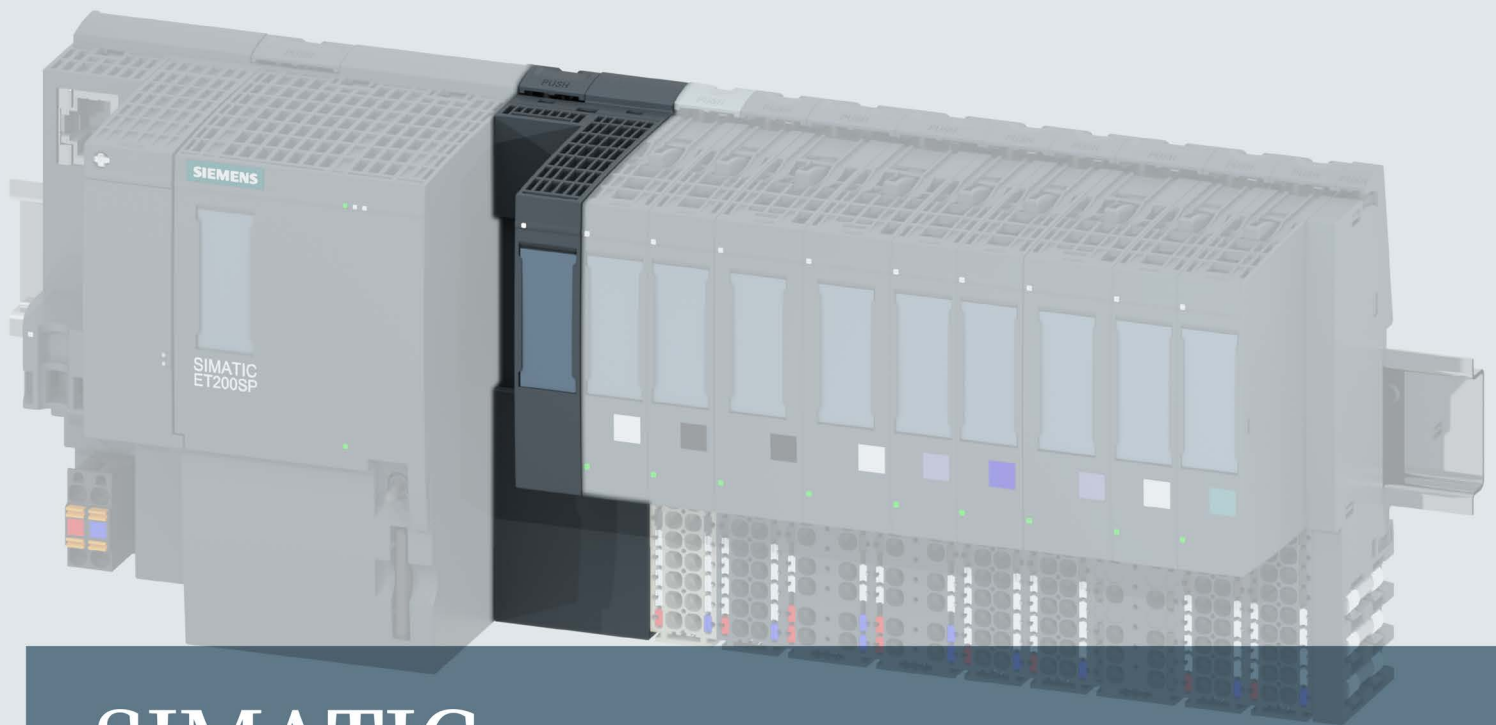# SIEMENS

SIMATIC

ET 200SP

Communication module CM DP (6ES7545-5DA00-0AB0)

Manual

Edition | 12/2014

Answers for industry.

SIEMENS

SIMATIC

ET 200SP
Communication module CM DP
(6ES7545-5DA00-0AB0)

Manual

12/2014
A5E33619758-AB

Legal information

Warning notice system

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

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

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

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

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

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

Qualified Personnel

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

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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 manual supplements the system manual ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293).

Functions that generally relate to the system are described in this system manual.

The information provided in this manual and in the system/function manuals supports you in commissioning the ET 200SP distributed I/O system.

Conventions

STEP 7: In this documentation, "STEP 7" is used as a synonym for all versions of the configuration and programming software "STEP 7 (TIA Portal)".

