SIEMENS

SIMATIC NET

S7 CPs for PROFIBUS CP 443-5 Extended

Manual

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

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with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

CAUTION

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

NOTICE

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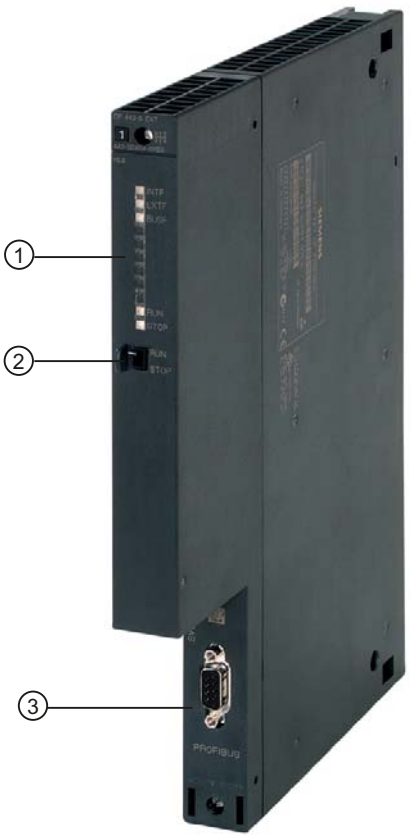
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Product overview and notes

CP 443-5 Extended



① LED displays
② Mode selector
③ PROFIBUS interface (9-pin D-sub socket)

Product name

This manual contains information on the following product:

- CP 443-5 Extended

  Order number: 6GK7 443-5DX05-0XE0

  Hardware product version 1 and firmware version V7.0 for SIMATIC S7-400 / S7-400H

Note

Names

- In this document, the term "CP" is used at times instead of the full product name.
- Instead of the full names of the configuration tools STEP 7 V5.5 and STEP 7 Professional, the name STEP 7 verwendet is used.

Structure of the documentation

The documentation for this device consists of the following parts:

- Manual Part A - Configuration manual "Configuring and Commissioning S7 CPs for PROFIBUS"

  You will find this manual on the Manual DVD that ships with every CP or on the Internet under the following entry ID:

  1158693 (http://support.automation.siemens.com/WW/view/de/1158693)
- Manual Part B - Manual "S7 CPs for PROFIBUS CP 443-5 Extended" (this manual)

Compatibility with predecessor versions

NOTICE
Compatibility with previous versions Read the information relating to enhanced functions and any restrictions that may apply in the sectionCompatibility with previous product (Page 31).

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 DVD

  The DVD ships with most 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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Properties / services

1

1.1 Application

Automation system

The CP 4435 Extended communications processor is designed for use in a SIMATIC S7400 (standard) and S7400H (faulttolerant system) automation system. The CP 443-5 Extended allows the S7400 / S7400H to be connected to a PROFIBUS fieldbus system.

You can use the CP as a router for data records intended for field devices (for example DP slaves).

1.2 Communication services

Supported communications services

The current version of the CP 4435 Extended supports the following communication services in the standard and H systems:

- **PROFIBUS DP with the following characteristics:**
  - DP master (class 1) (redundant operation in faulttolerant system also possible)
  - Direct data exchange (DP slave to DP slave)

    As a DP master, the CP 4435 Extended is capable of enabling direct data exchange for "its" DP slaves.
  - SYNC / FREEZE

    The outputs or inputs can be synchronized by the user program using system function SFC11.

    (Refer to the information in sections Table 2-1 Use with the current CPU types (Page 12) and Table 2-2 Use with no longer available CPU types - part 1 (Page 13))
  - Constant bus cycle time (only in the standard system)

    The ability to set a constant bus cycle time means that the DP master always starts the DP bus cycle after the same interval.
  - Selectable DP modes:

DPV1 functionality (default in STEP 7)	**S7-compatible**
DP master mode for • DP slaves complying with the PROFIBUS DP-V0 and DPV1 standard • Siemens DP slaves Refer to the information about the required CPU in: • Table 2-1 Use with the current CPU types (Page 12) • Table 2-3 Use with no longer available CPU types - part 2 (Page 14)	DP master mode for • DP Slaves complying with the PROFIBUS DPV0 standard (DP slaves complying with the DPV1 standard can only be used with restricted functionality) • Siemens DP slaves

(For more information on the topic of DPV1, refer to the STEP 7 online help)

- **CiR (Configuration in RUN) - in the standard system**

  By making a change to the configuration with CiR (Configuration in RUN), it is possible to put a DP slave / DP slot extension into operation or take it out of operation when necessary while the system is running.

  In other words, you can configure and activate additional DP slaves or DP slots while the S7 station is in RUN.

- **Enabling /disabling DP slave - in the standard system**

  DP slaves can be activated and deactivated by the user program using system function SFC12.

- **Diagnostics requests**

  As a DP master (class 1), the CP 4435 supports diagnostics requests of a DP master (class 2).

- **Getting the bus topology in a DP master system**

  The CP 443-5 Extended operating as DP master supports the measurement of the PROFIBUS bus topology in a DP master system using a diagnostics repeater (DP slave).

