

# SIEMENS

## SIMATIC NET

### S7-1500 - PROFIBUS CP 1542-5

Manual

Preface

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### Warning notice system

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

#### **DANGER**

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

#### **WARNING**

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

#### **CAUTION**

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

#### **NOTICE**

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

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

### Qualified Personnel

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

### Proper use of Siemens products

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

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### Disclaimer of Liability

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

# Preface

## Purpose of the documentation

This device manual supplements the system manual of the S7-1500 automation system and the function manuals. All functions that go beyond the system are described in the system manual.

With the information in this manual and the system manual, you will be able to commission the CP 1542-5.

See also Guide to the documentation (Page 7)

## Conventions

Make sure you read the special notices below:

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### Note

A notice contains important information on the product described in the documentation, handling the product or about parts of the documentation you should pay particular attention to.

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## Names

- In this document, the term "CP" is also used instead of the full product name.
- The name STEP 7 is used to mean the STEP 7 Professional configuration tool.

## SIMATIC NET glossary

Explanations of many 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 or product DVD  
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>)

## License conditions

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### Note

#### Open source software

Read the license conditions for open source software carefully before using the product.

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You will find license conditions in the following documents on the supplied data medium:

- DOC\_OSS-S7CMCP\_74.pdf
- DOC\_OSS-CP1542-5\_76.pdf

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SIMATIC NET, CP 1542-5

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# Guide to the documentation

## Introduction

The documentation of the SIMATIC products has a modular structure and covers topics relating to your automation system.

The complete documentation for the S7-1500 system consists of a system manual, function manuals and device manuals.

The STEP 7 information system (online help) also supports you when configuring and programming your automation system.

## Overview of the documentation on communication with S7-1500

The following table lists additional documents that supplement this description of the CP 1542-5 and are available in the Internet.

Table 1- 1 Documentation for the CP 1542-5

Topic	Documentation	Most important contents
System description	System manual: S7-1500 Automation System ( <a href="http://support.automation.siemens.com/WW/view/en/59191792">http://support.automation.siemens.com/WW/view/en/59191792</a> )	<ul style="list-style-type: none"> <li>• Application planning</li> <li>• Installation</li> <li>• Connecting</li> <li>• Commissioning</li> </ul>
Module properties	Device manual: Power supplies ( <a href="http://support.automation.siemens.com/WW/view/en/57251228">http://support.automation.siemens.com/WW/view/en/57251228</a> )	<ul style="list-style-type: none"> <li>• Connecting</li> <li>• Parameter assignment/ addressing</li> <li>• Interrupts, error messages, diagnostics and system alarms</li> <li>• Technical specifications</li> <li>• Dimensional drawing</li> </ul>
	Device manual: Signal modules ( <a href="http://support.automation.siemens.com/WW/view/en/59174020">http://support.automation.siemens.com/WW/view/en/59174020</a> )	
System diagnostics	Function manual: System diagnostics ( <a href="http://support.automation.siemens.com/WW/view/en/59192926">http://support.automation.siemens.com/WW/view/en/59192926</a> )	<ul style="list-style-type: none"> <li>• Overview</li> <li>• Diagnostics evaluation for hardware/software</li> </ul>
Communication	Function manual: Communication ( <a href="http://support.automation.siemens.com/WW/view/en/59192925">http://support.automation.siemens.com/WW/view/en/59192925</a> )	<ul style="list-style-type: none"> <li>• Overview</li> </ul>
	Function manual: PROFINET with STEP 7 V12 ( <a href="http://support.automation.siemens.com/WW/view/en/49948856">http://support.automation.siemens.com/WW/view/en/49948856</a> )	<ul style="list-style-type: none"> <li>• PROFINET basics</li> <li>• PROFINET functions</li> <li>• PROFINET diagnostics</li> </ul>

