SIEMENS

SIMATIC NET

S7-400 - Industrial Ethernet CP 442-1 RNA

Equipment Manual

Manual Part B

03/2022

C79000-G8976-C318-05

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

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Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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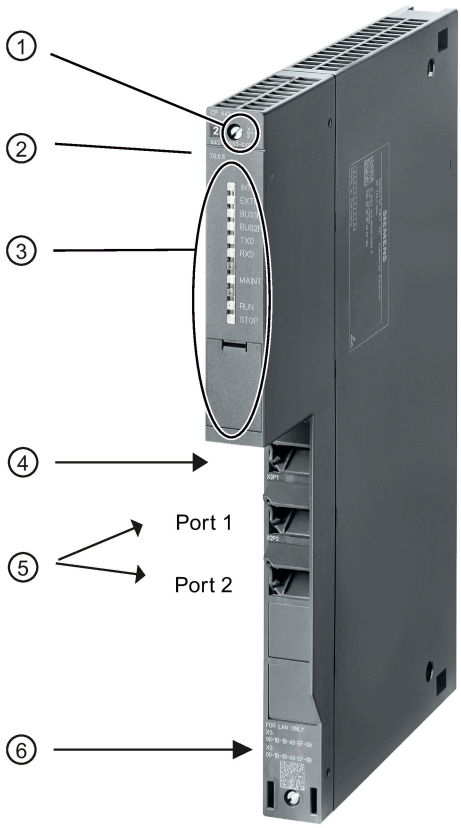
Ⓟ 04/2022 Subject to change

Preface



Legend:

① X = Placeholder for hardware version
② Firmware version
③ LEDs
④ Ethernet interface: Interface X1P1 with 1 x 8-pin RJ-45 jack
⑤ RNA interface: Ports X2P1 / X2P2 with 2 x 8-pin RJ-45 jacks
Designed for a redundant subnet
⑥ Label with MAC addresses

Figure 1 CP 442-1 RNA

Validity and product names

This description contains information on the following product

CP 442-1 RNA
Article number 6GK7 442-1RX00-0XE0
Hardware version 2
Firmware version V1.5
Communications processor for SIMATIC S7-400 / S7-400H

New in this edition

- New hardware version
- New firmware version, with improvements including security-relevant product improvements.
- New approvals (CCC / UKEX)
- Editorial revision

Replaced manual issue

Replaced manual edition: 03/2019

Current version of the manual and information on the Internet

You will find the current version of this document and additional information (e.g. FAQs) on using the CP on the Internet at the following address:

Link: (https://support.industry.siemens.com/cs/ww/en/ps/15355)

Select the appropriate entry type in the filter settings.

Manual on DVD

You can find the documentation on the product and the configuration on the "SIMATIC NET Manual Collection" or "SIMATIC Communication Products" DVD. This DVD contains the product manuals valid at the time it is created.

Structure of the documentation

The documentation for this device consists of the following parts:

- Manual Part A: Configuration manual "Configuring and Commissioning S7CPs for Industrial Ethernet", see references /1/ (Page 73).
- Manual Part B: Manual "CP 442-1 RNA" (this manual)
- Program blocks for SIMATIC NET S7 CPs - programming manual, see references /4/ (Page 74)

  Contains the detailed description of the program blocks for the following services:

  – Open communications services
  – Access coordination with FETCH/WRITE
  – Connection and system diagnostics

Compatibility with other modules - service and maintenance

Note

Read the information regarding extended functions and restrictions in section Replacing the modules used with CP 442-1 RNA (Page 58) of this manual!

Address label: Unique MAC address preset for the CP

The CP is supplied with a total of 2 default MAC addresses with the following assignment:

- Ethernet interface
- RNA interface

The two MAC addresses of the Ethernet interface and the RNA interface are printed on the housing.

If you configure a MAC address (ISO transport connections), we recommend that you use the MAC address of the relevant interface printed on the module for module configuration!

- This ensures that you assign a unique MAC address in the subnet!
- If you replace a module, the MAC address of the predecessor is adopted when you load the configuration data; configured ISO transport connections remain operable.

Notes on this document

Abbreviations and names

- **CP / device / module**

  Designations for the full product name

- **STEP 7**

  Name for the STEP 7 V5.5 and STEP 7 Professional configuration tools

Cross-references

In this manual, there are often cross-references to other sections. To return to the original page after jumping to a cross-reference, some PDF readers support the command <Alt>+<Left arrow>.

Search

To display all instances of a search term in a list, some PDF readers support the command <Ctrl>+<Shift>+<F>.

License conditions

Note

Open source software

Read the license conditions for open source software carefully before using the product. The acceptance of the disclaimers of liability and warranty it contains is a clear precondition of the use of open source software.

You will find the license conditions on the same data medium as this manual under the following file name:

OSS_CP44x1RNA_86.pdf

Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit
Link: (http://www.siemens.com/industrialsecurity)

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customers' exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under
Link: (https://www.siemens.com/cert)

Firmware

The firmware is signed and encrypted. This ensures that only firmware created by Siemens can be downloaded to the device.

Note on firmware/software support

Check regularly for new firmware/software versions or security updates and apply them. After the release of a new version, previous versions are no longer supported and are not maintained.

Device defective

If a fault develops, please send the device to your Siemens representative for repair. Repairs on-site are not possible.

Decommissioning

Shut down the device properly to prevent unauthorized persons from accessing confidential data in the device memory.

To do this, restore the factory settings on the device.

Recycling and disposal

The product is low in pollutants, can be recycled and meets the requirements of the WEEE directive 2012/19/EU "Waste Electrical and Electronic Equipment".

Do not dispose of the product at public disposal sites. For environmentally friendly recycling and the disposal of your old device contact a certified disposal company for electronic scrap or your Siemens contact.

Keep to the local regulations.

You will find information on returning the product on the Internet pages of Siemens Industry Online Support:
Link: (https://support.industry.siemens.com/cs/ww/en/view/109479891)

SIMATIC NET glossary

The SIMATIC NET glossary describes terms that may be used in this document.

You will find the SIMATIC NET glossary in the Siemens Industry Online Support at the following address:

Link: (https://support.industry.siemens.com/cs/ww/en/view/50305045)

Training, Service & Support

You will find information on training, service and support in the multilanguage document "DC_support_99.pdf" on the Internet pages of Siemens Industry Online Support:

Link: (https://support.industry.siemens.com/cs/ww/en/view/38652101)

Table of contents

Application and functions

1

1.1 Properties of the CP

Application

The CP is intended for use in an S7400 or S7400H (faulttolerant) automation system. It allows the S7400 / S7400H to be connected to Industrial Ethernet.

The CP has the following interfaces:

- Ethernet interface

  The CP has a 100 Mbps Ethernet interface. The Ethernet interface can be used as an alternative to the RNA interface. The Ethernet interface can, for example, be used to connect to a PG/PC or to a higherlevel company network.

  For special situations, each port can be set to a fixed mode manually using STEP 7, for example 10 or 100 Mbps half duplex / full duplex.

- RNA interface

  The RNA interface has 2 ports. These two ports are used as follows:

  – PRP mode with both ports as a redundancy solution

  – Port 1 as the only used port of the RNA interface with 100 Mbps full duplex (port 2 is disabled)

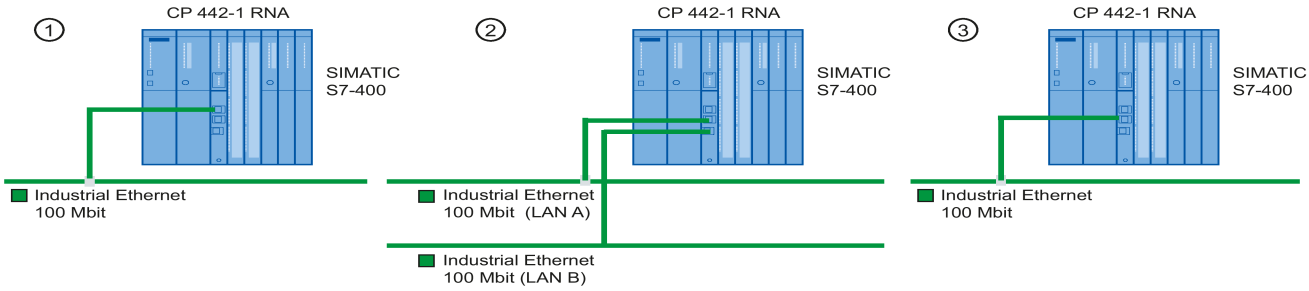
  The RNA interface only supports the "automatic setting" mode with 100 Mbps full duplex. The communications partner must use the same settings.

Each port supports autocrossing and autonegotiation and is equipped with a combined RXD/TXD / LINK dual LED for simple diagnostics.

Note

Interfaces can only operated as alternatives

The Ethernet interface or the RNA interface can only be enabled as alternatives (one or the other). Simultaneous use of both interfaces is not possible. These are activated during configuration with STEP 7. Note further information in the section Switching over interfaces (Page 44)



① Connection to port X1P1 of the Ethernet interface (ISO transport)
② Connection of the RNA interface to a PRP network
③ Connection to port X2P1 of the RNA interface (ISO transport / ISO-on-TCP / TCP)

Figure 1-1 CP 442-1 RNA - connection variants

1.2 Communication services

Depending on the interface being used, the CP supports the following communications services:

- **S7 communication with the following functions:**
  - PG functions;
  - Operator monitoring and control functions;
  - Data exchange over S7 connections.
- **Open communication services with the following functions:**
  - SEND/RECEIVE interface over ISO transport connections;
  - SEND/RECEIVE interface over TCP connections, ISOonTCP and UDP connections;

    With the SEND/RECEIVE interface via TCP connections, the CP supports the socket interface to TCP/IP available on practically every end system.

    UDP frame buffering on the CP can be disabled during configuration. When necessary, this allows you to achieve a shorter reaction time between the arrival of a UDP frame and its evaluation on the CPU.
  - Multicast over UDP connection

    The multicast mode is made possible by selecting a suitable IP address when configuring connections.
  - FETCH/WRITE services (server services; corresponding to S5 protocol) via ISO transport connections, ISOonTCP connections and TCP connections;

    Here, the SIMATIC S7400 with the CP is always the server (passive connection establishment) while the fetch or write access (client function with active connection establishment) is always initiated by a SIMATIC S5 or a device from another range / PC.
  - LOCK/UNLOCK with FETCH/WRITE services (CPUdependent; see section Requirements for use (Page 25));

- **Open TCP/IP communication**

  Open TCP/IP communication provides a program interface for the transfer of connection-oriented and connectionless services. The establishment and termination of connections is initiated here only via the "dynamic" program interface.

  STEP 7 provides a UDT for the connection parameter assignment as well as four FBs for high-speed data exchange.

  The CP supports communication via ISO-on-TCP connections for this interface.

Interfaces used and communications services

The following table provides an overview of the services available at the interfaces.

Communications service		Ethernet interface	RNA interface
S7 communication	PG functions; operator control and monitoring functions (ISO)	x	x
	PG functions; operator control and monitoring functions (ISO-on-TCP)	-	x
	Data exchange over S7 connections (ISO)	x	x
	Data exchange over S7 connections (TCP)	-	x
Open communications services using SEND/RECEIVE interface	ISO transport connections	x	x
	TCP connections, ISOonTCP and UDP connections	-	x
	Multicast over UDP connection	-	x
	FETCH/WRITE services (ISO)	x	x
	FETCH/WRITE services (RFC, TCP)	-	x
Open TCP/IP communication		-	x
Time of day	NTP mode and SIMATIC mode	-	x
H connections	via ISO	x	x
	via TCP	-	x

1.3 Network topology with redundancy (PRP)

Redundant Network Access (RNA)

In Siemens Industry, Redundant Network Access (RNA) stands for devices and software that support the redundancy protocol "Parallel Redundancy Protocol" (PRP). RNA allows the connection of devices to redundant Ethernet network structures.

The product names of the RNA devices end with "RNA".

Some devices of the SCALANCE X-200RNA product line also support the redundancy protocol "High-availability Seamless Redundancy" (HSR).

