SIEMENS

SIMATIC NET

S7-1200 - Telecontrol CP 1242-7

Operating Instructions

Preface

Application and properties 1

Configuration examples 2

LEDs and connectors 3

Installation, connecting up, commissioning 4

Notes on configuration and operation 5

Configuration and programming 6

Service and maintenance 7

Technical specifications 8

Dimension drawings A

Approvals B

Accessories C

References D

10/2012

C79000-G8976-C247-04

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Preface

Validity of this manual

This document contains information on the following product:

CP 1242-7
Order number 6GK7 242-7KX30-0XE0
Hardware product version 1
Firmware version V1.3

The device is the communications processor for data transmission using GPRS for the SIMATIC S7-1200. The CP was developed for use in industrial environments.



Figure 1 CP 1242-7

At the top right behind the hinged cover of the module housing, you will see the hardware product version printed as a placeholder "X" (for example X 2 3 4). In this case, "X" would be the placeholder for hardware product version 1.

Product name

In this document, the term "CP" is also used instead of the full product name "CP 1242-7".

Purpose of the manual

This manual describes the properties of this module and supports you when installing and commissioning the device.

The necessary configuration steps are described in the form of an overview.

You will also find instructions for operation and information about the diagnostics options of the device.

New in this issue

- Sending diagnostics SMS messages
- Optimization of several functions with the firmware version named above.

  You will find information on these functions and the firmware for downloading on the Internet on the pages of Siemens Industrial Automation Customer Support at the following address:

  45605894 (http://support.automation.siemens.com/WW/view/en/45605894)
- Editorial revision

Replaced documentation

This manual replaces the manual release 03/2012.

Current manual release on the Internet

You will also find the current version of this manual on the Internet pages of Siemens Automation Customer Support under the following entry ID:

61029644 (http://support.automation.siemens.com/WW/view/en/61029644)

Required experience

To install, commission and operate the CP, you require experience in the following areas:

- Automation engineering
- Setting up the SIMATIC S7-1200
- SIMATIC STEP 7 Basic / Professional V11
- Data transmission using GPRS and the Internet

Sources of information and other documentation

You will find an overview of further reading and references in the Appendix of this manual.

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 license conditions in the document "DOC_OSS-S7-CM-CP_74.pdf" on the supplied data medium with the product documentation.

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Note

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(http://support.automation.siemens.com/WW/llisapi.dll?func=cslib.csinfo2&aktprim=99&lang=en)

Here, you can register for a product-specific newsletter.

For the secure operation of a plant/machine, it is also necessary to integrate the automation components in a full IT security concept for the entire plant/machine that represents the state of the art in IT technology. You will find information on this in:
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Products from other manufacturers that are being used must also be taken into account.

SIMATIC NET glossary

Explanations of the specialist terms used in this documentation can be found in the SIMATIC NET glossary.

You will find the SIMATIC NET glossary here:

- SIMATIC NET Manual Collection

  The DVD ships with certain SIMATIC NET products.

- On the Internet under the following entry ID:

  50305045 (http://support.automation.siemens.com/WW/view/en/50305045)

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In addition to the product documentation, the comprehensive online information platform of Siemens Automation Customer Support supports at any time and at any location in the world. You will find the Service & Support pages on the Internet at the following address: (http://support.automation.siemens.com/WW/llisapi.dll?func=cslib.csinfo2&aktprim=99&lang=en)

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Table of contents

Preface **3**

1 Application and properties **9**

1.1 Connecting the S7-1200 to a GSM network 9

1.2 Applications 10

1.3 Other properties of the CP 11

1.4 Performance data 11

1.5 Requirements for operation 13

2 Configuration examples **15**

3 LEDs and connectors **21**

3.1 Opening the housing 21

3.2 LEDs 22

3.3 Electrical connections 25

4 Installation, connecting up, commissioning **27**

4.1 Important notes on using the device 27

4.2 Installing and commissioning the CP 29

4.3 Pin assignment of the socket for the external power supply 34

5 Notes on configuration and operation **35**

5.1 Modes and communications partners of the CP 1242-7 35

5.2 Connection modes and connection establishment 36

5.3 The wake-up SMS 38

5.4 Calling a TeleService connection 40

5.5 Connection monitoring, data buffering, acknowledgement 41

5.5.1 Redial delay (STEP 7) 41

5.5.2 Connection monitoring time 42

5.5.3 Frame buffer and acknowledgement 42

5.6 Data management in the process image 43

5.7 Data transfer between communications partners 44

5.7.1 Sending from station to station 44

5.7.2 The S7-1200 sends data to the master station (TC_SEND) 44

5.7.3 Master station reads data from the S7-1200 (read) 46

5.7.4 Master station sends data to the S7-1200 (write, TC_RECV) 47

5.8 Main and substitute telecontrol server 47

5.9 Reading out time by CPU 48

6 Configuration and programming 49
6.1 Configuration in STEP 7 49
6.2 Information required for configuration 49
6.3 Using and creating the telecontrol instructions 52
6.4 Programming the telecontrol instructions 53
6.4.1 TC_CON: Establish connection via the GSM network 53
6.4.2 TC_DISCON: Terminate connection via the GSM network 56
6.4.3 TC_SEND: Send data via the GSM network 59
6.4.4 TC_RECV: Receive data via the GSM network 63
6.4.5 TC_CONFIG: Transferring configuration data to CP 66
6.4.6 Other error messages 69
6.4.7 TCON_...: SDTs for the telecontrol connection establishment 69
6.4.8 IF_CONF: SDT for telecontrol configuration data 74
7 Service and maintenance 83
7.1 Diagnostics 83
7.2 Downloading firmware 84
7.3 Module replacement 85
8 Technical specifications 87
A Dimension drawings 89
B Approvals 91
B.1 Certification 91
B.2 Standards and test specifications 94
C Accessories 97
C.1 Antennas 97
C.2 TS Gateway 99
D References 103
Glossary 105
Index 109

Application and properties

1

1.1 Connecting the S7-1200 to a GSM network

IP-based WAN communication via GPRS

Using the CP 1242-7 communications processor, the S7-1200 SIMATIC controller can be connected to GSM networks. The CP 1242-7 allows WAN communication from remote stations with a master station, communication between stations via a master station (inter-station communication) and direct communication between stations.

The CP 1242-7 supports the following services for communication via the GSM network:

- GPRS (General Packet Radio Service)

  The packet-oriented service for data transmission "GPRS" is handled via the GSM network.

- SMS (Short Message Service)

  The CP 1242-7 can receive and send SMS messages. The communications partner can be a mobile phone or an S7-1200.

The CP 1242-7 is suitable for use in industry worldwide and supports the following frequency bands:

- 850 MHz
- 900 MHz
- 1 800 MHz
- 1 900 MHz

In countries in which the CP is approved, you will find this on the Internet on the pages of Siemens Automation Customer Support under the following entry ID:

45605894 (http://support.automation.siemens.com/WW/view/en/45605894)

On the Internet page, select the "Entry list" tab and the "Certificates" entry type.

Note

No CDMA mode

The CP is not suitable for GSM networks in which the code multiplex method "Code Division Multiple Access" (CDMA) is used.

1.2 Applications

The CP 1242-7 is intended for use in an industrial environment. The following applications are supported by the CP:

Telecontrol applications

- Sending messages by SMS

  The function is not dependent on the operating mode of the CP.

  Via the CP 1242-7, the CPU of a remote S7-1200 station can receive SMS messages from the GSM network or send messages by SMS to a configured mobile phone or an S7-1200.

- Communication with a control center

  The CP is configured in "Telecontrol" mode.

  Remote S7-1200 stations communicate via the GSM network and the Internet with a telecontrol server in the master station. The telecontrol server communicates with a higher-level control system using the integrated OPC server function.

- Communication between S7-1200 stations via a GSM network

  Depending on the GSM service being used and the mode of the CP, the communication between remote stations with a CP 1242-7 will be handled in different ways:

  – Inter-station communication via a master station ("Telecontrol" mode)

    In this configuration, connections between S7-1200 stations and the telecontrol server are established in the master station. The telecontrol server forwards the messages between the stations.

  – Direct communication between stations ("GPRS direkt" mode)

    The CP requires a fixed IP address to be assigned by the GSM network provider.

TeleService via GPRS

A TeleService connection can be established between an engineering station with STEP 7 installed on it and a remote S7-1200 station via the GSM network.

You can use the TeleService connection for the following purposes:

- Downloading project or program data from the STEP 7 project to the station
- Querying diagnostics data on the station

With TeleService via GPRS, a switching station is required between the remote station and engineering Station. This switching station can be a telecontrol server or, if there is no telecontrol server in the configuration, a TeleService gateway. You will find detailed information about both systems in the documentation , see References.

Other connections are not interrupted by a TeleService connection. You will find examples of the structure in the section Configuration examples (Page 15).

1.3 Other properties of the CP

Other services and functions of the CP 1242-7

- Time-of-day synchronization of the CP via the Internet

  You can set the time on the CP as follows:

  – In "Telecontrol" mode, the time of day is transferred by the telecontrol server. The CP uses this to set its time.

    This time-of-day is adopted in the frames sent by the CP.

  – In "GPRS direct" mode, the CP can request the time using NTP.

    Make sure that your network provider supports NTP.

    The NTP server and the time zone are specified during configuration.

  The time of day of the CP can be read out by the CPU, see the section Reading out time by CPU (Page 48).
- Buffering frames on the telecontrol server
- Increased availability thanks to the option of connecting to a substitute telecontrol server
- Optimized data volume (temporary connection)

  As an alternative to a permanent connection to the telecontrol server, the CP can be configured in STEP 7 with a temporary connection to the telecontrol server. In this case, a connection to the telecontrol server is established only when required.
- Logging of a variety of data and its transfer to the telecontrol server, for example:
  – Data volumes transferred
  – ID of the wireless cell in the area of the station
  – GSM signal strength
  – Communication status

    etc.

1.4 Performance data

Types of connection establishment

The number of connections depends on the type of connection establishment:

- Active connection establishment

  The connection establishment is initiated by the local CPU.
- Passive connection establishment

  The connection establishment is initiated by the communications partner.

Number of simultaneous connections in "Telecontrol" mode

- 1 reserved connection to the telecontrol server, for example for TeleService

  When connection establishment is active also:
- Max. 5 telecontrol connections (TCON_WDC)
- Max. 5 UDP connections (send only)

Number of simultaneous connections in "GPRS direct" mode

A total of maximum 4 connections

Of which:

- Max. 1 connection to an NTP server
- Max. 1 TeleService connection
- Max. 4 productive connections

  With active connection establishment:
  - Max. 4 ISO-on-TCP connections or
  - Max. 4 UDP connections (send only) or
  - A combination of the connection types listed above

  With passive connection establishment: Only ISO-on-TCP connections

Note

Port 30000 for ISO-ON-TCP

For ISO-ON-TCP, the CP does not use port number 102 but port 30000.

User data

User data per send call with the various connection types:

- For telecontrol connections: Max. 2048 bytes
- For ISO-ON-TCP connections: Max. 2048 bytes
- For UDP connections: Max. 1472 bytes
- For SMS: Max. 160 bytes

Frame buffer

Data buffering in "telecontrol" mode if the connection to the telecontrol server is interrupted:

- With send jobs with up to 1254 bytes of user data:

  Maximum 2000 frames
- With send jobs with 1255 to 2048 bytes of user data:

  Maximum 1000 frames

1.5 Requirements for operation

Hardware requirements

Apart from the CP 1242-7 in the remote S7-1200, the following hardware is also required:

- A CPU with firmware version as of V2.0
- An external antenna for the CP 1242-7, see Accessories (Page 97)
- In the "Telecontrol" mode of the CP 1242-7, a PC with Internet access is required for the central telecontrol server.
- If you intend to use TeleService via GPRS, a TeleService gateway with Internet access is required for configurations without a telecontrol server. This is a PC on which the "TS Gateway" software is installed, see Accessories (Page 97).

Configuration software

- Configuration tool

  To configure the module, the following configuration tool is required:

  STEP 7 Basic V11.0 SP2 Update 2

  For STEP 7, you also require support package "HSP CP1242-7" version 1.1.

  Install the support package in STEP 7 using the menu command "Options" > "Support packages". You can install the support package from your local file system if it is already stored there or from the Internet pages of Siemens Automation Customer Support. You will find the support package at one of the following addresses:

  – 45605894 (http://support.automation.siemens.com/WW/view/en/45605894)

  – 28919804 (http://support.automation.siemens.com/WW/view/en/28919804)

  On the Internet page, select the "Entry list" tab and the "Download" entry type.

  A description of installing support packages is available in the help system of STEP 7 under the search term "Support packages".

Program blocks (instructions)

For productive communication, the telecontrol instructions are required.

For TeleService, the telecontrol instructions are not necessary.

The telecontrol instructions execute on the CPU. They are made available with the "HSP CP1242-7" support package in STEP 7. For a description of the instructions, refer to the section Configuration and programming (Page 49).

Software for communication with a telecontrol server

The CP is configured in "Telecontrol" mode.

- The telecontrol server requires the "TELECONTROL SERVER BASIC" software.

  For the documentation, see /2/ (Page 104) in the References.

Software for TeleService functions

- STEP 7 including the support package "HSP CP1242-7"

  For the current version, see above in the section "Configuration software".
- For the switching station:
  - For configuration with telecontrol server:

    The "TELECONTROL SERVER BASIC" software
  - For configuration without telecontrol server

    The "TS Gateway" software

    The software and the manual describing it are on the DVD that ships with the CP. For the documentation, see /3/ (Page 104) in the References.

Requirements for using GSM services

- A contract with a suitable GSM network provider
  - The contract must allow the transfer of data using GPRS.
  - The contract must allow the assignment of public IP addresses.
  - If there is to be direct communication between GPRS stations ("GPRS direct" mode), the GSM network provider must assign fixed IP addresses to the CP 1242-7 and forward the frames to the destination subscribers.
- The SIM card belonging to the contract

  The SIM card is inserted in the CP 1242-7.
- Local availability of a GSM network capable of GPRS in the range of the station

Configuration examples

2

Below, you will find configuration examples for stations with a CP 1242-7.

Sending messages by SMS

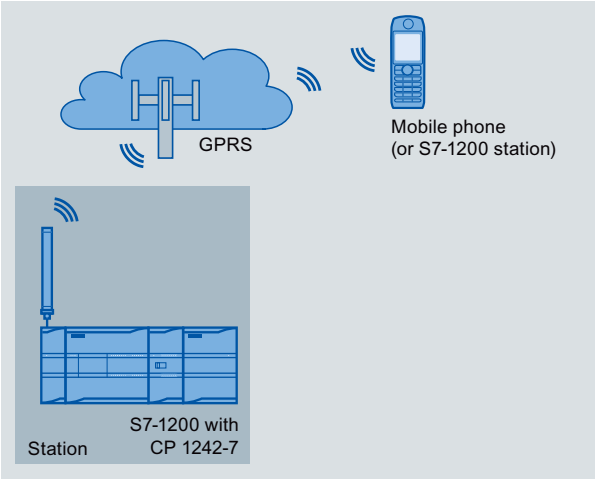


Figure 2-1 Sending messages by SMS from an S7-1200 station

A SIMATIC S7-1200 with a CP 1242-7 can send messages by SMS to a mobile phone or a configured S7-1200 station.

The function can also be used to send diagnostics SMS messages to an authorized mobile phone. You will find details in the section Diagnostics (Page 83).

Telecontrol by a control center

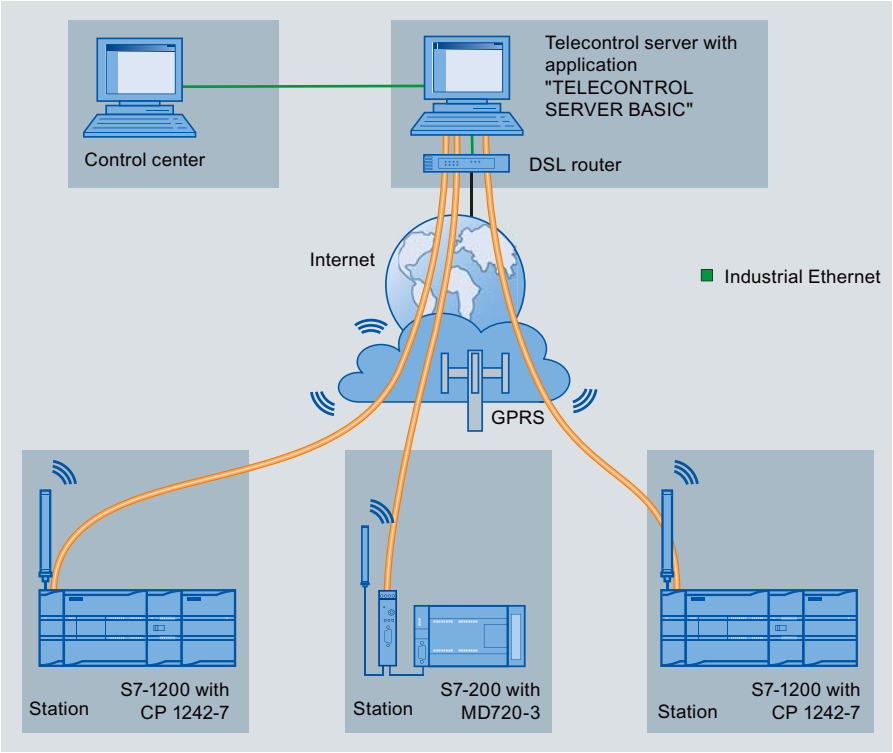


Figure 2-2 Communication between S7-1200 stations and a control center

In telecontrol applications, SIMATIC S7-1200 stations with a CP 1242-7 communicate with a control center via the GSM network and the Internet. The "TELECONTROL SERVER BASIC" (TCSB) application is installed on the telecontrol server in the master station. This results in the following use cases:

- Telecontrol communication between station and control center

  In this use case, data from the field is sent by the stations to the telecontrol server in the master station via the GSM network and Internet. The telecontrol server is used to monitor remote stations.

- Communication between a station and a control room with OPC client

  As in the first case, the stations communicate with the telecontrol server. Using its integrated OPC server, the telecontrol server exchanges data with the OPC client of the control room.

  The OPC client and telecontrol server can be located on a single computer, for example when TCSB is installed on a control center computer with WinCC.

- Inter-station communication via a control center

  Inter-station communication is possible with S7 stations equipped with a CP 1242-7.

  To allow inter-station communication, the telecontrol server forwards the messages of the sending station to the receiving station.