  System function SFC103 in the user program can instruct diagnostics repeaters to measure the PROFIBUS BUS topology in a DP master system. When completed, the results of the measurements made by the diagnostics repeater can then be read in and processed by the user program.

- **Open communications services (SEND/RECEIVE interface) over FDL connections of the following type:**
  - Specified FDL connections
  - Free layer 2 connections
  - Broadcast
  - Multicast

- **S7 communication and PG/OP communication**
  - PG functions with uploading / downloading of FM modules, configuration / diagnostics and routing

    Note on routing: Dynamic switchover to alternative paths (for example if there is a problem on one of the possible transmission paths) is not supported.
  - Operator control and monitoring functions (HMI)
  - Download S7 connections and gateways in RUN.
  - Client and server for data exchange on S7 connections using communications function blocks (faulttolerant S7 connections also possible)
- **Timeofday synchronization via PROFIBUS**
  - The CP forwards timeofday synchronization frames from the LAN to the station (CPU = time slave) or from the station to the LAN (CPU= time master).

    Another option is for this station to be synchronized via a different LAN. The timeofday synchronization frame must be forwarded over PROFIBUS for the synchronization of further stations.
  - The CP supports time stamping of distributed process signals in conjunction with the IM 153.
  - Timeofday status value (standard/daylight saving time switchover, synchronization status).
- **Data record routing**

  You can use the CP as a router for data records intended for field devices (for example DP slaves). SIMATIC PDM (Process Device Manager) is a tool that creates data records of this type for assigning parameters to field devices.

The services of the CP 4435 Extended module listed above can be used independently at the same time.

Replacing a module without a programming device

When installing the CP 4435 Extended, the configuration data of the CP is always stored in the CPU. This means that replacing modules is possible without having to download the configuration data from the PG.

Storage of the configuration data is protected from power failure by the battery backup or the flash memory card in the CPU.

Requirements for use

2

The CP 4435 Extended described here is supported by all CPU operating systems in the versions listed in Tables 2-1 and 2-2 below.

2.1 Use with the current CPU types

Configuration limits

To use the CP type described here, the following limits and constraints apply within a rack:

- Number of operable CPs: 14
- Max. number of external DP lines (CP as DP master): 10

NOTICE
The number CPs that can be operated as DP masters depends on the number of CP 443-1 Advanced modules operated as PROFINET IO controllers in the S7-400 station. In total, 10 CPs can be operated as: • PROFINET IO controllers (CP 443-1 Advanced) - maximum 4 • DP masters (CP 443-5 Extended) - maximum 10

- Multicomputing is supported (except with CiR and H systems)

System environment

The CP 4435 Extended is supported by the S7-400 CPUs and CPU operating systems with the order numbers and versions listed in the table below.

From the table, you can see which functionality is supported when you use the CP 4435 Extended V 6.1 with the various CPU types. The following characteristics are shown:

- CPU type, order number and version
- Option of multicomputing
- The number of AG_SEND or AG_RECV calls on the SEND/RECEIVE interface that can be active at the same time (data exchange on FDL connections over PROFIBUS and corresponding connections over Industrial Ethernet)
- CPU support for SYNC/FREEZE functionality (SFC11) via the CP
- CPU support of the "activate / deactivate DP functionality (SFC12)" via the CP
- CPU support of the functionality for "identifying the bus topology in a DP master system" (SFC103) via the CP

- DPV1 functionality
- CiR functionality (DP slave / DP slot, configurable extension)

NOTICE
ET 200M devices that were assigned to SYNC/FREEZE groups with STEP 7, must **not** have modules of the type FM or CP inserted.

Table 2- 1 Use with the current CPU types

CPU	Order number of the CPU: 6ES7...	Firmware version	Number of AG_SEND or AG_RECV calls at same time	a = SYNC/FREEZE functionality b = DP-V1 functionality c = CiR / HCiR functionality [1)] d = enable / disable DP slaves e = identify bus topology				
				a	b	c	d	e
CPU412	.. 412-1XF04-0AB0	as of V4.0	24 /24	+	+	+	+	-
		as of V4.1	24 /24	+	+	+	+	+
CPU412-2	..412-2XG04-0AB0	as of V4.0	24 /24	+	+	+	+	-
		as of V4.1	24 /24	+	+	+	+	+
CPU414-2	..414-2XG04-0AB0	as of V4.0	24 /24	+	+	+	+	-
		as of V4.1	24 /24	+	+	+	+	+
CPU414-3	..414-3XJ04-0AB0	as of V4.0	24 /24	+	+	+	+	-
		as of V4.1	24 /24	+	+	+	+	+
CPU414-4H	..414-4HJ04-0AB0	as of V4.0	24 /24	+	+	+	+	-
		as of V4.0.5	24 /24	-	+	+	-	+
CPU416-2	..416-2XK04-0AB0	as of V4.0	64 / 64	+	+	+	+	-
		as of V4.1	64 / 64	+	+	+	+	+
CPU416-3	..416-3XL04-0AB0	as of V4.0	64 / 64	+	+	+	+	-
		as of V4.1	64 / 64	+	+	+	+	+
CPU416F-2	..416-2FK04-0AB0	as of V4.0	64 / 64	+	+	+	+	-
		as of V4.1	64 / 64	+	+	+	+	+
CPU417-4	..417-4XL04-0AB0	as of V4.0	64 / 64	+	+	+	+	-
		as of V4.1	64 / 64	+	+	+	+	+
CPU417-4H	..417-4HL04-0AB0	as of V4.0	64 / 64	-	+	+	-	-
		as of V4.0.5	64 / 64	-	+	+	-	+