Parallel Redundancy Protocol (PRP)

The Parallel Redundancy Protocol (PRP) is a redundancy protocol for Ethernet networks. It is specified in IEC 62439-3.

The areas of application of PRP are distributed applications with high reliability demands that depend on the high availability of the network. Compared with classic fault-tolerant networks, bumpless path redundancy is possible with PRP.

PRP has the advantage that it uses parallel, separate networks made up of standard network components. End devices that use this method are connected to both networks via two ports of an interface of the device or via a SCALANCE X-200RNA or a RUGGEDCOM RS950G. This means that data of the end device can be transferred at the same time via both networks. If a transmission path is interrupted, the data reaches the communications partner via the second parallel path.

If a network is interrupted, communication can be maintained with PRP via the second network without any interruption. Reconfiguration times required with the other redundancy protocols (e.g. MRP) do not therefore apply.

An end device with PRP capability can be connected to redundant networks by using the PRP protocol. An end device that does not have PRP capability can be connected to a redundant network via a SCALANCE X-200RNA or RUGGEDCOM RS950G that does have PRP capability. This means that PRP can also be used by end devices without PRP capability.

Devices with PRP capability are located in two independent networks with the same MAC and IP address.

Communication with PRP

PRP is only possible when two end devices are connected via two independent networks (LAN A and LAN B).

Each end device is represented in both networks LAN A and LAN B with the same MAC and IP address.

PRP communication is handled using the following mechanisms:

- **Send**

  An end device with PRP capability duplicates each frame to be sent on the PRP interface. The two duplicates are sent via the 2 ports of the PRP interface via the two separate networks LAN A and LAN B to the communications partner.

  If the end device does not have PRP capability, the frame to be sent is duplicated by an X-200RNA to which the end device is connected and sent via LAN A and LAN B to the communications partner.

- **Received**

  The two duplicates are received by an end device with PRP capability via LAN A and LAN B on the two ports of the PRP interface.

  If the end device does not have PRP capability, the receiving end device must be preceded by an X-200RNA. The X-200RNA forwards the first frame to arrive to the addressee. The second frame is discarded ((N-1) redundancy).

Connecting up and cabling

Each frame duplicate sent using the PRP mechanisms is given in identifier that specifies whether it is sent via LAN A or LAN B.

Note

Cabling

Make sure that all the PRP ports of the nodes and the SCALANCE X204RNA / RUGGEDCOM RS950G on LAN A and LAN B are connected correctly. A frame with the identifier "LAN A" must be received at the corresponding port.

The PRP ports of SIMATIC NET devices have the following identifiers. The CP ports are the ports of the interface with PRP capability.

- Ports for connection to LAN A
  - CPs: X2/P1
  - SCALANCE X204RNA: PRP A
- Ports for connection to LAN B
  - CPs: X2/P2
  - SCALANCE X204RNA: PRP B

How is a redundant PRP network set up?

A network topology in which the Parallel Redundancy Protocol is used (PRP network) consists of two separate Ethernet subnets. The structure of the two subnets does not need to be identical.

A PRP network can be set up both with end devices with PRP capability as well as with standard components. The following devices can be used:

- End devices with PRP capability (Double Attached Nodes PRP, Double Attached Node implementing PRP, DANP), for example:
  - CP 443-1 RNA
  - PC with SOFTNET-IE RNA
  - SIPROTEC protective devices with PRP capability
- Standard components (Singly Attached Nodes, SAN)

  Standard components without PRP functionality, for example, can be connected to a PRP network via SCALANCE X-200RNA or RuggedCom RS950G.

  SANs can, however, also be connected to a PRP network without supporting the PRP functionality.

All devices that are intended to use the PRP function in redundant networks must be able to process frames with length of up to 1532 bytes (oversize frames). If this function is not supported, data may be lost.

Example of a configuration for a PRP network

The following figure shows the options for connecting devices in a network topology in which the Parallel Redundancy Protocol (PRP) is used.

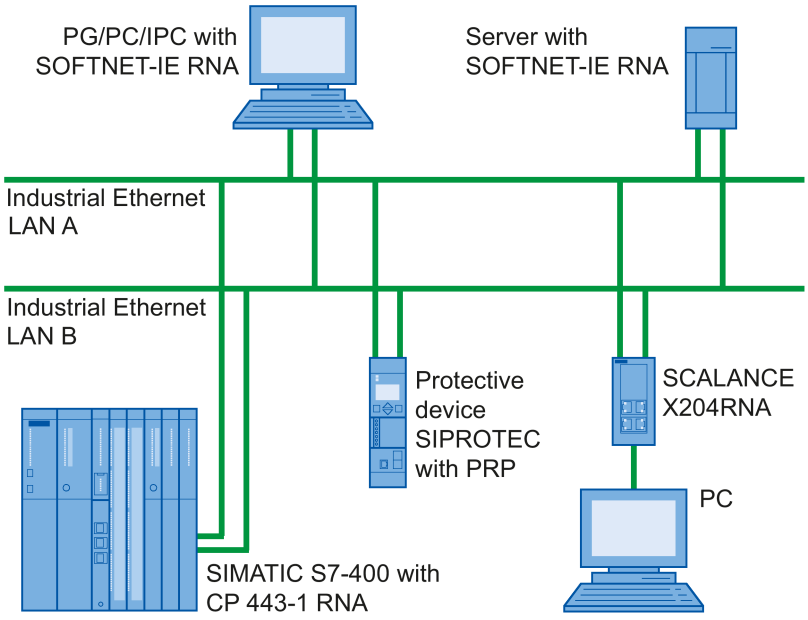


Figure 1-2 Example of the configuration of a network topology with PRP

1.4 Further services and characteristics of the CP

- **Timeofday synchronization over the RNA interface using the following configurable modes:**
  - SIMATIC mode

    The CP receives MMS timeofday messages and synchronizes its local time.

    You can choose whether or not the time of day is forwarded. You can also decide on the direction in which it is forwarded.

  or

  - NTP mode (NTP: Network Time Protocol)

    The CP sends timeofday queries at regular intervals to an NTP server and synchronizes its local time of day.

    The time can also be forwarded automatically to the CPU modules in the S7 station allowing the time to be synchronized in the entire S7 station.
- **Addressable with the factoryset MAC address**

  To assign the IP address to a new CP (direct from the factory), it can be accessed using the preset MAC address on port X2P1 of the RNA interface. Online address assignment is made in STEP 7.

- **SNMP agent on the RNA interface**

  The CP supports data queries over SNMP in version V1 (Simple Network Management Protocol). It delivers the content of certain MIB objects according to the MIB II standard (RFC 1213), PRP-MIB IEC62439 (IEC-62439-3-MIB) and Automation MIB.

- **Module access protection**

  To protect the module from accidental or unauthorized access, protection can be configured at various levels.

- **IP access protection on the RNA interface (IPACL)**

  Using IP access protection gives you the opportunity of restricting communication over the CP of the local S7 station to partners with specific IP addresses.

- **Web diagnostics on the RNA interface**

  With the aid of Web diagnostics, you can read out the diagnostics data from a station connected via the CP to a PG/PC with a Web browser.

  The Web pages contain the following information:

  – Module and status information

- **Diagnostics buffer extract request**

  With the aid of a Web browser, the CP supports the option of obtaining an extract of the diagnostics buffer containing the most recent diagnostics events of the CPUs and CPs located in the same S7 station as the CP.

- **Connection diagnostics with the AG_CNTEX program block**

  With the AG_CNTEX program block, you can diagnose connections.

  – When necessary, you can activate or deactivate connections or initiate reestablishment of a connection.

  – You can check the reachability of the connection partners using the PING function (on the RNA interface).

  – You can find out which connection types are set up on the RNA interface for the SEND / RECEIVE function.

- **S5/S7 addressing mode**

  The addressing mode can be configured for FETCH/WRITE access as the S7 or S5 addressing mode (S7 addressing mode only for data blocks / DBs).

- **Detecting IP double addressing in the network on the RNA interface**

  To save you timeconsuming troubleshooting in the network, the CP detects double addressing in the network.

  For more detailed information, see section Detecting duplicate IP addressing in the network (Page 48)

- **Support in the fault-tolerant system (H system)**

  S7 communication is supported in the H system with the following protocols:

  – Ethernet interface

    ISO transport

  – RNA interface

    ISO transport and ISO-on-TCP (RFC1006)

Performance data

2

2.1 General characteristic data

Characteristic	Explanation / values
Total number of connections on Industrial Ethernet	128 The value applies to the total number of connections of the following types: • S7 connections • SEND/RECEIVE connections

Example

You can, for example, operate the following combination of connections:

- 62 S7 connections or 62 H connections
- 30 ISO-on-TCP connections
- 10 TCP connections
- 10 UDP connections
- 8 ISO transport connections

2.2 Characteristics of S7 communication

S7 communication provides data transfer via the ISO Transport or ISO-on-TCP protocols.

Characteristic	Explanation / values
Total number of S7 connections on Industrial Ethernet	128 max., of those max. 62 H connections
LAN interface - data field length generated by CP per protocol data unit • sending • receiving	 480 bytes / PDU 480 bytes / PDU
• Number of PG connections • Number of OP connections	2 max. 30 max.

Note

Effects of connections in the SPEED SEND/RECV mode

Note the effects of connections on the SEND/RECEIVE interface that are used in the SPEED SEND/RECEIVE mode.

The maximum configuration limits of S7 communication are reduced by each configured connection using the SPEED SEND/RECV mode.

2.3 SEND/RECEIVE interface

2.3.1 Characteristic data

The SEND/RECEIVE interface provides access to communication over TCP, ISOonTCP, ISO transport and UDP connections.

The following characteristics are important:

Characteristic	Explanation / values
Number of SEND/RECEIVE connections	• TCP connections: 1...64 [1)] • ISO-on-TCP connections: 1...64 • ISO transport connections: 1...64 • Total number of UDP connections (specified and free) that can be configured: 1 to 64 (of those up to 48 in multicast mode) • Max. number of connections in total: (ISO transport and ISOonTCP + TCP + UDP) <= 64 Refer to the example in section 5.1 (Page 19) Notes: • [1)] Avoid overload at receiving end The flow control on TCP connections **cannot** control permanent overload of the recipient. You should therefore make sure that the processing capabilities of a receiving CP are not permanently exceeded by the sender (approximately 150200 messages per second).
Number of SEND/RECV connections in SPEED SEND/RECV mode	The number depends on the CPU type being used. • Per CPU 412/414 maximum 30 • Per CPU 416/417 maximum 62
Maximum data length for AG_SEND and AG_RECV program blocks	AG_SEND and AG_RECV were shipped with other CPs of the S7-400 family and allowed the transfer of user data with a length of 1 to 240 bytes. The version of the CP described here continues to support these program blocks.

Characteristic	Explanation / values
Maximum data length for AG_LSEND and AG_LRECV program blocks	AG_LSEND and AG_LRECV allow the transfer of user data with the following lengths: 1. ISO-on-TCP, TCP, ISO transport: 1 to 8192 bytes 2. UDP: 1 to 2048 bytes
Maximum data length for AG_SSEND and AG_SRECV program blocks	AG_SSEND and AG_SRECV allow the transfer of user data with the following lengths: 1. ISO-on-TCP, TCP, ISO transport: 1 to 1452 bytes 2. UDP: 1 to 1452 bytes
LAN interface max. data field length generated by CP per protocol data unit	• sending ISO transport, ISOonTCP, TCP: – 400 bytes / TPDU with AG_SEND / AG_LSEND – 1452 bytes / TPDU with AG_SSEND • receiving – ISO transport: 512 bytes / TPDU – ISO-on-TCP: 1452 bytes / TPDU – TCP: 1452 bytes / TPDU

Restrictions for UDP

- Transfer is not confirmed

  The transmission of UDP frames is unconfirmed, in other words the loss of messages is not detected or displayed by the send blocks (AG_SEND or AG_LSEND).

- No receipt of UDP broadcast

  To avoid overload due to high broadcast load, the CP does not allow reception of UDP broadcasts.