Direct communication between stations

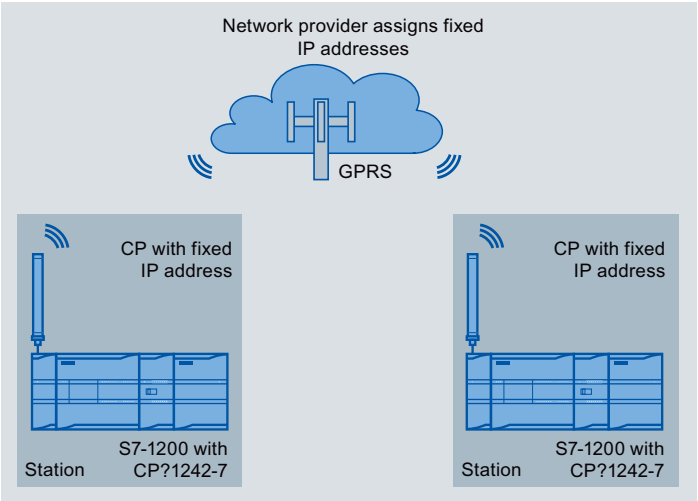


Figure 2-3 Direct communication between two S7-1200 stations

In this configuration, two SIMATIC S7-1200 stations communicate directly with each other using the CP 1242-7 via the GSM network. Each CP 1242-7 has a fixed IP address. The relevant service of the GSM network provider must allow this.

TeleService via GPRS

In TeleService via GPRS, an engineering station on which STEP 7 is installed communicates via the GSM network and the Internet with the CP 1242-7 in the S7-1200.

Since a firewall is normally closed for connection requests from the outside, a switching station between the remote station and the engineering station is required. This switching station can be a telecontrol server or, if there is no telecontrol server in the configuration, a TeleService gateway.

TeleService with telecontrol server

The connection runs via the telecontrol server.

- The engineering station and telecontrol server are connected via the Intranet (LAN) or Internet.
- The telecontrol server and remote station are connected via the Internet and via the GSM network.

The engineering station and telecontrol server can also be the same computer; in other words, STEP 7 and TCSB are installed on the same computer.

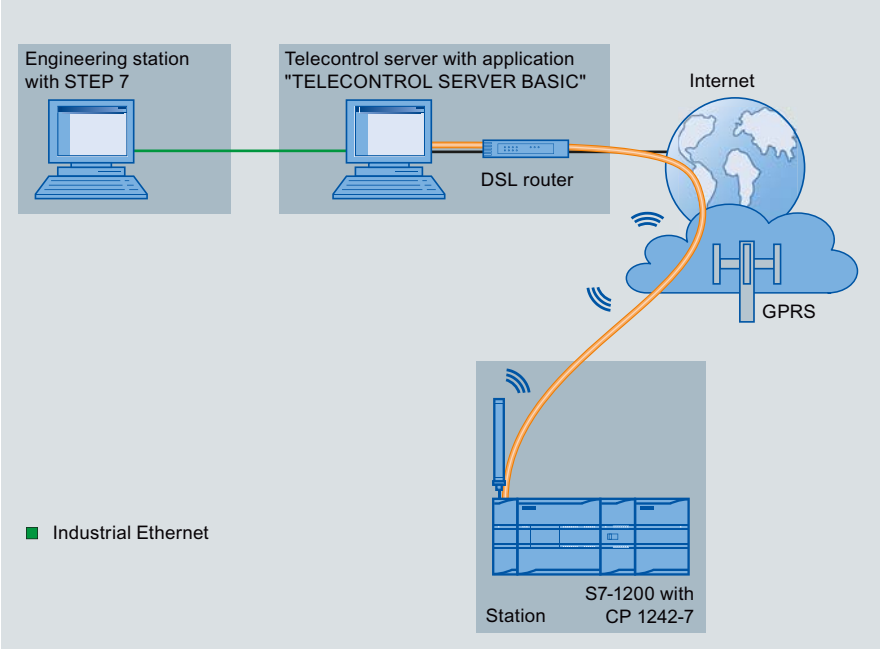


Figure 2-4 TeleService via GPRS in a configuration with telecontrol server

TeleService without a telecontrol server

The connection runs via the TeleService gateway.

The connection between the engineering station and the TeleService gateway can be local via a LAN or via the Internet.

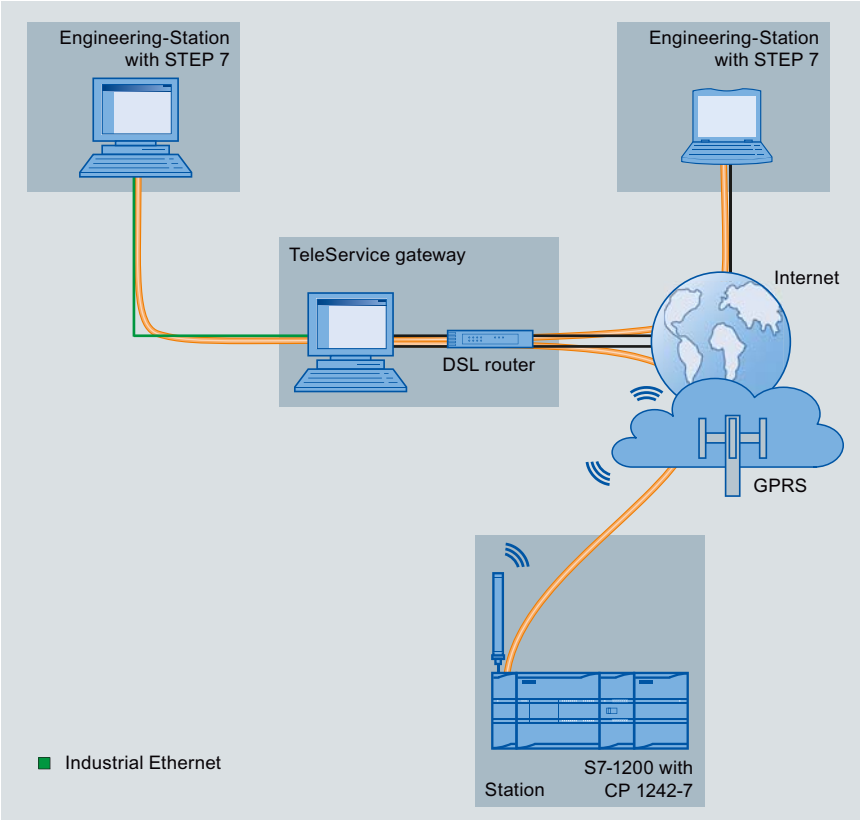


Figure 2-5 TeleService via GPRS in a configuration with TeleService gateway

LEDs and connectors

3

3.1 Opening the housing

Location of the display elements and the electrical connectors

The LEDs for the detailed display of the module statuses are located behind the upper cover of the module housing.

The socket for the power supply is located on the top of the module.

The connector for the external antenna is located on the bottom of the module.

Opening the housing

Open the upper or lower cover of the housing by pulling it down or up as shown in the illustration. The covers extend beyond the housing to give you a grip.

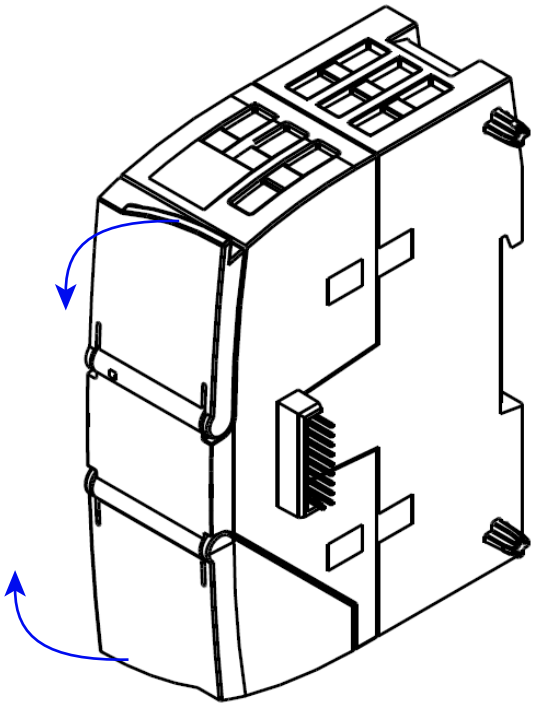


Figure 3-1 Opening the housing

3.2 LEDs

LEDs of the module

The module has various LEDs for displaying the status:

- LED on the front panel

  The "DIAG" LED that is always visible shows the basic statuses of the module.
- LEDs below the upper cover of the housing

  The LEDs below the upper cover provide more detailed information on the module status.

Table 3- 1 LED on the front panel

LED / colors	Name	Meaning
 red/green	DIAG	Basic status of the module

Table 3- 2 LEDs below the upper cover of the housing

LED / colors	Name	Meaning
 red/green	Network	Status of the network connection
 green	Connect	Number of connections to the telecontrol server
 yellow / green	Signal quality	Signal quality of the GSM network
 green	TeleService	Status of the TeleService connection

Note

LED colors when the module starts up

When the module starts up, all its LEDs are lit for a short time. Multicolored LEDs display a color mixture. At this point in time, the color of the LEDs is not clear.

Display of the operating and communication status

The LED symbols in the following tables have the following significance:

Table 3- 3 Meaning of the LED symbols

Symbol	○	● ● ●	☀ ☀ ☀	-
LED status	OFF	ON (steady light)	Flashing	Not relevant

The LEDs indicate the operating and communications status of the module according to the following scheme:

Table 3- 4 Display of the basic statuses of the module

DIAG (red / green)	**-**	**Network** (red / green)	**Connect** (green)	**Signal quality** (yellow / green)	**TeleService** (green)	**Meaning**
○		-	-	-	-	Power OFF
● green		-	-	-	-	RUN without errors, Telecontrol or TeleService is running
☀ green		-	-	-	-	Startup (STOP → RUN) and other statuses, refer to the next table.
☀ red		-	-	-	-	Error

Table 3- 5 Display schemes for detailed module statuses

DIAG (red / green)	-	**Network** (red / green)	**Connect** (green)	**Signal quality** (yellow / green)	**TeleService** (green)	**Meaning**
-		○	-	-	-	No connection to the GPRS service in the GSM network
● green		● green	-	-	-	Connection exists to the GPRS service in the GSM network
☼ green		☼ green	○	-	○	Waiting for PIN (SIM card OK)
☼ red		● red	○	-	○	SIM card defective
☼ red		☼ red	○	-	○	Wrong PIN
☼ red		○	○	○	○	Internal error: Station must be restarted.
☼ green		-	○	-	○	• No connection to the telecontrol server or • No configuration available
● green		● green	●	-	-	Connection to the telecontrol server established
● green		● green	☼	-	-	Data transfer
-		-	-	● green	-	Good GSM network (-73 ... > -53 dBm)
-		-	-	● yellow	-	Medium strength GSM network (-89 ... -75 dBm)
-		-	-	☼ yellow	-	Weak GSM network (-109 ... -91 dBm)
-		-	-	○	-	No GSM network (< -111 dBm)
-		-	-	-	○	Currently no TeleService session
● green		● green	-	-	●	TeleService session running [1]
● green		-	-	-	☼	Attempted login to TeleService session

[1] When a TeleServiceconnection is being established, the LED is lit for at least 10 minutes.

3.3 Electrical connections

Power supply

The 3-pin socket for the external 24 V DC power supply is located on the top of the module. The matching plug ships with the product.

You will find the pin assignment of the socket in section Pin assignment of the socket for the external power supply (Page 34).

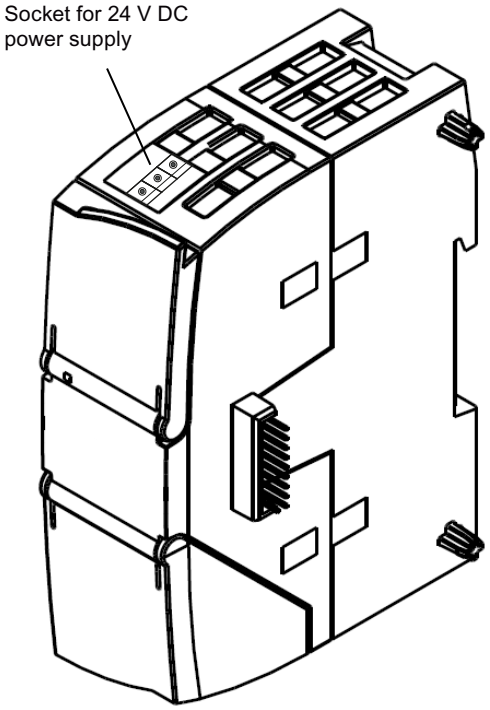


Figure 3-2 Socket for the 24 V DC power supply

Wireless interface for the GSM network

An extra antenna is required for GPRS communication in the GSM network. This is connected via the SMA socket of the CP. The SMA socket is located behind the lower front cover of the CP.

You will find a suitable antenna for indoor and outdoor use in the section Accessories (Page 97).

More detailed information on the electrical connections

For technical information on the electrical connections, refer to the section Technical specifications (Page 87).

Installation, connecting up, commissioning 4

4.1 Important notes on using the device

Safety notices on the use of the device

The following safety notices must be adhered to when setting up and operating the device and during all work relating to it such as installation, connecting up, replacing devices or opening the device.

General notices

⚠ WARNING

Safety extra low voltage

The equipment is designed for operation with Safety Extra-Low Voltage (SELV) by a Limited Power Source (LPS). (This does not apply to 100 V to 240 V devices.)

This means that only SELV / LPS complying with IEC 60950-1 / EN 60950-1 / VDE 0805-1 must be connected to the power supply terminals. The power supply unit for the equipment power supply must comply with NEC Class 2, as described by the National Electrical Code (r) (ANSI / NFPA 70).

There is an additional requirement if devices are operated with a redundant power supply:

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

⚠ WARNING

Opening the device

DO NOT OPEN WHEN ENERGIZED.

General notices on use in hazardous areas

⚠ WARNING

Risk of explosion when connecting or disconnecting the device

EXPLOSION HAZARD

DO NOT CONNECT OR DISCONNECT EQUIPMENT WHEN A FLAMMABLE OR COMBUSTIBLE ATMOSPHERE IS PRESENT.

⚠ WARNING

Replacing components

EXPLOSION HAZARD

SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2 OR ZONE 2.

⚠ WARNING

Requirements for the cabinet/enclosure

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.

General notices on use in hazardous areas according to ATEX

⚠ WARNING

Requirements for the cabinet/enclosure

To comply with EU Directive 94/9 (ATEX95), this enclosure must meet the requirements of at least IP54 in compliance with EN 60529.

⚠ WARNING

Suitable cables for temperatures in excess of 70 °C

If the cable or conduit entry point exceeds 70 °C or the branching point of conductors exceeds 80 °C, special precautions must be taken. If the device is operated at ambient temperatures > 50 °C, the permitted temperature range of the selected cable must be suitable for the temperatures actually measured.

⚠ WARNING

Protection against transient voltage surges

Provisions shall be made to prevent the rated voltage from being exceeded by transient voltage surges of more than 40%. This criterion is fulfilled, if supplies are derived from SELV (Safety Extra-Low Voltage) only.

Overvoltage protection

NOTICE
Protection of the external 24 VDC power supply If power is supplied to the module over longer 24 V power cables or networks, the coupling in of strong electromagnetic pulses onto the power supply cables is possible. This can be caused, for example by lightning strikes or switching of higher loads. The connector of the external 24 VDC power supply is not protected from strong electromagnetic pulses. To protect it, an external overvoltage protection module is necessary. A suitable device is, for example, the Dehn Blitzductor BVT AD 24V type no. 918 402 or comparable protective element. Manufacturer: DEHN + SÖHNE GmbH + Co. KG, Hans-Dehn-Str. 1, PO box 1640, D-92306 Neumarkt

4.2 Installing and commissioning the CP

Prior to installation and commissioning

⚠ WARNING
Read the system manual "S7-1200 Programmable Controller" Prior to installation, connecting up and commissioning, read the relevant sections in the system manual "S7-1200 Programmable Controller", refer to the documentation in the Appendix. When installing and connecting up, keep to the procedures described in the system manual "S7-1200 Programmable Controller".

Configuration

One requirement for the commissioning of the CP is the completeness of the STEP 7 project data (see below). You should also read the section "Configuration and programming (Page 49)".

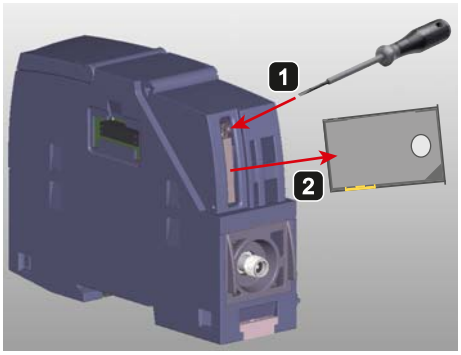
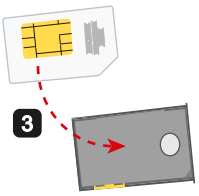
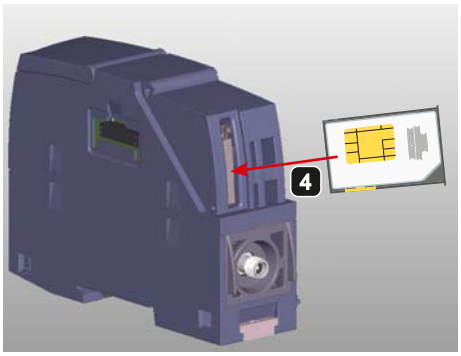
Inserting the SIM card

Note

Inserting and removing the SIM card

Do not insert or remove the SIM card while the CP is operating.

Prior to installation, insert the SIM card in the CP.

Step	Execution	Notes and explanations
1	Turn off the power supply to the station.	
2	Release the slide for the SIM card on the bottom of the CP by gently pressing the release pin.	
3	Remove the slide from the housing.	
4	Insert the SIM card in the slide as illustrated.	
5	Push the slide back into the housing, where it locks gently in place.	
6	Turn on the power supply to the station.	