Please also observe notes marked as follows:

Note

A note contains important information on the product described in the documentation, on the handling of the product or on the section of the documentation to which particular attention should be paid.

Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. You can find more information about industrial security on the Internet (http://www.siemens.com/industrialsecurity).

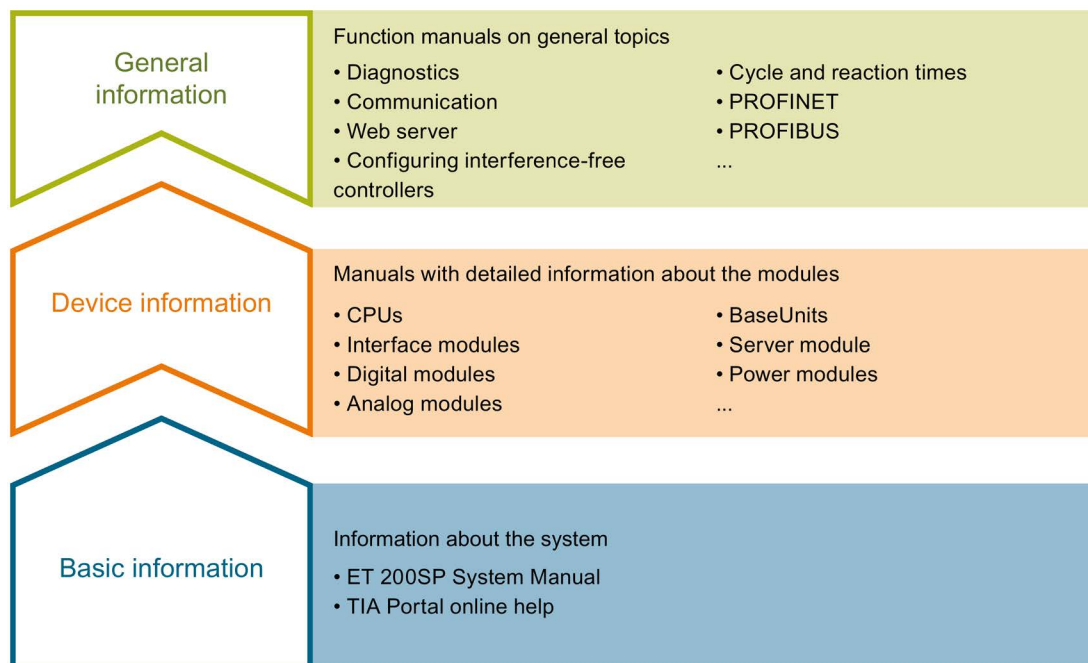To stay informed about product updates as they occur, sign up for a product-specific newsletter. You can find more information on the Internet (http://support.automation.siemens.com).

Table of contents

ET 200SP Documentation Guide

<div style="text-align: right; font-size: 3em;">1</div>

The documentation for the SIMATIC ET 200SP distributed I/O system is arranged into three areas.
This arrangement enables you to access the specific content you require.

General information	Function manuals on general topics
	• Diagnostics • Cycle and reaction times
	• Communication • PROFINET
	• Web server • PROFIBUS
	• Configuring interference-free controllers ...

Device information	Manuals with detailed information about the modules
	• CPUs • BaseUnits
	• Interface modules • Server module
	• Digital modules • Power modules
	• Analog modules ...

Basic information	Information about the system
	• ET 200SP System Manual
	• TIA Portal online help

Basic information

The system manual describes in detail the configuration, installation, wiring and commissioning of the SIMATIC ET 200SP. distributed I/O system. The STEP 7 online help supports you in the configuration and programming.

Device information

Product manuals contain a compact description of the module-specific information, such as properties, terminal diagrams, characteristics and technical specifications.

General information

The function manuals contain detailed descriptions on general topics regarding the SIMATIC ET 200SP distributed I/O system, e.g. diagnostics, communication, Web server, designing interference-free controllers.

You can download the documentation free of charge from the Internet (http://w3.siemens.com/mcms/industrial-automation-systems-simatic/en/manual-overview/tech-doc-et200/Pages/Default.aspx).

Changes and supplements to the manuals are documented in a Product Information.

Manual Collection ET 200SP

The Manual Collection contains the complete documentation on the SIMATIC ET 200SP distributed I/O system gathered together in one file.

