<thead>
<tr>
<th>If you use the following software packages with SOFTNET...</th>
<th>... please read the following documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOFTNET-S5/MS-DOS for Industrial Ethernet</td>
<td>• Product Information</td>
</tr>
<tr>
<td></td>
<td>• &quot;Description of Architecture&quot; chapter of this volume</td>
</tr>
<tr>
<td></td>
<td>• SIMATIC S5/S7 documentation</td>
</tr>
<tr>
<td></td>
<td>• Installation Instructions where required</td>
</tr>
<tr>
<td>SOFTNET-S7/Windows 98, NT 4.0, Windows 2000 Pro for Industrial Ethernet</td>
<td>• Product Information</td>
</tr>
<tr>
<td></td>
<td>• &quot;Description of Architecture&quot; chapter of this volume</td>
</tr>
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<td></td>
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<tr>
<td></td>
<td>• Installation Instructions where required</td>
</tr>
<tr>
<td>SOFTNET-PG for Industrial Ethernet</td>
<td>• Product Information</td>
</tr>
<tr>
<td></td>
<td>• &quot;Description of Architecture&quot; chapter of this volume</td>
</tr>
<tr>
<td></td>
<td>• SIMATIC S5/S7 documentation</td>
</tr>
<tr>
<td></td>
<td>• Installation Instructions where required</td>
</tr>
</tbody>
</table>
### 2.4 Required Previous Knowledge for Startup Engineers

**What Previous Knowledge?**

The table below shows the previous knowledge required by anyone starting up software packages with SOFTNET Industrial Ethernet.

<table>
<thead>
<tr>
<th>If you use the following software packages with SOFTNET...</th>
<th>... you require the following</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOFTNET-S5/MS-DOS for Industrial Ethernet</td>
<td>• Knowledge of PCs&lt;br&gt;• SIMATIC-S5/S7 system knowledge&lt;br&gt;• Knowledge of networks</td>
</tr>
<tr>
<td>SOFTNET-S7/Windows 98, NT 4.0, Windows 2000 Pro for Industrial Ethernet</td>
<td>• Knowledge of PCs&lt;br&gt;• SIMATIC-S5/S7 system knowledge&lt;br&gt;• Knowledge of networks</td>
</tr>
<tr>
<td>SOFTNET-PG for Industrial Ethernet</td>
<td>• Knowledge of PCs&lt;br&gt;• SIMATIC-S5/S7 system knowledge&lt;br&gt;• Knowledge of networks</td>
</tr>
</tbody>
</table>
## 2.5 Documentation Guide for Startup Engineers

The table below shows the software packages with SOFTNET Industrial Ethernet and documentation provided for **startup engineers**:

<table>
<thead>
<tr>
<th>Software Packages</th>
<th>Documentation Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOFTNET-S5/MS-DOS for Industrial Ethernet</td>
<td>• Product Information&lt;br&gt;• Installation Instructions&lt;br&gt;• &quot;Introducing SOFTNET for Industrial Ethernet&quot; manual&lt;br&gt;• SCOPE Industrial Ethernet documentation where required&lt;br&gt;• SIMATIC S5/S7 documentation</td>
</tr>
<tr>
<td>SOFTNET-S7/Windows 98, NT 4.0, Windows 2000 Pro for Industrial Ethernet</td>
<td>• Product Information&lt;br&gt;• Installation Instructions&lt;br&gt;• &quot;Introducing SOFTNET for Industrial Ethernet&quot; manual&lt;br&gt;• When using the SAPI-S7 programming interface, the &quot;Configuring S7 operation with COML S7&quot; manual&lt;br&gt;• SCOPE Industrial Ethernet documentation where required&lt;br&gt;• SIMATIC S5/S7 documentation</td>
</tr>
<tr>
<td>SOFTNET-PG for Industrial Ethernet</td>
<td>• Product Information&lt;br&gt;• Installation Instructions&lt;br&gt;• &quot;Introducing SOFTNET for Industrial Ethernet&quot; manual&lt;br&gt;• SCOPE Industrial Ethernet documentation where required&lt;br&gt;• SIMATIC documentation</td>
</tr>
</tbody>
</table>
## 2.6 Required Previous Knowledge for Programmers

The table below shows the previous knowledge required by a programmer of software packages with SOFTNET Industrial Ethernet.