Dimensions for installation

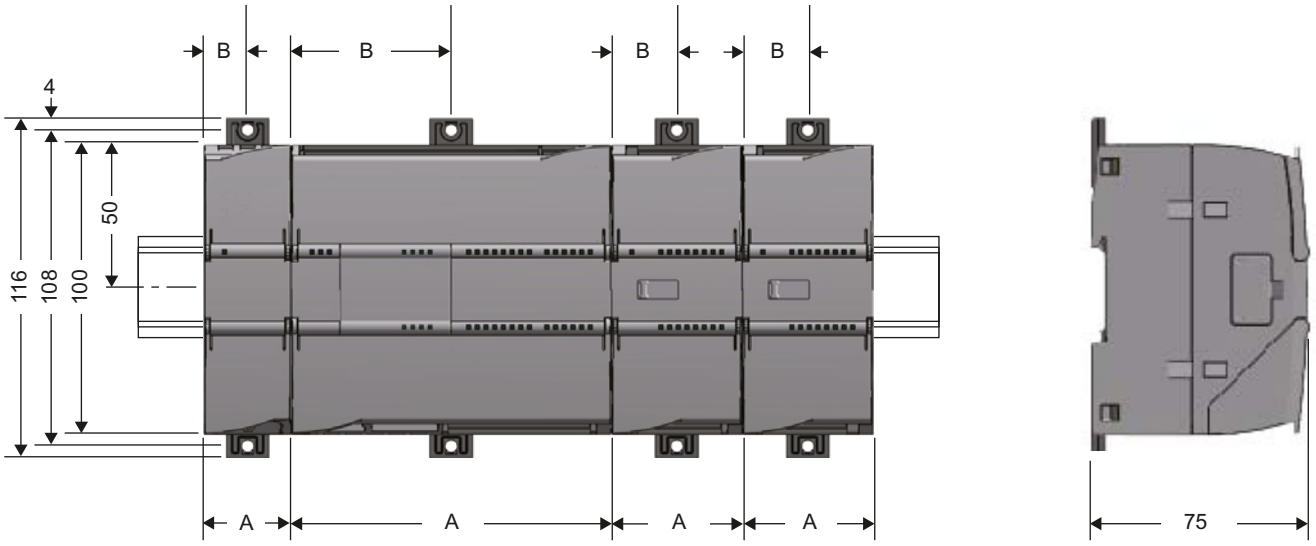


Figure 4-1 Dimensions for installation of the S7-1200

Table 4- 1 Dimensions for installation (mm)

S7-1200 devices		Width A	Width B *
CPU	CPU 1211C, CPU 1212C	90 mm	45 mm
	CPU 1214C	110 mm	55 mm
Signal modules	8 or 16 digital I/Os 2, 4 or 8 analog I/Os Thermocouple, 4 or 8 I/Os RTD, 4 I/Os	45 mm	22.5 mm
	16 analog I/Os RTD, 8 I/Os	70 mm	35 mm
Communications interfaces	CM 1241 RS-232 and CM 1241 RS-485	30 mm	15 mm
	CM 1243-5 (PROFIBUS master) CM 1242-5 (PROFIBUS slave)	30 mm	15 mm
	CP 1242-7 (GPRS CP)	30 mm	15 mm

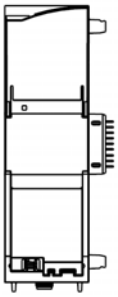
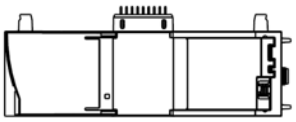
* Width B: The distance between the edge of the housing and the center of the hole in the DIN rail mounting clip

DIN rail mounting clips

All CPUs, SMs, CMs and CPs can be installed on the DIN rail in the cabinet. Use the pull-out DIN rail mounting clips to secure the device to the rail. These mounting clips also lock into place when they are extended to allow the device to be installed in a switching panel. The inner dimension of the hole for the DIN rail mounting clips is 4.3 mm.

Procedure for installation and commissioning

NOTICE
Installation location The module must be installed so that its upper and lower ventilation slits are not covered, allowing adequate ventilation. Above and below the device, there must be a clearance of 25 mm to allow air to circulate and prevent overheating. Remember that the permitted temperature ranges depend on the position of the installed device.

Device position / permitted temperature range	Installation location
Horizontal installation of the rack: 0 °C to 55 °C	
Vertical installation of the rack: 0 °C to 45 °C	

Note

Connection with power off

Only wire up the S7-1200 with the power turned off.

Power supply from the power outputs of the CPU

The power supply of the CP must be supplied via the power outputs of the CPU.

Keep within the maximum load of the power outputs of the CPU.

You will find data relating to the current consumption and power loss of the CP in the section Technical specifications (Page 87).

Turning off the station when plugging/pulling the CP

Do not only turn off the power supply to the CP. Always turn off the power supply for the entire station.

Table 4- 2 Procedure for installation and connecting up

Step	Execution	Notes and explanations
1	Mount the CP on the DIN rail and connect it to the module to its right.	Use a 35 mm DIN rail. The slots to the left of the CPU are permitted.
2	Secure the DIN rail.	
3	Secure the power supply wires to the power output of the CPU.	
4	Secure the wires of the power supply to the plug supplied with the CM and insert the plug in the socket on the top of the CM.	The pinning is shown beside the socket on the top of the housing. You will also find this in the section Pin assignment of the socket for the external power supply (Page 34).
5	Connect the antenna to the SMA socket of the CP.	Lower surface of the CP
	Notice • Protect the antenna connector using suitable overvoltage protection equipment if the antenna cable is longer than 30 m. • Protect the antenna connector with suitable lightning protection if you install the antenna outdoors.	
6	Turn on the power supply.	
7	Close the front covers of the module and keep them closed during operation.	
8	The remaining steps in commissioning involve downloading the STEP 7 project data.	The STEP 7 project data of the CP is transferred when you load to the station. To load the station, connect the engineering station on which the project data is located to the Ethernet interface of the CPU. You will find more detailed information on loading in the following sections of the STEP 7 online help: • "Loading project data" • "Using online and diagnostics functions"

4.3 Pin assignment of the socket for the external power supply

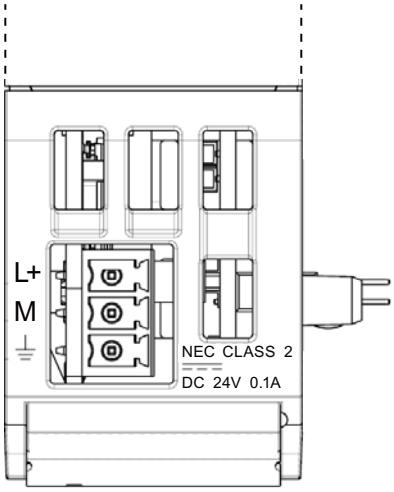


Figure 4-2 Socket for the external 24 VDC power supply (view from above)

Table 4- 3 Pin assignment of the socket for the external power supply

Pin	Labeling	Function
1	L+	+ 24 VDC
2	M	Ground reference for + 24 VDC
3	⏚	Ground connector

Notes on configuration and operation 5

CAUTION
Minimum clearance to the device
The device may only be operated when the distance between the device (or antenna) and user is at least 20 cm.

NOTICE
Closing the front panels
To ensure interference-free operation, keep the front panels of the module closed during operation.

5.1 Modes and communications partners of the CP 1242-7

Modes and communications partners of the CP

For communication with the CP 1242-7 via GPRS, the CP is set to one of the following modes:

- Telecontrol

  This CP mode allows the GPRS station to exchange data with a telecontrol server.

  The telecontrol server is a PC with the "TELECONTROL SERVER BASIC" application that is connected to the Internet. It is generally located in the master station and is used for monitoring and control of the remote GPRS stations.

  Possible communications partners of the GPRS station with a CP 1242-7 in "Telecontrol" mode are:

  – A telecontrol server
  – A central control system (via the OPC interface of the telecontrol server)
  – An engineering station (for TeleService)
  – Up to 5000 GPRS stations with a CP 1242-7 logged on with the telecontrol server

  You will find detailed information about the "TELECONTROL SERVER BASIC" application in /2/ (Page 104), see References in the Appendix.

- GPRS direct

  This mode of the CP is used for direct communication between remote stations via the GSM network. No telecontrol server is necessary.

  To allow network nodes in public wireless networks to be directly accessible, these need to be addressed using a fixed address. Here, SIM cards with a fixed IP address are used that allow the stations to address each other directly.

  The possible communications services and security functions (for example VPN) depend on what is offered by the network provider.

  Possible communications partners of the GPRS station with a CP 1242-7 in "GPRS direct" mode are:

  – A subscriber that can be reached by the CP via an IP address (for example S7-1200 with CP 1242-7)
  – An engineering station (for TeleService)

5.2 Connection modes and connection establishment

Note

Connection interrupted by GSM network provider

When using the GPRS service, remember that existing connections can be interrupted by GSM network providers for maintenance purposes.

Connection modes

- "GPRS direct" mode

  There are no different connection modes in the "GPRS direct" mode.

- "Telecontrol" mode

  The CP can be configured for the following connection modes.

  – "Permanent" connection mode

    There is a permanent TCP connection to the telecontrol server. Following connection establishment, there is a permanent TCP connection to the telecontrol server even if data is not transferred permanently.

  – "Temporary" connection mode

    A connection is only established to the telecontrol server when required.

If a TCP connection is established, process data is sent as soon as the telecontrol instructions are called on the CPU.

Connection establishment

A connection is always established by the CP. If a connection established by the CP is interrupted, the CP automatically attempts to re-establish the connection.

Triggering connection establishment for permanent stations ("Telecontrol" mode)

In the "Telecontrol" mode, the permanent connection to the telecontrol server is established when the station starts up. If the connection is interrupted, the CP attempts to re-establish the connection at 15 minute intervals. Connection establishment to the main or substitute server can, however, also be initiated by a wake-up SMS (see below).

Note

Cyclic data exchange with the telecontrol server

The special settings for cyclic data exchange initiated by a telecontrol server are described in the section The S7-1200 sends data to the master station (TC_SEND) (Page 44).

Triggering connection establishment for temporary stations ("Telecontrol" mode)

With "temporary" stations, connection establishment can be triggered by the following events:

- Event on the local CPU that needs to be evaluated by the program.

  These can, for example, be events that lead to a one-time connection establishment (for example alarms or commands of an operator) or the elapsing of a time interval that leads to cyclic connection establishment (for example once daily for data transfer).

- Request by a communications partner (OPC client or S7 station)

  A wake-up call or a wake-up SMS message from the communications partner causes a connection establishment.

- Request for TeleService by an engineering station

  The request switched by the telecontrol server or TeleService gateway does not need to be evaluated in the program.

- Wake-up SMS of the telecontrol server

  The wake-up SMS can be triggered spontaneously on the telecontrol server. It is also possible to configure cyclic sending on the telecontrol server.

- Telephone wake-up call

  The wake-up call can be sent from a telephone that has a phone number authorized in the STEP 7 project. The telephone must support the CLIP function (transfer of its own call number).

  The connection establishment with the (main) telecontrol server is triggered.

- Telephone wake-up SMS

  The wake-up SMS can be sent from a telephone that has a phone number authorized in the STEP 7 project. The telephone must support the CLIP function (transfer of its own call number) and the sending of SMS messages.

  The connection establishment with the telecontrol server specified in the SMS is triggered.

Triggering connection establishment in "GPRS direct" mode

In "GPRS direct" mode, a connection establishment is triggered by the following events:

- Event on the local CPU that is evaluated by the program.
- Request for TeleService by an engineering station

  The wake-up frame (SMS) from the TeleService gateway does not need to be evaluated in the program.

5.3 The wake-up SMS

Right to wake-up by "authorized phone numbers"

The CP only accepts an SMS if the sending communication partner is authorized based on its phone number. These numbers are in configured for the CP in STEP 7 in the "authorized phone numbers" list.

"Authorized phone numbers" in the STEP 7 project

- A phone number entered here gives the sender who transfers this phone number the right to trigger connection establishment.
- If only an asterisk (*) is entered in the list, the CP accepts SMS messages from all senders.
- An asterisk (*) after a phone number body authorizes connection establishment for all nodes connected to the body (extension numbers).

  Example: +49123456* authorizes +49123456101, +49123456102, +49123456207 etc.

Note

No wake-up without an authorized phone number

If the "Authorized phone numbers" list is empty, the CP cannot be woken up for connection establishment.

Wake-up call and wake-up SMS

The CP is woken by its communications partner using a wake-up call or a wake-up SMS and requested to establish the connection to the partner.

Depending on the connection type and the connection partner, the following text must be transferred in the wake-up SMS:

- For telecontrol connections:
  - Text for the wake-up SMS message for establishing a connection to the telecontrol server:

    ```
    TELECONTROL
    ```

  - Text for the wake-up SMS message for establishing a connection to the main telecontrol server:

    ```
    TELECONTROL MAIN
    ```

  - Text for the wake-up SMS message for establishing a connection to the substitute telecontrol server:

    ```
    TELECONTROL BACKUP
    ```

  The configuration of the telecontrol server for the CP 1242-7 is set in STEP 7 in "Telecontrol interface > Operating mode > main or substitute telecontrol server".

  Note

  Wake-up with a mobile phone

  - One of the texts listed above can be used in a wake-up SMS message.
  - With a wake-up call, the station always connects to the main telecontrol server.

- For TeleService connections:
  - Text for the wake-up SMS message for establishing a connection to the first configured TeleService server:

    ```
    TELESERVICE
    ```

    or

    ```
    TELESERVICE 1
    ```

  - Text for the wake-up SMS message for establishing a connection to the second configured TeleService server:

    ```
    TELESERVICE 2
    ```

  For TeleService, no extra wake-up SMS needs to be sent since the connection establishment is initiated by the engineering station.

  The phone number of the TeleService must also be configured in the STEP 7 project for the CP in the "Authorized phone numbers" list.

  The configuration of the TeleService server for the CP 1242-7 is set in STEP 7 in "Telecontrol interface > TeleService settings.

5.4 Calling a TeleService connection

Requirement for the engineering station

The STEP 7 project with the CP 1242-7 is stored on the engineering station.

Requirement for switching the connection

The request for connection establishment is triggered by the engineering station. To switch the connection to the remote station, a telecontrol server or a TeleService gateway is required. See also section Requirements for operation (Page 13).

Procedure for connection establishment for TeleService

Note

No TeleService connection establishment using "Online" > "Go online"

If you attempt to establish a TeleService connection by selecting the CPU and then selecting the menu or shortcut menu command "Online" > "Connect online", STEP 7 will automatically attempt to connect via Ethernet. Reason: In STEP 7, the last connection path used to download the project data is stored.

TeleService only from one single STEP 7 project

You can only operate TeleService on an engineering Station from within a single STEP 7 project. TeleService from more than one STEP 7 project at any one time is not possible.

Follow the steps below to establish a TeleService connection to the remote station via GPRS from the engineering station:

1. Select the CPU of the remote station in the STEP 7 project.
2. Select the "Online" > "Online & Diagnostics" menu.

   The "Online access" dialog opens.
3. Choose the entry "TeleService via GPRS" in the "Type of interface" drop-down list.
4. Choose the entry "GPRS TeleService board" in the "PG/PC interface" drop-down list.
5. Click on the  icon next to the "PG/PC interface" drop-down list.

   The "Establish remote connection" dialog box opens.
6. Make the necessary entries in this dialog.

   You will find information on the necessary entries in the tooltips of the STEP 7 online help.

Working with TeleService

Note

Loading only in offline mode

Loading software and blocks with TeleService via GPRS by calling the function "Load to device" only works when no TeleService connection is established.

Canceling a TeleService connection when calling online dialogs

An existing TeleService connection is canceled when you attempt to access an additional station or a node.

When there is an existing TeleService connection, do not select any of the menu commands "Go online", "Online & Diagnostics", "Load to device", "Extended download to device" or "Accessible nodes".

Terminating a TeleService connection

On completion of the TeleService session, terminate the TeleService connection again using the "Go offline" button. The connection is terminated after approximately 5 minutes.

5.5 Connection monitoring, data buffering, acknowledgement

5.5.1 Redial delay (STEP 7)

"Redial delay " parameter ("Telecontrol" mode)

In "Telecontrol" mode, the redial delay is the waiting time between the connection establishment attempts of the CP if the telecontrol server cannot be reached. It is configured in STEP 7, parameter group "Operating mode" of the CP.

A basic value is configured for the waiting time before the next connection establishment attempt. After every 3 redial attempts, the basic value is doubled up to a maximum of 900 s. Range of values: 10 to 600 s.

Example: The basic value 20 results in the following intervals for connection establishment attempts:

- three times 20 s
- three times 40 s
- three times 80 s
- etc. up to max. 900 s

If a substitute telecontrol server is configured, the 4th time the CP attempts to connect to the substitute server, in this example therefore after the following time:

- three times 20 s redial delay +
- three times the connection monitoring time configured for the CP
  (time until the arrival of the TCP acknowledgement from the communications partner)

Note

Depending on your contract, costs may result from each connection establishment attempt.

5.5.2 Connection monitoring time

"Connection monitoring time" parameter

The connection monitoring time is the monitoring time for the connection to the communications partner. The connection monitoring time is configured in the STEP 7 "Keepalive timeout" parameter group of the CP. Range of values: 0...600 s. The response differs depending on the mode of the CP:

- **"Telecontrol" mode**

  In the "Telecontrol" mode, the connection monitoring time is the time until the acknowledgement is received from the partner after sending a frame.

  If the configured time is exceeded, the frame is buffered if the Telecontrol server is the recipient (RemoteWdcAddress = 0).

  If 0 is entered, the default value 10 s will be used.

  Note: The time until the arrival of the acknowledgement depends largely on the GSM network being used.

- **"GPRS direct" mode**

  In the "GPRS direct" mode (TCON_IP_RFC), the reachability of the partner is checked if the configured time elapses.

  If the partner cannot be reached STATUS has the value $80F5_h$.

  If you enter 0, the function is disabled.

  If a connection is disrupted ERROR = 1 is set by TC_SEND and STATUS has the value $80F5_h$.

5.5.3 Frame buffer and acknowledgement

Data buffering when there is a connection abort ("Telecontrol")

If the connection to the telecontrol server is interrupted or if the connection monitoring time is exceeded, the send frames are stored with a time stamp in the frame buffer of the CP.

The next time a connection is established to the telecontrol server, the buffered frames are sent to the relevant destination subscribers.

The frame buffer is a ring buffer; if the buffer capacity is exceeded the oldest frames are discarded without any warning.

The maximum number of buffered frames can be found in the section Performance data (Page 11).

Monitoring and acknowledgement of send frames

The receipt of a frame is monitored and acknowledged in different ways. The mechanisms differ depending on the recipients as follows:

- **Recipient: Telecontrol server**

  After processing the send job, DONE is set to 1 in the "TC_SEND" instruction.

  If there is a connection abort or the send monitoring time is exceeded, the frame is buffered and sent to the telecontrol server when the connection is re-established.

  Receipt is acknowledged by a frame from the telecontrol server.

- **Recipient: CP 1242-7 - "Telecontrol" mode**

  The frame is forwarded by the telecontrol server to the destination CP.

  Receipt is acknowledged by a frame from the destination CP. DONE is only set to 1 in the "TC_SEND" instruction after receiving the acknowledgement.

  If there is a connection abort or the send monitoring time is exceeded, TC_SEND outputs to the ERROR and STATUS condition codes. The sending of the frame is not automatically repeated.

- **Recipient: CP 1242-7 - "GPRS direct" mode**

  The transfer of the frame with the TC_SEND instruction to the CP firmware is monitored and acknowledged by TCP mechanisms and DONE is set to 1 in the "TC_SEND" instruction.