You can find the Manual Collection on the Internet (http://support.automation.siemens.com/WW/view/en/84133942).

My Documentation Manager

The My Documentation Manager is used to combine entire manuals or only parts of these to your own manual.
You can export the manual as PDF file or in a format that can be edited later.

You can find the My Documentation Manager on the Internet (http://support.automation.siemens.com/WW/view/en/38715968).

Applications & Tools

Applications & Tools supports you with various tools and examples for solving your automation tasks. Solutions are shown in interplay with multiple components in the system - separated from the focus in individual products.

You can find Applications & Tools on the Internet (http://support.automation.siemens.com/WW/view/en/20208582).

CAx Download Manager

The CAx Download Manager is used to access the current product data for your CAx or CAe systems.

You configure your own download package with a few clicks.

In doing so you can select:

- Product images, 2D dimension drawings, 3D models, internal circuit diagrams, EPLAN macro files

- Manuals, characteristics, operating manuals, certificates

- Product master data

You can find the CAx Download Manager on the Internet (http://support.automation.siemens.com/WW/view/en/42455541).

TIA Selection Tool

With the TIA Selection Tool, you can select, configure and order devices for Totally Integrated Automation (TIA).
This tool is the successor of the SIMATIC Selection Tool and combines the known configurators for automation technology into one tool.
With the TIA Selection Tool, you can generate a complete order list from your product selection or product configuration.

You can find the TIA Selection Tool on the Internet (http://w3.siemens.com/mcms/topics/en/simatic/tia-selection-tool).

Product overview 2

2.1 Properties

Article number

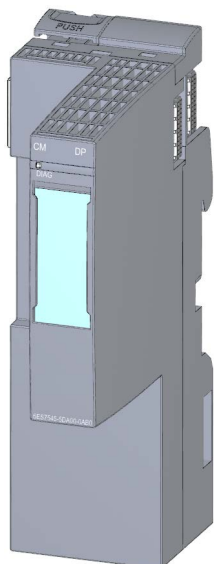6ES7545-5DA00-0AB0

View of the module

Figure 2-1   View of the CM DP communication module

Properties

The communication module CM DP can be used with the ET 200SP CPUs. You insert the communication module to the right next to the CPU.

The communication module has the following properties:

- Technical properties
  - Connects the CPU of the ET 200SP distributed I/O system with PROFIBUS DP
  - Bus connection via RS485 interface
- Supported functions
  - Operation as DP master or DP slave
  - Enable/disable DP slave
  - Diagnostics requirements
  - Identify the bus topology in a DP master system
  - Identification data I&M 0
  - Time-of-day synchronization
  - Line diagnostics
  - S7 services

Supported communication services

The communication module supports the following communication services:

- PROFIBUS DP-Master, as of STEP 7 V13, Update 3
  - PROFIBUS DP according to IEC 61158 and 61784 DPV1, DP master for DP slaves according to PROFIBUS DP and DPV1 standard
- PROFIBUS DP slave, as of STEP 7 V13, SP1
  - PROFIBUS DP according to IEC 61158 and 61784 DPV1, DP slave and I-slave

---

Note

DP master or DP slave

Note however: The CM DP only supports alternative operation as DP master or DP slave.

Maximum configuration as DP Master

Table 2- 1   General characteristics of DP mode

Feature	Explanation/values
Number of operable DP slaves	125
Max. size of the input area over all DP slaves	8 KB
Max. size of the output area via all DP slaves	8 KB
Maximum number of inputs per DP slave	244 bytes
Maximum number of outputs per DP slave	244 bytes
Max. size of the consistency area for a module	128 bytes

Note

Setting the PROFIBUS DP address on the communication module CM DP

The communication module CM DP does not have a DIP switch. You set the PROFIBUS DP address via STEP 7 (TIA Portal). You can find more information on this topic in the STEP 7 online help.

Accessories

A detailed list of the available accessories can be found in the system manual ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293).