  As an alternative, use the multicast function over a UDP connection. This allows you to register the CP as a node in a multicast group.

- UDP frame buffering

  Length of the frame buffer with buffering enabled:

  2 KB

  Note:

  Following a buffer overflow, newly arriving frames are discarded.

2.3.2 Number of simultaneous SEND/RECEIVE calls

The number of SEND/RECEIVE calls that can be used at the same time is limited both by the CPU and by the CP.

If the maximum number of simultaneous SEND/RECEIVE calls is exceeded, the value 8302H (no receive resources) is indicated in the STATUS of the surplus SEND functions. This can, for example, happen when too many SEND/RECEIVE calls are sent at the same time in OB1.

Limitation by the CPU

In productive operation, the number of SEND/RECEIVE calls that can be used at one time depends on the CPU resources being used. Note the information on the available CPU resources in section System environment (Page 25).

The following CPU resources are required:

- Per SEND job short (AG_SEND) or long (AG_LSEND): 1 resource
- Per RECEIVE job short (AG_RECV): 1 resource
- Per RECEIVE job long (AG_LRECV): 2 resources
- Per SPEED SEND/RECV job (AG_SSEND, AG_SRECV): 0 resources

Limitation by the CP

A maximum of 64 SEND/RECEIVE connections can be operated by the CP.

At an assignment of 1 CP per CPU, the maximum number of SEND/RECEIVE calls that can be used at one time is limited as follows:

- SEND calls short (AG_SEND) or long (AG_LSEND): max. 32*) / 12**) per CPU
- RECEIVE calls short (AG_RECV): max. 64*) / 24**) per CPU
- RECEIVE calls long (AG_LRECV): variable ***)

*)The higher values apply to the CPU 416 and CPU 417.

**)The lower values apply to the CPU 412 and CPU 414.

***)The number of AG_LRECV program blocks that can be used at the same time depends on the number of SEND calls active at the same time (see tables below).

Table 2- 1 Dependency of the maximum number of RECEIVE calls long (AG_LRECV FC60) used at the same time on the number of SEND calls (CPU 412/414)

Number of simultaneous SEND calls	**0**	**1**	**2**	**3, 4**	**5**	**6**	**7**	**8, 9**	**10**	**11**	**12**
Max. number of simultaneous FC60s per CPU 412/414	19	18	17	16	15	14	13	12	11	10	9

Table 2- 2 Dependency of the maximum number of RECEIVE calls long (AG_LRECV FC60) used at the same time on the number of SEND calls (CPU 416/417)

Number of simultaneous SEND calls	**0**	**1**	**2**	**3, 4**	**5**	**6**	**7**	**8, 9**	**10**	**11**	**12**	**13, 14**	**15**	**16**
Max. number of simultaneous FC60s per CPU 416/417/41x-H	51	50	49	48	47	46	45	44	43	42	41	40	39	38
Number of simultaneous SEND calls	**17**	**18, 19**	**20**	**21**	**22**	**23, 24**	**25**	**26**	**27**	**28, 29**	**30**	**31**	**32**	
Max. number of simultaneous FC60s per CPU 416/417/41x-H	37	36	35	34	33	32	31	30	29	28	27	26	25	

The maximum number of SPEED SEND/RECEIVE calls that can be used simultaneously (FC53, FC63) depends only on the CPU (see above).

2.4 Characteristics of open TCP/IP communication

Open TCP/IP communication provides a program interface for the transfer of connection-oriented and connectionless services. The establishment and termination of connections is initiated here only via the "dynamic" program interface.

The CP supports communication via ISO-on-TCP connections for this interface.

Table 2- 3 Open TCP/IP communication

Characteristic	Explanation / values
Number of dynamically generated connections over Industrial Ethernet	• ISO-on-TCP connections: 1...64
Max. data length	1452 bytes

2.5 Characteristic data of TCP connections for HTTP

Characteristic data of TCP connections for HTTP

For HTTP access, up to 4 CP-internal TCP connections are available. When necessary, these TCP connections are used by one or more Web browsers to display data of the CP.

CP-internal TCP connections do not affect the configuration limits of the configured TCP connection resources.

Requirements for use

3

3.1 Configuration limits

When using the CP type described here, the following limits apply:

- Number of operable CPs within a rack: 14

3.2 System environment

General requirements

- The CP is released with CPUs as of firmware version 5.3.2.
  - CPUs with older firmware versions must be upgraded to V5.3.2.
- H communication
  - The CPU substitute function of the CP requires CPUs with a firmware version from V4.5.6 up to lower than V6.0.

Table of compatible CPUs

The CP is supported by the S7400 CPUs with the order numbers and firmware versions as shown in the following table.

The table also contains the following information:

- The number of CPs that can be operated with one CPU;
- The number of CPU resources for SEND/RECEIVE calls;
- Which CPUs support the LOCK/UNLOCK function with the FETCH/WRITE services;

CPU	**Order number of the CPU: 6ES7...**	**as of firmware version**	**a = multiprocessor mode** **b = number of operable CPs** **c = CPU resources for SEND/RECEIVE jobs [1])** **d = LOCK/UNLOCK**			
			a	**b**	**c**	**d**
CPU 412-1	..412-1XJ05-0AB0	V5.3.2	+	14	24	+
CPU 412-2	..412-2XJ05-0AB0	V5.3.2	+	14	24	+
CPU 412-2	..412-2EK06-0AB0	V6.0.2	+	14	24	+
CPU 414-2	..414-2XK05-0AB0	V5.3.2 as of V5.2	+ +	14 14	24 24	+ +
CPU 414-3	..414-3XM05-0AB0	V5.3.2	+	14	24	+

CPU	Order number of the CPU: 6ES7...	as of firmware version	a = multiprocessor mode b = number of operable CPs c = CPU resources for SEND/RECEIVE jobs [1] d = LOCK/UNLOCK			
CPU 414-3 PN/DP	..414-3EM05-0AB0	V5.3.2	+	14	24	+
CPU 414-3 PN/DP	..414-3EM06-0AB0	as of V6.0.2	+	14	24	+
CPU 414-3 PN/DP	..414-3FM06-0AB0	as of V6.0.2	+	14	24	+
CPU 416-2	..416-2XN05-0AB0	V5.3.2	+	14	64	+
CPU 416-3	..416-3XL04-0AB0	V5.3.2	+	14	64	+
CPU 416-3	..416-3XR05-0AB0	V5.3.2	+	14	64	+
CPU 416-3 PN/DP	..416-3ER05-0AB0	V5.3.2	+	14	64	+
CPU 416F-3 PN/DP	..416-3FR05-0AB0	V5.3.2	+	14	64	+
CPU 416F-3 PN/DP	..416-3ES06-0AB0	as of V6.0.2	+	14	64	+
CPU 416F-3 PN/DP	..416-3FS06-0AB0	as of V6.0.2	+	14	64	+
CPU 417-4	..417-4XT05-0AB0	V5.3.2	+	14	64	+
CPU 412-3H [2]	..412-3HJ14-0AB0	V4.5.6	+	14	64	+
CPU 414H [2]	..414-4HM14-0AB0	V4.5.6	+	14	64	+
CPU 417H [2]	..417-4HR14-0AB0	V4.5.6	+	14	64	+
CPU 417-4H [2]	..417-4HT14-0AB0	V4.5.6	+	14	64	+
CPU 412-5H [2]	..412-5HK06-0AB0	V6.0.2	+	14	64	+
CPU 414-5H [2]	..414-5HM06-0AB0	V6.0.2	+	14	64	+
CPU 416-5H [2]	..416-5HS06-0AB0	V6.0.2	+	14	64	+
CPU 417-5H [2]	..417-5HT06-0AB0	V6.0.2	+	14	64	+

Legend:

+ => The characteristic is supported / the listed mode is possible
- => The characteristic is not supported / the listed mode is not possible

1) Note: The calculation of the maximum number of SEND/RECEIVE calls that can be used simultaneously per CP is described in the section "Characteristic data".

2) Note: When operating with HCPUs with a firmware version lower than V6.0, the SSEND / SRECV mode on the SEND/RECV interface is not supported.

See also

Project engineering (Page 27)

Number of simultaneous SEND/RECEIVE calls (Page 21)

3.3 Project engineering

Configuration and downloading the configuration data

It is possible to download the configuration data to the CP via MPI or LAN/Industrial Ethernet. Downloading is possible over the RNA or the Ethernet interface of the CP. You require STEP 7 with additional modules in the following version:

STEP 7 version and additional modules		CP 443-1 RNA functionality
STEP 7 V5.5		
	• as of STEP 7 V5.5 + Service Pack 2 + HSP1098	The full functionality as described in this document can be used.
STEP 7 Professional		
	STEP 7 Professional ab V14	The full functionality as described in this document can be used.

3.4 Program blocks

Program blocks

For some communications services, there are preprogrammed program blocks (FCs / FBs) available as the interface in your STEP 7 user program.

Refer to the documentation of the program blocks in the online help of STEP 7 or in the manual /4/ (Page 74).

Note

Using current block versions

We recommend that you always use the latest block versions for all module types.

You will find information on the current block versions and the current blocks to download from the Internet in our Customer Support under entry ID:

Link: (https://support.industry.siemens.com/cs/ww/en/ps/15355/dl)

With older module types, this recommendation assumes that you are using the latest firmware for the particular module type.

Using program blocks for the SEND/RECEIVE interface

For data transfer on the SEND/RECEIVE interface, there are program blocks for short and long blocks of data.

For fast data transmission up to a data length of 1452 bytes, the SPEED SEND/RECEIVE program blocks AG_SSEND (FC53) and AG_SRECV (FC63) are supported.

Functionality	Requirement
Transfer of data fields <= 240 bytes	• You require the program blocks AG_SEND (FC5) and AG_RECV (FC6) or alternatively the program blocks AG_LSEND (FC50) and AG_ LRECV (FC60).
Transfer of blocks of data > 240 bytes to <= 8192 bytes *)	• You require the program blocks AG_LSEND (FC50) and AG_LRECV (FC60).
Accelerated transfer of blocks of data <= 1452 bytes	• You require the program blocks AG_SSEND (FC53) and AG_SRECV (FC63).

*) The length depends on the protocol

Note

Multicomputing mode

Note that in multicomputing mode, communication using SPEEDSEND/RECV is possible only via the CP assigned to the CPU.

Note

Operation with a high communications load

Note the recommendations in section Recommendation for use with a high communications load (Page 49) for operation with a high communications load.

LEDs

4

LEDs on the housing front

The following LEDs on the front panel show the operating and communication status of the CP:

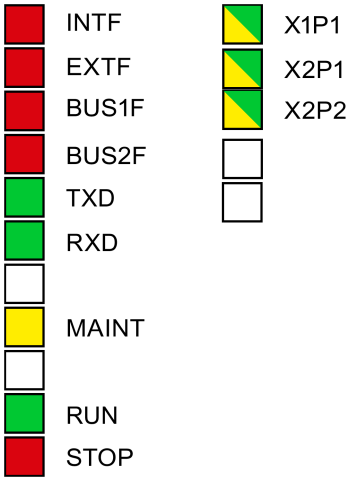


Figure 4-1 LEDs of the CP 442-1 RNA

The LEDs have the following meaning:

- INTF: Internal error
- EXTF: External error
- BUS1F: Bus fault on Ethernet interface
- BUS2F: Bus fault RNA interface
- TXD: Frame traffic (sending) over Ethernet
- RXD: Frame traffic (receiving) over Ethernet
- MAINT: Maintenance necessary (diagnostics buffer)
- RUN: RUN mode
- STOP: STOP mode
- X1 P1: Connection status / activity of the Ethernet port of the Ethernet interface
- X2P1, X2P2: Connection status / activity of Ethernet port 1, 2 of the RNA interface

Unlabeled LEDs have no significance (only relevant for diagnostics).