Topic	Documentation	Most important contents
	Function manual: PROFIBUS with STEP 7 V12 ( <a href="http://support.automation.siemens.com/WW/view/en/59193579">http://support.automation.siemens.com/WW/view/en/59193579</a> )	<ul style="list-style-type: none"> <li>• PROFIBUS basics</li> <li>• PROFIBUS functions</li> <li>• PROFIBUS diagnostics</li> </ul>
	Function manual: Web Server ( <a href="http://support.automation.siemens.com/WW/view/en/59193560">http://support.automation.siemens.com/WW/view/en/59193560</a> )	<ul style="list-style-type: none"> <li>• Function</li> <li>• Operation</li> </ul>
Interference-free installation of control systems	Function Manual: Interference-free installation of control systems ( <a href="http://support.automation.siemens.com/WW/view/en/59193566">http://support.automation.siemens.com/WW/view/en/59193566</a> )	<ul style="list-style-type: none"> <li>• Basics</li> <li>• Electromagnetic compatibility</li> <li>• Lightning protection</li> <li>• Housing selection</li> </ul>
Memory concept	Function manual: Structure and Use of the CPU Memory ( <a href="http://support.automation.siemens.com/WW/view/en/59193101">http://support.automation.siemens.com/WW/view/en/59193101</a> )	<ul style="list-style-type: none"> <li>• Design</li> <li>• Principle of operation</li> <li>• Use</li> </ul>
Cycle and response times	Function manual: Cycle and Response Times ( <a href="http://support.automation.siemens.com/WW/view/en/59193566">http://support.automation.siemens.com/WW/view/en/59193566</a> )	<ul style="list-style-type: none"> <li>• Basics</li> <li>• Calculations</li> </ul>
Analog value processing	Function manual: Analog value processing ( <a href="http://support.automation.siemens.com/WW/view/en/59193559">http://support.automation.siemens.com/WW/view/en/59193559</a> )	<ul style="list-style-type: none"> <li>• Wiring options</li> <li>• Tables of measured values</li> </ul>

## SIMATIC manuals

All current manuals for SIMATIC products are available for download free of charge from the Internet (<http://www.siemens.com/automation/service&support>).

## CP/CM documentation in the Manual Collection (article number A5E00069051)

The "SIMATIC NET Manual Collection" DVD contains the device manuals and descriptions of all SIMATIC NET products current at the time it was created. It is updated at regular intervals.

## Version History / Current Downloads for the SIMATIC NET S7 CPs/CMs

The "Version History/Current Downloads for SIMATIC NET S7 CPs (PROFIBUS)" provides information on all CPs available up to now for SIMATIC S7 (PROFIBUS).

An up-to-date version of this document can be found on the Internet (<http://support.automation.siemens.com/WW/view/en/9836605>)



## Product overview

### 2.1 Properties

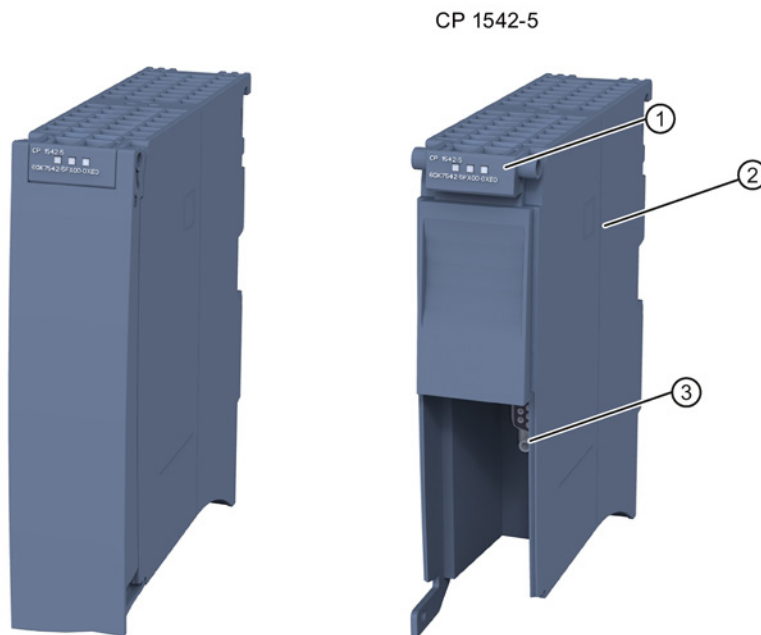
#### Article number, validity and product names

This description contains information on the following product:

CP 1542-5  
 Article number 6GK7 542-5FX00-0XE0  
 Hardware product version 1  
 Firmware version V1.0

Communications processor for connecting SIMATIC S7-1500 to PROFIBUS DP.

#### View of the CP



- ① LEDs
- ② Type plate
- ③ PROFIBUS interface: 1 x 9-pin D-sub female connector (RS-485)

Figure 2-1 View of the CP 1542-5 with closed (left) and open (right) front cover

## Application

The communications processor CP 1542-5 is intended for operation in an S7-1500 automation system. The CP 1542-5 allows the connection of an S7-1500 station to a PROFIBUS fieldbus system.

## Supported communications services

In its current configuration, the CP 1542-5 supports the following communications services:

- **PROFIBUS DP master (class 1)**

- PROFIBUS DP according to EN 50170 DPV1, DP master
- DP master mode for DP slaves complying with the PROFIBUS DPV0 and DPV1 standard
- DP master mode for Siemens DP slaves
- Direct data exchange (DP slave to DP slave)

As a DP master, the CP 1542-5 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 DPSYNC\_FR.

- **PROFIBUS DP slave**

PROFIBUS DP according to EN 50170 DPV1, DP slave

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**Note**

**DP master or DP slave**

Please note, however: The CP 1542-5 only supports operation either as DP master or DP slave.