Legend:

+ => The characteristic is supported / the listed mode is possible

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

[1)] All CPUs are capable of CiR (the H-CPUs HCiR).

2.2 Converting older systems

In conjunction with the CP 443-5 Extended V 7.0, the functionality supported by the discontinued CPU types listed in Table 2-2 is as follows:

- **No** DPV1 functionality
- **No** CiR functionality (DP slave / DP slot, configurable extension)
- **No** identification of the bus topology by the user program
- Max. number of external DP lines per station: 4
- Number of operable CPs: 8
- Multicomputing

Table 2- 2 Use with no longer available CPU types - part 1

CPU	Order number	Version	Number of AG_SEND or AG_RECV calls at same time	SYNC / FREEZE
CPU412	6ES7 412-1XF01-0AB0	2 or higher	12 / 12	-
	6ES7 412-1XF02-0AB0	2 or higher	12 / 12	+
CPU413	6ES7 413-1XG01-0AB0	2 or higher	12 / 12	-
	6ES7 413-1XG02-0AB0	1 or higher	12 / 12	+
CPU413-2	6ES7 413-2XG01-0AB0	2 or higher	12 / 12	-
	6ES7 413-2XG02-0AB0	1 or higher	12 / 12	+
CPU414-1	6ES7 414-1XG01-0AB0	2 or higher	12 / 12	-
	6ES7 414-1XG02-0AB0	2 or higher	12 / 12	+
CPU414-2	6ES7 414-2XG01-0AB0	2 or higher	12 / 12	-
128 KB	6ES7 414-2XG02-0AB0	2 or higher	12 / 12	+
CPU414-2	6ES7 414-2XJ00-0AB0	4 or higher	12 / 12	-
384 KB	6ES7 414-2XJ01-0AB0	2 or higher	12 / 12	+
CPU416-1	6ES7 416-1XJ01-0AB0	2 or higher	32 / 32	-
	6ES7 416-1XJ02-0AB0	1 or higher	32 / 32	+
CPU416-2	6ES7 416-2XK00-0AB0	4 or higher	32 / 32	-
0.8 MB	6ES7 416-2XK01-0AB0	1 or higher	32 / 32	+
CPU416-2	6ES7 416-2XL00-0AB0	4 or higher	32 / 32	-
1.6 MB	6ES7 416-2XL01-0AB0	1 or higher	32 / 32	+

Legend:

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

Table 2- 3 Use with no longer available CPU types - part 2

CPU	Order number of the CPU: 6ES7...	Firmware version	Number of AG_SEND or AG_RECV calls at same time	a = SYNC/FREEZE functionality b = DP-V1 functionality c = CiR / HCiR functionality 1) d = enable / disable DP slaves e = identify bus topology				
				a	b	c	d	e
CPU412	..412-1XF03-0AB0	as of V3.1	24 / 24	+	+	+	+	-
CPU412-2	..412-2XG00-0AB0	as of V3.1	24 / 24	+	+	+	+	-
CPU414-2	..414-2XG03-0AB0	as of V3.1	24 / 24	+	+	+	+	-
CPU414-3	..414-3XJ00-0AB0	as of V3.1	24 / 24	+	+	+	+	-
CPU414-4H	..414-4HJ00-0AB0	as of V3.1	24 / 24	-	+	+	-	-
CPU416-2	..416-2XK02-0AB0	as of V3.1	64 / 64	+	+	+	+	-
CPU416-3	..416-3XL00-0AB0	as of V3.1	64 / 64	+	+	+	+	-
CPU416F-2	..416-2FK02-0AB0	as of V4.0	64 / 64	+	+	+	+	-
CPU417-4	..417-4XL00-0AB0	as of V3.1	64 / 64	+	+	+	+	-
CPU417-4H	..417-4HL00-0AB0	as of V2.1	64 / 64	-	-	+	-	-
	..417-4HL01-0AB0	as of V3.1	64 / 64	-	+	+	-	-

Legend:

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

1) All CPUs are capable of CiR (the H-CPUs HCiR).

2.3 Project engineering

Configuration and downloading the configuration data

The following version of STEP 7 is required:

STEP 7 version	Functions of the CP
STEP 7 as of V5.5 SP1	The functional range of the following CP type can be configured: • 6GK7 443-**5DX05**-0XE0
STEP 7 Professional V11 SP1	The functional range of the following CP type can be configured: • 6GK7 443-**5DX04**-0XE0

Depending on what is available on your PG / PC and the S7-300 station, use one of the following connectors to load the configuration data: MPI, Industrial Ethernet or PROFIBUS.