Table 4- 1 Legend: Meaning of the LED symbols in the following tables

Symbol				-
Meaning	ON	OFF	Flashing	Any

Table 4- 2 Meaning of the LED displays

INTF (red)	EXTF (red)	BUSxF (red) *)	RUN (green)	STOP (yellow)	MAINT (yellow)	CP operating mode
○	○	○	☼	●	-	Starting up (STOP->RUN)
●	●	●	●	●	●	• Temporary LED pattern during startup (a few seconds) • With permanent LED pattern: Hardware fault in the CP
○	○	○	●	○	-	Running (RUN)
○	○	○	●	☼	-	Stopping (RUN->STOP)
○	○	○	○	●	-	Stopped (STOP) In STOP mode, configuring and performing diagnostics on the CP remain possible.
●	○	○	○	●	-	• STOP with internal error (for example IP double addressing detected during startup of the CP in network) or • following memory reset / reset to factory defaults The following applies in this status: • The CPU or intelligent modules in the rack remain accessible using PG functions (over MPI or the ISO protocol). • SNMP functionality and access using HTTP are not possible.
-	○	●	-	-	-	• Error on the RNA interface (BUS2F) – The transmission mode of the communications partner is not permitted (only the "automatic setting" mode with 100 Mbps full duplex) – PRP error or • double IP address
○	●	○	●	○	-	• RUN with external error; The CP diagnostics buffer provides detailed information.
○	○	●	●	○	-	• A duplicate IP address was detected after the CP was in RUN. or • Difference in the transmission medium or the duplex settings between the configuration and the actual system

INTF (red)	EXTF (red)	BUSxF (red) *)	RUN (green)	STOP (yellow)	MAINT (yellow)	CP operating mode
●	●	●	☼	●	○	Loading using the Firmware Loader is active.
●	●	●	☼	☼	○	The firmware download was aborted. (STOP LED and RUN LED flash alternately)
●	●	●	●	●	○	Firmware is being activated.
☼	☼	☼	☼	☼	-	Module fault / system error

*) The behavior applies to BUS1F and BUS2F if there is no restriction listed in the "CP mode" column.

The "MAINT" LED (yellow)

If the "MAINT" LED lights up, there is an error or an update is being performed in the CP.

Check the entries in the diagnostics buffer of the device.

CP communications status

Table 4- 3 Meaning of the LED displays

LED	LED display	Meaning
TXD (green)	☼	CP sending over Ethernet.
RXD (green)	☼	CP is receiving over Ethernet.
X1P1 X2P1 / X2P2 (green / yellow)	○	Port has no connection over Ethernet.
	●	Existing connection over port to Ethernet
	◉	LED flashes yellow (constant light green): Port is sending / receiving via Ethernet. Note: Here, all received / sent frames are signaled separately for each port.
	●	Continuous data transfer via Ethernet at the port

Module identification

Note

Module identification - make the port LEDs flash briefly

With the help of Web diagnostics or the online functions of STEP 7, you can search for and identify the module in the rack. The options for this are as follows:

- In Web diagnostics

  You click the "Flash" button in the update center.
- In STEP 7

  You click the "Flash" button in the "Browse network" dialog

When the "Flash" button is clicked, the port LED of the enabled interface flashes briefly.

Installation, wiring, commissioning, removal 5

Safety notices on the use of the device

Note the following safety notices when setting up and operating the device and during all associated work such as installation, connecting up or replacing the device.

5.1 Important notes on using the device

5.1.1 Notices on use in hazardous areas

⚠ WARNING

The device may only be operated in an environment with pollution degree 1 or 2 as described in EN/IEC 60664-1, GB/T 16935.1.

⚠ WARNING

EXPLOSION HAZARD

You may only connect or disconnect cables carrying electricity when the power supply is switched off or when the device is in an area without inflammable gas concentrations.

5.1.2 Notes on use in hazardous areas according to ATEX / UKEX / IECEx / CCC-Ex

⚠ WARNING

Requirements for the cabinet

To comply with EU Directive 2014/34 EU (ATEX 114), UK Regulation SI 2016/1107 or the conditions of IECEx or CCC-Ex, the housing or cabinet must meet the requirements of at least IP54 (according to EN/IEC 60529, GB/T 4208) in compliance with EN IEC/IEC 60079-7, GB 3836.8.

WARNING

Suitable cables at high ambient temperatures in hazardous area

Use heat-resistant cables with an ambient temperature ≥ 60 °C; these cables must be rated for an ambient temperature that is at least 20 °C higher. The cable entries used on the housing must comply with the IP degree of protection required by EN IEC 60079-0 / GB 3836.1.

WARNING

Transient overvoltages

Take measures to prevent transient overvoltages of more than 40% of the rated voltage (or more than 119 V). This is the case if you only operate devices with SELV (safety extra-low voltage).

5.1.3 Notes on use in hazardous areas according to UL HazLoc and FM

This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D or non-hazardous locations only.

This equipment is suitable for use in Class I, Zone 2, Group IIC or non-hazardous locations only.

WARNING

When used in hazardous environments corresponding to Class I, Division 2 or Class I, Zone 2, the device must be installed in a cabinet or a suitable enclosure.

WARNING

EXPLOSION HAZARD

Replacing components may impair suitability for Class 1, Division 2 or Zone 2.

WARNING

If the device is installed in a cabinet, the inner temperature of the cabinet corresponds to the ambient temperature of the device.

WARNING

EXPLOSION HAZARD

The equipment is intended to be installed within an ultimate enclosure. The inner service temperature of the enclosure corresponds to the ambient temperature of the module. Use installation wiring connections with admitted maximum operating temperature of at least 30 °C higher than maximum ambient temperature.

5.2 Installation, removal and repairs in hazardous areas

⚠ WARNING

Impermissible accessories and spare parts

Risk of explosion in hazardous areas

- Only use original accessories and original spare parts.
- Observe all relevant installation and safety instructions described in the manuals for the device or supplied with the accessories or spare parts.

⚠ WARNING

Unsuitable cables or connectors

Risk of explosion in hazardous areas

- Only use connectors that meet the requirements of the relevant type of protection.
- If necessary, tighten the connector screw connections, device fastening screws, grounding screws, etc. according to the specified torques.
- Close unused cable openings for electrical connections.
- Check the cables for a tight fit after installation.

⚠ WARNING

Improper installation of shielded cables

There is a risk of explosion due to equalizing currents between the hazardous area and the non-hazardous area.

- Ground shielded cables that cross hazardous areas at one end only.
- Lay a potential equalization conductor when grounding at both ends.

⚠ WARNING

Lack of equipotential bonding

If there is no equipotential bonding in hazardous areas, there is a risk of explosion due to equalizing current or ignition sparks.

- Ensure that equipotential bonding is available for the device.

⚠ WARNING

Unprotected cable ends

There is a risk of explosion due to unprotected cable ends in hazardous areas.

- Protect unused cable ends according to IEC/EN 60079-14.

⚠ WARNING

Insufficient isolation of intrinsically safe and non-intrinsically safe circuits

Risk of explosion in hazardous areas

- When connecting intrinsically safe and non-intrinsically safe circuits, ensure that the galvanic isolation is performed properly in compliance with local regulations (e.g. IEC 60079-14).
- Observe the device approvals applicable for your country.

⚠ WARNING

Unauthorized repair of devices in explosion-proof design

Risk of explosion in hazardous areas

- Repair work may only be performed by personnel authorized by Siemens.

5.3 Installing and connecting

NOTICE

Improper mounting

Improper mounting may damage the device or impair its operation.

- Before mounting the device, always ensure that there is no visible damage to the device.
- Mount the device using suitable tools. Observe the information in the respective section about mounting.

⚠ WARNING

Open equipment

The devices are "open equipment" acc. to the standard IEC 61010-2-201 or UL 61010-2-201 / CSA C22.2 No. 61010-2-201. To fulfill requirements for safe operation with regard to mechanical stability, flame retardation, stability, and protection against contact, the following alternative types of installation are specified:

- Installation in a suitable cabinet.
- Installation in a suitable enclosure.
- Installation in a suitably equipped, enclosed control room.

WARNING

Power supply

The device is designed for operation with a directly connectable safety extra low voltage (SELV) from a limited power source (LPS).

The power supply therefore needs to meet at least one of the following conditions:

- Only safety extra low voltage (SELV) with limited power source (LPS) complying with IEC 60950-1 / EN 60950-1 / VDE 0805-1 or IEC 62368-1 / EN 62368-1 / VDE 62368-1 may be connected to the power supply terminals.
- The power supply unit for the device must meet NEC Class 2 according to the National Electrical Code (r) (ANSI / NFPA 70).

If the equipment is connected to a redundant power supply (two separate power supplies), both must meet these requirements.

The steps for installing the CP are explained below.

Result: The CP is installed in the rack and the interfaces have been networked.

Follow the steps outlined below:

1. Plugging in the CP:
   Fit the CP onto the rack from the top and push it in at the bottom.

   The CP can be operated in central or universal racks.

   Note

   K bus link

   When using the universal rack UR1 or UR2 as an expansion rack, a communication bus link is necessary!

2. Secure the CP with screws.
3. Turn on the power supply.
4. Connect the CP to Industrial Ethernet via one of the RJ45 jacks.

See also

Network settings (Page 46)

5.4 Commissioning

5.4.1 Commissioning - procedure

The steps for commissioning the CP are explained below. Commissioning involves the addressing and downloading the configuration data and user programs.

Result: The CP is reachable in the network and has been supplied with configuration data.

Follow the steps outlined below:

1. Download the configuration data from your STEP 7 project to the S7400 station.
   – Requirement:

     You have configured the CP in a STEP 7 project for the properties and services you want to use.

     Note

     You can connect the PG when configuring the CP as follows:
     - via MPI
     - via Industrial Ethernet

       For further details, refer to the general part /1/ (Page 73) of this manual:
       – Initial addressing (node initialization);
       – Downloading the configuration

     The PG/PC requires a LAN attachment, for example via a CP 1623 or CP 1411 and must have the necessary software (for example the S71623 package or SOFTNET IE). The TCP/IP protocol or ISO protocol must be installed. The protocol used must then be applied to the S7ONLINE access point.

2. Use the diagnostics functions during commissioning and to analyze problems.

   You have the following options available:
   – Hardware diagnostics and troubleshooting with STEP 7.
   – Communication diagnostics with special diagnostics.
   – Web diagnostics.

5.4.2 Controlling the mode

You can change the mode of the CP between RUN and STOP using the STEP 7 configuration software or using STEP 7 special diagnostics.

Change from STOP to RUN:

The CP loads configured and/or downloaded data into the work memory and then changes to RUN mode.

Change from RUN to STOP:

The CP changes to STOP (transitional phase with LED display "Stopping").

The reaction is as follows in STOP:

- Established connections (ISO transport, ISOonTCP, TCP, UDP connections) are terminated
- The following the functions are disabled:
  - Time-of-day synchronization
- The following functions remain enabled:
  - The configuration and diagnostics of the CP (system connections for configuration, diagnostics, and PG channel routing are retained);
  - Web diagnostics

5.5 Disassembly

⚠ WARNING

Improper disassembly

Improper disassembly may result in a risk of explosion in hazardous areas.

For proper disassembly, observe the following:

- Before starting work, ensure that the electricity is switched off.
- Secure remaining connections so that no damage can occur as a result of disassembly if the system is accidentally started up.

Configuration and operation

6

6.1 Security recommendations

Keep to the following security recommendations to prevent unauthorized access to the system.

General

- You should make regular checks to make sure that the device meets these recommendations and other internal security guidelines if applicable.
- Evaluate your plant as a whole in terms of security. Use a cell protection concept with suitable products.
- Do not connect the device directly to the Internet. Operate the device within a protected network area.
- Check regularly for new features on the Siemens Internet pages.
  - You can find information on Industrial Security here:
    Link: (http://www.siemens.com/industrialsecurity)
  - You can find a selection of documentation on the topic of network security here:
    Link: (https://support.industry.siemens.com/cs/ww/en/view/92651441)
- Keep the firmware up to date. Check regularly for security updates of the firmware and use them.

  Information regarding product news and new firmware versions is available at the following address:
  Link: (https://support.industry.siemens.com/cs/ww/en/ps/15355/dl)

Physical access

Restrict physical access to the device to qualified personnel.