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- **S7 communication**

- PG communication for uploading / downloading of S7 configuration, diagnostics and routing
- Operator control and monitoring functions (HMI communication)
- Data exchange via S7 connections

The services of the CP 1542-5 listed above can be used independently at the same time.

## 2.2 Further functions

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

DP slaves can be activated and deactivated by the user program using system function D\_ACT\_DP.

### Diagnostics requests

As a DP master (class 1), the CP 1542-5 supports diagnostics requests of a DP master (class 2).

### Getting the bus topology in a DP master system

The CP 1542-5 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 DP\_TOPOL in the user program can instruct diagnostics repeaters to measure the PROFIBUS BUS topology in a DP master system.

### Time-of-day synchronization - time master or time slave

The CP 1542-5 can be enabled for time-of-day synchronization. As an alternative, the CP can be configured as time master or time slave on PROFIBUS.

- Time master: The CP is synchronized using the time of day in the S7-1500 station and outputs the time of day on PROFIBUS. The output interval can be set.
- Time slave: The CP receives time-of-day frames on PROFIBUS and outputs the time within the S7-1500 station. The output interval within the S7-1500 station is set permanently to 10 seconds.

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#### Note

#### Recommendation for setting the time

It is advisable to set the time-of-day master so that time-of-day frames are sent at intervals of approximately 10 seconds. This achieves as small a deviation as possible between the internal time and the absolute time.

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### Web diagnostics

With the aid of Web diagnostics of the CPU, you read the diagnostics data from an S7 station via the Web browser on the PG/PC.

In terms of the CP, the Web pages provide the following information:

- Module and status information
- Special information on the DP master system (status of the DP slaves)



## Functional characteristics

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### Note

#### Measured values of transfer or reaction times

Measurements of transfer and reaction times in Ethernet, PROFIBUS and PROFINET networks for a series of configurations can be found on the Internet (<http://support.automation.siemens.com/WW/view/en/25209605>)

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### 3.1 Transmission speeds supported

The transmission speed is set with the SIMATIC STEP 7 configuration software.

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### Note

#### Remember the cable length

The permitted cable length must be kept to depending on the transmission speed.

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Refer to the information in the section Technical specifications (Page 33)

### 3.2 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.

Table 3- 1 General characteristic data of DP mode

Characteristic	Explanation / values
Number of operable DP slaves	32
Max. size of the input area of all DP slaves	2 Kbytes
Max. size of the output area of all DP slaves	2 Kbytes
Maximum size of the input area per DP slave	244 bytes
Maximum size of the output area 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 1542-5 supports diagnostics requests of a DP master (class 2).

### DP startup behavior

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**Note****Increasing the default value for startup parameters - configuration of the CPU**

In some situations, it is necessary to increase the default value for the startup parameter "Parameter assignment time for the distributed I/O" in the configuration 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.
- 

## 3.3 Characteristics of S7 communication

### General characteristic data

The following information is important when operating S7 connections:

Table 3- 2 General characteristics of S7 connections

Characteristic	Explanation / values
Number of S7 connections that can be operated via PROFIBUS	Operable in total: Max. 16 The value depends on the S71500 CPU being used.

## Requirements for use

### 4.1 Configuration limits

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

- The number of CPs that can be operated in a rack depends on the CPU type being used.

Note the information in the documentation of the CPU, see Guide to the documentation (Page 7)

### 4.2 Project engineering

#### Configuration and downloading the configuration data

When the configuration data is downloaded to the CPU, the CP 1542-5 is supplied with the configuration information. The configuration data can be downloaded to the CPU via PROFIBUS or any PROFINET interface of the S7-1500 station.

The following version of STEP 7 is required:

STEP 7 version and additional modules	Functions of the CP
STEP 7 Professional V12 SP1	The full functionality of the CP 1542-5 (6GK7 542 5FX00 0XE0) can be configured

### 4.3 Programming

#### Program blocks

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

Table 4- 1 Instructions for PROFIBUS DP

System blocks and system functions	Meaning when used with CP
DPSYC_FR	DP slaves synchronize / freeze inputs (SYNC/FREEZE instruction)
DPNRM_DG	Reading the diagnostics data of a DP slave
DP_TOPOL	Detecting the topology for the DP master system
WRREC	Writing the data record of a DP slave

System blocks and system functions	Meaning when used with CP
RDREC	Reading the data record of a DP slave
GETIO	Reading the process image of a DP standard slave
SETIO	Transferring the process image of a DP standard slave
GETIO_PART	Reading the process image partition of a DP standard slave
SETIO_PART	Transferring the process image partition of a standard DP slave
D_ACT_DP	Disable / enable DP slaves
DPRD_DAT	Reading consistent data of a DP standard slave
DPWR_DAT	Writing consistent data of a DP standard slave
RALRM	Event-driven reading of interrupt information (diagnostics, pull/plug, hardware interrupt) and DPV1-specific interrupts (update, status, vendor-specific interrupt)

Refer to the documentation of the program blocks in the online help of STEP 7

### Calling program blocks (instructions) for distributed I/O

Several calls are necessary for the instructions of the distributed I/O.