5.6 Data management in the process image

Data storage in the process image of the CP

Note

The process image on the CP is only created for communication with the OPC server of the telecontrol server ("RemoteWdcAddress" in "TCON_WDC" = 0).

The data that the CP receives via GPRS and forwards to the CPU and the process data that the CP receives from the CPU to forward via GPRS is stored as an image on the CP:

- **Send process image**
  - Data that the "TC_SEND" instruction in the program of the S7-1200 CPU transfers to the CP to send via GPRS for a read job.
  - Data called up by a read job of the telecontrol server.
- **Receive process image**
  - Data that the "TC_RECV" instruction in the program of the S7-1200 CPU receives from the CP for a receive job.
  - Data that the CP receives via GPRS and forwards to the "TC_RECV" instruction for a write job of the telecontrol server.

5.7 Data transfer between communications partners

5.7.1 Sending from station to station

Sending to an S7 station with CP 1242-7

After transferring data from the CPU (TC_SEND) to the send process image of the CP, the CP sends the data immediately to the remote communications partner via GPRS. This applies to the S7 stations:

- S7 stations that can be reached via the telecontrol server.

  CP in "Telecontrol" mode
- S7 stations that can be reached directly.

  CP in "GPRS direct" mode

5.7.2 The S7-1200 sends data to the master station (TC_SEND)

Requirements

- The OPC server has been started on the telecontrol server (an OPC client has connected to the telecontrol server).
- The TC_CON instruction was started successfully.

Sequence

The sequence and time of sending the data to the telecontrol server via GPRS depend on the setting of the "RemoteWdcAddress" parameter (access ID) of the TCON_WDC data block:

- RemoteWdcAddress = DW#16#0: immediate transfer
- RemoteWdcAddress = DW#16#FEEDDADA: no immediate or cyclic transfer

  The DW#16#FEEDDADA setting is only used to update the process image on the CP.

  If the CP is required to receive additional data written by the OPC server, a second connection must be established with RemoteWdcAddress = DW#16#0.

These two transfer options can also be used on the CP at the same time. To achieve this, two different TC_CON instructions must be called.

Immediate transfer

"RemoteWdcAddress" = DW#16#0

1. TC_SEND sends data to the CP.
2. The CP compares the data received from TC_SEND with the existing send process image.
   - If the process image does not yet exist or the data received from TC_SEND is larger than the existing image, the new data is stored in the image and the size of the image is automatically increased.
   - If the data received from TC_SEND does not differ from the existing image, the call is ended and step 3 is omitted.
   - If the existing image is larger than the data received from TC_SEND, only the first data received from TC_SEND is stored in the image.
3. Transfer of the entire process image to the telecontrol server via GPRS.

Note

Send cycle time

If you send frames directly to the Telecontrol server ("Telecontrol" mode), make sure that the send cycle time is ≥ 1 second.

No immediate transfer

"RemoteWdcAddress" = DW#16#FEEDDADA

1. TC_SEND sends data to the CP.
2. The CP does not compare the new process data with the previous image, but writes the new data to its process image.
3. Only when the telecontrol server sends a request to the CP, for example after a request by an OPC client, does the CP send the requested part of the data from the image to the telecontrol server.

This option is particularly suitable for cyclic data exchange initiated by a request from the telecontrol server ("cyclic communication") to supply data archives with data at fixed intervals.

5.7.3 Master station reads data from the S7-1200 (read)

Requirements

- The OPC server has been started on the telecontrol server (an OPC client has connected to the telecontrol server).
- The TC_SEND instruction was called at least once in the CPU of the station.

  This creates the send process image on the CP.

Note

Item name of the OPC client

The process image on the CP is created as a data block. The read access of an OPC client to the process image must be transferred by the DB1 item to the CP.

Sequence

1. With the DB1, DBx,y item, the OPC server sends a read job for "x" bytes starting at offset "y" to the CP.
2. The CP checks whether "x" bytes starting at offset "y" exist in the process image.
3. Reaction of the CP:
   - If "x" bytes starting at offset "y" exist in the image, the data ("x" bytes) is sent to the telecontrol server.
   - If the image is smaller than x + y bytes, the read job is acknowledged negatively.

     The OPC client receives an error message from the OPC server of the telecontrol server.

5.7.4 Master station sends data to the S7-1200 (write, TC_RECV)

Sequence

1. The telecontrol server writes "x" bytes starting at offset "y" in a write job to the CP.
2. The CP saves the data at position "y" in the receive process image.
   - If the receive process image does not yet exist on the CP or is smaller than x + y bytes, the data is saved as a new image. Data areas without value are filled with the value 0.
   - If the data area of the write job is smaller than the image, the image is not reduced in size.
3. The CP always transfers the entire image to TC_RECV.

   Note: Remember this when specifying the size of the "LEN" parameter of TC_RECV.

5.8 Main and substitute telecontrol server

Telecontrol server: Main and substitute server

If TCSB is installed as the main and substitute server, two parallel systems are installed by TCSB and these are independent of each other. Both systems have their own database and the complete communications functions of TCSB. The two TCSB systems do not monitor each other.

Configuration of the main and substitute server

Make sure that the configuration data on the two systems are consistent with each other. You can achieve this by entering all the configuration data twice manually or after configuring the main system, by copying the database of the main system to the substitute system using operating system tools. Follow the steps outlined below:

1. Copy the database file from the following directory of the main system:

   Programdata > Siemens > Automation > TCS Basic > Data > "Smsc.sqlite"
2. Insert the database file at the same location in the file system of the substitute system.

   The existing "Smsc.sqlite" file on the substitute system is overwritten.
3. If necessary, adapt the addressing of the database server in the configuration of the substitute server under "Settings" if CMT and the database in the main system are installed on different computers.

Copying ensures the consistency of the configuration data. Since the system parameters of the main and substitute system can be configured in the CMT, following copying no editing of the system parameters of the substitute system is necessary.

Interaction between the main and substitute server

In a normal situation, the stations are connected to the main telecontrol server. If the main server cannot be reached, the connection of the remote S7-1200 with the CP 1242-7 fails over from the main to the substitute server.

Switchover between the main and substitute server by the CP 1242-7

When establishing the GPRS connection to the telecontrol server, the CP automatically switches over to the substitute server after the 4th dialing attempt if the main server cannot be reached.

If the substitute server cannot be reached either, the 4th time the CP once again tries to connect to the main server.

The intervals of the redial attempts are controlled by the "Redial delay" parameter.

You will find an example in the section Redial delay (STEP 7) (Page 41).

5.9 Reading out time by CPU

Requirement

Before the CPU can read out the correct time-of-day from the CP, the time-of-day of the CP needs to be set. The options for time-of-day synchronization of the CP via the Internet can be found in the section Other properties of the CP (Page 11).

Reading out time by the CPU with RDREC

You can read out the CP time of day with the RDREC "read data record" instruction. To do this, create a block of the type RDREC.

The parameters of the RDREC need to have the following settings:

- ID

  As the logical address, enter the hardware identifier of the CP 1242-7.

- MLEN

  Enter a length of 12 bytes.

- INDEX

  For the index, enter the data record with the number 160.

- RECORD

  Specify a structure of the data type DTL as the target area.

Configuration and programming 6

6.1 Configuration in STEP 7

Configuration in STEP 7

You configure the modules, networks and connections in SIMATIC STEP 7. You will find the required version in the section Requirements for operation (Page 13).

You can configure a maximum of three CMs/CPs per station. If you insert several modules of the type CP 1242-7 in an S7-1200, you can, for example, establish redundant communications paths.

When you load the station, the configuration data of the CP is stored on the CPU.

How to configure in STEP 7

Follow the steps below when configuring:

1. Create a STEP 7 project.
2. Insert the required SIMATIC stations.
3. Insert the CPs in the relevant stations.
4. Configure the inserted CPs.

   No Ethernet network needs to be created for the GPRS communication of the CP 1242-7.

   A telecontrol server or a TeleService- gateway cannot be configured in STEP 7.
5. Save the project.

You will find more detailed information on configuring the CP in the help system of STEP 7.

6.2 Information required for configuration

To configure and commission the CP and the connected telecontrol system, the following information is required:

General information

The following information is required for the STEP 7 configuration of the CP 1242-7:

- Own phone number of the CP (required for TeleService)
- Authorized phone numbers

  Phone numbers of the subscribers that are allowed to send a wake-up call, a wake-up SMS or a data SMS to the CP.

- APN

  Name of the GPRS access point (APN) of the GSM network provider
- APN user name

  User name for the GPRS access point of the GSM network provider
- APN password

  Password for the GPRS access point of the GSM network provider
- Subscriber number of the SMS center
- PIN of the SIM card

Note

Configured PIN and PIN on the SIM card must match.

If you enter the PIN of the SIM card of the CP 1242-7 incorrectly during STEP 7 configuration and download the station, the CP stores the wrong PIN. An incorrectly entered PIN is transferred by the CP only once so that the SIM card is not locked.

If you change the PIN of the SIM card externally to the incorrectly configured PIN (new PIN of the SIM card = incorrectly entered PIN in STEP 7), the CP rejects this PIN again without checking it.

Solution after entering an incorrect PIN:

To avoid the PIN being rejected by the CP again, use a PIN that is different from the incorrectly entered PIN. Procedure:

- If the PIN of the SIM card was not changed:
  - Configure the PIN in STEP 7 with the PIN of the SIM card.
  - Reload the station.
- If the original PIN of the SIM card was changed externally to the PIN that was previously incorrectly entered in STEP 7:
  - Change the PIN of the SIM card externally to a new PIN that has not yet been incorrectly configured in STEP 7.
  - Change the configured PIN in STEP 7 to the newly assigned PIN of the SIM card.
  - Reload the station.

Information required in "Telecontrol" mode

The following information is required for the STEP 7 configuration of the CP 1242-7:

- Address of the telecontrol server
  - IP address

    or
  - Name of the telecontrol server that can be resolved by DNS
  - Port number

    The relevant station type-dependent number of the listener port is configured in the telecontrol instructions.

  If you install a substitute telecontrol server: Address and port of the substitute telecontrol server
- DNS server address(es)

  You require the DNS server address if you address the telecontrol server using a name that can be resolved by DNS.
  - If you do not specify an address, the DNS server address is obtained automatically from the network provider (recommended procedure).
  - If you want to use a different DNS server, enter its address.

Information for TeleService

The following information is required for the STEP 7 configuration of the CP 1242-7:

- TeleService user name

  To authenticate the user with the CP
  - Configuration of the CP in STEP 7. You can configure up to 10 TeleService users.
  - Entry at the engineering station
- TeleService password

  To authenticate the user with the CP
  - Configuration of the CP in STEP 7
  - Entry at the engineering station
- Server password

  To authenticate the CP with the telecontrol server
  - Configuration of the telecontrol server
  - Entry at the engineering station

    If no server password is configured on the telecontrol server, no server password needs to be entered when establishing the TeleService connection.
- Phone number of the SIM card of the CP

CP parameter for configuring the telecontrol server

The following parameters from the STEP 7 configuration of the CP 1242-7 are also required for the configuration of the telecontrol server:

- Address and port of the telecontrol server
- Project number
- Station number
- Slot of the CP
- Telecontrol password
- Authorized phone numbers
- Connection mode (permanent/temporary)

6.3 Using and creating the telecontrol instructions

Using the instructions for GPRS communication

The telecontrol instructions are necessary whenever data of the station needs to be sent to a communications partner.

If you only want to use the TeleService function, no telecontrol instructions are necessary.

Installing the telecontrol instructions and creating the SDTs

You need to install the telecontrol instructions "TC_..." in a new library in STEP 7 after installing the support package "HSP CP1242-7" (file name: <TC_LIB.al11>).

You create the corresponding system data types (SDTs) "TCON_xxx" and "IF_CONF" as a data block. The procedure is described in the sections for the two SDTs.

Connection establishment with the "TC_CON" instruction

Connections are established via GPRS using the "TC_CON" instruction. Note that a separate "TC_CON" instruction must be called for each connection.

Once a connection is established, data can then be received with the "TC_RECV" instruction and/or sent with the "TC_SEND" instruction.

A separate connection must be established for each communications partner even if identical blocks of data are being sent.

After a successful transfer of the data, a connection can be terminated. A connection is also terminated by calling "TC_DISCON".

Note the maximum number of parallel connections in the section Performance data (Page 11).

Note

Connection abort

If an existing connection is aborted by the communications partner or due to disturbances on the network, the connection must also be terminated by calling "TC_DISCON". Make sure that you take this into account in your programming.

Application example for the "TC_CONFIG" instruction

With the "TC_CONFIG" instruction, you cannot permanently overwrite the configuration data of the CP 1242-7. This can have practical applications if you want to activate a TeleService partner temporarily by setting an input and this partner is disabled in the default configuration.

6.4 Programming the telecontrol instructions

6.4.1 TC_CON: Establish connection via the GSM network

Meaning

The TC_CON instruction allows an S7-1200 with a CP 1242-7 to establish a connection of the following types:

- ISO-ON-TCP

  Connection partner is a CP 1242-7.

  ISO-ON-TCP connections are used only in "GPRS direct" mode.

- UDP

  Any connection partner is possible.

- SMS

  The connection partner is an SMS client.

- Telecontrol connection

  The connection partner is either a telecontrol server or another station that can be reached via the telecontrol server.

A TC_CON establishes exactly one connection. Depending on the mode of the CP 1242-7 and the protocol you are using, a maximum of 3 to 5 simultaneous connections with unique IDs (see below) are supported per CP. You will find the maximum number of simultaneous connections in the performance data of the CP.

The CONNECT parameter uses a data block (DB) with the structure of a system data type (SDT) for the connection description.

The required connection type is defined using a connection-specific SDT "TCON_..." (see below). For each of the connection types listed above, one of the following SDTs must be assigned:

- TCON_IP_RFC for ISO-ON-TCP connections
- TCON_IP_V4 for UDP connections
- TCON_PHONE for SMS connections
- TCON_WDC for telecontrol connections

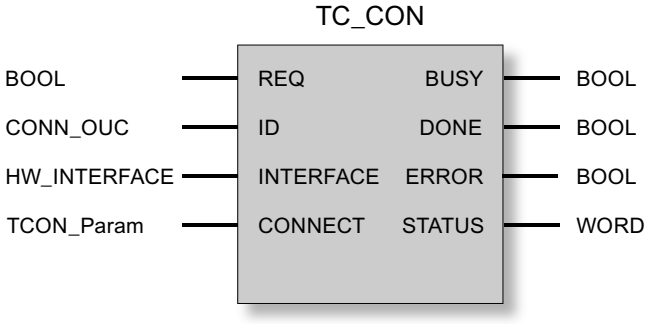
The "ActiveEstablished" parameter of these SDTs also specifies whether or not connection establishment is active or passive.

For parameter settings for these SDTs, see TCON_...: SDTs for the telecontrol connection establishment (Page 69).

The ID parameter references the GPRS connection. The ID is assigned and must be unique within the CPU.

The INTERFACE parameter references the GPRS interface of the required local CP. This must be taken from STEP 7.

Call interface in FBD representation



Explanation of the formal parameters

The following table explains all the formal parameters for the TC_CON instruction.

Parameter	Declaration	Data type	Possible values	Description
REQ	INPUT	BOOL	0, 1	The instruction is started and the status codes initialized on a rising edge. Updating of the DONE, ERROR and STATUS status codes when there is no positive edge.
ID	INPUT	CONN_OUC (WORD)	1...07FF$_h$	Reference to the relevant connection. The ID is assigned. The value of ID is also required by the system data type (SDT) of the CONNECT parameter.

Parameter	Declaration	Data type	Possible values	Description
INTERFACE	INPUT	HW_ INTERFACE (WORD)		Reference to the interface of the local CP 1242-7 (see STEP 7 > CP configuration > Telecontrol interface > "Hardware identifier")
CONNECT	INOUT	TCON_Param	See also "TCON_...: SDTs for telecontrol connection establishment"	Reference to a data block for connection establishment. The SDTs of the type TCON_IP_RFC, TCON_IP_V4, TCON_PHONE or TCON_WDC specify the structure of the data block suitable for the relevant connection. In the SDTs, note the parameter "ActiveEstablished" (active / passive connection establishment).
ENO	OUTPUT	BOOL	0: Error 1: Error-free	Enable output If there is a runtime error with the instruction, ENO = 0 is set.
BUSY	OUTPUT	BOOL	0: Execution of the instruction not yet started, completed or aborted 1: The instruction is executing	Display of the processing status of the instruction
DONE	OUTPUT	BOOL	0: - 1: The instruction executed successfully	This parameter indicates whether or not the job was completed without errors. For the meaning in conjunction with the parameters ERROR and STATUS, refer to Codes of the instruction.
ERROR	OUTPUT	BOOL	0: - 1: Error	Error code For the meaning in conjunction with the parameters DONE and STATUS, refer to Codes of the instruction.
STATUS	OUTPUT	WORD		Status code For the meaning in conjunction with the parameters DONE and ERROR, refer to Codes of the instruction.

The codes BUSY, DONE and ERROR

The codes of DONE and ERROR are relevant only when BUSY = 0.

BUSY	DONE	ERROR	Meaning
0	0	0	No job being executed

You will find all other code combinations of DONE and ERROR in the following table.

When called, the instruction remains in the BUSY = 1 state for several seconds. In the following situations, the BUSY state = 1 can last for a longer time:

- On active ISO-on-TCP connections if the partner cannot be reached.
- On passive connections when no frame is received.

The codes DONE, ERROR and STATUS

The following table shows the condition codes formed based on DONE, ERROR and STATUS that must be evaluated by the user program.

DONE	ERROR	STATUS	Meaning
1	0	0000_H	Job executed without errors
0	0	7000_H	No job processing active (first instruction call)
0	0	7001_H	Job processing started (first instruction call)
0	0	7002_H	Job processing already active (renewed instruction call when BUSY = 1)
0	1	8086_H	Illegal value for ID
0	1	8087_H	Maximum number of connections reached, no further connection possible
0	1	$80E3_H$	The ID is already being used by another connection.
0	1	$80E6_H$	No query in progress (instruction call not started)
0	1	$80E8_H$	Remote partner cannot be reached. Check the connection parameters. In the "GPRS direct" mode, the message is output if the partner is reachable but does not react to the connection request.
0	1	$80EB_H$	Request temporarily denied (TC_CON has already been called with the same destination address.)
0	1	$80EC_H$	Opening the Listener Port failed: Check the connection parameters.
0	1	$80F2_H$	The CP is in the wrong mode: • Telecontrol connections are permitted only in "Telecontrol" mode. • ISO-ON-TCP connections are permitted only in "GPRS direct" mode.
0	1	$80F3_H$	No free connection endpoint for sending data: • Use less connections or • Use less passive connections or • Turn off NTP. Remember the maximum number of simultaneous connections of the CP 1242-7.
0	1	$80F4_H$	Connection endpoint cannot be generated: Repeat the call. If necessary, check the connection parameters.
0	1	$80F6_H$	Format error of a parameter in the called data block (wrong length, wrong format or invalid value) Check the configuration of the "TC_CON..." SDT.