Network attachment

Do not connect the PC directly to the Internet. If a connection from the CP to the Internet is required, arrange for suitable protection before the CP, for example a SCALANCE S with firewall.

Security functions of the product

Use the options for security settings in the configuration of the product. These includes among others:

- Protection levels
  - Configure a protection level of the CPU.
  - Configure the protection level "Status-dependent".
- Security function of the communication
  - Enable the IP access protection of the CP (HW Config).
  - Disable access to the Web server of the CPU (CPU configuration) and on the CP.
- Protection of the passwords of program blocks

  Protect the passwords stored in data blocks for the blocks from being viewed. The procedure is described below.

Know-how protection of blocks (STEP 7 V5)

You can prevent the contents of data blocks (e.g. passwords) being read out by protecting the block with the "KNOW_HOW_PROTECT" option. Follow the steps outlined below in STEP 7:

1. Select the DB in the block folder.
2. Open the block in the editor.
3. Close the block in the editor.
4. Generate a source from the block in the editor.
5. Select the source of the DB in the sources folder.
6. Open the source.
7. Insert an empty line in the header of the source and write "KNOW_HOW_PROTECT" in this line.
8. Compile the source.

   Result: The block is protected. You can recognize this by the padlock symbol in the block folder.

If you want to later change parameters in a DB, for example a password, remember the following: The contents of a DB with know-how protection are no longer visible and can only be changed via the source or by direct assignment of parameters.

Passwords

- Define rules for the use of devices and assignment of passwords.
- Regularly update the passwords to increase security.
- Only use passwords with a high password strength. Avoid weak passwords for example "password1", "123456789" or similar.

- Make sure that all passwords are protected and inaccessible to unauthorized personnel.

  See also the preceding section for information on this.
- Do not use one password for different users and systems.

Protocols

Secure and non-secure protocols

- Only activate protocols that you require to use the system.

Table: Meaning of the column titles and entries

The following table provides you with an overview of the open ports on this device.

- **Protocol / function**

  Protocols that the device supports.
- **Port number (protocol)**

  Port number assigned to the protocol.
- **Default of the port**
  - Open

    The port is open at the start of the configuration.
  - Closed

    The port is closed at the start of the configuration.
- **Port status**
  - Open

    The port is always open and cannot be closed.
  - Open after configuration

    The port is open if it has been configured.
  - Open (login, when configured)

    As default the port is open. After configuring the port, the communications partner needs to log in.
- **Authentication**

  Specifies whether or not the protocol authenticates the communications partner during access.

Protocol / function	Port number (protocol)	Default of the port	Port status	Authentication
HTTP	80 (TCP)	Open	Open after configuration	No
ISO-on-TCP (RFC1006)	102 (TCP)	Open	Open	No
NTP	123 (UDP)	Closed	Open after configuration	No
SNMP	161 (UDP)	Open	Open after configuration	Yes (with SNMPv3)

6.2 Switching over interfaces

The choice of the interface to be used, RNA interface or Ethernet interface is made in the configuration of the CP. Each configuration or changeover of the interface therefore requires that the configuration data is downloaded again.

NOTICE
Interface change - load configuration data only via other module If you change over the currently active interface and when you load the configuration data, you will need to use an interface of the CPU or the interface of another CP to load the configuration data. If you load the configuration data via the interface of the CP 442-1 RNA, on which the interface should be switched over, the loading cannot be completed.

6.3 Memory reset / reset to factory defaults

The CP has a twolevel function available for resetting memory:

- Memory reset
- Resetting to factory setting

Note

Data on the CP is deleted - CPU data is retained

The functions for resetting and resetting to factory defaults described here do not change the configuration data on the CPU! Only the data kept on the CP is deleted.

If you subsequently upload the configuration data from the CPU to a PG you will always object the configuration data that was previously on the CP (with parameters, connections, IP address).

Note

Memory reset - ACL (access control list)

After a memory reset on the module, the following applies:

- ACL remains active.

How to use the functions

You can start the memory reset functions in STEP 7. The CP must be in STOP. When you reset memory using special diagnostics, the CP is automatically changed to STOP.

- Memory reset
  - In STEP 7 V5.5 with the menu command "PLC" > "Clear/Reset"
  - In STEP 7 special diagnostics with the "Operating Mode" > "Clear/Reset Module" menu command
- Resetting to factory settings
  - In STEP 7 V5.5 with the menu command "PLC" > "Edit Ethernet Node..." > Select CP > "OK" > "Reset to Factory Defaults"
  - In STEP 7 special diagnostics with the "Operating Mode" > "Reset to Factory Settings" menu command

Clear/reset module - effects

Following the memory reset, the CP retains the configured MAC address, the IP address and the retentive parameters. The CP is therefore immediately ready for downloads using the IP address.

The configuration data is retained on the CPU.

The CPU in the S7 station does not recognize that the CP memory was reset. The CP changes to the "Stopped (STOP) with error" state (see LEDs (Page 29)). The configuration data must then be reloaded. You can also initiate this loading by cycling power (OFF/ON).

Reset to factory defaults - effects

After resetting to factory defaults, the CP always retains the factory set MAC address (as supplied).

The IP address and the configuration data in the CP RAM are deleted. The configuration data is retained on the CPU.

6.4 Network settings

6.4.1 Reserved MAC address

NOTICE
Do not use the MAC address
Internally, the CP uses the following reserved MAC address:
00-1B-1B-31-4D-00
Do not use this MAC address for communications partners of the CP, otherwise no communication is possible with the communications partner.

6.4.2 Transmission properties of the Ethernet and RNA interfaces

The common transmission characteristics of the two interfaces are described below.

The configuration of the network settings "Transmission medium / duplex" is made for the Ethernet interfaces in the properties of the port in STEP 7/HW Config:

Row "X1P1": Port properties of the Ethernet interface

Automatic setting or individual network settings

As default, the CP is configured for automatic detection (autosensing) for both interfaces.

The settings for the RNA interface are fixed.

If necessary, you can change the settings for the Ethernet interface.

Note

In normal situations, the basic setting ensures troublefree communication. You should only change this in exceptional situations.

Ethernet interface:
If you create a manual configuration for the CP and disable the autonegotiation option, the automatic negotiation of the network settings (autonegotiation) is no longer effective. If, on the other hand, the communications partner works with autonegotiation, it is not certain that error-free communication will be established.

Autocrossing mechanism

With the integrated autocrossing mechanism, it is possible to use a standard cable to connect the PC/PG. A crossover cable is not necessary.

STEP 7 special diagnostics and Web diagnostics display the network setting

Diagnostics of the port settings for the CP described here is possible using the entries in the diagnostics buffer using SNMP, special diagnostics, and the LED displays.

You will find information on the currently used network settings in STEP 7 as follows:

- in special diagnostics under the diagnostics object "Industrial Ethernet" in the "Network Attachment" group box;
- in STEP 7 with the menu command "PLC > Module Information";
- In Web diagnostics.

Further notes:

- 10/100 Mbps network components without "autonegotiation"

  If you use 10/100 Mbps network components that do not support "Autonegotiation", it is possible that you will have to set the mode manually.

- Forcing a specific mode instead of "Automatic settings"

  If your application requires a specific mode instead of the automatic settings, you will need to match up the partner devices.

- No reaction to Autonegotiation query with manual configuration

  Remember that if you configure the CP manually and the "Autonegotiation" option is disabled, it will not react to an autonegotiation query! As a result, a connected partner may not be able to set the required mode and communication will not be ideal.

  Example:

  If, for example, the CP is set to "100 Mbps - full duplex" and autonegotiation is disabled, a CP connected as partner will set "100 Mbps - half duplex". Reason: Due to the fixed setting, an autonegotiation reply is not possible. Although the connected partner detects 100 Mbps with autosensing, it remains at half duplex.

- Recommendation: Change individual network settings only over MPI

  If you modify the LAN settings, these changes will be adopted by the CP and activated when the configuration data is downloaded to the target system (STEP 7). In some situations, the device may then no longer be obtainable over Ethernet.

  We therefore recommend that you download configuration data to the S7 station over an MPI connection if you change this setting.

  If you download the configuration data via the LAN interface then, depending on the selected setting, it is possible that the current download will not be completed due to the changes to the configuration taking immediate effect and an inconsistent configuration is reported.

  Example:

  The download is started initially with the setting TP/ITP at 10 Mbps half duplex. If the "Individual network settings" are now changed to 100 Mbps full duplex, the download cannot be completed.

6.5 IP configuration

6.5.1 Setting the IP address

You can only assign the CP an IP address in the factory settings status.

To be able to assign an already configured CP a new IP address via SINEC PNI or the STEP 7 function "Edit Ethernet node", you will need to reset it to factory settings.

6.5.2 Detecting duplicate IP addressing in the network

To save you timeconsuming troubleshooting in the network, the CP detects double addressing in the network.

Behavior during operation (CP in RUN)

If the CP detects double addressing on the network (new node with an IP address that has already been assigned), a message is generated in the diagnostics buffer and the bus fault LED lights up.

The CP remains in RUN mode. After the device with the duplicate IP address has been removed from the network, the bus fault LED goes off automatically.

Behavior when the CP starts up

If duplicate addressing is detected when the CP starts up, the CP remains in STOP. The bus fault LED is lit and a diagnostics buffer entry is generated.

Restart the CP after the double addressing problem has been eliminated.

6.6 Time-of-day synchronization

General rules

On the RNA interface, the CP supports the following two modes for timeofday synchronization:

- SIMATIC mode
- NTP mode (NTP: Network Time Protocol)

Note

No automatic changeover to daylight saving is defined in NTP. As a result, you may need to implement this changeover using a program application.

Note

Note the following about timeofday synchronization in NTP mode:

If an NTP frame is detected by the CP as "not exact" (example: NTP server is not synchronized externally), there is no forwarding on the K bus. If this problem occurs, none of the NTP servers is displayed as "NTP master" in the diagnostics; rather all NTP servers are displayed only as being accessible.

Project engineering

For more detailed information on configuration, refer to the online help of the "Time-of-day synchronization" parameter group and in Part A of the manual /1/ (Page 73).

6.7 Recommendation for use with a high communications load

Reason

To avoid an overload situation on the CPU you are using, note the following information about the CP.

Known problems

- The program blocks for sending and receiving AG_SEND / AG_RECV (FC5/FC6, FC50/60 or FC53/63) are often called cyclically in OB1. This leads to constant communication between the CPU and CP. As a result, other types of communication such as PG functions cannot be executed or only very slowly.
- HMI systems access data of the CPU too often using S7 functions. This slows down communication overall and there may be resource bottlenecks on the CPU.

Remedy

Note the following recommendations:

- Do not call communication program blocks cyclically in OB1!

  Instead, call up communication time-controlled in a suitable time OB. The call interval of this OB should be significantly higher than the average cycle time of OB1.
- Set a minimum cycle time that is higher than the average execution time of OB1. This frees resources for communication on the CPU. Setting a minimum cycle time is a suitable solution, for example, for existing applications when communication already takes place cyclically in OB1.
- If necessary, reduce the time for processing communication on the CPU. The setting is made with the "Cycle load due to communication" parameter in the properties of the CPU.

6.8 SNMP agent

SNMP (Simple Network Management Protocol)

SNMP is a protocol for managing networks. To transmit data, SNMP uses the connectionless UDP protocol.

The information on the properties of SNMPcompliant devices is entered in MIB files (MIB = Management Information Base).

The CP supports data queries using SNMP in version 1. It supplies the content of certain MIB objects according to MIB-II (RFC1213), PRP-MIB IEC62439 (IEC-62439-3-MIB) and Automation System MIB.

MIB file and SNMP profile file

You will find the MIB file and the SNMP profile file of the module in the STEP 7 installation in the folders "S7DATA" > "snmp" under the name of the module.

Further information

For more detailed information on working with MIB files, refer to the documentation of the SNMP client you are using (example of an SNMP client: SNMP OPC server from SIMATIC NET).