The time required to process the job depends on load, round-trip time and transmission speed. If these instructions are called in a loop within one cycle, the cycle time could be exceeded.

Exceptions:

- Only one call is required for the RALRM instruction "receive alarm".

Program blocks for DPV1 (according to the PNO standard) <sup>1)</sup>:

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

<sup>1)</sup> PNO: PROFIBUS Users Organization

### See also

8797900 (<http://support.automation.siemens.com/WW/view/en/8797900>)




## Connecting up / commissioning

### 5.1 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 associated work such as installation, connecting up, replacing devices or opening the device.


#### General notices


 <b>WARNING</b>
<b>Safety extra low voltage</b> 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...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). <b>There is an additional requirement if devices are operated with a redundant power supply:</b> If the equipment is connected to a redundant power supply (two separate power supplies), both must meet these requirements.


#### General notices on use in hazardous areas


 <b>WARNING</b>
<b>Risk of explosion when connecting or disconnecting the device</b> EXPLOSION HAZARD DO NOT CONNECT OR DISCONNECT EQUIPMENT WHEN A FLAMMABLE OR COMBUSTIBLE ATMOSPHERE IS PRESENT.

 <b>WARNING</b>
<b>Replacing components</b> EXPLOSION HAZARD SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2 OR ZONE 2.


 <b>WARNING</b>
<b>Requirements for the cabinet/enclosure</b> 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.

 <b>WARNING</b>
<b>Restricted area of application</b> This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D or non-hazardous locations only.

 <b>WARNING</b>
<b>Restricted area of application</b> This equipment is suitable for use in Class I, Zone 2, Group IIC or non-hazardous locations only.

 <b>WARNING</b>
<b>LAN attachment</b> A LAN or LAN segment with the attachments belonging to it should be within a single low-voltage supply system and within a single building. Make sure that the LAN is in an of type A environment according to IEEE 802.3 or in a type 0 environment according to IEC TR 62101. Never establish a direct electrical connection to TNV networks (telephone network) or WANs (Wide Area Network).

**General notices on use in hazardous areas according to ATEX**

 <b>WARNING</b>
<b>Requirements for the cabinet/enclosure</b> 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 above 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.

## 5.2 Installing and commissioning the CP 1542-5

** WARNING****Read the system manual "S7-1500 Automation System"**

Prior to installation, connecting up and commissioning, read the relevant sections in the system manual "S7-1500 Automation System" (references to documentation, refer to the section Guide to the documentation (Page 7)).

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

### Configuration

Commissioning the CP fully is only possible if the STEP 7 project data is complete.

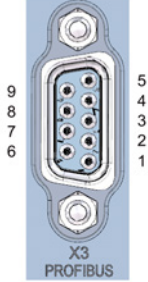
**Procedure for installation and commissioning**

Step	Execution	Notes and explanations
1	When installing and connecting up, keep to the procedures described for installing I/O modules in the system manual "S7-1500 Automation System".	
3	Connect the CP to PROFIBUS via the RS-485 socket.	Underside of the CP
4	Turn on the power supply.	
5	Close the front covers of the module and keep them closed during operation.	
6	The remaining steps in commissioning involve downloading the STEP 7 project data.	<p>The STEP 7 project data of the CP is transferred when you download to the station. To load the station, connect the engineering station on which the project data is located to the Ethernet/MPI interface of the CPU.</p> <p>You will find more detailed information on loading in the following sections of the STEP 7 online help:</p> <ul style="list-style-type: none"><li>• Downloading project data</li><li>• Using online and diagnostics functions</li></ul>

## PROFIBUS interface

The table below shows the terminal assignment of the PROFIBUS interface. The assignment corresponds to the standard assignment of RS485 interface.

Table 5- 1 Terminal assignment PROFIBUS interface

View	Signal name	Designation	
	1	-	
	2	-	
	3	RxD/TxD-P	Data line B
	4	RTS	Request To Send
	5	M5V2	Data reference potential (from station)
	6	P5V2	Supply plus (from station)
	7	-	-
	8	RxD/TxD-N	Data line A
	9	-	-

### Note

#### PROFIBUS interface

The CP provides no 24 VDC power supply on the PROFIBUS interface. I/O devices (for example, PC adapter 6ES7972-0CB20-0XA0) are therefore not operational on the interface).