6.4.2 TC_DISCON: Terminate connection via the GSM network

Meaning

The TC_DISCON instruction on an S7-1200 with CP 1242-7 terminates an ISO-ON-TCP, UDP, SMS or telecontrol connection that was established with the TC_CON instruction.

You will find detailed information on the connection types in the description of the TC_CON instruction.

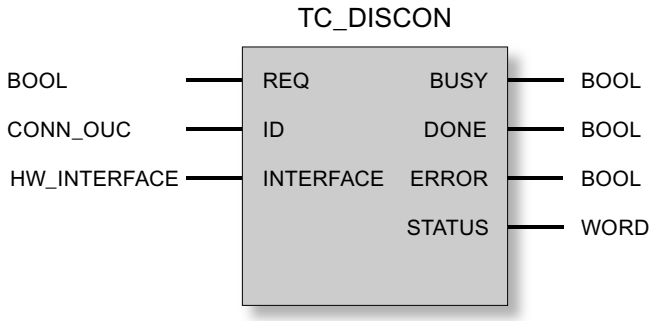
TC_DISCON terminates the connection to the telecontrol server only logically. If you want the connection to the telecontrol server to be terminated physically, configure the connection as a "Temporary connection" in the "telecontrol server" parameter group in STEP 7.

At the TCP/IP level, the connection is retained. Temporary stations terminate the connection automatically after sending the data.

The ID parameter references the GPRS connection. The ID must be unique within the CPU and the same as the ID used with TC_CON.

The INTERFACE parameter references the GPRS interface of the required local CP. The value must be the same as that used by TC_CON for INTERFACE.

Call interface in FBD representation



Explanation of the formal parameters

The following table explains all the formal parameters for the TC_DISCON instruction

Parameter	Declaration	Data type	Possible values	Description
REQ	INPUT	BOOL	0, 1	The instruction is started and the status codes initialized on a rising edge. Updating of the DONE, ERROR and STATUS status codes when there is no positive edge.
ID	INPUT	CONN_OUC (WORD)	1...07FF$_h$	Reference to the relevant connection
INTERFACE	INPUT	HW_ INTERFACE (WORD)		Reference to the interface of the local CP 1242-7 (see STEP 7 > CP configuration > Telecontrol interface > "Hardware identifier")
ENO	OUTPUT	BOOL	0: Error 1: Error-free	Enable output If there is a runtime error with the instruction, ENO = 0 is set.
BUSY	OUTPUT	BOOL	0: Execution of the instruction not yet started, completed or aborted 1: The instruction is executing	Display of the processing status of the instruction

Parameter	Declaration	Data type	Possible values	Description
DONE	OUTPUT	BOOL	0: - 1: The instruction executed successfully	This parameter indicates whether or not the job was completed without errors. For the meaning in conjunction with the parameters ERROR and STATUS, refer to Codes of the instruction.
ERROR	OUTPUT	BOOL	0: - 1: Error	Error code For the meaning in conjunction with the parameters DONE and STATUS, refer to Codes of the instruction.
STATUS	OUTPUT	WORD		Status code For the meaning in conjunction with the parameters DONE and ERROR, refer to Codes of the instruction.

The codes BUSY, DONE and ERROR

The codes of DONE and ERROR are relevant only when BUSY = 0.

BUSY	DONE	ERROR	Meaning
0	0	0	The instruction has not yet been called.

You will find all other code combinations of DONE and ERROR in the following table.

Note

When called, the instruction remains in the BUSY = 1 state for several seconds.

The codes DONE, ERROR and STATUS

The following table shows the condition codes formed based on DONE, ERROR and STATUS that must be evaluated by the user program.

DONE	ERROR	STATUS	Meaning
1	0	0000_H	Job executed without errors
0	0	7000_H	No job processing active (first instruction call)
0	0	7001_H	Job processing started (first instruction call)
0	0	7002_H	Job processing already active (renewed instruction call when BUSY = 1)
0	1	8086_H	Illegal value for ID
0	1	$80E4_H$	Unknown ID: No connection with this ID has been established by TC_CON.
0	1	$80E6_H$	No query in progress (instruction call not started)

DONE	ERROR	STATUS	Meaning
0	1	$80F5_H$	Invalid connection endpoint: • Connection establishment by TC_CON failed or • Connection terminated by remote partner.
0	1	$80F6_H$	Format error of a parameter in the called data block (wrong length, wrong format or invalid value) Check the configuration of the "TC_CON..." SDT.

6.4.3 TC_SEND: Send data via the GSM network

Meaning

The TC_SEND instruction allows the sending of data via programmed connections of the following types:

- ISO-ON-TCP connections
- UDP connections
- SMS connections

  The sending of SMS messages is supported only if this was set up in the STEP 7 configuration of the CP.
- Telecontrol connections

Note

Sending SMS messages to multiple recipients

If you want to send an identical SMS message to several recipients, you need to establish a connection to each recipient.

You will find more detailed information on the connection types in the description of the TC_CON instruction.

The ID parameter references the GPRS connection. The value of ID must correspond to the value used for ID by TC_CON.

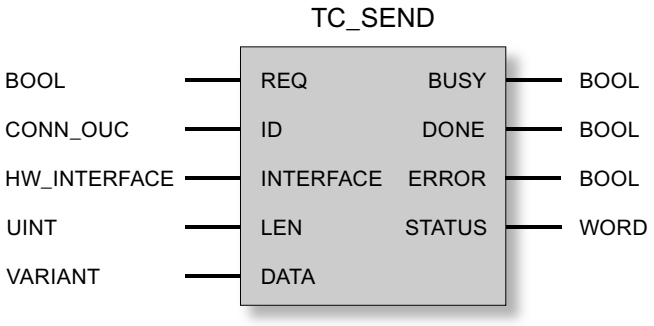
The INTERFACE parameter references the GPRS interface of the required local CP. The value must be the same as that used by TC_CON for INTERFACE.

The amount of data to be sent is specified with the LEN parameter.

The size of the data area specified in DATA must be at least as large as the number of bytes configured for LEN. Permitted data types in the data area specified in DATA are all except BOOL and ARRAY of BOOL.

The destination address (connection partner) for the data to be sent is configured in the TC_CON instruction.

Call interface in FBD representation



Explanation of the formal parameters

The following table explains all the formal parameters for the TC_SEND instruction.

Parameter	Declaration	Data type	Possible values	Description
REQ	INPUT	BOOL	0, 1	The instruction is started and the status codes initialized on a rising edge. Updating of the DONE, ERROR and STATUS status codes when there is no positive edge.
ID	INPUT	CONN_OUC (WORD)	1...07FF$_h$	Reference to the relevant connection
INTERFACE	INPUT	HW_ INTERFACE (WORD)		Reference to the interface of the local CP 1242-7 (see STEP 7 > CP configuration > Telecontrol interface > "Hardware identifier")
LEN	INPUT	UINT	1...2048	Number of bytes of data to be sent, maximum 2048. The value should match the size of the range of DATA.
DATA	INOUT	VARIANT		Address reference to the send data area of the CPU *
ENO	OUTPUT	BOOL	0: Error 1: Error-free	Enable output If there is a runtime error with the instruction, ENO = 0 is set.
BUSY	OUTPUT	BOOL	0: Execution of the instruction not yet started, completed or aborted 1: The instruction is executing	Display of the processing status of the instruction
DONE	OUTPUT	BOOL	0: - 1: The instruction executed successfully	This parameter indicates whether or not the job was completed without errors. ** For the meaning in conjunction with the parameters ERROR and STATUS, refer to Codes of the instruction.

Parameter	Declaration	Data type	Possible values	Description
ERROR	OUTPUT	BOOL	0: - 1: Error	Error code For the meaning in conjunction with the parameters DONE and STATUS, refer to Codes of the instruction.
STATUS	OUTPUT	WORD		Status code For the meaning in conjunction with the parameters DONE and ERROR, refer to Codes of the instruction.

* For special features of the DATA parameter for SMS texts, refer to the next section.

** After sending a frame, TC_SEND sets DONE = 1. Note the following response:
The loss of an ISO-on-TCP connection is only recognized by the sender after 1 to 2 minutes. The transferred data may be lost although TC_SEND has set DONE = 1 at the sender.
If an ISO-on-TCP connection is aborted after receiving a frame before TC_RECV was started, the transferred data may be lost even if TC_SEND sets DONE = 1 at the sender.

Configuring SMS texts with the DATA parameter

The instruction sends the data referenced by the pointer of the type VARIANT of the DATA parameter as an SMS text.

If an operand of the data type STRING is referenced by DATA for SMS texts, the first two bytes are transferred with length information of the string.

One option for the correct text representation of SMS messages to be sent is to convert the text string into an Array of BYTE or Array of CHAR using the conversion function Strg_TO_Chars. Strg_TO_Chars at the EN parameter is linked to the output parameter ENO by TC_SEND.

For SMS texts, the CP does not support all special characters, for example umlauts (ü, ä etc.). The specification GSM 03.38 applies. There may be additional restrictions imposed by the GSM network provider.

The codes BUSY, DONE and ERROR

The codes of DONE and ERROR are relevant only when BUSY = 0.

BUSY	DONE	ERROR	Meaning
0	0	0	No job being executed

You will find all other code combinations of DONE and ERROR in the following table.

The codes DONE, ERROR and STATUS

The following table shows the condition codes formed based on DONE, ERROR and STATUS that must be evaluated by the user program.

DONE	ERROR	STATUS *	Meaning
1	0	0000_H	Job executed without errors
0	0	7000_H	No job processing active (first instruction call)
0	0	7001_H	Job processing started (first instruction call)
0	0	7002_H	Job processing already active (renewed instruction call when BUSY = 1)
0	1	8086_H	Illegal value for ID
0	1	$80E0_H$	• The length information under LEN is greater than the range of data to be transferred under DATA. or • Internal error If you send frames directly to the Telecontrol server ("Telecontrol" mode), make sure that the send cycle time is ≥ 1 second.
0	1	$80E1_H$	Timeout: • Increase the value of the "Connection monitoring time" in the configuration of the CP 1242-7 or • Check the connection partner.
0	1	$80E4_H$	Unknown ID: First call TC_CON.
0	1	$80E6_H$	No query in progress (instruction call not started)
0	1	$80E7_H$	Data to be sent not completely transferred: Repeat the job.
0	1	$80E8_H$	Remote partner cannot be reached. Check the connection parameters. In the "GPRS direct" mode, the message is output if the partner is reachable but does not react to the connection request.
0	1	$80E9_H$	Connection establishment by remote partner: Check the connection partner. If necessary, terminate the connection with TC_DISCON and establish it again with TC_CON.
0	1	$80EA_H$	Error message from remote partner: • Check the connection partner. Enable the "TC_RECV" instruction on the communications partner. • If necessary, terminate the connection with TC_DISCON and establish it again with TC_CON.
0	1	$80EF_H$	SMS could not be sent: • Check whether the destination address (telephone number of the destination subscriber) exists. • Check whether the inserted SIM card allows sending of SMS. • Make sure that when the data block TCON_PHONE was created, the "Standard" option was selected for block access.

DONE	ERROR	STATUS *	Meaning
0	1	$80F1_H$	Sending of SMS messages is not enabled in the STEP 7 configuration of the CP: Enalble the "Allow SMS" option in the configuration of the CP.
0	1	$80F4_H$	Connection endpoint cannot be generated: Check the connection partner.
0	1	$80F5_H$	Invalid connection endpoint: • Connection establishment by TC_CON failed. or • Connection terminated by remote partner: First call TC_DISCON.
0	1	$80F6_H$	Format error of a parameter in the called data block (wrong length, wrong format or invalid value) Check the configuration of the "TC_CON..." SDT.

* Other statuses that are not listed here can be found in the status codes of the "RDREC" and "WRREC" instructions in the two middle status bytes (STATUS[2], STATUS[3]).

6.4.4 TC_RECV: Receive data via the GSM network

Meaning

The TC_RECV instruction allows the reception of data via programmed connections of the following types:

- ISO-ON-TCP connections
- SMS connections

  To receive SMS messages, the phone number of the sender must be configured in the STEP 7 configuration of the receiving CP (authorized phone numbers). The sender must support the CLIP function.

  The phone number of the connection partner must be entered in the "TCON_PHONE" SDT.

  Wake-up SMS messages are filtered out.
- Telecontrol connections

Note

Receiving SMS messages from different senders

If you want to receive SMS messages from different senders, you have two alternatives:

- You configure several connections (TC_CON, TC_RECV, TC_DISCON).

  or
- You may only enter no telephone number for only one configured connection in the required data block "TCON_PHONE" in the "PhoneNumber" parameter. When receiving messages, this is then interpreted as a placeholder for all authorized connection partners.

You will find more detailed information on the connection types in the description of the TC_CON instruction.

The ID parameter references the GPRS connection. The value of ID must correspond to the value used for ID by TC_CON.

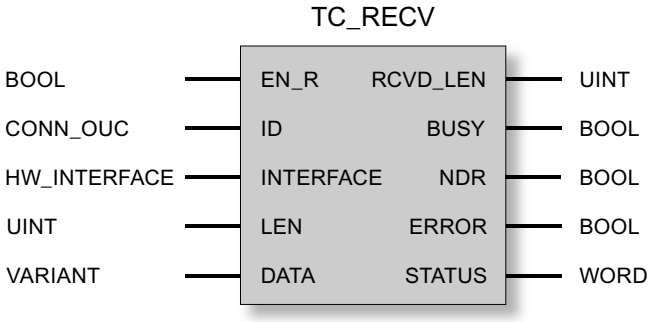
The INTERFACE parameter references the GPRS interface of the required local CP. The value must be the same as that used by TC_CON for INTERFACE.

The maximum amount of data to be received is specified with the LEN parameter.

The size of the data area specified in DATA must be at least as large as the number of bytes configured for LEN. Permitted data types in the data area specified in DATA are all except BOOL and ARRAY of BOOL. The received data is interpreted as if the sending partner had used the same data types.

The DB (system data type) used for the connection description of TC_RECV must differ from a DB used for TC_SEND.

Call interface in FBD representation



Explanation of the formal parameters

The following table explains all the formal parameters for the TC_RECV instruction

Parameter	Declaration	Data type	Possible values	Description
EN_R	INPUT	BOOL	0: Data reception locked 1: Data reception enabled	Enables / locks the reception of data. After setting 1 to 0, the program block receives data again.
ID	INPUT	CONN_OUC (WORD)	1...07FF$_h$	Reference to the relevant connection
INTERFACE	INPUT	HW_ INTERFACE (WORD)		Reference to the interface of the local CP 1242-7 (see STEP 7 > CP configuration > Telecontrol interface > "Hardware identifier")
LEN	INPUT	UINT	1...2048	(minimum) number of bytes of data to be received, maximum 2048
DATA	INOUT	VARIANT		Address reference to the receive data area of the CPU *

Parameter	Declaration	Data type	Possible values	Description
ENO	OUTPUT	BOOL	0: Error 1: Error-free	Enable output If there is a runtime error with the instruction, ENO = 0 is set.
RCVD_LEN	OUTPUT	UINT		Number of bytes of received data
BUSY	OUTPUT	BOOL	0: Execution of the instruction not yet started, completed or aborted 1: The instruction is executing	Display of the processing status of the instruction
DONE	OUTPUT	BOOL	0: - 1: The instruction executed successfully	This parameter indicates whether or not the job was completed without errors. For the meaning in conjunction with the parameters ERROR and STATUS, refer to Codes of the instruction.
ERROR	OUTPUT	BOOL	0: - 1: Error	Error code For the meaning in conjunction with the parameters DONE and STATUS, refer to Codes of the instruction.
STATUS	OUTPUT	WORD		Status code For the meaning in conjunction with the parameters DONE and ERROR, refer to Codes of the instruction.

* For special features of the DATA parameter for SMS texts, refer to the next section.

Configuring SMS texts with the DATA parameter

The instruction references the received SMS text with the pointer of the type VARIANT of the DATA parameter to the data area of the CPU.

If DATA references an operand of the data type STRING for the SMS text, the first two bytes of the SMS text will be interpreted as length information of the data type STRING and not as SMS text.

One option for the correct text representation of SMS messages to be received is to convert an Array of BYTE or Array of CHAR to a text string using the conversion function Chars_TO_Strg. Chars_TO_Strg at the EN parameter is linked to the output parameter ENO of TC_RECV.

For SMS texts, the CP does not support all special characters, for example umlauts (ü, ä etc.). The specification GSM 03.38 applies. There may be additional restrictions imposed by the GSM network provider.

The codes BUSY, DONE and ERROR

The codes of DONE and ERROR are relevant only when BUSY = 0.

BUSY	DONE	ERROR	Meaning
0	0	0	No job being executed

You will find all other code combinations of DONE and ERROR in the following table.

The codes DONE, ERROR and STATUS

The following table shows the condition codes formed based on DONE, ERROR and STATUS that must be evaluated by the user program.

DONE	ERROR	STATUS	Meaning
1	0	0000_H	Job executed without errors
0	0	7000_H	No job processing active (first instruction call)
0	0	7001_H	Job processing started (first instruction call)
0	0	7002_H	Job processing already active (renewed instruction call when BUSY = 1)
0	1	$80A3_H$	• An attempt is being made to establish the connection. • An attempt is being made to terminate a non-existent connection.
0	1	$80E0_H$	• The size of the data received for the range specified by DATA is greater than the length information in LEN. or • Internal error
0	1	8086_H	Illegal value for ID
0	1	$80E4_H$	Unknown ID: First call TC_CON.
0	1	$80E6_H$	No query in progress (instruction call not started)
0	1	$80F5_H$	Invalid connection endpoint: • Connection establishment by TC_CON failed. or • Connection terminated by remote partner: First call TC_DISCON.
0	1	$80F6_H$	Format error of a parameter in the called data block (wrong length, wrong format or invalid value) Check the configuration of the "TC_CON..." SDT.

* Other statuses that are not listed here can be found in the status codes of the "RDREC" and "WRREC" instructions in the two middle status bytes (STATUS[2], STATUS[3]).

6.4.5 TC_CONFIG: Transferring configuration data to CP

Meaning

With the TC_CONFIG instruction, parameters of a the CP 1242-7 configured in STEP 7 can be modified. The configured values are not overwritten retentively. The overwritten values remain valid until TC_CONFIG is called again or until the station starts up again (cold restart after cycling power).

If the STEP 7 configuration data of the CP needs to be changed permanently, the instruction needs to be called again each time the station restarts (cold restart) or a modified project must be downloaded to the station.