For more information on SNMP, refer to the /12/ (Page 76) manual.

Supported MIBs

The CP supports the following groups of MIB objects of the standard MIB II according to RFC1213:

- System
- Interfaces
- IP

- ICMP
- TCP
- UDP
- SNMP

The other groups of the MIB II standard are not supported:

- EGP
- Transmission
- at

The CP also supports the Automation System MIB and the PRP-MIB (IEC-62439-3-MIB).

Exceptions / restrictions:

- Write access is permitted only for the following MIB objects of the system group:
  - sysContact
  - sysLocation
  - sysName

  For all other MIB objects / MIB object groups, only read access is possible for security reasons.
- Traps are not supported by the CP.

"Interfaces" MIB group

The "Interfaces" MIB object provides status information about the CP interfaces. The MIB objects of the ifTable provide the status information of the interfaces. The "ifIndex" object identifier is assigned to the CP interfaces as follows:

Table 6- 1 ifIndex

ifIndex	Type of interface
1	Ethernet interface
2-3	Port 1-2 (RNA interface)

Access permissions using community name

The CP uses the following community names to control the access rights in the SNMP agent:

Table 6- 2 Access rights in the SNMP agent

Type of access	Community name *)
Read access	public
Read and write access	private

*) Note the use of lowercase letters!

MIB files for your SNMP tools

If you use an SNMP tool, you will find the MIB files relevant to the CP in the STEP 7 installation in the following folder:
`<Drive>\<Installation folder>\Siemens\Step7\S7DATA\snmp\mib`

There, you will find, for example, the following MIB files:

- automationPS.mib
- automationSmi.mib
- automationSystem.mib
- automationTC.mib
- IEC-62439-3-MIB.mib

6.9 Interface in the user program

6.9.1 Call interface for open communications services SEND/RECV

Change call parameters only after job confirmation

Note

Note the following for the call interface of the program blocks AG_SEND / AG_LSEND / AG_SSEND or AG_RECV / AG_LRECV / AG_SRECV:

Once the job has been triggered, you can only make changes again after the program block has confirmed completion of the job with DONE=1 or with ERROR=1.

If this is ignored, it is possible that the execution of the job will be aborted with an error and resources could be permanently occupied on the CPU.

6.9.2 Open TCP/IP communication

Note

Validity

The information in this section applies only to the RNA interface.

Use

To allow the user program to exchange data with other TCP/IPcompliant communications partners, STEP 7 provides a UDT for the connection parameter assignment and four program blocks:

- UDT 65 "TCON_PAR" with the data structure for connection parameter assignment
- FB65 "TCON" for connection establishment
- FB66 "TDISCON" for connection termination
- FB63 "TSEND" for sending data
- FB64 "TRCV" for receiving data

TCP/IP communication is connectionoriented. Data can be transmitted only when a connection has been established to the communications partner. The CPU can use several connections to a communications partner at the same time.

The following protocol variants are supported:

- ISO on TCP according to RFC 1006

Programming

Make the following parameter settings in the connection description (UDT 65):

- local_tsap_id: Byte 1 = 0xE0 (value mandatory for correct functionality)
- local_tsap_id: Byte 2 = rack/slot number
- remote_tsap_id: Byte 1 = 0xE0 (value mandatory for correct functionality)
- remote_tsap_id: Byte 2 = rack/slot number

Note: The TSAPs can be 2-16 bytes long. The first two bytes must be occupied as described, you can use the other bytes to suit your task.

Note

Note that the number of dynamically established connections also depends on the number of configured, statically established connections.

You will receive corresponding condition codes on the call interface of the FBs.

Refer to the documentation of the program blocks in the online help and in the documentation for STEP 7. There, you will also find examples of parameter assignment!

6.10 Ping: Permitted length of ICMP packets

Pings with a packet size of more than 1000 bytes are evaluated as an attack and filtered by the CP. This response is intentional and improves the robustness of the CP in an industrial environment.

A ping simply serves to check reachability. There is therefore no need to support extremely long ICMP packets.

6.11 Communication in PRP mode

In PRP mode, the first frame from an unknown node is discarded and remains unanswered. This response must be taken into account with the services that do not generally cause any frame repetitions such as:

- Firmware download (see also section Loading new firmware (Page 57))
- Searching the network
- PING

Diagnostics and maintenance 7

⚠ WARNING

Cleaning the housing

- **In hazardous areas**
  Only clean the outer parts of the housing with a damp, but not wet, cloth.
- **In non-hazardous areas**
  Only clean the outer parts of the housing with a dry cloth.

Do not use any liquids or solvents.

⚠ CAUTION

Hot surfaces

Risk of burns during maintenance work on parts with a surface temperature above 70 °C (158 °F).

- Take appropriate protective measures, for example, wear protective gloves.
- Once maintenance work is complete, restore the touch protection measures.

7.1 Diagnostics options

Overview of the Diagnostics options

The following diagnostics options are available:

- **LEDs of the module**
  For information on the LED displays, refer to the section The CP as Web server (Page 56).
- **Web diagnostics**
  For information on Web diagnostics using HTTP, refer to the section LEDs (Page 29).
- **STEP 7 V5.5**
  - Hardware diagnostics and troubleshooting
  - Communication diagnostics with special diagnostics

- **STEP 7 Professional**

  In the "Diagnostics" tab in the Inspector window, you will see the following information:

  – Entries in the diagnostics buffer of the CPU

  – Information on the online status

  In the "Online > Online and diagnostics" menu, you obtain the static information about the module:

  – General information on the module

  – Diagnostics status

  – Information on the interfaces

  – Information relating to special diagnostics (folder "Functions" > Special diagnostics)

  You will find further information on the diagnostics functions of STEP 7 in the STEP 7 information system.

7.2 The CP as Web server

Web diagnostics

The CP provides you with the functionality of a Web server for access using a Web browser. With the following address, you have access to Web diagnostics:
`http:\\<IP address of the CP>`

Diagnostics buffer entries

When supplied, diagnostics buffer entries shown on diagnostics pages are always in English. This is not influenced by the language selected for display of the Web pages.

How to download other languages to the CP and further information about Web diagnostics can be found in the general Part A of this manual /1/ (Page 73).

Enabling the Web server function

To use the Web server functionality of the CP, enable the relevant option in STEP 7 in the module properties, "Web" parameter group.

The Web server function is enabled as default.

For detailed information on the Web server and Web diagnostics, refer to the general Part A of this manual /1/ (Page 73).

Web browser

To access the HTML pages on the CP, you require a Web browser. The following Web browsers are suitable for communication with the CP (other browsers also possible):

- Internet Explorer (recommended version: as of 7.0)
- Chrome (recommended version: as of 12.0)
- Firefox (recommended version: as of 4.0)

These Web browsers support all the requirements necessary for the implementation of the IT functions of the CP (Java reference implementation - Java Development Kit 1.1.x is supported).

7.3 Loading new firmware

Options for a firmware update

The following alternative methods can be used to download new firmware to a SIMATIC NET CP:

- Using the firmware loader supplied with STEP 7

  Requirement for downloading:

  – To download firmware, you require an Industrial Ethernet CP module in the PG/PC (for example, CP 1613) or a normal Ethernet module with the "Softnet" software package.

  – The S7ONLINE interface must be set to the "ISO - Industrial Ethernet" protocol. It is not possible to download using TCP/IP (and therefore not to other networks).

  Always run the download using the active MAC address of the CP!

- Using the update center

  You can reach the update center using Web diagnostics.

  The CP supports the storage of several firmware versions. Using the firmware load function in the update center, you can activate the required firmware version.

  Requirement: The "Firmware download via Web" option is selected in the configuration and the user rights have been set.

Note the descriptions of firmware downloads in the manual Part A LEDs (Page 29).

How to download new firmware

You can download the firmware via the active interface of the CP.

Follow the steps outlined below:

1. Connect the CP module to the PG/PC via a LAN cable.
2. Start the download on your PG/PC using one of the firmware download functions described above.

   The download involves two stages:

   – Section 1: Downloading firmware

   – Section 2: Activating firmware

   You will find the LED displays in the section LEDs (Page 29)

   If the download is aborted, RUN and STOP flash alternately.
3. After the firmware download, the CP goes through a warm restart.

NOTICE
Behavior in PRP mode If you start the download, this can lead to a timeout being indicated in PRP mode. In this case, restart the download. You should also refer to the explanation in the section Communication in PRP mode (Page 54)

What to do if a download is interrupted

Disturbances or collisions on the network can lead to packets being lost. In such cases, this can lead to an interruption of the firmware download. The firmware loader then signals a timeout or negative response from the module being loaded. En entry is made in the diagnostics buffer. The CP restarts with the firmware that existed before the aborted download.

Repeat the download using the active MAC address after the CP has started up again.

If you cannot start the download again following an aborted attempt, you should turn off the entire rack and turn it on again. You can then restart the firmware download.

Note

PRP mode

A timeout may be indicated in PRP mode. In this case, restart the firmware download again.

7.4 Replacing the modules used with CP 442-1 RNA

Converting

By adhering to certain rules and restrictions, you can replace other module types with the CP 442-1 RNA.

When replacing modules, the following module types can be considered:

- CP 443-1 EX20 / EX30

Taking into account the following information, the range of functions of the replaced module will continue to be supported with the specified restrictions.

Replacement of a CP 443-1 (EX20 / EX30)

Note the following procedure when replacing modules:

Adapting the configuration

1. In the STEP 7 configuration, replace the already configured CP with the new module; You will find this in the hardware catalog.
2. As soon as you drag the new module from the catalog onto the module you are replacing, the configured connections and data are adopted.
3. If necessary, modify the configuration according to your requirements, for example in the Properties dialog for the Ethernet subnet.
4. Save and compile the project.
5. Download the configuration data to the target system again.

Effects

The CP 442-1 RNA adopts the settings of the EX20/EX30 as far as it supports them.

After the replacement, the CP is in the mode with the activated RNA interface with port 1 as the only port in use (no PRP mode)

The following continues to apply:

- Functions, such as DHCP are not supported.
- The previously set IP parameters are adopted.
- If the replaced CP was configured as a PROFINET IO controller, the PROFINET line will be detached from the module. The PROFINET line can then be assigned to another PROFINET IO controller in STEP 7.
- Connections are assigned to the RNA interface.
- Explicit parameter assignments of the ports are lost since the CP 442-1 RNA does not support this.

7.5 Replacing a module without a programming device

General procedure

The configuration data of the CP is stored on the CPU. This makes it possible to replace this module with a module of the same type (identical order number) without a PG.

Note

Configured MAC address is adopted

When setting the ISO protocol, remember that MAC address set previously during configuration is transferred by the CPU to the new CP module.

For information on replacement using other modules, refer to the information in section Replacing the modules used with CP 442-1 RNA (Page 58).