## 5.3 Replacing a module without a programming device

### General procedure

The configuration data of the CP is stored on the CPU. This means that this module can be replaced by a module of the same type (identical article number) without using a PG.

## 5.4 Mode of the CPU - effect on the CP

You can change the mode of the CPU between RUN and STOP using the STEP 7 configuration software.

Depending on the operating status of the CPU, the CP behaves as described below.

### Changing the CPU from STOP to RUN:

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

### Changing the CPU from RUN to STOP:

The reaction is as follows in STOP:

- DP master mode: Change to the CLEAR mode.
- DP slave mode: Input data is sent to the DP master with the value "0" and a DP diagnostics alarm is sent.
- The following functions remain enabled:
  - The configuration and diagnostics of the CP (system connections for configuration, diagnostics, and PG channel routing are retained);
  - S7 routing function
  - Time-of-day synchronization

# Interrupts, diagnostics messages, error and system alarms

# 6

The status and error displays of the CP 1542-5 are described below.

You can find additional information on "Interrupts" in the STEP 7 online help.

You can find additional information on "Diagnostics" and "System alarms" in the System diagnostics (<http://support.automation.siemens.com/WW/view/en/59192926>) function manual.

## 6.1 Status and error display of the CP

### LED display

The following figure shows the LEDs of the CP 1542-5 .



- ① RUN/STOP LED
- ② ERROR LED
- ③ MAINT LED

Figure 6-1 LED display of the CP 1542-5 (without front cover)

### Meaning of the LED displays

The CP 1542-5 has 3 LEDs to display the current operating status and the diagnostics status and these have the following meanings:

- RUN/STOP LED (one-color LED: green)
- ERROR LED (one-color LED: red)
- MAINT LED (one-color LED: yellow)

The following table shows the meaning of the various combinations of colors of the RUN/STOP, ERROR and MAINT LEDs.

Table 6- 1 Meaning of the LEDs

RUN/STOP LED	ERROR LED	MAINT LED	Meaning
□ LED off	□ LED off	□ LED off	No supply voltage on the CP or supply voltage too low.
■ LED lit green	■ LED lit red	■ LED lit yellow	LED test during startup
■ LED lit green	■ LED lit red	□ LED off	Startup (booting the CP)
■ LED lit green	□ LED off	□ LED off	CP is in RUN mode. No disruptions
⚡ LED flashing green	□ LED off	□ LED off	No CP configuration exists Loading firmware
■ LED lit green	⚡ LED flashing red	□ LED off	A diagnostics event has occurred.
■ LED lit green	□ LED off	■ LED lit yellow	Maintenance, maintenance is demanded.
■ LED lit green	□ LED off	⚡ LED flashing yellow	Maintenance is required. Downloading the user program
⚡ LED flashing green	⚡ LED flashing red	⚡ LED flashing yellow	Module fault

### Diagnostics with LEDs

Diagnostics using the LEDs is the first means of narrowing down errors/faults. To narrow the error/fault down even further, evaluate the message on the display of the S7-1500 CPU. If errors/faults occur, you can also identify them using the Web server or by evaluating the diagnostics buffer of the CPU. The diagnostics buffer of the CPU contains plain language information about the error/fault that has occurred. The diagnostics buffer is accessible via STEP 7, the display and the Web server.



## 6.2 Diagnostics options

### Diagnostics options

You have the following diagnostics options available for the module:

- The LEDs of the module

For information on the LED displays, refer to the section Status and error display of the CP (Page 23).

- 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 PROFIBUS interface

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

- DP diagnostics

The DP diagnostics of the CP is described below.

The evaluation of diagnostics data records requested by the DP master and the diagnostics interrupts or diagnostics alarms of the DP slaves is handled in the user program of the DP master station.

## 6.3 DP slave diagnostics

### DP-V1 slave: Diagnostics interrupt

The diagnostics data is transferred as a diagnostics interrupt. Diagnostics interrupts must be acknowledged by the DP master.

### Supported diagnostics functions

The CP 1542-5 supports the following blocks of DP diagnostics:

- Standard diagnostics (6 bytes)
- Identifier-related diagnostics (2 to 17 bytes), depending on the number of configured transfer areas
- Module status (5 to 35 bytes), depending on the number of configured transfer areas
- If it exists: Diagnostics interrupt (8 bytes)

6.3 DP slave diagnostics

**User program (DP master)**

To read out the diagnostics data of the DP slave (DP single diagnostics), use the "DPNRM\_DG" instruction on the DP master.

Diagnostics interrupts of DP-V1 slaves are evaluated in the user program of the master using the "RALRM" instruction.

You will find the required parameter assignment for the instructions in the STEP 7 online help.

Below, there is an overview of the structure of the diagnostics data.