The CONFIG parameter points to the memory area with the configuration data. The configuration data is stored in a data block (DB). The structure of the DB is specified by the system data type (SDT) IF_CONF.

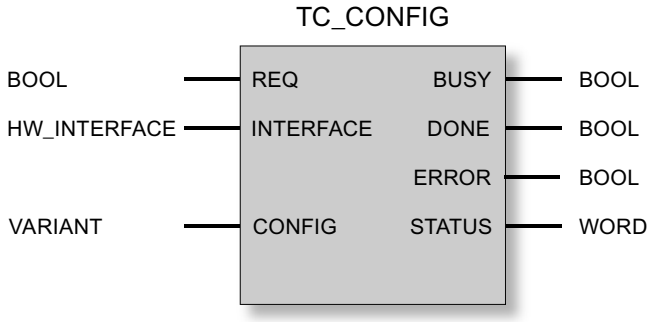
The configuration data to be modified on the CP is put together as necessary in blocks in IF_CONF "IF_CONF_..." for the individual parameters.

Parameters that are not intended to change as a result of the instruction are not entered in IF_CONF. They retain the value configured in STEP 7.

For detailed information on settings for IF_CONF, refer to the section IF_CONF: SDT for telecontrol configuration data (Page 74).

The INTERFACE parameter references the GPRS interface of the required local CP.

Call interface in FBD representation



Explanation of the formal parameters

The following table explains all the formal parameters for the TC_CONFIG instruction

Parameter	Declaration	Data type	Possible values	Description
REQ	INPUT	BOOL	0, 1	The instruction is started and the status codes initialized on a rising edge. Updating of the DONE, ERROR and STATUS status codes when there is no positive edge.
INTERFACE	INPUT	HW_ INTERFACE (WORD)		Reference to the interface of the local CP 1242-7
CONFIG	INOUT	VARIANT	See also "IF_CONF: SDT for telecontrol configuration data	Reference to the memory area with the collected configuration data to be modified
ENO	OUTPUT	BOOL	0: Error 1: Error-free	Enable output If there is a runtime error with the instruction, ENO = 0 is set.
BUSY	OUTPUT	BOOL	0: Execution of the instruction not yet started, completed or aborted 1: The instruction is executing	Display of the processing status of the instruction

Parameter	Declaration	Data type	Possible values	Description
DONE	OUTPUT	BOOL	0: - 1: The instruction executed successfully	This parameter indicates whether or not the job was completed without errors. For the meaning in conjunction with the parameters ERROR and STATUS, refer to Codes of the instruction.
ERROR	OUTPUT	BOOL	0: - 1: Error	Error code For the meaning in conjunction with the parameters DONE and STATUS, refer to Codes of the instruction.
STATUS	OUTPUT	WORD		Status code For the meaning in conjunction with the parameters DONE and ERROR, refer to Codes of the instruction.

The codes BUSY, DONE and ERROR

The codes of DONE and ERROR are relevant only when BUSY = 0.

BUSY	DONE	ERROR	Meaning
0	0	0	No job being executed

You will find all other code combinations of DONE and ERROR in the following table.

The codes DONE, ERROR and STATUS

The following table shows the condition codes formed based on DONE, ERROR and STATUS that must be evaluated by the user program.

DONE	ERROR	STATUS	Meaning
1	0	0000_H	Job executed without errors
0	0	7000_H	No job processing active (first instruction call)
0	0	7001_H	Job processing started (first instruction call)
0	0	7002_H	Job processing already active (renewed instruction call when BUSY = 1)
0	1	$80E6_H$	No query in progress (instruction call not started)
0	1	$80EB_H$	Query temporarily rejected (the CP is currently being configured by STEP 7).
0	1	$80F6_H$	Format error of a parameter in the called data block (wrong length, wrong format or invalid value) Check the "IF_CONF" SDT.
0	1	$80F7_H$	Wrong ID in the parameter fields of the configuration data: Check the "IF_CONF" SDT.

6.4.6 Other error messages

Other error messages

The following error messages are used for diagnostics purposes. You can obtain more information from the Siemens hotline.

DONE	ERROR	STATUS	Meaning
0	1	$80E0_H$	Internal error You should also note the possible meaning with the TC_SEND and TC_RECV instructions.

6.4.7 TCON_...: SDTs for the telecontrol connection establishment

System data types TCON_... for the TC_CON instruction

To configure a telecontrol connection using the TC_CON instruction, the CONNECT parameter of the instruction is used for the connection description.

The connection description is specified by the structure of the system data type (SDT). The structure of the relevant SDT contains the parameters necessary to establish the connection with the remote communications partner.

For different connection types that depend on the remote communications partner, the following SDTs are used:

- TCON_IP_RFC for ISO-on-TCP connections to IPv4 stations with CP 1242-7
- TCON_IP_V4 for UDP connections to IPv4 stations (sending only)
- TCON_PHONE for connections to SMS clients
- TCON_WDC for connections to telecontrol servers or stations that can be reached via the telecontrol server.

The parameter assignment of the connection description is made in a data block of the same type as the SDT.

Creating a DB of the type TCON_...

You will need to type in the data types of the relevant DBs with the keyboard. They are not displayed in the selection list. The data types are not case-sensitive.

To create a TCON_... DB, follow the steps outlined below:

1. Create a data block of the type "global DB" with block access "Standard".
2. Create an SDT in the table of the parameter configuration of the DB by assigning the name and typing in the required type (for example "TCON_IP_RFC") in the cell of the data type.

   The SDT and its parameters are created (see below).
3. Configure the parameters that are described below for each SDT type.

Reserved bits are not displayed.

System data type TCON_IP_RFC for connections to IPv4 stations

This connection type is supported only on ISO-on-TCP connections to communications partners with a fixed IP address. The CP must be configured for the "GPRS direct" mode.

Table 6- 1 Parameters of TCON_IP_RFC

Byte	Parameter	Data type	Initial value	Description
0 ... 1	InterfaceID	HW_ANY		Reference to the interface of the local CP 1242-7 (see STEP 7 > CP configuration > Telecontrol interface > "Hardware identifier")
2 ... 3	ID	CONN_OUC	1...07FF$_h$	Reference to the GPRS connection. The ID is assigned and must be unique within the CPU. Here, the same value as that of the ID parameter of the TC_CON instruction must be used.
4	ConnectionType	BYTE	W#16#0C	Protocol variant 12 (C$_h$): ISO-on-TCP connection
5	ActiveEstablished	BOOL		Identifier for the type of connection establishment: • 0: Passive connection establishment • 1: Active connection establishment
6 ... 7	-	-	-	- reserved -
8 ... 11	RemoteAddress	IP_V4		IP address of the connection partner
	ADDR	Array [1...4] of Byte		IP address of the relevant connection partner
12 ... 13	RemoteTSelector	TSelector		Remote T selector
	TSelLen	UINT		Length of the remote T selector "RemoteTSelector"
14 ... 45	TSel	Array [1...32] of Byte	any	Remote transport selector of the connection • When "ActiveEstablished" = 1: With active connection establishment, the T selector of the local partner must be the same as the T selector of the connection partner (passive connection establishment on the remote partner). • When "ActiveEstablished" = 0 correspondingly (passive connection establishment local, active connection establishment remote)

Byte	Parameter	Data type	Initial value	Description
46 ... 47	LocalTSelector	TSelector		Local T selector
	TSelLen	UINT		Length of the local T selector "LOCAL_TSel"
48 ... 79	TSel	Array [1...32] of Byte	any	Local transport selector of the connection • When "ActiveEstablished" = 1: With active connection establishment, the T selector of the local partner must be the same as the T selector of the connection partner (passive connection establishment on the remote partner). • When "ActiveEstablished" = 0 correspondingly (passive connection establishment local, active connection establishment remote)

System data type TCON_IP_V4 for connections to IPv4 stations

This connection type is supported only for sending on UDP connections to communications partners with a fixed IP address.

To receive, ActiveEstablished = 0 must be set.

Table 6- 2 Parameters of TCON_IP_V4

Byte	Parameter	Data type	Initial value	Description
0 ... 1	InterfaceID	HW_ANY		Reference to the interface of the local CP 1242-7 (see STEP 7 > CP configuration > Telecontrol interface > "Hardware identifier")
2 ... 3	ID	CONN_OUC	1...07FF$_h$	Reference to the GPRS connection. The ID is assigned and must be unique within the CPU. Here, the same value as that of the ID parameter of the TC_CON instruction must be used.
4	ConnectionType	BYTE	W#16#0B	Protocol variant 11 (B$_h$): UDP connection
5	ActiveEstablished	BOOL		Identifier for the type of connection establishment: • 0: Passive connection establishment Setting for sending and receiving data. • 1: Active connection establishment Setting for sending data only.
6 ... 7	-	-	-	- reserved -
8 ... 11	RemoteAddress	IP_V4		IP address of the connection partner
	ADDR	Array [1...4] of Byte		IP address of the relevant connection partner
12 ... 13	RemotePort	UINT	1...65535	IP port of the connection partner Not relevant if ActiveEstablished = 0
14 ... 15	LocalPort	UINT	1...65535	Local IP port ("0" is not permitted) Not relevant if ActiveEstablished = 1

System data type TCON_PHONE for SMS connections

Note

Authorized phone numbers

The CP only accepts an SMS if the sending communication partner is authorized based on its phone number. These numbers are in configured for the CP in STEP 7 in the "authorized phone numbers" list.

SMS text

- Programmed SMS texts for SMS messages to be sent are accessed using the DATA parameter of the TC_SEND instruction.
- The text of a received SMS message is assigned to the address area of the CPU by the DATA parameter of the TC_RECV instruction.

Table 6- 3 Parameters of TCON_PHONE

Byte	Parameter	Data type	Initial value	Description
0 ... 1	InterfaceID	HW_ANY		Reference to the interface of the local CP 1242-7 (see STEP 7 > CP configuration > Telecontrol interface > "Hardware identifier")
2 ... 3	ID	CONN_OUC	1...07FF$_h$	Reference to the GPRS connection. The ID is assigned and must be unique within the CPU. Here, the same value as that of the ID parameter of the TC_CON instruction must be used.
4	ConnectionType	BYTE	W#16#0E	Protocol variant 14 (E$_h$): SMS connection
5	ActiveEstablished	BOOL		Identifier for the type of connection establishment (not relevant for the CP 1242-7): • 0: Passive connection establishment (not relevant here) • 1: Active connection establishment
6...7	-	-	-	- reserviert -
8 ... 31	PhoneNumber	STRING[22]		Call number of the connection partner Permitted values: Plus character (+) and numbers Note the exact notation of the international dialing code of the relevant phone number assigned by the network provider ("+" character or zeros). Without an entry for the PhoneNumber parameter, no connection partner is specified and SMS messages can be received reception from all authorized connection partners. Note the following during startup: Without an entry, TC_RECV first delivers the oldest received SMS message.

System data type TCON_WDC for connections to telecontrol servers or remote stations

You can configure the connection to the telecontrol server assigned to the S7-1200 or to a remote station that can be reached via the telecontrol server with TCON_WDC. The address data of the telecontrol server assigned to the CP can be found in STEP 7 in the "Telecontrol interface > Mode" tab of the CP. The telecontrol server or a remote station is addressed using the host name or the IP address.

The "RemoteWdcAddress" parameter of TCON_WDC specifies the Access ID of the connection partner.

Table 6- 4 Parameters of TCON_WDC

Byte	Parameter	Data type	Initial value	Description
0 ... 1	InterfaceID	HW_ANY		Reference to the interface of the local CP 1242-7 (see STEP 7 > CP configuration > Telecontrol interface > "Hardware identifier")
2 ... 3	ID	CONN_OUC	1...07FF$_h$	Reference to the GPRS connection. The ID is assigned and must be unique within the CPU. Here, the same value as that of the ID parameter of the TC_CON instruction must be used.
4	ConnectionType	BYTE	W#16#0F	Protocol variant 15 (F$_h$): Telecontrol connection using an IP address
5	ActiveEstablished	BOOL		Identifier for the type of connection establishment: • 0: Passive connection establishment • 1: Active connection establishment
6 ... 7	-	-	-	- reserved -
8 ... 11	RemoteWdcAddress	DWORD		Specifies the Access ID (hex). The access ID depends on the connection partner. • Connection to a remote CP: The access ID is made up of the following: – STEP 7 project number – Station number – Slot If the remote station has more than one GPRS-CP and you do not want to specify the path, the last byte for the slot must be set to 0. You will find the access ID in the STEP 7 project in the "CP authentication of the CP" parameter group. • Connection to the telecontrol server: Access ID = 0 • To only write to the process image of the CP: Access ID = DW#16#FEEDDADA

6.4.8 IF_CONF: SDT for telecontrol configuration data

Structure of the system data type IF_CONF for the TC_CONFIG instruction

The CONFIG parameter of the TC_CONFIG instruction references the memory area with the configuration data of the CP 1242-7 to be modified. The configuration data stored in a data block is described as a structure of the system data type (SDT) IF_CONF.

IF_CONF is made up of a header followed by fields that correspond to the parameters or parameter areas of the CP in the device properties of the STEP 7 project.

The CP configuration data to be modified is collected together as IF_CONF fields. Parameters that will not be modified are ignored in the IF_CONF structure and remain as they were configured in the STEP 7 project.

Creating the DB and the IF_CONF structures

You can create the parameters of the CP within the IF_CONF DB in one or more structures each with one or more fields.

You will need to type in the data types of the fields using the keyboard. They are not displayed in the selection list. The data types are not case-sensitive.

Follow the steps below to create IF_CONF:

1. Create a data block of the type "global DB" with block access "Standard".
2. Create a structure (data type "Struct") in the table of the parameter configuration of the DB.

   You can specify any name.
3. Under this structure add a header by assigning the name of the header and typing it in in the cell of the data type "IF_CONF_Header".

   The header of the structure and its three parameters (see below) is created.
4. Create a field for the first parameter to be changed by typing in the required data type (for example "IF_CONF_APN") in the cell of the data type.
5. Repeat the last step for all parameters you want to change on the CP using the TC_CONFIG instruction.
6. Finally, update the number of fields in the header in the "subfieldCnt" parameter.

Header of IF_CONF

Table 6- 5 IF_CONF_Header

Byte	Parameter	Data type	Initial value	Description
0 ... 1	fieldType	UINT		Field type: Must always be 0.
2 ... 3	fieldId	UINT		Field ID: Must always be 0.
4 ... 5	subfieldCnt	UINT		Total number of fields contained in the structure

General parameters of the parameter fields

Each field has the following general parameters:

- Id

  This parameter identifies the field and must not be modified.

- Length

  This parameter indicates the length of the field. The value serves as information.

  Fields with strings and / or arrays have a variable length. Due to hidden bytes, the actual length of fields can be greater than the sum of the displayed parameters.

- Mode

  The following values are permitted to these parameters:

Table 6- 6 Values of "Mode"

Value	Meaning
1	Permanent validity of the configuration data Not relevant for the CP 1242-7
2	Temporary validity of the configuration data, including deleting of existing permanent configuration data The permanent configuration data is replaced by the parameter fields of IF_CONF.

Field for the parameter area "GPRS access"

Table 6- 7 IF_CONF_APN

Parameter	Data type	Initial value	Description
Id	UINT	4	ID of the parameter field
Length	UINT		Length of the parameter field in bytes: 174
Mode	UINT		Validity (1: permanent, 2: temporary)
AccesspointGPRS	STRING [98]		APN: Name of the access point of the GSM network provider to the Internet
AccesspointUser	STRING [42]		APN user name
AccesspointPassword	STRING [22]		APN password

Field for the parameter area "CP identification"

Table 6- 8 IF_CONF_Login

Parameter	Data type	Initial value	Description
Id	UINT	5	ID of the parameter field
Length	UINT		Length of the parameter field in bytes: 54
Mode	UINT		Validity (1: permanent, 2: temporary)

Parameter	Data type	Initial value	Description
ModemName	STRING [22]		Access ID The value cannot be set.
ModemPassword	STRING [22]		Telecontrol password (max. 20 characters)

Field for the parameter area "Telecontrol server access"

This field is only used when the telecontrol server is addressed with a name that can be resolved by DNS. If the telecontrol server is addressed with its IP address, the "IF_CONF_TCS_IP_V4" field is used.

In STEP 7, the corresponding data is located in the "Mode" parameter area.

If there is more than one telecontrol server, use the field once per server.

Table 6- 9 IF_CONF_TCS_Name

Parameter	Data type	Initial value	Description
Id	UINT	6	ID of the parameter field
Length	UINT		Length of the parameter field in bytes: 266
Mode	UINT		Validity (1: permanent, 2: temporary)
TcsName	-	-	- reserved -
	STRING [254]		Name of the telecontrol server that can be resolved by DNS
RemotePort	UINT		Port of the telecontrol server
Rank	UINT		Priority of the server [1, 2] 1 = main telecontrol server, 2 = substitute telecontrol server

Field for the parameter area "Telecontrol server access"

This field is only used when the telecontrol server is addressed by its IP address. If the telecontrol server is addressed by its DNS name, the "IF_CONF_TCS_Name" field is used.

In STEP 7, the corresponding data is located in the "Mode" parameter area.

If there is more than one telecontrol server, use the field once per server.

Table 6- 10 IF_CONF_TCS_IP_v4

Parameter	Data type	Initial value	Description
Id	UINT	7	ID of the parameter field
Length	UINT		Length of the parameter field in bytes: 14
Mode	UINT		Validity (1: permanent, 2: temporary)
RemoteAddress	IP_V4		IP address of the telecontrol server
RemotePort	UINT		Port of the telecontrol server
Rank	UINT		Priority of the server [1, 2] 1 = main telecontrol server, 2 = substitute telecontrol server

Field for the "Mode" parameter area

In STEP 7, the corresponding data is located in the parameter areas "Mode" and Modem settings".

Table 6- 11 IF_CONF_GPRS_Mode

Parameter	Data type	Initial value	Description
Id	UINT	8	ID of the parameter field
Length	UINT		Length of the parameter field in bytes: 10
Mode	UINT		Validity (1: permanent, 2: temporary)
GPRSmode	UINT		Mode of the CP: • 0 = Telecontrol • 1 = GPRS direct
TemporaryStation	BOOL		Bit 0: Temporary connection If this option is selected, the CP only establishes a temporary connection to send data. Once the frames have been transferred, the CP terminates the connection again. • 1: activated (temporary connection) • 0: deactivated (permanent connection)
SMS_Enabled	BOOL		Bit 1: Allow SMS Selecting the option allows the S7 station to send SMS messages. • 1: activated (SMS allowed) • 0: deactivated (no SMS)

Field for the "SMSC" parameter

In STEP 7, the corresponding data is located in the parameter area "Modem settings".