NOTICE
Changing bus parameters If you change the bus parameters in the configuration data, you must not load this configuration data on the CP via PROFIBUS!

2.4 Programming

Program blocks

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

Refer to the documentation of the program blocks in the online help of STEP 7 or in the manual "/7/ (Page 39)".

NOTICE
We recommend that you always use the latest block versions for all module types. You will find information on the current block versions and the current blocks to download from the Internet in our Customer Support under entry ID: 8797900 (http://support.automation.siemens.com/WW/news/de/8797900) With older module types, this recommendation assumes that you are using the latest firmware for the particular module type.

Program blocks for open communications services

Program block	Meaning
AG_SEND (FC5)	Send data
AG_RECV (FC6)	Receive data
AG_LSEND (FC50)	Send data
AG_LRECV (FC60)	Receive data

Program blocks for S7 communication

Program block	Meaning
USEND (SFB 8) / URCV (SFB 9)	Uncoordinated sending / receipt of data
BSEND (SFB 12) / BRCV (SFB 13)	Block-oriented sending / receipt of data

Program block	Meaning
PUT (SFB 14) / GET (SFB 15)	Write data to a remote CPU / read data from a remote CPU
START (SFB 19) / STOP (SFB 20)	Run a warm restart / stop on a remote device.
RESUME (SFB 21)	Run a hot restart on a remote device.
STATUS (SFB 22)	Query the device status of a remote partner.
USTATUS (SFB 23)	Receive the status change of a remote device.
CONTROL (SFC 62)	Query the status of the connection belonging to an SFB instance.

For more information on the program blocks for S7 communication, see also STEP 7 online help or the manual /8/ (Page 40))

Installation and commissioning 3

3.1 Installation and commissioning

CAUTION
Do not pull or plug the CP while power is on The CP 443-5 Extended must not be pulled or plugged while the power is connected. In some cases, this could lead to damage of the module. If you do pull or plug the CP while power is on, the CPU changes to STOP. Afterwards, the power for the central rack must be cycled.

Keep to the installation guide for SIMATIC S7-400

During installation, keep to the guidelines and instructions in the following documents:

- S7-400 installation manual /3/ (Page 38)
- SIMATIC NET PROFIBUS network manual /4/ (Page 38)

Procedure

Step	Procedure / significance
1. Plug in the CP 443-5 Extended	The CP 443-5 Extended can be operated in the following racks: • Central rack CR2, CR3 • Universal rack UR1 UR2 or UR2H as central device as central device with rack no. 1-6 (only possible if there is no DP operation). The CP 443-5 Extended cannot be used in an ER1 or ER2 expansion rack. Suitable slots in the rack: With the exception of the slots reserved for the power supply and IM-R, the CP 443-5 Extended can be inserted in all slots with a P and K bus interface (in the central or in an expansion rack no. 1-6).

NOTICE
When you are using PROFIBUS-DP, the module must only be operated in the central rack! When using the universal rack as an extension rack, you require an IM with a communication bus link!

Step	Procedure / significance
2. Connection to PROFIBUS	Refer to /1/ (Page 37).
3. Project engineering	Depending on the communication services being used, configuration involves the following steps: • Node initialization This is necessary in all cases. This assigns a PROFIBUS address and bus parameters to the PROFIBUS CP. • Connection configuration This is necessary when using the communications services, S7 functions and FDL connections (SEND/RECEIVE interface). • DP configuration This is necessary when the DP mode is used. For details, refer to /1/ (Page 37).
4. PG/PC connection for configuration	You can connect the PG as follows via the PROFIBUS interface of the CP when configuring the CP: • via LAN / PROFIBUS Requirement: The CP 443-5 Extended must already have a PROFIBUS address. As an alternative, configuration via the CPU and its available interfaces to the PG/PC is also possible. For details, refer to /1/ (Page 37).

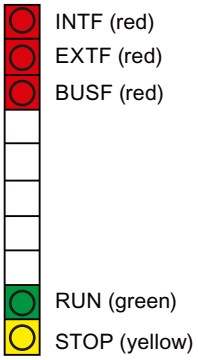
Displays and mode selector

4

4.1 Displays and mode selector

LED display of the operating status of the CP

Front panel:



The different combinations of the five LEDs on the front panel indicate the status of the CP:

INTF LED	EXTF LED	BUSF LED	RUN LED	STOP LED	CP operating mode
-	-	-	☼	●	Starting up (STOP->RUN)
-	-	-	●	○	Running (RUN)
-	-	-	●	☼	Stopping (RUN->STOP)
-	-	-	○	●	Stopped (STOP)
●	-	-	○	●	STOP with internal error or memory reset.
○	○	○	○	☼	Waiting for firmware update (duration 10 seconds after power on)
●	●	○	○	☼	Waiting for firmware update (CP currently has an incomplete firmware version)
●	-	-	●	○	• Download in RUN active / CiR • RUN with internal error (for example, bad configuration data)
-	-	●	-	-	PROFIBUS bus error

INTF LED	EXTF LED	BUSF LED	RUN LED	STOP LED	CP operating mode
-					RUN; however problems on DP line (DP slave not in data transfer or not accessible)
-					RUN; however problems on DP line (faulty module in DP slave)
					Module fault / system error Note: For service purposes, you can read out the cause of the operating status from the diagnostics buffer of the CP. To do this, the CP needs to be changed from STOP to RUN using the mode selector.