**Overview of standard diagnostics**

Standard diagnostics	
Byte	Meaning
0	Station status 1
1	Station status 2
2	Station status 3
3	Master address
4...5	Vendor ID of the slave

**Overview of device-specific diagnostics**

The device-specific diagnostics data depends on the protocol variant operating on the DP slave:

- DP-V1 slave

Table 6-2 Overview of device-specific diagnostics of the CP with DP-V1 slaves

Device-specific diagnostics	
Byte	Meaning
0	Header
1	Variant Interrupt type      Variant Status type
2	Slot number
3	Variant Interrupt specifier      Variant Status specifier
4...62	Module-specific diagnostics data

## 6.4 Standard diagnostics

The coding of the standard diagnostics bytes is explained below.

### Byte 0: Station status 1

Table 6-3 Structure of station status byte 1

Bit no.	Name	Explanation
7	Master_Lock	The DP slave was assigned parameters by a different DP master. The DP slave can only be read by the configured productive DP master. This bit is set by the DP master when its bus address differs from the configured address.
6	Parameter_Fault	The last received parameter assignment frame was bad or not permitted. The DP slave sets this bit. Solution: Check the parameter settings for illegal parameters.
5	Invalid_Slave_Response	This bit is set by the DP master when no plausible response has been received from the DP slave.
4	Service_Not_Supported	This bit is set by the DP master when the master has requested a function that is not supported by the DP slave. Solution: Change the parameter setting to disable the function on the master.
3	Ext_Diag	This bit is set by the slave. <ul style="list-style-type: none"> <li>• Bit =1: There is diagnostics data in the slave-specific diagnostics area. The diagnostics data can be evaluated in the user program of the master.</li> <li>• Bit =0: There may be status information in the slave-specific diagnostics area. The status information can be evaluated in the user program of the master.</li> </ul>
2	Slave_Config_Check_Fault	The configuration data sent by the DP master is rejected by the DP slave. Cause: Configuration error. Solution: Change configuration.
1	Station_Not_Ready	The DP slave is not ready for productive data exchange. This is a temporary status that cannot be influenced by the DP master.
0	Station_Non_Existent	The DP slave is not reacting on the bus. This bit is set by the DP master 1 (the slave sets this bit permanently to 0). If the bit is set, the diagnostic bits have the state of the last diagnostics alarm or the initial value.

**Byte 1: Station status 2**

Table 6- 4 Structure of station status byte 2

Bit no.	Name	Explanation
7	Deactivated	The DP slave was identified as being not active in the local parameter record and it is not polled cyclically.
6	Reserved	- reserved -
5	Sync_Mode	The DP slave is in SYNC mode. The bit is set by the slave.
4	Freeze_Mode	The DP slave is in FREEZE mode. The bit is set by the slave.
3	Watchdog_On	Watchdog monitoring is active on the DP slave. The bit is set by the slave.
2	Status_From_Slave	Bit =1: The diagnostics information comes from the DP slave. The bit is set permanently to 1 by the slave.
1	Static_Diag	Static diagnostics If the DP slave sets this bit, the DP master must fetch diagnostics data from the DP slave until the DP slave resets the bit. The DP slave sets this bit, for example when it is not capable of data transfer.
0	Parameter_Request	The DP slave sets this bit when it needs to have new parameters assigned and be reconfigured. If bit 0 and bit 1 are both set, bit 0 has the higher priority.

**Byte 2: Station status 3**

Table 6- 5 Structure of station status byte 3

Bit no.	Name	Explanation
7	Ext_Data_Overflow	If this bit is set, there is more diagnostics information available than indicated in the diagnostics data. This data cannot be displayed.
6...0	Reserved	- reserved -

**Byte 3: Master address**

The address of the DP master that assigned parameters to this DP slave is entered in the "Master\_Add" byte.

If the DP slave did not have parameters assigned to it by any DP master, the DP slave sets the address 255 in this byte.

**Bytes 4 and 5: Vendor ID of the slave ("Ident\_Number")**

The vendor ID ("Ident\_Number") for the DP slave type is entered in bytes 4 and 5. This identifier can be used to identify the slave.

The more significant part of the value is in byte 5.

## 6.5 Device-specific diagnostics in DP-V1

There are two variants of device-specific diagnostics with DP-V1 slaves:

- Interrupt type
- Status type

The two variants differ from each other in the coding of byte 1, bit 7 of the device-specific diagnostics data. The difference is component-specific.

### Byte 0: Header

The two most significant bits have the value 00. This identifies the "module-specific diagnostics data" field (see bytes 4... 62) as a whole.

The remaining six bits indicate the length of the data field including byte 0.