<table>
<thead>
<tr>
<th>What Previous Knowledge?</th>
<th>... you require the following</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>If you use the following software packages with SOFTNET ...</strong></td>
<td><strong>SOFTNET-S5/MS-DOS for Industrial Ethernet</strong></td>
</tr>
<tr>
<td></td>
<td>- Knowledge of PCs</td>
</tr>
<tr>
<td></td>
<td>- SIMATIC-S5/S7 system knowledge</td>
</tr>
<tr>
<td></td>
<td>- Knowledge of networks</td>
</tr>
<tr>
<td></td>
<td>- Knowledge of a programming language (Preferably &quot;C&quot;)</td>
</tr>
<tr>
<td><strong>SOFTNET-S7/Windows 98, NT 4.0, Windows 2000 Pro for Industrial Ethernet</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Knowledge of PCs</td>
</tr>
<tr>
<td></td>
<td>- SIMATIC-S5/S7 system knowledge</td>
</tr>
<tr>
<td></td>
<td>- Knowledge of networks</td>
</tr>
<tr>
<td></td>
<td>- Knowledge of a programming language (Preferably &quot;C&quot;)</td>
</tr>
<tr>
<td><strong>SOFTNET-PG for Industrial Ethernet</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Knowledge of PCs</td>
</tr>
<tr>
<td></td>
<td>- SIMATIC-S5/S7 system knowledge</td>
</tr>
<tr>
<td></td>
<td>- Knowledge of networks</td>
</tr>
</tbody>
</table>
## 2.7 Documentation Guide for Programmers

The table below shows the software packages with SOFTNET Industrial Ethernet and the relevant programmer documentation provided:

<table>
<thead>
<tr>
<th>If you use the following software packages with SOFTNET...</th>
<th>... please read the following documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOFTNET-S5/MS-DOS for Industrial Ethernet</td>
<td>• Product Information</td>
</tr>
<tr>
<td></td>
<td>• Installation Instructions</td>
</tr>
<tr>
<td></td>
<td>• &quot;Introducing SOFTNET for Industrial Ethernet&quot; manual</td>
</tr>
<tr>
<td></td>
<td>• When using the SEND/RECEIVE programming interface, the &quot;SEND/RECEIVE-Programming Interface&quot; manual</td>
</tr>
<tr>
<td></td>
<td>• SIMATIC S5/S7 documentation</td>
</tr>
<tr>
<td>SOFTNET-S7/Windows 98, NT 4.0, Windows 2000 Pro for Industrial Ethernet</td>
<td>• Product Information</td>
</tr>
<tr>
<td></td>
<td>• Installation Instructions</td>
</tr>
<tr>
<td></td>
<td>• &quot;Introducing SOFTNET for Industrial Ethernet&quot; manual</td>
</tr>
<tr>
<td></td>
<td>• When using the S7 programming interface, the &quot;S7 Programming Interface&quot; manual</td>
</tr>
<tr>
<td></td>
<td>• When using the SEND/RECEIVE programming interface, the &quot;SEND/RECEIVE-Programming Interface&quot; manual</td>
</tr>
<tr>
<td></td>
<td>• SIMATIC S5/S7 documentation</td>
</tr>
<tr>
<td>SOFTNET-PG for Industrial Ethernet</td>
<td>• Product Information</td>
</tr>
<tr>
<td></td>
<td>• Installation Instructions</td>
</tr>
<tr>
<td></td>
<td>• &quot;Introducing SOFTNET for Industrial Ethernet&quot; manual</td>
</tr>
<tr>
<td></td>
<td>• SIMATIC S5/S7 documentation</td>
</tr>
</tbody>
</table>
3 Description of Architecture

This chapter describes the features and functions of the SOFTNET Industrial Ethernet software products. It conveys basic information on the following topics:

➢ ISO/OSI reference model for communications
➢ Siemens communications networks
➢ Industrial Ethernet
➢ SOFTNET Industrial Ethernet in the ISO/OSI reference model
➢ SOFTNET Industrial Ethernet interfaces
3.1 The ISO/OSI Reference Model