Legend - meaning of the symbols:

Symbol				-
Status	ON (steady light)	OFF	Flashing	Any

Controlling the mode

There are different ways in which you can control the mode of the CP 443-5 Extended, as follows:

- Mode selector
- STEP 7 special diagnostics configuration software

To control the CP mode from STEP 7, the mode selector must be set to RUN.

Mode selector

With the mode selector, you can set the following modes:

- Change from STOP to RUN:

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

- Change from RUN to STOP:

  The CP changes to STOP with the following response:

  – Established connections (FDL connections, configured, and unconfigured S7 connections) are terminated
  – DP slaves are taken out of data transfer
  – Data record routing is deactivated
  – In STOP mode, configuring and performing diagnostics on the CP remain possible
  – In STOP mode, the time of day continues to be forwarded

Performance data

5

5.1 Transmission speeds supported

The transmission speed is set with the SIMATIC STEP 7 configuration software. For the permitted values, refer to Table 7-1 in Section 7 (Page 33)

NOTICE
Remember the cable length The permitted cable length must be kept to depending on the transmission speed. Refer to the information in /4/ (Page 38)

5.2 Characteristic data of the DP interface

General characteristic data

No special program blocks are required for DP mode. The interfacing to the distributed I/O is by direct I/O access or using program blocks (SFCs/SFBs) of the CPU (see /4/ (Page 38)).

Table 5- 1 General characteristic data of DP mode

Characteristic	Explanation / values
Number of operable DP slaves	125
Max. size of the input area of all DP slaves	4 Kbytes
Max. size of the output area of all DP slaves	4 Kbytes
Maximum number of inputs per DP slave	244 bytes
Maximum number of outputs per DP slave	244 bytes
Max. size of the consistent area for a module	128 bytes

Diagnostics requests

As a DP master (class 1), the CP 4435 supports diagnostics requests of a DP master (class 2).

NOTICE
Default value for the startup parameter "Monitoring time for transfer of parameters to modules" In some situations, it is necessary to increase the default value for the startup parameter "Monitoring time for transfer of parameters to modules" in the Properties dialog of the CPU: - When there is a large number of modules (DP slaves) configured that can be assigned parameters - When a high value is configured for the constant bus cycle time in the network properties of the PROFIBUS DP line

CiR functionality

The numbers of connections etc. shown in Table 5-1 General characteristic data of DP mode (Page 21) also apply to the entire DP master system if there is a configured DP slave expansion (CiR functionality).

If you specify the properties of a CiR object in the DP master system of the CP 4435 Extended in STEP 7, these values are included in checks performed by STEP 7.

The configurable properties relate to:

- The number of DP slaves and modules you can insert in a DP slave
- The number of input and output bytes that can still be configured in RUN.

(see also manual /5/ (Page 39))

5.3 Characteristic data of open communications services (SEND/RECEIVE interface) over FDL connections

General characteristic data

The characteristic data is important when operating FDL connections (specified, free layer 2 (SDA and SDN), broadcast, multicast):

Table 5- 2 General characteristic data of open communications services

Characteristic	Explanation / values
Total number of FDL connections that can be operated.	32 max.
Size of the transferable data area on FDL connections.	1-240 bytes max. per specified FDL connection (for sending and receiving) Free Layer 2, broadcast and multicast: Up to 236 bytes of user data can be transferred per job. The job header occupies an additional 4 bytes.

Cycle load time due to FDL connections

The calculation of the cycle load time for FDL connections is largely dependent on the time required to execute the program blocks (AG_SEND, AG_RECV) on the S7400 CPU.

The following table lists the cycle load times of the available FCs in milliseconds. A distinction is made between the statuses "job completed" and "job active". The entries relate to the run time in the CPU 417 (6ES7 417-4XL04-0AB0 - see).

Table 5- 3 Cycle load time

Job status	Job completed		Job active	
Component / FC	min.	max.	min.	max.
AG_SEND	0.10 ms	0.11 ms	0.14 ms	0.16 ms
AG_RECV	0.13 ms	0.14 ms	0.12 ms	0.13 ms

5.4 Characteristics of S7 communication

General characteristic data

The following information is important when operating S7 connections:

Table 5- 4 General characteristics of S7 connections

Characteristic	Explanation / values
Number of S7 connections that can be operated via PROFIBUS	48 max. (The value depends on the S7400 CPU being used.)

5.5 Parallel use of communications services (multiprotocol mode)

Performance

Using the various available communications services at the same time affects communication performance.