Table 6- 12 IF_CONF_SMS_Provider

Parameter	Data type	Initial value	Description
Id	UINT	10	ID of the parameter field
Length	UINT		Length of the parameter field in bytes: 28
Mode	UINT		Validity (1: permanent, 2: temporary)
SMSProvider	STRING [20]		Node number of the SMS center (SMSC) of the GSM network provider with which the contract was signed for this station.

Field for the "PIN" parameter

In STEP 7, the corresponding data is located in the parameter area "Modem settings".

Table 6- 13 IF_CONF_PIN

Parameter	Data type	Initial value	Description
Id	UINT	11	ID of the parameter field
Length	UINT		Length of the parameter field in bytes: 16
Mode	UINT		Validity (1: permanent, 2: temporary)
Pin	STRING [8]		PIN of the SIM card inserted in the SIM card The parameter is not relevant if the PIN was correctly configured. If the PIN was incorrectly configured, the correct PIN can be entered.

Field for monitoring times

In STEP 7, the corresponding data is located in the parameter areas "Keepalive timeout" and Operating mode".

Table 6- 14 IF_CONF_TC_Timeouts

Parameter	Data type	Initial value	Description
Id	UINT	12	ID of the parameter field
Length	UINT		Length of the parameter field in bytes: 12
Mode	UINT		Validity (1: permanent, 2: temporary)
KeepAliveTimeout	-	-	- Reserved - (cannot be set)
SendTimeout	UINT		Connection monitoring time: Monitoring time of the connection to the communications partner (seconds) Relevant in the "Telecontrol" and "GPRS direct" modes
RedialTimeout	UINT		Dialing repetition delay: Basic value for the wait time until the next attempt to establish a connection following an unsuccessful connection establishment. After every 3 attempts, the basic value is doubled up to a maximum of 900 s. Range of values: 10 to 600 s. If a substitute telecontrol server is configured, the CP attempts to connect to it at the 4th dialin attempt. Example: Basic value 20 results in the following dialing intervals: three times 20 s, three times 40 s, three times 80 s etc. up to a maximum of 900 s. Not relevant for SMS connections

Field for the "Wake up right" parameter area

Table 6- 15 IF_CONF_WakeupList

Parameter	Data type	Initial value	Description
Id	UINT	13	ID of the parameter field
Length	UINT		Length of the parameter field in bytes: 246
Mode	UINT		Validity (1: permanent, 2: temporary)
WakeupPhone [1...10]	ARRAY [1...10] of STRING [22]		Phone number subscriber authorized to wake up The asterisk (*) at the end of a call number is used a placeholder for direct dialing numbers.

Field for the "Preferred GSM networks" parameter area

Table 6- 16 IF_CONF_PrefProvider

Parameter	Data type	Initial value	Description
Id	UINT	14	ID of the parameter field
Length	UINT		Length of the parameter field in bytes: 46
Mode	UINT		Validity (1: permanent, 2: temporary)
Provider [1...5]	ARRAY [1...5] of STRING [6]		Alternative GSM networks with priority 1 to 5 into which the CP dials. Up to 5 networks can be configured. No. 1 with highest priority, no. 5 with lowest priority. Entry of the Public Land Mobile Network (PLMN) of the network provider consisting of Mobile Country Code (MCC) and Mobile Network Code (MNC). Example (test network of Siemens AG): 26276

Field for the "DNS configuration" parameter area

Table 6- 17 IF_CONF_DNS

Parameter	Data type	Initial value	Description
Id	UINT	16	ID of the parameter field
Length	UINT		Length of the parameter field in bytes: 14
Mode	UINT		Validity (1: permanent, 2: temporary)
DNS_IP [1]	IP_V4		IP address of the 1st domain name system server
DNS_IP [2]	IP_V4		IP address of the 2nd domain name system server

Field for the "Time-of-day synchronization" parameter area

Table 6- 18 IF_CONF_NTP

Parameter	Data type	Initial value	Description
Id	UINT	17	ID of the parameter field
Length	UINT		Length of the parameter field in bytes: 24
Mode	UINT		Validity (1: permanent, 2: temporary)
NTP_IP [1]	ARRAY [1...4] of IP_V4		IP address of NTP server 1
...	...		(IP address of NTP server 2...3)
NTP_IP [4]	ARRAY [1...4] of IP_V4		IP address of NTP server 4

Block for activating / deactivating TeleService users

SDT for activating or deactivating TeleService users already configured in the STEP 7 project of the CP. In STEP 7, the corresponding data can be found in the parameter area "TeleService settings" > "TeleService user management".

Table 6- 19 IF_CONF_GPRS_UserList

Parameter	Data type	Initial value	Description
Id	UINT	19	ID of the parameter field
Length	UINT		Length of the parameter field in bytes: 506
Mode	UINT		Validity (1: permanent, 2: temporary)
GPRS_User [1...10]	ARRAY [1...10] of GPRS_User		TeleService user no. 1 to max. no. 10

The array is formed from the parameter records for the TeleService users ("GPRS_User" [1...n]).

Table 6- 20 GPRS_User [n] (parameter for TeleService user)

Parameter	Data type	Initial value	Description
UserName [n]	STRING [22]		TeleService user name
Password [n]	STRING [22]		- The string must be empty! -
Diag_Allowed [n]	BOOL		- Reserved - (cannot be set)
Teleserv_Allowed [n]	BOOL		Activation of the TeleService user • 0 = user is deactivated • 1 = user is activated
FW_Load_Allowed [n]	BOOL		- Reserved - (cannot be set)

Field for setting the parameters for TeleService access (DNS name of the server)

Access data of the TeleService server (switching station).

In STEP 7, the corresponding data is located in the parameter area "TeleService settings".

If there is more than one TeleService server, use the field once per server.

Table 6- 21 IF_CONF_TS_Name

Parameter	Data type	Initial value	Description
Id	UINT	20	ID of the parameter field
Length	UINT		Length of the parameter field in bytes: 266
Mode	UINT		Validity (1: permanent, 2: temporary)
ts_name	String [254]		Name of the TeleService server that can be resolved by DNS
RemotePort	UINT		Port of the engineering station
Rank	UINT		Priority of the server [1] or [2] 1 = server 1, 2 = server 2

Field for setting the parameters for TeleService access (IP address of the server)

Access data of the TeleService server (switching station).

In STEP 7, the corresponding data is located in the parameter area "TeleService settings".

If there is more than one TeleService server, use the field once per server.

Table 6- 22 IF_CONF_TS_IF_V4

Parameter	Data type	Initial value	Description
Id	UINT	21	ID of the parameter field
Length	UINT		Length of the parameter field in bytes: 14
Mode	UINT		Validity (1: permanent, 2: temporary)
RemoteAddress	IP_V4		IP address of the TeleService server
RemotePort	UINT		Port of the TeleService server
Rank	UINT		Priority of the server [1] or [2] 1 = server 1, 2 = server 2

Service and maintenance

7

7.1 Diagnostics

The following diagnostics options are available:

LEDs of the module

For information on the LED displays, refer to the section LEDs (Page 22).

STEP 7: The "Diagnostics" tab in the Inspector window

Here, you can obtain the following information on the selected module:

- Entries in the diagnostics buffer of the CPU
- Information on the online status of the module

STEP 7: Diagnostics functions in the "Online > Online and diagnostics" menu

Here, you can obtain static information on the selected module:

- General information on the module
- Diagnostics status
- Information on the Telecontrol interface:
  - Network
  - Ethernet port
  - Statistics

You can obtain further information on the diagnostics functions of STEP 7 in the STEP 7 online help.

Diagnostics SMS message

The CP sends a diagnostics SMS message to a telephone with an authorized call number if it receives an SMS message with the following text from this telephone:

```
CPDIAG
```

The diagnostics SMS message that is then sent contains the following data of the S7 station:

- Firmware version of the CP 1242-7
- Mode of the CPU (RUN / STOP)
- Status of the GPRS connection

- Date and time of the last dial-in to the GSM network

  The data is specified in the ISO 8601 format ("Attach: YYYY-MM-DD hh:mm:ss").

  If the time-of-day of the CP has not been synchronized at the time of the dial-in, the time of the measurement since the beginning of the default time-of-day of the CP (01.01.2009) is transferred.

  If the last attempted dial-in to the GSM network was not successful, "Attach: -" is sent.
- Name of the current GSM network
- IP address of the CP
- Signal strength of the GSM network
  - weak: poor signal quality (-109 ... -91 dBm)
  - medium: medium signal quality (-89 ... -75 dBm)
  - good: good signal quality (-73 ... -53 dBm)
  - no signal: signal too weak to be received
- Received Signal Strength Indication (RSSI) - received field strength at the station [0 ... 31]
- Status of the connection to the telecontrol server or substitute server (only in "Telecontrol" mode)

If the data to be sent exceeds the default size of an SMS message, several SMS messages are sent.

7.2 Downloading firmware

New firmware versions

If a new firmware version is available for the module, you will find this on the Ethernet pages of the Siemens Automation Customer Support under the following ID:

45605894 (http://support.automation.siemens.com/WW/view/en/45605894)

On the Internet page, select the "Entry list" tab and the "Download" entry type. You will find the firmware file and a description of the procedure there.

You can recognize that firmware is being loaded by the flashing LEDs of the CP, see section LEDs (Page 22).

7.3 Module replacement

Module replacement

The STEP 7 project data of the CP is stored on the local CPU. If there is a fault on the device, this allows simple replacement of this communications module without needing to load the project data to the station again.

When the station starts up again, the new CP reads the project data from the CPU.

If you replace a module, remember to take the SIM card from the old module and insert it in the new CP.

⚠ WARNING

Read the system manual "S7-1200 Programmable Controller"

Prior to installation, connecting up and commissioning, read the relevant sections in the system manual "S7-1200 Programmable Controller" (refer to the documentation in the Appendix).

When installing and connecting up, keep to the procedures described in the system manual "S7-1200 Programmable Controller".

Make sure that the power supply is turned off when installing/uninstalling the devices.

Technical specifications

8

Table 8- 1 Technical specifications of the CP 1242-7

Technical specifications		
Order number	6GK7 242-7KX30-0XE0	
Wireless interface		
Antenna connector	Amount	1
	Design	SMA socket
	Nominal impedance	50 ohms
Frequency bands	GPRS	850, 900, 1800, 1900 MHz
Maximum transmit power	GSM 850, class 4	+33 dBm ±2dBm
	GSM 900, class 4	+33 dBm ±2dBm
	GSM 1800, class 1	+30 dBm ±2dBm
	GSM 1900, class 1	+30 dBm ±2dBm
GPRS	Properties	Multislot class 10 device class B coding scheme 1 to 4 (GMSK)
SMS	Properties	Mode outgoing: MO service: point-to-point
Electrical data		
External power supply	Power supply	24 VDC
	Permitted range	19.2 ... 28.8 V
	Design	Connector with terminal block, 3 terminals
	Cable cross-section	
	• Minimum	• 0.14 mm^2 (AWG 25)
	• Maximum	• 1.5 mm^2 (AWG 15)
	Max- tightening torque of the screw terminals	0.45 Nm (4 lb-in)
	Electrical isolation: Power supply unit to internal circuit	710 VDC for 1 minute
Current consumption (typical)	From 24 VDC	100 mA
	From the S7-1200 backplane bus	0 mA
Effective power loss (typical)	From 24 VDC	2.4 W
	From the S7-1200 backplane bus	0 W

Technical specifications		
Permitted ambient conditions		
Ambient temperature	During operation with the rack installed horizontally	0 °C to +55 °C
	During operation with the rack installed vertically	0 °C to +45 °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
Design, dimensions and weight		
Module format	Compact module for S7-1200, single width	
Degree of protection	IP20	
Weight		
• Net weight	• 133 g	
• Weight including packaging	• 170 g	
Dimensions (W x H x D)	30 x 100 x 75 mm	
Installation options	Standard DIN rail Switch panel	

You will find additional functions and performance data in the section Application and properties (Page 9).

Dimension drawings

A

Note

All dimensions in the drawings are in millimeters.

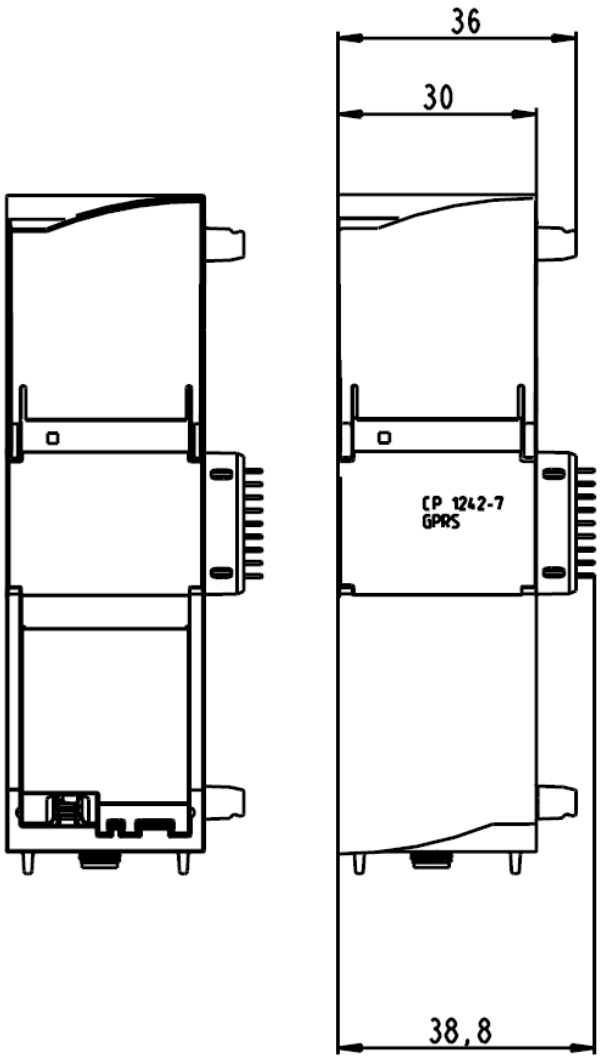


Figure A-1 CP 1242-7 - front view

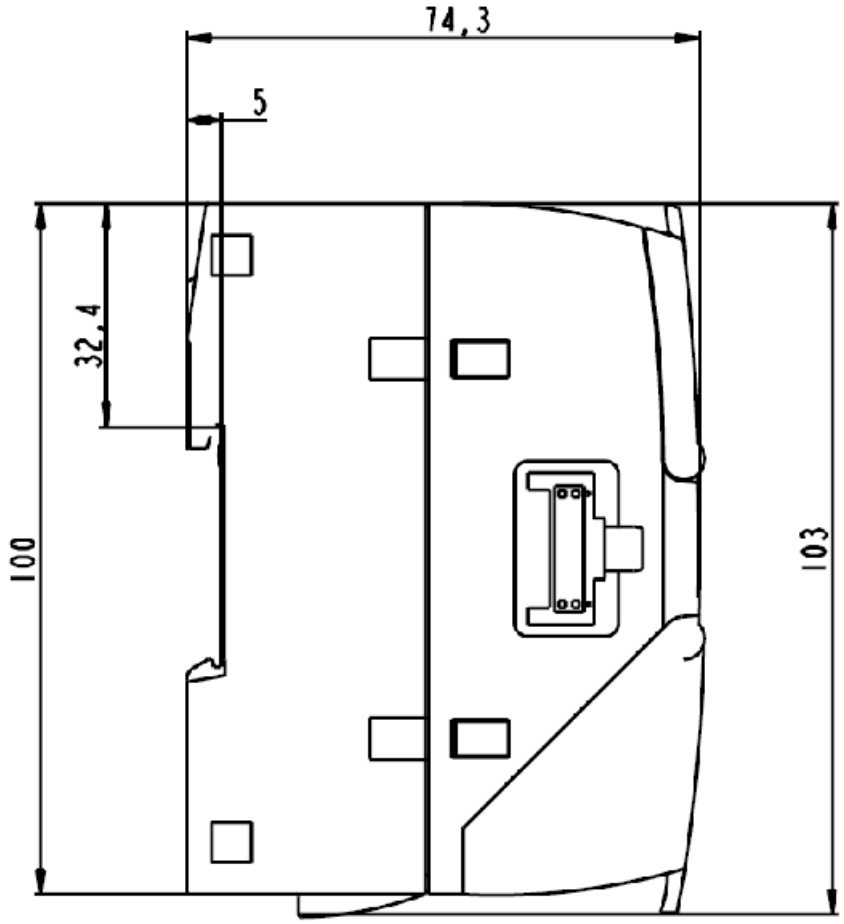


Figure A-2 CP 1242-7 - side view left

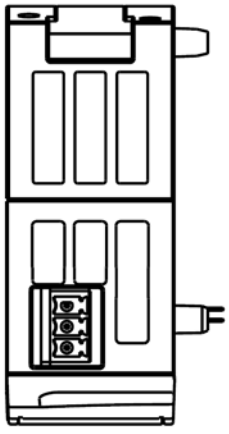


Figure A-3 CP 1242-7 - view from above

Approvals

B

B.1 Certification

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.

National approvals

You will find an overview of the country-specific wireless approvals of SIMATIC NET devices with GSM or UMTS services on the Internet pages of Siemens Automation Customer Support. You will find the link to the document on the following page:

ik-Info (www.siemens.com/simatic-net/ik-info)

Other 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 Automation Customer Support:

45605894 (http://support.automation.siemens.com/WW/view/en/45605894)

Under this entry, go to the relevant product and select the following settings: "Entry list" tab > entry type "Certificates".

Approvals for SIMATIC NET products

You will find an overview of the approvals for SIMATIC NET products including approvals for shipbuilding on the Internet pages of Siemens Automation Customer Support under the following entry ID:

57337426 (http://support.automation.siemens.com/WW/view/en/57337426)

Overview of approvals and standards

The CP 1242-7 has the following approvals and meets the following standards:

- cULus LISTED IND. CONT. EQ. for HAZ.LOC.
- FM: No. 3600 and 3611
- ATEX: KEMA 10 ATEX 0166X
- EU directives and standards
  - EU Directive 2004/108/EEC "Electromagnetic Compatibility" (EMC Directive)
  - EU Directive 2002/95/EC (RoHS)
  - EC Directive 1999/5/EC (R&TTE)
  - Electromagnetic compatibility (EMC) according to the following standards:

    EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-11, EN 61000-6-4
  - Use in industrial environments according to EN 61000-6-4:2007 and EN 61000-6-2:2005
- C-TICK

EC 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.