Smooth Interaction
As a user of powerful automation system components such as master computers, field devices, printers, data servers, etc. you need these components and controllers to interact smoothly so you expect the following:

➢ The ability to use communications systems at low expense
➢ Independence of vendors
➢ The possibility to change system structures in a flexible way without affecting the capability to communicate
➢ The highest degree of transmission security possible
➢ Protection of your current investment (current and future devices must be compatible)

Open Communications
The keyword behind the demand for open communications is heterogeneous (open) network of automation components. Devices from different vendors communicate openly with each other. (In contrast to this, homogeneous networks only integrate equipment by one manufacturer.)

The ISO/OSI Reference Model
The International Organization for Standardization (ISO) has designed a reference model for open systems interconnection as a basis for inter-vendor agreements.

This ISO/OSI reference model (OSI - Open System Interconnection) is the guiding principle for the standardization of communication procedures. It determines the framework for the standardization of communication procedures in seven consecutive layers.

Manufacturers of automation components and, generally, of data terminal equipment, not only in the industrial sector, follow the ISO/OSI-reference model today.
The ISO/OSI reference model representing the basis of open communications, is divided into 7 layers. The rules applied within the layers are called protocols.

The table below shows the 7 layers together with their names and functions.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Application layer</td>
<td>Application functions</td>
</tr>
<tr>
<td>6</td>
<td>Presentation layer</td>
<td>Data representation</td>
</tr>
<tr>
<td>5</td>
<td>Session layer</td>
<td>Synchronization of communications (opening, end)</td>
</tr>
<tr>
<td>4</td>
<td>Transport layer</td>
<td>Connection setup and clearance, acknowledgments, segmentation</td>
</tr>
<tr>
<td>3</td>
<td>Network layer</td>
<td>Addressing of other networks/network connections</td>
</tr>
<tr>
<td>2</td>
<td>Data link layer</td>
<td>Access methods, error-protected transmission</td>
</tr>
<tr>
<td>1</td>
<td>Physical layer</td>
<td>Physical conditions of transmission rights</td>
</tr>
</tbody>
</table>
3.2 SIMATIC NET Communications Networks

SIMATIC NET is an open, vendor-independent communications system with graded local area networks (LANs) for manufacturing and process automation in the industrial sector. It is based on national and international standards in accordance with the ISO/OSI reference model.

In response to the subtly differentiated requirements, SIMATIC NET provides the following communications networks:

➢ Industrial Ethernet (SINEC H1), a communications network at cell and management level based on IEEE 802.3.
➢ PROFIBUS - Process Field Bus (SINEC L2), a communications network for the cell and field level based on DIN 19245, Parts 1, 2 and 3.
➢ AS-Interface - Actuator-Sensor-Interface (SINEC S1), a communications network for the actuator-sensor level.

![SIMATIC NET Communications Networks](image)

Fig. 3.1 SIMATIC NET Communications Networks
3.3 Industrial Ethernet

**Application Area**

The Industrial Ethernet cell and area network is an industrial communications network designed for use in manufacturing and industrial plants. It offers a wide range of network components for electrical and optical transmission technology.

**Industrial Twisted Pair (ITP)**

Industrial Twisted Pair is a supplement and alternative to conventional bus cabling. It is an industrial standard 2 x 2-core or 4 x 2-core bus cable.

**Basics**

The Industrial Ethernet cell and area network is based on the specifications of the IEEE 802.3 (Ethernet) standard. It operates using the CSMA/CD (Carrier Sense Multiple Access with Collision Detection) access method.

**Network Components**

Industrial Ethernet network components use individually shielded coaxial bus cables (triaxial cables) for electrical networking.

**Optical Transmission Media**

The optical transmission media implement networks using fiber optic cable.

Advantages of optical transmission media include:

- Immunity to electrical noise
- Ability to cover large distances
3.4 Multiprotocol Mode

What is Multiprotocol Mode?

In multiprotocol mode, several protocols are processed simultaneously on one computer. This applies both to using several protocols within one application and to the parallel operation of several applications with different protocols.