Technical specifications

8

Technical specifications		
Attachment to Industrial Ethernet		
Number	1 x Ethernet interface 1 x RNA interface with 2 ports	
Design of the Ethernet interface	Connector	1 x RJ-45 jacks
	Transmission speed	10 / 100 Mbps half duplex or full duplex
Design of the RNA interface	Connector	2 x RJ-45 jacks
	Transmission speed	100 Mbps full duplex
Electrical data		
Power supply	via S7 backplane bus	5 V
Current consumption	From backplane bus	2 A
	Power dissipation	10 W
Permitted ambient conditions		
Ambient temperature	During operation	0 °C to +60 °C
	During storage	-40 °C to +70 °C
	During transportation	-40 °C to +70 °C
Relative humidity	During operation	≤ 95 % at 25 °C, no condensation
Operating altitude	≤ 2,000 m above sea level	
Contaminant concentration	Acc. to ISA-S71.04 severity level G1, G2, G3	
Design, dimensions and weight		
Module format	Compact module for S7-400, single width	
Degree of protection	IP20	
Weight	Approx. 700 g	
Dimensions (W x H x D)	25 x 290 x 210 mm	
Installation options	Mounting in an S7-400 rack	
Permitted cable lengths	**(Alternative combinations per length range) ***	
0 ... 55 m	• Max. 55 m IE TP Torsion Cable with IE FC RJ45 Plug 180 • Max. 45 m IE TP Torsion Cable with IE FC RJ45 + 10 m TP Cord via IE FC RJ45 Outlet	
0 ... 85 m	• Max. 85 m IE FC TP Marine/Trailing/Flexible/FRNC/Festoon/Food Cable with IE FC RJ45 Plug 180 • Max. 75 m IE FC TP Marine/Trailing/Flexible/FRNC/Festoon/Food Cable + 10 m TP Cord via IE FC RJ45 Outlet	
0 ... 100 m	• Max. 100 m IE FC TP Standard Cable with IE FC RJ45 Plug 180 • Max. 90 m IE FC TP Standard Cable + 10 m TP Cord via IE FC RJ45 Outlet	
Product functions **		

* For details, refer to the IK PI catalog, cabling technology

** You will find the product functions in the section Application and functions (Page 11).

For further data, refer to section Performance data (Page 19)

In addition to this, all the information in the S7-400/M7-400 reference manual "Module Data" /10/ (Page 75) in the section "General Technical Specifications" on the topics listed below applies to the CP

- Electromagnetic compatibility
- Transportation/storage conditions
- Mechanical and climatic environmental conditions
- Information on insulation checks, protection class and degree of protection

Approvals

9

Approvals issued

Note

Issued approvals on the type plate of the device

The specified approvals apply only when the corresponding mark is printed on the product. You can check which of the following approvals have been granted for your product by the markings on the type plate.

Approvals for shipbuilding are not printed on the device type plate.

Documents on the Internet

You will find the declarations of conformity listed below and certificates of the product on the Internet at the following address:
Link: (https://support.industry.siemens.com/cs/ww/en/ps/15355/cert)

You can see the current versions of the standards in the relevant certificate, which you will find on the Internet at the address specified above.

Address for declarations of conformity

The EU and the UK declarations of conformity are available to all responsible authorities at:

Siemens Aktiengesellschaft
Digital Industries
P.O. Box 48 48
90026 Nuremberg
Germany

EU declaration of conformity

CE

The CP meets the requirements and safety objectives of the following EU directives and it complies with the harmonized European standards (EN) for programmable logic controllers which are published in the official documentation of the European Union.

- **2014/34/EU (ATEX explosion protection directive)**

  Directive of the European Parliament and the Council of 26 February 2014 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres, official journal of the EU L96, 29/03/2014, pages 309-356

- **2014/30/EU (EMC)**

  EMC directive of the European Parliament and of the Council of 26 February 2014 on the approximation of the laws of the member states relating to electromagnetic compatibility; official journal of the EU L96, 29/03/2014, pages 79-106

- **2011/65/EU (RoHS)**

  Directive of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

UK Declaration of Conformity

UK CA

Importer UK:

Siemens plc
Sir William Siemens House
Princess Road
Manchester
M20 2UR

The product meets the requirements of the following regulations:

- UKEX Regulations

  SI 2016/1107 The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016, and related amendments

- EMC Regulations

  SI 2016/1091 The Electromagnetic Compatibility Regulations 2016

- RoHS Regulations

  SI 2012/3032 The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

ATEX / IECEx / UKEX / CCC-Ex

Note the information in the document "Use of subassemblies/modules in a Zone 2 Hazardous Area", which you will find on the Internet at the following address:
Link: (https://support.industry.siemens.com/cs/ww/en/view/78381013)

The conditions must be met for safe usage of the CP according to the section Notes on use in hazardous areas according to ATEX / UKEX / IECEx / CCC-Ex (Page 33).

The product meets the explosion protection requirements outlined below.

IECEx

Classification: Ex ec IIC T4 Gc, Certificate no.: DEK 18.0019X

The product meets the requirements of the standards:

- IEC 60079-0 - Explosive atmospheres - Part 0: Equipment - General requirements
- IEC 60079-7 - Explosive Atmospheres - Part 7: Equipment protection by increased safety 'e'

ATEX

Classification: II 3G Ex ec IIC T4 Gc, Certificate no.: DEKRA 18ATEX0027 X

The product meets the requirements of the standards:

- EN IEC 60079-0 - Explosive atmospheres - Part 0: Equipment - General requirements
- EN 60079-7 - Explosive Atmospheres - Part 7: Equipment protection by increased safety 'e'

UKEX

Classification: Ex ec IIC T4 Gc, Certificate no.: DEKRA 21UKEX0003 X

The product meets the requirements of the standards:

- EN IEC 60079-0 - Explosive atmospheres - Part 0: Equipment - General requirements
- EN 60079-7 - Explosive Atmospheres - Part 7: Equipment protection by increased safety 'e'

Importer UK: Siemens plc (see above)

CCC

Classification: Ex na IIC T4 Gc, Certificate no.: 2020322310002625

The product meets the requirements of the following standards:

- GB 3836.1

  Hazardous areas - Part 0: Equipment - General requirements
- GB 3836.8

  Explosive atmospheres - Part 15: Equipment protection by type of protection 'n'

EMC

The CP meets the requirements of the following directives:

- EU directive 2014/30/EU "Electromagnetic Compatibility" (EMC directive)
- EMC Regulations SI 2016/1091 The Electromagnetic Compatibility Regulations 2016

Applied standards:

- EN 61000-6-2

  Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
- EN 61000-6-4

  Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments

RoHS

The CP meets the requirements of the following directives:

- EU directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
- SI 2012/3032 The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Applied standard: EN IEC 63000

c(UL)us

Applied standards:

- Underwriters Laboratories, Inc.: UL 508 Listed (Industrial Control Equipment)
- Canadian Standards Association: CSA C22.2 No. 142 (Process Control Equipment)

Report / UL file: E85972 (NRAG, NRAG7)

cULus Hazardous (Classified) Locations

Underwriters Laboratories, Inc.: cULus IND. CONT. EQ. FOR HAZ. LOC.

Applied standards:

- ANSI ISA 12.12.01
- CSA C22.2 No. 213-M1987

APPROVED for Use in:

- Cl. 1, Div. 2, GP. A, B, C, D T4
- Cl. 1, Zone 2, GP. IIC T4

Ta: Refer to the temperature class on the type plate of the CP.

Report / UL file: E223122 (NRAG, NRAG7)

Note the conditions for the safe deployment of the CP according to the section Notes on use in hazardous areas according to UL HazLoc and FM (Page 34).

FM

Factory Mutual Approval Standard Class Number 3600, 3611, 3810

Class I, Division 2, Group A, B, C, D, T4 or Class I, Zone 2, Group IIC, T4

Ta: Refer to the temperature class on the type plate of the CP.

Certificate of Compliance: 3030463

Australia - RCM

The CP meets the requirements of the AS/NZS 2064 standards (Class A).

Notice for Canada

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

AVIS CANADIEN

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

Current approvals

SIMATIC NET products are regularly submitted to the relevant authorities and approval centers for approvals relating to specific markets and applications.

If you require a list of the current approvals for individual devices, consult your Siemens contact or check the Internet pages of Siemens Industry Online Support:

Link: (https://support.industry.siemens.com/cs/ww/en/ps/15351/cert)

PRP-compatible devices

A

PRP-compatible devices

The devices listed below are compatible for use in PRP networks. You can process frames with excess length of up to 1532 bytes (oversize frames).

Table A- 1 PRP-compatible devices

Product	Order number	Version *
SCALANCE XB004-1, unmanaged IE Switch for 10/100 Mbps	6GK5004-1BD00-1AB2	ES: 01
SCALANCE XB004-1LD, unmanaged IE Switch for 10/100 Mbps	6GK5004-1BF00-1AB2	ES: 01
SCALANCE XB004-1G, unmanaged IE Switch for 10/100/1000 Mbps	6GK5004-1GL00-1AB2	ES: 01
SCALANCE XB004-1LDG, unmanaged IE Switch for 10/100/1000 Mbps	6GK5004-1GM00-1AB2	ES: 01
SCALANCE X005, IE Entry Level Switch unmanaged	6GK5005-0BA00-1AA3	ES:07
SCALANCE XB005, unmanaged IE Switch for 10/100 Mbps	6GK5005-0BA00-1AB2	ES: 01
SCALANCE X005-TS, IE Entry Level Switch unmanaged, -40°/+75 °C	6GK5005-0BA00-1CA3	ES:07
SCALANCE XB005G, unmanaged IE Switch for 10/100/1000 Mbps	6GK5005-0GA00-1AB2	ES: 01
SCALANCE XB008, unmanaged IE Switch for 10/100 Mbps	6GK5008-0BA00-1AB2	ES: 01
SCALANCE XB008G, unmanaged IE Switch for 10/100/1000 Mbps	6GK5008-0GA00-1AB2	ES: 01
SCALANCE X104-2, unmanaged IE Switch	6GK5104-2BB00-2AA3	ES: 01
SCALANCE X106-1, unmanaged IE Switch	6GK5106-1BB00-2AA3	ES: 01
SCALANCE X108, unmanaged IE Switch	6GK5108-0BA00-2AA3	ES: 01
SCALANCE X108POE, unmanaged IE Switch	6GK5108-0PA00-2AA3	ES: 01
SCALANCE X112-2, unmanaged IE Switch	6GK5112-2BB00-2AA3	ES: 01
SCALANCE X116, unmanaged IE Switch	6GK5116-0BA00-2AA3	ES: 01
SCALANCE X124, unmanaged IE Switch	6GK5124-0BA00-2AA3	ES: 01
SCALANCE X200-4P IRT, managed IE IRT Switch POF	6GK5200-4AH00-2BA3	ES: 01
SCALANCE X201-3P IRT, managed IE IRT Switch POF	6GK5201-3BH00-2BA3	ES: 01
SCALANCE X201-3P IRT, managed IE IRT Pro Switch	6GK5201-3JR00-2BA6	ES: 01
SCALANCE X202-2,IRT managed IE Switch	6GK5202-2BB00-2BA3	ES: 01
SCALANCE X202-2P IRT managed IE IRT Switch POF	6GK5202-2BH00-2BA3	ES: 01
SCALANCE X202-2P IRT AIDA	6GK5202-2JR00-2BA6	ES: 01
SCALANCE XF204 managed IE Switch	6GK5204-0BA00-2AF2	V4.4
SCALANCE X204-2,IRT managed IE Switch	6GK5204-0BA00-2BA3	ES: 01
SCALANCE XF204 IRT managed IE Switch	6GK5204-0BA00-2BF2	ES: 01
SCALANCE X204-IRT AIDA	6GK5204-0JA00-2BA6	ES: 01
SCALANCE X204-2, managed IE Switch	6GK5204-2BB10-2AA3	V4.4
SCALANCE X204-2TS, managed IE Switch	6GK5204-2BB10-2CA2	V4.4
SCALANCE X204RNA	6GK5204-0BA00-2KB2	V1.0
SCALANCE X204RNA EEC	6GK5204-0BS00-3LA3	V1.0
RuggedCom RS950G, managed PRP Redundancy Box	6GK6095-0GS2-...	V3.11.1
RuggedCom RNA Technology Module, managed PRP Redbox	6GK	V