To illustrate the relationship between the connection types, the DP mode, and configured connections, the following values apply to the typical configurations:

Connection type	Number of connections	With the DP configuration
FDL connections	32	No DP mode
	32	With DP mode
S7 connections	48	No DP mode
	48	With DP mode
FDL and S7 connections [1)]	59	No DP mode
	54	With DP mode

1) one additional S7 connection can be set up online (for example for routing)

NOTICE
PG or HMI functions or data record routing If PG or HMI functions or data record routing are used, a suitable number of S7 connections must be reserved during configuration!

Help provided by STEP 7

The number of connections on PROFIBUS shown in the table above can vary due to other influencing factors. The STEP 7 configuration tool displays warnings and help messages as soon as limit values are exceeded.

Scaling of services in the "mixed mode"

The DP delay time is used to scale cyclic DP communication and the other services (FDL and S7 connections). A DP delay time of 0 seconds guarantees the fastest possible DP update. By increasing the DP delay time, you create extra time on the CP for handling other services.

Note

Recommendation for mixed mode - PROFIBUS DP along with communications functions

In mixed mode, a delay should be selected as follows: 1 ms at transmission speeds > 1.5 Mbps

NOTICE

Calling program blocks SFCs and SFBs

For SFCs 11, 12, 13, 51, 55, 56, 57, 58, 59 and 103 as well as SFB 52 and 53, several calls are necessary. The time required to process the job depends on load, round-trip time and transmission speed. If these SFCs are called in a loop within one cycle, the cycle time could be exceeded.

Exceptions:

- SFC51 requires only one call if it is used for reading the diagnostics data in a diagnostics interrupt (SFC51 with parameter 'partial system status list' 0xB1 and 0xB3).
- For SFB54 (receive interrupt with SFB54 "RALRM"), only one call is necessary.

Blocks for DPV1 (according to the PNO standard) [1]:

- SFB52 RDREC "Read data record from a DP slave" corresponds to SFC59 in terms of function
- SFB53 WRREC "Write data record to a DP slave" corresponds to SFC58 in terms of function
- SFB54 ALARM "Read interrupt information from a DP slave" - call in an interrupt OB

[1] PNO: PROFIBUS Users Organization

5.6 Time-of-day synchronization

The CP 4435 forwards timeofday synchronization frames in the following directions:

1. From the CPU via the CP to PROFIBUS if the local CPU is the time master or this station is synchronized via a different LAN and the timeofday synchronization frame is forwarded to PROFIBUS for the synchronization of further stations.
2. From PROFIBUS via the CP to the CPU if a remote station is time master, for example:
   - a remote CPU 41x with PROFIBUS interface (for example, CP 4435)
   - a remote PC with CP 5412 / 5613 / 5614

Note

Transmission speed and synchronization interval

With transmission rates < 1.5 Mbps, we recommend that you configure a synchronization interval of at least 10 s.

5.7 Data record routing

A maximum of 11 connections can be established simultaneously to PA field devices at any one time.

PDM can, however, use several connections to one PA field device (for more information, refer to the manual /6/ (Page 39)).

5.8 Use in faulttolerant systems

With a CP 4435 Extended, you have the following options in a faulttolerant (H) system:

- Operating faulttolerant S7 connections with communications services configured on one partner

or

- You can implement redundant and single peripheral structures (mixed mode is also possible).

You will find more detailed information about the possible operating and structural options in the manual /2/ (Page 38).

If the CP 4435 Extended is used in a faulttolerant S7400H system, the following communications services can also be used on single (nonredundant) connections:

- S7 connection (including PG functions and PG routing)
- S5compatible communication (SEND/RECEIVE interface) on FDL connections
- Forwarding time of day

Note

Use in faulttolerant systems

[1)] Note the CPU types in Table 2-1 Use with the current CPU types (Page 12) / Table 2-2 Use with no longer available CPU types - part 1 (Page 13) / Table 2-3 Use with no longer available CPU types - part 2 (Page 14)

5.9 Other characteristics

Note on DP:

The connected DP slaves can only be assigned to and serviced by one CPU.

NOTICE
CiR functionality - no multicomputing If you use the CiR functionality, multicomputing is not possible.

Memory reset on the CP

WARNING

Memory reset on the CP

Note that when you reset the CP memory using STEP 7 or STEP 7 special diagnostics, the configuration data on the CPU must also be deleted otherwise the data will become inconsistent.

Special feature of the DP mode:

If the CPU is in RUN mode at the same time, the memory reset is rejected by the CP.

DP diagnostics frames when the CPU is in STOP

All diagnostic frames from DPV0 standard slaves and all DP alarm frames from DP-S7/DP-V1 standard slaves arriving when the CPU is in STOP mode are handled as follows:

- In “S7-compatible" mode

  The problems that still exist at the transition from CPU STOP to CPU RUN are passed on the user program.

- In DP-V1 mode

  The diagnostics/interrupt frames are forwarded even when the CPU is in STOP mode, however, they must be evaluated by a suitable user program when the module starts up.