- EU directive 2006/95/EEC "Electrical Equipment Designed for Use within Certain Voltage Limits" (Low Voltage Equipment Directive)
- EN 60950-1 Information Technology Equipment - Safety
- EU Directive 2004/108/EEC "Electromagnetic Compatibility" (EMC Directive)
  - Emission
    EN 61000-6-4:2007: Industrial area
  - Immunity
    EN 61000-6-2:2005: Industrial area
- EU directive 94/9/EC "Equipment and protective systems intended for use in potentially explosive atmospheres" (ATEX Explosion Protection Directive)
  - EN 60079-15:2005: Type of protection 'n':
- Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE)

The EC Declaration of Conformity is available for all responsible authorities at:

Siemens Aktiengesellschaft
Industry Automation
Industrielle Kommunikation SIMATIC NET
Postfach 4848
D-90327 Nürnberg
Germany

You will find the EC Declaration of Conformity for this product on the Internet at the following address:

10805878 (http://support.automation.siemens.com/WW/view/en/10805878) → Tab "Entry List"

Filter settings:
Entry type: "Certificates"
Certificate Type: "Declaration of Conformity"
Search items(s): <name of the module>

cULus approval

Underwriters Laboratories Inc. meets

- Underwriters Laboratories, Inc.: UL 508 Listed (industrial control devices)
- Canadian Standards Association: CSA C22.2 Number 142 (process control equipment)

FM certification

Factory Mutual Research (FM):
Approval Standard Class number 3600 and 3611
Approved for use in:
Class I, Division 2, Group A, B, C, D, Temperature Class T4A, Ta = 55 °C
Class I, Zone 2, Group IIC, Temperature Class T4, Ta = 55 °C

ATEX approval

ATEX approval: II 3 G Ex nA II T4

Test number: KEMA 10 ATEX 0166X

EN 60079-0:2006: Potentially explosive atmosphere - general requirements

EN 60079-15:2005: Electrical apparatus for explosive gas atmospheres; type of protection 'n'

Over and above this, the following conditions must be met for the safe deployment of the CP:

- Install the modules in a suitable enclosure with degree of protection of at least IP54 to EN 60529 and take into account the environmental conditions for operation of the devices.
- If the rated temperatures of 70°C at the cable entry or 80°C at the branching point of the wires are exceeded, the permitted temperature range of the selected cable must be suitable for the actual measured temperatures.
- Measures must be taken to prevent the rated voltage being exceeded by more than 40% due to transient disturbances.

C-Tick approval

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

B.2 Standards and test specifications

The device meets the following standards and test specifications. The test criteria for the device are based on these standards and test specifications.

Industrial environments

The CP was developed for use in industrial environments.

Application	Requirements for emissions	Requirements for immunity
Industry	EN 61000-6-4:2007	EN 61000-6-2:2005

Electromagnetic compatibility (EMC)

The electromagnetic compatibility (EMC) of an electrical device is its capability of functioning as intended in an electromagnetic environment without emitting electromagnetic interference that could impair the operation of other electrical devices in the vicinity.

Electromagnetic compatibility - immunity	
EN 61000-4-2 Electrostatic discharge	• 8 kV air discharge on all surfaces • 4 kV contact discharge with free conductive surfaces
EN 61000-4-3 Radiated electromagnetic field	• 300 MHz to 2 GHz, 10 V/m, 80 % AM at 1 kHz • 2.0 to 2.7 GHz, 3 V/m, 80 % AM at 1 kHz
EN 61000-4-4 Fast transient bursts	• 2 kV, 5 kHz with coupling network to AC and DC system voltage • 2 kV, 5 kHz with coupling terminal to inputs/outputs
EN 61000-4-5 Surge immunity (power supply)	DC systems - 2 kV common mode, 1 kV push-pull For DC systems (DC power supplies), external protection is necessary.

Electromagnetic compatibility - immunity	
EN 61000-4-6 Conducted disturbances	150 kHz to 80 MHz, 10 V RMS, 80 % AM at 1 kHz
EN 61000-4-11 Voltage dips	DC systems 0 % for 1 cycle, 40 % for 12 cycles and 70 % for 30 cycles at 60 Hz

Electromagnetic compatibility - emission	
Conducted emissions	EN 61000-6-4, Class A
Emitted radiation	EN 61000-6-4, Class A

Environmental conditions

Environmental conditions - transportation and storage	
EN 60068-2-2, Test Bb, dry heat and EN 60068-2-1 Test Ab, cold	-40°C to +70°C
EN 60068-2-30, Test Db, damp heat	25°C to 55°C, 95% humidity
EN 60068-2-14, Test Na, temperature shock	-40°C to +70°C, dwell time 3 hours, 2 cycles
EN 24180-2 Free fall	0.3 m in dispatch packaging
Atmospheric pressure	1 080 to 660 hPa (corresponding to an altitude of -1 000 to 3 500 m)

Environmental conditions - operation	
Ambient temperatures / air humidity (inlet air 25 mm below device)	0 °C to 55 °C for horizontal installation of the rack 0 °C to 45 °C for vertical installation of the rack 95% relative humidity, non-condensing
Atmospheric pressure	1080 to 795 hPa (corresponding to an altitude of -1000 to 2000 m)
EN 60068-2-14, Test Nb, temperature change	5°C to 55°C, 3°C/minute
EN 60068-2-27 Mechanical shock	15 g, 11 ms pulse, 3 positive and 3 negative shocks in each of the 3 axes (half sine)
EN 60068-2-6 Sinusoidal vibration	DIN rail mount: 7 mm from 5 to 8.51 Hz, 10 m/s^2 from 8.51 to 150 Hz, 1 octave/minute

High voltage isolation test	
Circuit with 24 V/5 V rated voltage	520 VDC (type test of optical electrical isolation limits)

Protection class

- Protection class III according to EN 60950-1 (protective conductor not required)

Degree of protection

- Mechanical protection to EN 60529: IP20

  Protects against finger contact with high voltage as tested by standard probe. External protection required for dust, dirt, water and foreign objects of < 12.5 mm in diameter.

Rated voltage

Rated voltage	Tolerance
24 VDC	19.2 to 28.8 VDC

Accessories

C

C.1 Antennas

GSM/GPRS antennas

The following antennas are available for use in GSM/GPRS networks and can be installed both indoors and outdoors. The antennas must be ordered separately.

Antenna ANT794-4MR



Figure C-1 Antenna ANT794-4MR

Short name	Order no.	Explanation
ANT794-4MR	6NH9 860-1AA00	Quadband antenna (900, 1800/1900 MHz, UMTS); weatherproof for indoor and outdoor areas; 5 m connecting cable connected permanently to the antenna; SMA connector, including installation bracket, screws, wall plugs

You will find detailed information in the device manual. You will find this on the Internet on the pages of Siemens Industrial Automation Customer Support under the following entry ID:

23119005 (http://support.automation.siemens.com/WW/view/en/23119005)

Flat antenna ANT794-3M

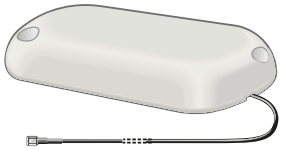


Figure C-2 Flat antenna ANT794-3M

Short name	Order no.	Explanation
ANT794-3M	6NH9 870-1AA00	Flat antenna (900, 1800/1900 MHz); weatherproof for indoor and outdoor areas; 1.2 m connecting cable connected permanently to the antenna; SMA connector, including adhesive pad, screws mounting possible

You will find detailed information in the device manual. You will find this on the Internet on the pages of Siemens Industrial Automation Customer Support under the following entry ID:

48729835 (http://support.automation.siemens.com/WW/view/en/48729835)

Technical specifications of the ANT794-4MR GSM/GPRS antenna

ANT794-4MR	
Order number	6NH9860-1AA00
Mobile wireless networks	GSM/GPRS
Frequency ranges	• 824 to 960 MHz (GSM 850, 900) • 1 710 to 1 880 MHz (GSM 1 800) • 1 900 to 2 200 MHz (GSM / UMTS)
Characteristics	Omnidirectional
Antenna gain	0 dB
Impedance	50 ohms
Standing wave ratio (SWR)	< 2,0
Max. power	20 W
Polarity	Linear vertical
Connector	SMA
Length of antenna cable	5 m
External material	Hard PVC, UV-resistant
Degree of protection	IP65
Permitted ambient conditions	
• Operating temperature	• -40 °C to +70 °C
• Transport/storage temperature	• -40 °C to +70 °C
• Relative humidity	• 100 %
External material	Hard PVC, UV-resistant

ANT794-4MR	
Construction	Antenna with fixed HF cable and SMA male connector
Dimensions (D x H) in mm	25 x 193
Weight	
• Antenna incl. cable	• 310 g
• Fittings	• 54 g
Installation	With supplied bracket

Technical specifications of the flat antenna ANT794-3M

Order number	6NH9870-1AA00	
Mobile wireless networks	**GSM 900**	**GSM 1800/1900**
Frequency ranges	890 - 960 MHz	1710 - 1990 MHz
Standing wave ratio (VSWR)	≤ 2:1	≤ 1,5:1
Return loss (Tx)	≈ 10 dB	≈ 14 dB
Antenna gain	0 dB	
Impedance	50 ohms	
Max. power	10 W	
Antenna cable	HF cable RG 174 (fixed) with SMA male connector	
Cable length	1.2 m	
Degree of protection	IP64	
Permitted temperature range	-40°C to +75°C	
Flammability	UL 94 V2	
External material	ABS Polylac PA-765, light gray (RAL 7035)	
Dimensions (W x L x H) in mm	70.5 x 146.5 x 20.5	
Weight	130 g	

C.2 TS Gateway

Use of TS Gateway

TS Gateway is an application used for TeleService connections via GPRS with remote SIMATIC stations of the type S7-1200.

What is a TeleService gateway?

A TeleService gateway is a PC on which the "TS Gateway" software is installed.

The TeleService gateway is not configured in STEP 7.

What functions does the TeleService gateway provide?

The TeleService gateway has the following functions:

- Switching station

  The TeleService gateway is a PC in the network that serves as the intermediary between the engineering station and remote S7 station.

  Since a firewall is normally closed for connection requests from the outside, a switching station between the remote station and the engineering station is required. This switching station can be a telecontrol server or, if there is no telecontrol server in the configuration, a TeleService gateway. The switching station directs the messages via a tunnel through the firewall. This allows access by the engineering station connected to a LAN to the S7-1200 via a router and via the APN of the network provider.

- Configuration of the SMS gateway provider

  With the help of TS Gateway, SMS gateway providers are configured that are necessary for the sending of wake-up SMS messages to the remote S7 stations.

Configuration with TeleService gateway

A TeleService gateway is intended for the following telecontrol systems in which TeleService is used with GPRS:

- Configurations without a telecontrol server

  In configurations without a telecontrol server, a TeleService gateway is required for TeleService via GPRS.

- Configurations with telecontrol server

  In configurations in which a second path needs to be established for TeleService via GPRS alongside the telecontrol server, a TeleService gateway can be used.

  This can, for example, be the case when certain people, groups or companies should not operate TeleService via the telecontrol server or when access to the stations for TeleService needs to be set up independent of the telecontrol server.

Range of performance of a TS Gateway

- Number of simultaneous TeleService connections: 1

Note

TS Gateway only for TeleService

TS Gateway is used only for the "TeleService" function via GPRS. No connections to the remote stations can be monitored and no process data can be transferred.

Main and substitute TeleService gateway

If the requirements for availability are higher, you can install TS Gateway as the main or substitute gateway. If the connection via the main system cannot be established, you can establish the TeleService connection via the substitute system. In terms of the range of functions, both systems are identical and do not monitor each other.

Requirements for TeleService with the TeleService gateway

The following requirements must be met for TeleService via a TeleService gateway:

- Engineering station connected to a LAN or with Internet access

  The engineering Station on which TeleService will be operated via GPRS requires STEP 7, version V11.0 SP1 or higher. For STEP 7 V11.0 SP1, support package "CP 1242-7" (HSP0003001) is also required.

  TeleService is started in the STEP 7 project that contains the remote station with the CP 1242-7.

- SIMATIC S7-1200
  - CPU with firmware version as of V2.0
  - Communications processor CP 1242-7
- PC for the TeleService gateway with:
  - DVD drive
  - Connection to LAN or Internet access for connecting to the engineering station
  - Internet access for connecting to the remote S7 station
  - Installation of the "TS Gateway" application

    The software ships with the CP 1242-7 (see product DVD).

References

D

Where to find Siemens documentation

- You will find the order 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 find SIMATIC NET manuals on the Internet pages of Siemens Automation Customer Support: Link to Customer Support (http://support.automation.siemens.com/WW/view/en)

  Enter the entry ID of the relevant manual as the search item. The ID is listed below some of the reference entries in brackets.

  As an alternative, you will find the SIMATIC NET documentation on the pages of Product Support:

  10805878 (http://support.automation.siemens.com/WW/view/en/10805878)

  Go to the required product group and make the following settings:

  "Entry list" tab, Entry type "Manuals / Operating Instructions"

  You will find the documentation for the SIMATIC NET products relevant here on the data medium that ships with some products:
  - Product CD / product DVD or
  - SIMATIC NET Manual Collection

/1/

SIMATIC
S7-1200 Programmable Controller
System Manual
Siemens AG
order number: 6ES7298-8FA30-8BH0
Entry ID: 36932465 (http://support.automation.siemens.com/WW/view/en/36932465)

/2/

SIMATIC NET
TELECONTROL SERVER BASIC
Operating Instructions
Siemens AG
Entry ID: 42674775 (http://support.automation.siemens.com/WW/view/en/42674775)

/3/

SIMATIC NET
TS Gateway
Operating Instructions
Siemens AG
Entry ID: 48548898 (http://support.automation.siemens.com/WW/view/en/48548898)

Glossary

CM

Communications module

Module for communications tasks that is used in an automation system as an interface expansion of the CPU. Same interface types of a CPU and a CM are functionally identical.

CMT

Configuration and Monitoring Tool

Program user interface of TELECONTROL SERVER BASIC. Used for configuration of the telecontrol server and monitoring of the connections to the remote stations.

CP

Communications processor

Module for expanded communications tasks that provides the CPU with additional interface types or communications options.

Direct communication

With direct communication, the S7 stations communicate directly with each other without the frames needing to be forwarded by a master station or station.
Compare "inter-station communication"
Context: Telecontrol / SINAUT

GPRS

General Packet Radio Service

Packet-oriented service for IP-based data transmission in GSM networks. GPRS data packets can also be transferred via the Internet. The data is transmitted using the Internet protocols TCP/IP or UDP/IP.

GPRS direct (mode)

Mode of the CP 1242-7 for direct communication between remote S7 stations via the GSM network. This mode is selected when it is known that the communications partner can be reached using a fixed IP address. This is made possible by the services of the network provider. No telecontrol server is necessary.

GPRS station

Remote S7 station with a GPRS-compliant communications module

Inter-station communication

With inter-station communication, S7 stations communicate with each other by having an intermediary forward the frames to the relevant destination node.
Compare "direct communication"
Context: Telecontrol / SINAUT

MCC - Mobile Country Code

→ *PLMN*

MNC - Mobile Network Code

→ *PLMN*

PLMN

Public Land Mobile Network

Worldwide unique identifier of mobile wireless networks. The PLMN is made up of the three-digit Mobile Country Code (MCC) and the two-or three-digit Mobile Network Code (MNC) of the network provider.

TCSB

→ *TELECONTROL SERVER BASIC*

Telecontrol server

PC for monitoring and control of remote S7 stations linked via a public GSM network for GPRS communication. The telecontrol server is normally a centrally deployed PC with a connection to the Internet on which the "TELECONTROL SERVER BASIC" application is installed. The telecontrol server is not configured in STEP 7.

TELECONTROL SERVER BASIC

Software for GPRS communication between remote stations and the central telecontrol server. Via the integrated OPC server of TCSB, data can be exchanged with the OPC client of a central control system. TCSB allows TeleService from S7-1200 stations with a CP 1242-7 via GPRS. Communication can be handled via public networks such as GSM networks or via the Internet without requiring addressing of the remote S7 stations using fixed IP addresses.

Telecontrol(mode)

Mode of the CP 1242-7 for GPRS communication between a remote S7 station and the following partners:

- Communication with a telecontrol server
- Communication with other remote GPRS stations (inter-station communication)

  In communication with other remote GPRS stations, the frames are sent via the telecontrol server.

TeleService gateway

PC in the network as intermediary between the engineering station and remote S7-1200 with CP 1242-7. The "TS Gateway" software is installed on the PC. TS Gateway is used only for the "TeleService" function via GPRS. No process data can be transferred with TS Gateway. The TeleService gateway is not configured in STEP 7.

TeleService server

Switching station for data transmission between the engineering station and remote S7 station. This can be a telecontrol server or a TeleService gateway.

TS Gateway

Application on a TeleService gateway

Index

A

Access ID, 45
Acknowledgment of frames, 43
ATEX, 28
Authorized phone numbers, 38

C

CDMA, 9
Connection abort, 42, 53
Connection establishment active/passive, 11
Connection interrupted, 36
Connection modes, 36
Connection resources, 11
Contact, 6
Cyclic communication, 46
Cyclic data exchange, 46

D

Data buffering, 12, 42
Degree of protection, 96
Dimensions, 31
Direct communication, 9
DNS server, 51

E

Electromagnetic compatibility (EMC), 94
EMC, 94
Environmental conditions, 94, 95
Establishing TeleService connection, 40

F

Firmware version, 3
Frame buffer, 12, 42

G

Glossary, 5
GPRS direct (mode), 36

H

Hardware identifier, 55, 57, 60, 64, 70, 71, 72, 73
Hardware product version, 3
Hazardous area, 27

I

Image on the CP, 43
Inserting/removing a SIM card, 29
Instructions, 13
Inter-station communication, 9
Item name (read job), 46

L

Load to device, 41

M

Main gateway, 101

N

NTP, 11

O

OPC client:Item name, 46
OPC, configuration, 16
Operating states, 23

P

Passwords, 51
Permanent connection, 36
Permanent station, 36
Phone number of the CP (SIM card), 49
PIN
    Configuration, 50
    Incorrect entry, 50
Process image, 43
Program blocks, 13
Protection class, 95

R

Rated voltage, 96
Reading out the time, 48
Receiving SMS messages, 63
RemoteWdcAddress, 45
Replacing a module, 85
Right to wake up, 38

S

Safety notices, 27
Sending SMS messages, 59
Server password, 51
SIMATIC NET glossary, 5
SMS gateway, 39
SMS text, 61, 65, 72
STEP 7 version, 13
Substitute gateway, 101
Support, 6
Support package (HSP), 13, 101

T

TC_CONFIG:Application example, 53
Telecontrol (mode), 35
Telecontrol connection, 12
Telecontrol server, 35
TELECONTROL SERVER BASIC, 35
TeleService, 49
TeleService gateway, documentation, 14
TeleService via GPRS, 10
Temporary connection, 11, 36
Temporary station, 36
Time synchronization, 11
Training, 6
TS Gateway, 101
TS gateway, documentation, 14

W

Wake-up SMS, 39