### Byte 1: Variant "Interrupt type"

Table 6- 6 Structure of byte 1 of the device-specific diagnostics (variant "interrupt type")

Bit no.	Meaning	
7	Value	Meaning
	0	Interrupt
6...0	<b>Alarm_Type</b>	
	0	- reserved -
	1	Diagnostics interrupt
	2	Hardware interrupt
	3	Pull interrupt
	4	Plug interrupt
	5	Status interrupt
	6	Update interrupt
	7...31	- reserved -
	32...126	Vendor-specific
127	- reserved -	

If status interrupts are received in quick succession, older status interrupts may be overwritten by newer interrupts.

**Byte 1: Variant "Status type"**

Table 6-7 Structure of byte 1 of the device-specific diagnostics (variant "status type")

Bit no.	Meaning	
7	Value	Meaning
	1	Status information
6...0	Status_Type	
	0	- reserved -
	1	Status information
	2	Modul_Status (see also bytes 4...62)
	3...31	- reserved -
	32...126	Vendor-specific
	127	- reserved -

**Byte 2: Slot number**

Slot number (1...n) of the slave module

0 is the placeholder for the entire device.

**Byte 3: Variant "Interrupt specifier"**

Table 6-8 Structure of byte 3 of the device-specific diagnostics (variant "interrupt specifier")

Bit no.	Meaning	
7...3	Seq_No	Unique identifier of an interrupt alarm
2	Add_Ack	If this bit is set, the DP-V1 master is indicating that this interrupt expects an acknowledgement in the form of a WRITE job.
1...0	Alarm_Specifier	
	0	No further distinction
	1	Interrupt appears, slot disrupted The slot generates an interrupt due to an error.
	2	Interrupt disappears, slot OK The slot generates the interrupt and indicates that it has no further errors.
	3	Interrupt disappears, slot still disrupted The slot generates an interrupt and indicates that it has further errors.

### Byte 3: Variant "Status specifier"

Table 6- 9 Structure of byte 3 of the device-specific diagnostics (variant "status specifier")

Bit no.	Meaning	
7...2	- reserved -	
1...0	Status_Specifier	
	0	No further distinction
	1	Status appears
	2	Status disappears
	3	- reserved -

### Bytes 4...62: Module-specific diagnostics: General coding

This byte contains data with module-specific information that is described in the relevant module documentation. The relevant module is identified by the slot (byte 2).

### Bytes 4...62: Module-specific diagnostics with "status type" and "module status"

With the variant "status type" of the device-specific diagnostics of DP-V1 slaves (see byte 1, bit 7) and the setting "Modul\_Status" (see byte 1, bits 0...6), there are two status bits here for each slot (= module). Bits not required are set to 0.

Table 6- 10 Structure of the bytes for module-specific diagnostics data

Byte	Bit assignment							
	7	6	5	4	3	2	1	0
4	Module status 4		Module status 3		Module status 2		Module status 1	
5	Module status 8		Module status 7		Module status 6		Module status 5	
...	...		...		...		...	
62	Module status 236		Module status 235		Module status 234		Module status 233	

The status bits are coded as follows:

Table 6- 11 Meaning of the values of the status bits

Value	Meaning
00	Data valid
01	Data invalid - error (for example short-circuit)
10	Data invalid - wrong module
11	Data invalid - no module plugged in

## **6.6 DP diagnostics frames when the CPU is in STOP**

### **DP diagnostics frames when the CPU is in STOP**

All diagnostics frames from DPV0 standard slaves and all DP interrupt frames from DP-S7/DPV1 standard slaves arriving when the CPU is in STOP are forwarded to the CPU. During module startup, the diagnostics frames must then be evaluated by a suitable user program.



## Technical specifications

Note the information in the System description of SIMATIC S7-1500 (Page 7).

In addition to the information in the system description, the following technical specifications apply to the module.

<b>6GK7 542-5FX00-0XE0</b>	
Product type name	CP 1542-5
<b>Connection to PROFIBUS</b>	
• Number	1 x PROFIBUS interface
Design of the PROFIBUS interface	
• Connector	1 x D-sub female connector (RS-485)
• Transmission speed	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
<b>Electrical data</b>	
Power supply	
• via S7-1500 backplane bus	15 V
Current consumption	
• From backplane bus	100 mA
• Power dissipation	1.5 W
<b>Insulation</b>	
Insulation tested with	707 VDC (type test)
<b>Design, dimensions and weight</b>	
Module format	Compact module S7-1500, single width
Degree of protection	IP20
Weight	Approx. 270 g
Dimensions (W x H x D)	35 x 142 x 129 mm
Installation options	Mounting in an S7-1500 rack
<b>Product functions *</b>	

\* You will find the product functions in the section Functional characteristics (Page 13).