Further notes on operation

6

6.1 General operation on PROFIBUS

Disruptions with modified transmission speed

If you modify the transmission speed when downloading the configuration, the CP 443-5 Extended sporadically remains in the "stopping" mode.

In such cases, a memory reset of the S7 station is necessary.

Follow the steps outlined below:

1. Run a memory reset on the S7 station (CPU)

   To reset memory, use the corresponding function in the configuration tool.

2. Turn the power supply to the S7 station on and off again.

Bus fault of the type "bus short-circuit"

If there is a bus short-circuit, this can cause one of the following responses on the PROFIBUS subnet:

- Failure of the bus line
- Failure of stations / of all stations

The response can be recognized by evaluating with OB86.

NOTICE
Bus fault statistics With STEP 7 special diagnostics, you can read out the information from the entry PROFIBUS > Statistics > Bus fault statistics If there is a bus fault, it is possible that different bus fault events are registered in the statistics even though it appears that identical bus faults have occurred.

6.2 Display "Existing channel error" in the diagnostics interrupt OB (OB82)

Display "Existing channel error" in the diagnostics interrupt OB (OB82)

Under certain circumstances, the "Existing channel error" flag may not be set (false) although there is a channel error.

This reaction corresponds to the current response on the PROFIBUS interfaces with SIMATIC.

Remedy: You can read out detailed up-to-date diagnostics information using the diagnostics function "Read system diagnostics" SFC13 (read out standard diagnostics).

6.3 Display of the the DP slave history

Restricted display of older diagnostics data in STEP 7 special diagnostics

Diagnostics data can be read out in STEP 7 special diagnostics. With an additional button, you can also have older diagnostics data displayed alongside the current diagnostics data.

With the CP 443-5 Extended (DX05), it is possible that not all the older diagnostics events can be displayed due to the limited buffer size - the display of underlying intermediate states is then omitted.

6.4 Other information available about the CP

FAQs on the Internet

You will find detailed information (FAQs) on using the PROFIBUS S7-CPs at the following Internet address (entry type: FAQ):

10805945 (http://support.automation.siemens.com/WW/view/de/10805945)

Compatibility with previous product 7

7.1 Extended functionality compared with previous product

Replacing a module

The CP443-5 Extended described here (6GK7 443-5DX05-0XE0) with firmware version V7.0 can be used as a replacement for the following predecessors of the CP 443-5 Extended:

- 6GK7 443-5DX00-0XE0
- 6GK7 443-5DX01-0XE0
- 6GK7 443-5DX02-0XE0
- 6GK7 443-5DX03-0XE0
- 6GK7 443-5DX04-0XE0

Firmware loader - reduced loading time with "FWL_FAST_LOAD"

To load new firmware, use only the new function for fast loading.

To do this, select the following entry for the interface parameter assignment of your PC/PG in the firmware loader:

CPxxx(FWL_FAST_LOAD)

By using this function, the time required for loading firmware is reduced significantly compared with the old function.

NOTICE
CPxxx (FWL) cannot be used The setting CPxxx(FWL) in the interface parameter assignment cannot be used with this CP type.

NOTICE
PROFIBUS Download the firmware only via the PROFIBUS interface of the CP. To download the firmware, you can use the following: • PROFIBUS connecting cable 6ES7 901-4BD00-0XA0 • PROFIBUS cable with a maximum length of 200 m The use of an MPI cable is not permitted!

Version history / predecessor products

The document “Version History for the SIMATIC NET S7 CPs" contains information on the all the previously supplied PROFIBUS CPs for SIMATIC S7. An up-to-date version of this document is available for downloading on the Internet under the following entry ID:

9836605 (http://support.automation.siemens.com/WW/view/en/9836605)

7.2 Replacing older modules / module replacement

Module replacement

Please follow the procedure below when replacing an older module with the module described in this document:

Module used up to now	Configuration procedure
6GK7 443-5DX00-0XE0 6GK7 443-5DX01-0XE0 6GK7 443-5DX02-0XE0 6GK7 443-5DX03-0XE0 6GK7 443-5DX04-0XE0	**Configuration unchanged (replacing a defective module)** If you have no requirements beyond what you had with the previous CP, you do not need to make changes in the configuration. All you need to do is replace the hardware with the power supply turned off. **Extending the configuration (using new functions)** If you want to use options that you had not used with the previous CP, follow the steps below (see also Chapter 3 (Page 17)): 1. In STEP 7, replace the already configured CP 443-5 with the new module; You will find this in the hardware catalog. 2. Modify your configuration according to your requirements, for example in the Properties dialog for the PROFIBUS subnet. 3. Save, compile and load the configuration data to the CPU or CP again.