Support of Multiprotocol Mode

Support of multiprotocol mode may be restricted in the case of individual communications processors and operating systems. Please consult the relevant Product Information for more detailed information.
3.5 Computer Structure of the Soft and Hardware Components

**The Software and Hardware Components under MS-DOS**

- **STEP 5**
- **SR Application**
- **SR library**
- **Drivers for Industrial Ethernet NIC**
- **NIC for Industrial Ethernet**

Fig. 3.2 Software and Hardware Components under MS-DOS

**The Software and Hardware Components under MS Windows 95, MS Windows NT**

- **STEP 5**
- **STEP 7 Application**
- **SR Application**
- **S7 Application**
- **SR-DLL**
- **S7-DLL**
- **Access DLL**
- **RFC 1006**
- **TCP/IP driver (WINSOCK.DLL)**
- **ISO transport driver**
- **Driver for Industrial Ethernet NIC**
- **NIC for Industrial Ethernet**

Fig. 3.3 Software and Hardware Components under MS Windows 95, MS Windows NT
3.6 SOFTNET-S5/S7 and SOFTNET-PG in the ISO/OSI Model

SOFTNET-S5 and SOFTNET-PG
The SOFTNET-S5 and SOFTNET-PG program packages are arranged within the ISO/OSI model in layers 2b to 4. Layer 3 (Network layer) is inactive in ISO Transport. The subdivision in layers 2a and 2b is necessary, since the interface with the ODI driver is implemented within layer 2.

SOFTNET S7
The SOFTNET-S7 program package is arranged within the ISO/OSI model in layers 2b to 7. Layer 3 (Network layer) is inactive in ISO Transport.

Layers 5 to 7
Layers 5 to 7 are covered by user programs or the S7 programming interface.

Layers 1 and 2
Layers 1 and 2a are implemented by an ODI/NDIS driver and a CP or an Ethernet NIC. SOFTNET-S5/S7 and SOFTNET-PG are able to communicate with all NICs whose drivers comply with the ODI/NDIS specification.
The illustration below shows SOFTNET-S5/S7 and SOFTNET-PG, integrated into an overall software concept. User programs, that is, the SIMATIC STEP 5/STEP 7 software package, use SOFTNET-S5/S7 and SOFTNET-PG. Connection to Industrial Ethernet is by a CP or an Ethernet NIC via an ODI/NDIS driver.

The SOFTNET-S5/S7 and SOFTNET-PG interfaces are described individually in the subsequent sections.
3.7 Interfaces

Introduction

SOFTNET-S5/S7 and SOFTNET-PG offer two interfaces at layer 4 of the ISO/OSI model:

➢ SEND/RECEIVE interface
➢ Interface for the SIMATIC STEP 5/STEP 7 software package

The S7 programming interface is available at layer 7.

Interfaces

The illustration below shows the two interfaces of SOFTNET-S5/S7 and SOFTNET-PG at layer 4.

<table>
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<th>ISO/OSI layers</th>
<th>Communications Components</th>
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<td>User application</td>
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<td>SIMATIC PG functions</td>
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<td>Interface for STEP 5/7</td>
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<td>4</td>
<td>Interface for STEP 5/7</td>
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<tr>
<td>3</td>
<td>SOFTNET S5/S7</td>
</tr>
<tr>
<td></td>
<td>SOFTNET PG</td>
</tr>
</tbody>
</table>

SEND/RECEIVE Interface

The SOFTNET-S5/S7 software package for Industrial Ethernet offers communication to SIMATIC S5 via the SEND/RECEIVE interface.

S7 Programming Interface

The SOFTNET-S7 software package for Industrial Ethernet offers communication to SIMATIC-S7 via the S7 programming interface.

Interface for the SIMATIC STEP 5/STEP 7 Software Package

The interface for the SIMATIC STEP 5/STEP 7 software package is used by all those using SIMATIC STEP 5/STEP 7 on their programming device, PC, notebook or SIMATIC M7 computer.

The SIMATIC STEP 5/STEP 7 interface is not open for the user.
### 3.8 SEND/RECEIVE and SAPI-S7 Programming Interface

#### Compatibility

The SOFTNET-S5/S7's SEND/RECEIVE interface is a layer 4 (Transport layer) interface.