# Approvals

## Approvals issued

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### Note

#### Issued approvals on the type plate of the device

The specified approvals - with the exception of the certificates for shipbuilding - have only been obtained when there is a corresponding mark on the product. You can check which of the following approvals have been granted for your product by the markings on the type plate. The approvals for shipbuilding are an exception to this.

---

## Certificates for shipbuilding and national approvals

The device certificates for shipbuilding and special national approvals can be found on the pages of Siemens Automation Customer Support on the Internet (<http://support.automation.siemens.com/WW/news/en/10805878>)

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

## Standards and test specifications

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

### IEC 61131-2

The SIMATIC NET S7 CPs described in this manual fulfill the requirements and criteria of the IEC 61131-2 standard (Programmable Logic Controllers, Part 2: equipment requirements and verifications).

**CE mark**



The SIMATIC NET S7-CPs described in this manual fulfill the requirements and protection goals of the following EC directives and meet the harmonized European standards (EN) that have been published for the programmable logic controllers in the official journals of the European communities:

- 2004/108/EEC "Electromagnetic Compatibility" (EMC Directive)
- 94/9/EC "Equipment and protective systems intended for use in potentially explosive atmospheres" (Explosion Protection Directive)

The EC Declarations of Conformity are available for the responsible authorities according to the above-mentioned EC Directive at the following address:

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

You will find the EC Declaration of Conformity at the following address / under the following entry ID on the Internet (<http://support.automation.siemens.com/WW/view/en/16689636>)

**EMC directive**

The SIMATIC NET S7 CPs listed above are designed for use in an industrial environment.

Field of application	Requirements	
	Emission	Immunity to interference
Industry	EN 61000-6-4	EN 61000-6-2

**Explosion Protection Directives**



Complying with EN 60079  
(electrical apparatus for potentially explosive atmospheres; Type of protection "n")

EN 60079-15, EN 60079-0

II 3 G Ex nA IIC T4 Gc

DEKRA 12 ATEX 0240X

**Note**

When using (installing) SIMATIC NET products in hazardous area zone 2, make absolutely sure that the associated conditions are adhered to!

You will find these conditions here:

- In the SIMATIC NET Manual Collection under  
"All Documents" > "Use of subassemblies/modules in a Zone 2 Hazardous Area"

**Notice for Australia - C-TICK**

The above listed SIMATIC NET S7 CPs meet the requirements of the standard AS/NZS 2064 (Class A).

**Notices for Canada**

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

**AVIS CANADIEN**

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

**UL and CSA approval****Note**

You will recognize the approval, UL/CSA or cULus, assigned to your product from the mark on the rating plate.

**UL approval**

UL Recognition Mark Underwriters Laboratories (UL) nach Standard UL 508:

- Report E 85972

**CSA approval**

CSA Certification Mark Canadian Standard Association (CSA) nach Standard C 22.2 No. 142:

- Certification Record 063533-C-000

**cULus Approval, Hazardous Location**

CULUS Listed 7RA9 IND. CONT. EQ. FOR HAZ. LOC.


Underwriters Laboratories Inc. complying with

- UL 508 (Industrial Control Equipment)
- CSA C22.2 No. 142 (Process Control Equipment)
- ANSI ISA 12.12.01, CSA C22.2 No. 213-M1987 (Hazardous Location)
- CSA-213 (Hazardous Location)

APPROVED for Use in

- Cl. 1, Div. 2, GP. A, B, C, D T3...T6
- Cl. 1, Zone 2, GP. IIC T3...T6

You will find the temperature class on the type plate on the module.

 <b>WARNING</b>
<b>Explosion Hazard -</b> Do not disconnect while circuit is live unless area is known to be non hazardous. Explosion Hazard - Substitution of components may impair suitability for Class I, Division 2.

---

**Note**

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

---

**Note**

For devices with C-PLUG memory: The C-PLUG memory module may only be inserted or removed when the power is off.

---

**Note**

This plant has to be mounted according to the NEC (National Electrical Code) stipulations.

When used in environments according to class I, division 2 (see above) , the SIMATIC NET S7 CPs must be mounted in an enclosure.

---

**FM approval**




Factory Mutual Approval Standard Class Number 3611,

Class I, Division 2, Group A, B, C, D, T3...T6 or

Class I, Zone 2, Group IIC, T3...T6.

You will find the temperature class on the type plate on the module.

 <b>WARNING</b>
<b>Personal injury and damage to property may occur.</b> In hazardous areas, personal injury or property damage can result if you create or break an electrical circuit during operation of a SIMATIC NET S7 CP (for example, by means of plug-in connections, fuses, switches). <b>WARNING - EXPLOSION HAZARD: DO NOT DISCONNECT EQUIPMENT WHEN A FLAMMABLE OR COMBUSTIBLE ATMOSPHERE IS PRESENT.</b> When used in hazardous locations (division 2 or zone 2), the device must be installed in an enclosure.

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