Technical specifications

8

8.1 Technical specifications

General technical specifications

Technical specifications	Value
Transmission speeds supported	9.6 kbps, 19.2 kbps, 45.45 kbps 93.75 kbps, 187.5 kbps, 500 kbps 1.5 Mbps, 3 Mbps, 6 Mbps, 12 Mbps
Interfaces	
• Connection to PROFIBUS	1 x 9-pin D-sub female connector (RS-485)
Maximum current consumption on the PROFIBUS interface when connecting network components (for example optical network components)	100 mA at 5 V
Supply voltage from backplane bus (rated voltage)	5 V DC
Current consumption	
From the S7-400 backplane bus	0.6 A typical at 5 V
Power dissipation	5.5 W maximum
Permitted ambient conditions	
• Operating temperature	• 0 °C to +60 °C
• Transport/storage temperature	• -40 °C to +70 °C
• Relative humidity	• maximum 95% at +25 °C
• Operating altitude	up to 2000 m above sea level
Degree of protection	IP 20
Construction	
Dimensions W x H x D (mm)	25 x 290 x 210
Weight	Approx. 650 g

Over and above this, all the information listed in the reference manual for the S7-400/M7-400 "Module data" /3/ (Page 38) in the section "General technical specifications" applies to the CP 443-5 Extended

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

Approvals

A

A.1 Approvals

Approvals for the CP 443-5 Extended

⚠ WARNING

Information on standards and approvals

Before you put the device into operation, read the information on standards and approvals in Part A of this manual /3/ (Page 38).

The CP has the following approvals or conforms to the following directives:

- IEC 61131-2
- CE mark
- EMC directive for an industrial environment
  - emission: EN 61000-6-4 : 2007
  - immunity: EN 61000-6-2 : 2005
- Explosion protection directive (KEMA)
- EC machinery directive
- UL 508
- CSA C22.2 No. 142
- UL 1604 / UL 2279 Pt. 15 cULus HazLoc Class I, Div. 2 / Class I, Zone 2, T4 or

  ANSI/ISA 12.12.01 cULus HazLoc Class I, Div. 2 / Class I, Zone 2, T4
- FM 3611

  Class I, Division 2, Group A, B, C, D T4 or
  Class I, Zone 2, Group IIC, T4
- ATEX 94/9 EG

  II 3G Ex nA II T4 (Zone 2)
- C-TICK

Note

The approvals that apply to the device are printed on the device.

A.2 EU declaration of conformity

EU declaration of conformity

You will find the EU declaration of conformity for this product on the Internet under the following entry ID:

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

→ tab "Entry List"

Filter settings:

- Entry type: "Certificates"
- Certificate type: "Declaration of conformity"
- Search item(s): <name of the module>

References

B

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 → Entry type "Manuals / Operating Instructions"

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

B.1 On configuring and using the CP

/1/

SIMATIC NET
S7 CPs for PROFIBUS
Configuring and Commissioning
Manual Part - General Application
Configuration Manual
Siemens AG

(SIMATIC NET Manual Collection)

On the Internet under the following entry ID:

1158693 (http://support.automation.siemens.com/WW/view/en/1158693)

/2/

SIMATIC
Fault-tolerant Systems S7-400H
Manual
Siemens AG

On the Internet under the following entry ID:

1186523 (http://support.automation.siemens.com/WW/view/en/1186523)

B.2 On installing and commissioning the CP

/3/

SIMATIC S7
Automation System S7-300

- CPU 31xC and 31x Installation: Operating instructions
  Entry ID: 13008499 (http://support.automation.siemens.com/WW/view/en/13008499)
- Module Data: Reference manual
  Entry ID: 8859629 (http://support.automation.siemens.com/WW/view/en/8859629)

Siemens AG

and

SIMATIC S7
Automation System S7-400, M7-400

- Installation: Installation manual
  Entry ID: 1117849 (http://support.automation.siemens.com/WW/view/en/1117849)
- Module Data: Reference manual
  Entry ID: 1117740 (http://support.automation.siemens.com/WW/view/en/1117740)

Siemens AG

/4/

SIMATIC NET
PROFIBUS Network Manual
Siemens AG

(SIMATIC NET Manual Collection)

On the Internet under the following entry ID: 10805945
(http://support.automation.siemens.com/WW/view/en/35222591)

/5/

SIMATIC
Modifying the System during Operation via CiR
Manual
Siemens AG

On the Internet under the following entry ID:

45531308 (http://support.automation.siemens.com/WW/view/en/45531308)

/6/

SIMATIC
The Process Device Manager
Manual
Siemens AG

On the Internet under the following entry ID:

21407212 (http://support.automation.siemens.com/WW/view/en/21407212)

B.3 On programming

/7/

SIMATIC NET
Functions (FCs) and Function Blocks (FBs) for SIMATIC NET S7-CPs
Programming Manual
Siemens AG

(SIMATIC NET Manual Collection)

On the Internet under the following entry ID:

30564821 (http://support.automation.siemens.com/WW/view/de/30564821)

/8/

SIMATIC
System and Standard Functions for S7-300/400 - Volume 1/2

Reference manual
Siemens AG

(part of the STEP 7 documentation package STEP 7 Basic Knowledge)

(part of the online documentation in STEP 7)

On the Internet under the following entry ID:

1214574 (http://support.automation.siemens.com/WW/view/en/1214574)

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