SOFTNET-S5/S7's SAPI-S7 interface is a layer 7 (Application layer) interface.

All programs provided with the SEND/RECEIVE interface or the S7 programming interface can, therefore, easily access SOFTNET-S5/S7.

#### Communications with SIMATIC S5 Programmable Controllers

There is easy problem-free communication with the data handling blocks of the SIMATIC-S5 programmable controllers via the calls of the SEND/RECEIVE programming interface. The call structure and the sequence of communication with the SIMATIC S5 programmable controllers are described in detail in the "SEND/RECEIVE Programming Interface" manual.

#### Communications with SIMATIC S7 Programmable Controllers

Communication with SIMATIC-S7 is best handled with the S7 programming interface. Alternatively, the SEND/RECEIVE programming interface can be used with restrictions. The call structure and the sequence of communication with the SIMATIC S7 programmable controllers are described in detail in the "S7 Programming Interface" manual.

#### Advantages of the SEND/RECEIVE Programming Interface

All programs equipped with the SEND/RECEIVE interface have easy access to SOFTNET-S5.

#### Advantages of the S7 Programming Interface

The S7 programming interface offers significantly more user-friendly communications functions than the SEND/RECEIVE programming interface; for example "Read/write variables".

#### Independence of Programming Languages

The SEND/RECEIVE and SAPI-S7 programming interfaces are not programming-language-dependent. Programmers can therefore choose whichever programming language they want when planning a software project!

#### Programmer Support

To make it easier for programmers to familiarize themselves with the use of SEND/RECEIVE and SAPI-S7 in the software packages of SOFTNET-S5/S7, the following is provided in addition to the documentation already mentioned:

- Sample programs
- A call library
Sample Programs

Sample programs are provided with SOFTNET-S5/S7. They are written in the "C" programming language.

The mode of operation of the interface can be discerned from the program context of the sample programs. Also, sections of the sample programs can be taken over in analogous contexts.

Call Library

Of further help is the call library for SEND/RECEIVE or SAPI-S7 interface function calls, written in "C" and included in the scope of supply.

For "C" programmers, this means:

➢ the call library can be integrated direct into your own software
➢ the related calls can be used direct, as described in detail in the sample programs

The sample programs and functions calls provide a second practical description, in addition to the explanation in the manual, of the data structures required (request block in the case of SEND/RECEIVE).
3.9 ODI/NDIS Interface of SOFTNET-S5/S7 and SOFTNET-PG

**Interfacing to a SIMATIC NET NIC**
The SOFTNET-S5/S7 and SOFTNET-PG software packages offer a layer 2b access; with MS-DOS the **ODI interface**, with Windows 95 and Windows NT the **NDIS interface**.

SOFTNET-S5/S7 and SOFTNET-PG provide the appropriate ODI/NDIS drivers for the CP 1411, CP 1511 and CP 1401 communications processors.

**Interfacing to Other NICs**
Users of other Ethernet NICs use the ODI/NDIS drivers supplied with their NIC.
Parallel operation of several CP/NICs is not possible with MS-DOS.

**ODI/NDIS Drivers**
The illustration below shows SOFTNET-S5/S7 and SOFTNET-PG connected to different NICs via ODI/NDIS drivers.

<table>
<thead>
<tr>
<th>ISO/OSI layers</th>
<th>Communications Components</th>
</tr>
</thead>
<tbody>
<tr>
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<td>SOFTNET Industrial Ethernet</td>
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<tr>
<td>3</td>
<td>ODI/NDIS interface</td>
</tr>
<tr>
<td>2b</td>
<td></td>
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<tr>
<td>2a</td>
<td>ODI/NDIS driver CP 1411</td>
</tr>
<tr>
<td>1</td>
<td>ODI/NDIS driver CP 1511</td>
</tr>
<tr>
<td></td>
<td>ODI driver CP 1401</td>
</tr>
<tr>
<td></td>
<td>ODI/NDIS driver Ethernet interface module</td>
</tr>
</tbody>
</table>
Notes
4 Where to Get Help

This chapter lists SIMATIC NET contacts:
- Contacts for technical questions
- Contacts for training in SIMATIC NET products
4.1 Help with Technical Questions