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SCALANCE XF204-2, flat, managed IE Switch	6GK5204-2BC00-2AF2	V4.4
SCALANCE X204-2LD, managed IE Switch	6GK5204-2BC10-2AA3	V4.4
SCALANCE X206-1, managed IE Switch	6GK5206-1BB10-2AA3	V4.4
SCALANCE X206-2LD, managed IE Switch	6GK5206-1BC00-2AA3	V4.4
SCALANCE XF206-1 managed IE Switch	6GK5206-1BC00-2AF2	V4.4
SCALANCE X206-2LD, managed IE Switch	6GK5206-1BC10-2AA3	V4.4
SCALANCE XF208 managed IE Switch	6GK5208-0BA00-2AF2	V4.4
SCALANCE X208, managed IE Switch	6GK5208-0BA10-2AA3	V4.4
SCALANCE X208PRO, managed IE Switch	6GK5208-0HA00-2AA6	V4.4
SCALANCE X212, managed IE Switch	6GK5212-2BB00-2AA3	V4.4
SCALANCE X212-LD, managed IE Switch	6GK5212-2BC00-2AA3	V4.4
SCALANCE X216, managed IE Switch	6GK5216-0BA00-2AA3	V4.4
SCALANCE X224, managed IE Switch	6GK5224-0BA00-2AA3	V4.4
SCALANCE X302-7EEC; 24 VDC	6GK5302-7GD00-1EA3	V3.7.0
SCALANCE X302-7EEC ;24 V DC REDUNDANT POWER SUPPLY UNIT;	6GK5302-7GD00-2EA3	V3.7.0
SCALANCE X302-7EEC; 24 VDC POWER SUPPLY UNIT; CONFORMAL COATING;	6GK5302-7GD00-1GA3	V3.7.0
SCALANCE X302-7EEC; 24 VDC REDUNDANT POWER SUPPLY UNIT; CONFORMAL COATING;	6GK5302-7GD00-2GA3	V3.7.0
SCALANCE X302-7EEC; 100 - 240 VAC/VDC POWER SUPPLY UNIT;	6GK5302-7GD00-3EA3	V3.7.0
SCALANCE X302-7EEC; 100 - 240 VAC/VDC RED. POWER SUPPLY UNIT;	6GK5302-7GD00-4EA3	V3.7.0
SCALANCE X302-7EEC; 100 - 240 VAC/VDC POWER SUPPLY UNIT; CONFORMAL COATING;	6GK5302-7GD00-3GA3	V3.7.0
SCALANCE X302-7EEC; 100 - 240 VAC/VDC RED. POWER SUPPLY UNIT; CONFORMAL COATING;	6GK5302-7GD00-4GA3	V3.7.0
SCALANCE X307-2EEC; 24 VDC POWER SUPPLY UNIT;	6GK5307-2FD00-1EA3	V3.7.0
SCALANCE X307-2EEC; 24 VDC REDUNDANT POWER SUPPLY UNIT;	6GK5307-2FD00-2EA3	V3.7.0
SCALANCE X307-2EEC; 24 VDC POWER SUPPLY UNIT; CONFORMAL COATING	6GK5307-2FD00-1GA3	V3.7.0
SCALANCE X307-2EEC; 24 VDC REDUNDANT POWER SUPPLY UNIT; CONFORMAL COATING;	6GK5307-2FD00-2GA3	V3.7.0
SCALANCE X307-2EEC; 100 - 240 VAC/DC POWER SUPPLY UNIT;	6GK5307-2FD00-3EA3	V3.7.0
SCALANCE X307-2EEC; 100 - 240 VAC/VDC POWER SUPPLY UNIT; CONFORMAL COATING;	6GK5307-2FD00-3GA3	V3.7.0
SCALANCE X307-2EEC; 100 - 240 VAC/VDC RED. POWER SUPPLY UNIT;	6GK5307-2FD00-4EA3	V3.7.0
SCALANCE X307-2EEC; 100 - 240 VAC/VDC RED. POWER SUPPLY UNIT; CONFORMAL COATING;	6GK5307-2FD00-4GA3	V3.7.0
SCALANCE X304-2FE, managed IE Switch	6GK5304-2BD00-2AA3	V3.7.0
SCALANCE X306-1LDFE , managed IE switch	6GK5306-1BF00-2AA3	V3.7.0
SCALANCE X307-3, managed PLUS IE switch	6GK5307-3BL00-2AA3	V3.7.0
SCALANCE X307-3LD, managed PLUS IE switch	6GK5307-3BM00-2AA3	V3.7.0
SCALANCE X308-2, managed PLUS IE switch	6GK5308-2FL00-2AA3	V3.7.0
SCALANCE X308-2LD, managed PLUS IE switch	6GK5308-2FM00-2AA3	V3.7.0
SCALANCE X308-2LH, managed PLUS IE switch	6GK5308-2FN00-2AA3	V3.7.0
SCALANCE X308-2LH+, managed PLUS IE switch	6GK5308-2FP00-2AA3	V3.7.0
SCALANCE X310-FE, managed PLUS IE switch	6GK5310-0BA00-2AA3	V3.7.0
SCALANCE X310, managed PLUS IE switch	6GK5310-0FA00-2AA3	V3.7.0
SCALANCE X320-1FE, managed IE switch	6GK5320-1BD00-2AA3	V3.7.0

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SCALANCE X320-3LDFE, managed IE switch	6GK5320-3BF00-2AA3	V3.7.0
SCALANCE X308-2M , managed IE switch	6GK5308-2GG00-2AA2	V3.7.0
SCALANCE X308-2M TS, managed IE switch	6GK5308-2GG00-2CA2	V3.7.0
SCALANCE X308-2M POE , managed IE switch	6GK5308-2QG00-2AA2	V3.7.0
SCALANCE XR324-12M; MANAGED IE SWITCH, 24 VDC, cable outlet front	6GK5324-0GG00-1AR2	V3.7.0
SCALANCE XR324-12M; MANAGED IE SWITCH, 24VDC, cable outlet at rear	6GK5324-0GG00-1HR2	V3.7.0
SCALANCE XR324-12M; MANAGED IE SWITCH, 230 VAC, cable outlet front	6GK5324-0GG00-3AR2	V3.7.0
SCALANCE XR324-12M; MANAGED IE SWITCH, 230 VAC, cable outlet at rear	6GK5324-0GG00-3HR2	V3.7.0
SCALANCE XR324-4M EEC; MANAGED IE SWITCH, 1 X 24 VDC, cable outlet front	6GK5324-4GG00-1ER2	V3.7.0
SCALANCE XR324-4M EEC; MANAGED IE SWITCH, 2 X 24 VDC, cable outlet front	6GK5324-4GG00-2ER2	V3.7.0
SCALANCE XR324-4M EEC; MANAGED IE SWITCH, 1 X 24 VDC, cable outlet at rear	6GK5324-4GG00-1JR2	V3.7.0
SCALANCE XR324-4M EEC; MANAGED IE SWITCH, 2 X 24 VDC, cable outlet at rear	6GK5324-4GG00-2JR2	V3.7.0
SCALANCE XR324-4M POE; MANAGED IE SWITCH, 24 VDC, cable outlet front	6GK5324-4QG00-1AR2	V3.7.0
SCALANCE XR324-4M POE; MANAGED IE SWITCH, 24 VDC, cable outlet at rear	6GK5324-4QG00-1HR2	V3.7.0
SCALANCE XR324-4M POE TS; MANAGED IE SWITCH, 24 VDC	6GK5324-4QG00-1CR2	V3.7.x
SCALANCE XR324-12M TS; MANAGED IE SWITCH, 24 VDC, cable outlet front	6GK5324-0GG00-1CR2	V3.7.2
SCALANCE X408-2, modular IE Switch	6GK5408-2FD00-2AA2	V3.7.0
SCALANCE X414-3E, modular IE Switch	6GK5414-3FC00-2AA2	V3.7.0
COMPACT SWITCH MODULE CSM 1277	6GK7277-1AA10-0AA0	ES: 01
COMPACT SWITCH MODULE CSM 377	6GK7377-1AA00-0AA0	ES: 01
SCALANCE XR552-12M; MANAGED IE SWITCH	6GK5552-0AA00-2AR2	ES: 1.0
SCALANCE XR528-6M; MANAGED IE SWITCH	6GK5528-0AA00-2AR2	ES: 1.0
CP 343-1 Lean	6GK7343-1CX10-0XE0	V2.4
CP 343-1 Bacnet	6FL4 343-1CX10-0XE0	V1.1
CP 343-1	6GK7343-1EX30-0XE0	V2.4
CP 343-1 Advanced	6GK7343-1GX30-0XE0	V1.2
CP 343-1 Advanced	6GK7343-1GX31-0XE0	V3.0
CP 443-1 Advanced	6GK7443-1GX20-0XE0	V2.1
CP 443-1 Advanced	6GK7443-1GX30-0XE0	V3.0
CP 443-1	6GK7443-1EX20-0XE0	V2.1
CP 443-1	6GK7443-1EX30-0XE0	V3.0
CP 443-1 RNA	6GK7443-1RX00-0XE0	V1.0
CP 442-1 RNA	6GK7442-1RX00-0XE0	V1.0

***** Information about the product version (ES) or the firmware version (V) as of which PRP is supported.

Documentation references

B

Introduction to the documentation

Where to find Siemens documentation

- Article numbers

  You will find the article numbers for the Siemens products of relevance here in the following catalogs:

  – SIMATIC NET - Industrial Communication / Industrial Identification, catalog IK PI

  – SIMATIC - Products for Totally Integrated Automation and Micro Automation, catalog ST 70

  You can request the catalogs and additional information from your Siemens representative. You will also find the product information in the Siemens Industry Mall at the following address:

  Link: (https://mall.industry.siemens.com)

- Manuals on the Internet

  You will find SIMATIC NET manuals on the Internet pages of Siemens Industry Online Support:

  Link: (https://support.industry.siemens.com/cs/ww/en/ps/15247/man)

  Go to the required product in the product tree and make the following settings:

  Entry type “Manuals”

- Manuals on the data medium

  You will find manuals of SIMATIC NET products on the data medium that ships with many of the SIMATIC NET products.

On configuring, commissioning and using the CP

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SIMATIC NET
S7 CPs for Industrial Ethernet
Configuring and Commissioning - configuration manual
manual Part A - General Applications
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/view/30374198)

For configuration with STEP 7 / NCM S7

/2/

SIMATIC NET
Commissioning PC Stations - Manual and Quick Start
Configuration Manual
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/15362/man)

/3/

SIMATIC
Configuring Hardware and Connections with STEP 7
Siemens AG
Part of the documentation package "STEP 7 Basic Knowledge"
(Part of the online documentation in STEP 7)
Link: (https://support.industry.siemens.com/cs/ww/en/view/45531110)

On programming (S7 CPs / OPC)

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SIMATIC NET
Program blocks for SIMATIC NET S7 CPs
Programming Manual
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/view/60641662)

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SIMATIC NET
Version history of the SIMATIC NET program blocks for S7 CPs
Reference manual
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/view/1214574)

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SIMATIC
Programming with STEP 7
Siemens AG
(Part of the STEP 7 documentation package STEP 7 Basic Knowledge)
(Part of the online documentation in STEP 7)
Link: (https://support.industry.siemens.com/cs/ww/en/view/18652056)

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SIMATIC
System and Standard Functions for S7-300/400 - Volume 1/2
Reference manual
Siemens AG
(Part of the STEP 7 documentation package STEP 7 Basic Knowledge)
(Part of the online documentation in STEP 7)
Link: (https://support.industry.siemens.com/cs/ww/en/view/109474421)

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SIMATIC NET
Industrial Communication with PG/PC
- Volume 1: Basics - System Manual
- Volume 2: Interfaces - programming manual
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/15362/man)

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Automatisieren mit STEP 7 in AWL und SCL (ISBN: 978-3-89578-280-0) /
Automating with STEP 7 in STL and SCL (ISBN: 978-3-89578-295-4)

User manual, programming manual
Berger, Hans
Publicis KommunikationsAgentur GmbH, GWA, 2006

S7 CPs On installing and commissioning the CP

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SIMATIC S7
Automation System S7-400, M7-400
Siemens AG

- Installation: Installation manual
  Link: (https://support.industry.siemens.com/cs/ww/en/view/1117849)
- Module Data: Reference Manual
  Link: (https://support.industry.siemens.com/cs/ww/en/view/1117740)
- CPU data: Device Manual
  Link: (https://support.industry.siemens.com/cs/ww/en/view/53385241)

Establishing and diagnosing an Ethernet network

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SIMATIC NET
Industrial Ethernet
System manual
Siemens AG

- Volume 1: Industrial Ethernet

  Link: (https://support.industry.siemens.com/cs/ww/en/view/27069465)

- Volume 2: Passive network components

  Link: (https://support.industry.siemens.com/cs/ww/en/view/84922825)

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SIMATIC NET
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Link: (https://support.industry.siemens.com/cs/ww/en/view/103949062)

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