Documentation
You will find information about topics related to using this software in the following sources:
➢ In the relevant printed documentation
➢ In the help system integrated in the software (F1 key)
➢ In text files on the diskette(s) supplied

Who to Contact
If you have technical questions about using the software and your problem is not dealt with in the documentation or in the integrated help system, please contact your Siemens representative or dealer.
The addresses are listed in the following:
➢ in our Catalog IK 10
➢ in CompuServe (go autforum > library area SIMATIC NET)
➢ on the Internet (http://www.aut.siemens.de)

Common Questions
Our customer support on the Internet provides useful information and answers to common questions. Under FAQ (Frequently Asked Questions), you will find a variety of information about our entire range of products.
The address of the AUT homepage in the worldwide web of Internet is:
http://www.aut.siemens.de/net

Hotline
If you have problems, you can also contact our hotline:
➢ Telephone: 0911 - 895 - 7000
   (from abroad +49 - 911 - 895 - 7000)
➢ Telefax: 0911 - 895 - 7001
   (from abroad +49 - 911 - 895 - 7001)
4.2 Contacts for SIMATIC NET Training

Course Enrollment
Siemens AG
Trainings-Center für Automatisierungstechnik
AUT 959 Kursbüro
Östliche Rheinbrückenstraße 50
76181 Karlsruhe

Telephone 0721 - 595 - 2917
from abroad +49 - 721 - 595 - 2917
Fax 0721 - 595 - 6987
from abroad +49 - 721 - 595 - 6987
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## Glossary

<table>
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<th>Term</th>
<th>Definition</th>
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<tr>
<td><strong>CP</strong></td>
<td>Communications Processor - communications module/network interface card (NIC) for installing in computers or programmable controllers.</td>
</tr>
<tr>
<td><strong>Drivers</strong></td>
<td>Software used for exchanging data between applications using the CP.</td>
</tr>
<tr>
<td><strong>ISO</strong></td>
<td>International Standard Organization - Based in Geneva and concerned with the creation of general standards, particularly in the field of data transmission.</td>
</tr>
<tr>
<td><strong>ITP</strong></td>
<td>Industrial Twisted Pair - Industrial standard 2 x 2-core or 4 x 2-core bus cable.</td>
</tr>
<tr>
<td><strong>NDIS</strong></td>
<td>Network Device Interface Specification - a Microsoft® software interface specification.</td>
</tr>
<tr>
<td><strong>Network</strong></td>
<td>A network consists of one or more linked subnetworks with any number of nodes. Several networks can exist together. There is a common node table for each subnetwork.</td>
</tr>
<tr>
<td><strong>ODI</strong></td>
<td>Open Data Interface - Novell® interface.</td>
</tr>
<tr>
<td><strong>OSI</strong></td>
<td>Open System Interconnection - an architecture concept for data communications between technical information systems drawn up and published by the ISO.</td>
</tr>
<tr>
<td><strong>PCMCIA</strong></td>
<td>PC card standard for compact PC expansion cards.</td>
</tr>
<tr>
<td><strong>Protocol</strong></td>
<td>Procedural rule for data transmission. The rule prescribes both the message formats and the data flow in a transmission.</td>
</tr>
</tbody>
</table>
RFC 1006  RFC 1006 is an international standard that describes the mode of operation of ISO layer 4 on TCP.

S5 PLC  Abbreviation for a programmable controller (automation system) of the SIMATIC product family of Siemens AG.

Services  The services offered by a communication protocol.

SIMATIC S7  SIMATIC S7 are Siemens programmable controllers. SIMATIC S7 is the successor to the SIMATIC S5 PLC system on a totally innovated platform.

SINEC  Siemens Network and Communication - previous product name for Siemens networks and network components, now called SIMATIC NET.

SINEC L2  SINEC bus system for industrial use based on PROFIBUS.

SR Interface  SEND/RECEIVE programming interface, also known as the PC-E-S5 programming interface.

System  The entirety of electrical equipment. A system includes the following: programmable controllers, human machine interface devices, bus systems, field devices, drives, supply lines.

TCP/IP  Transmission Control Protocol/Internet Protocol - standardized protocol of the transport layer or network layer (OSI) for communications between programs of different DP systems.