Additional information

You can obtain detailed information on the topic of PROFIBUS in the function manual PROFIBUS (http://support.automation.siemens.com/WW/view/de/59193579/0/en)

2.2 Operating and display elements

Operating and connection elements

The following figure shows the operating and connection elements of the CM DP communication module.
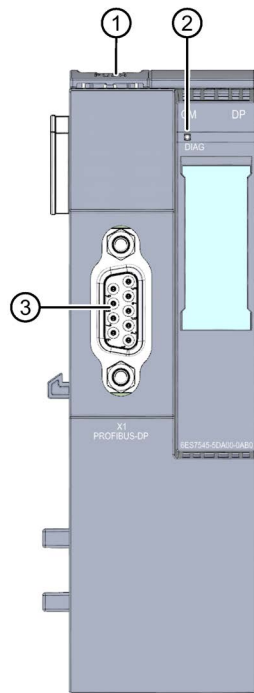
①   Mounting rail release
②   DIAG LED
③   DP interface

Figure 2-2   Operating and display elements of the communication module CM DP
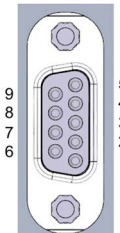
Wiring   3

3.1   Pin assignment

PROFIBUS DP with RS485 interface

The following table shows the signal names and the designations of the pin assignment for the PROFIBUS DP interface.

Table 3- 1   Pin assignment PROFIBUS DP with RS485 interface

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

3.2 Block diagram

The following figure shows the block diagram of the CM DP communication module.
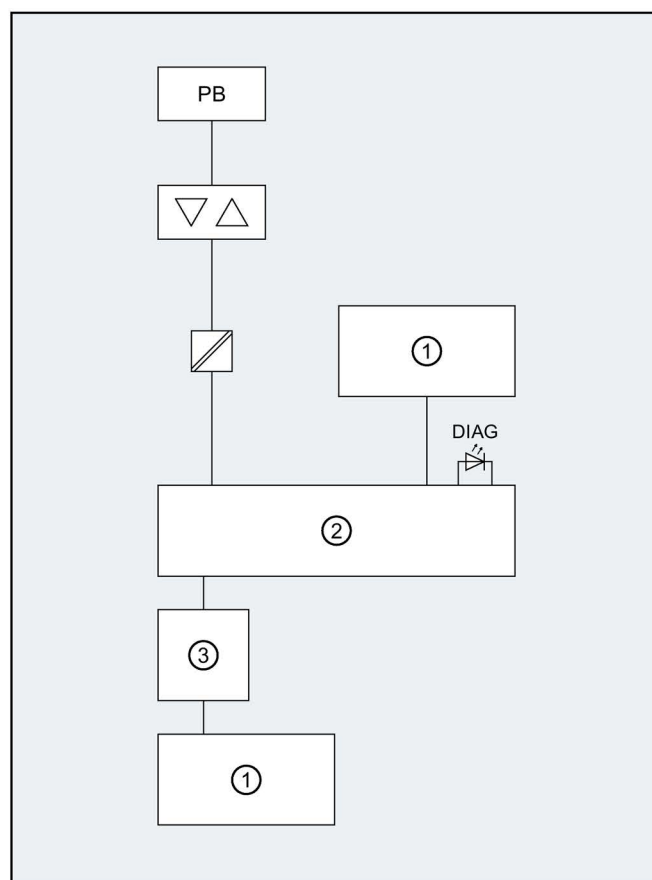
①	Backplane bus	PB	PROFIBUS interface
②	ET 200SP PROFIBUS interface and backplane bus transmission	DIAG	LED diagnostics (green/red)
③	Internal power supply		

Figure 3-1   Block diagram of the CM DP

Programming

4

Instructions

Pre-written instructions are available as an interface in your STEP 7 user program for communication services.

Table 4- 1   Instructions for PROFIBUS DP

Instructions	Meaning when used with CM DP	
	DP master	DP slave (I-slave)
DPSYC_FR	Synchronize DP slaves/Freeze inputs (SYNC/FREEZE instruction)	-
DPNRM_DG	Read diagnostics data of a DP slave	-
DP_TOPOL	Determine topology for DP master system	-
WRREC	Write data record of a DP slave	-
RDREC	Read data record of a DP slave	-
GETIO	Read process image of a DP standard slave	Read process image
SETIO	Transfer process image of a DP standard slave	Transfer process image
GETIO_PART	Read process image area of a DP standard slave	Read process image area
SETIO_PART	Transfer process image area of a DP standard slave	Transfer process image area
D_ACT_DP	Enable/disable DP slaves	-
DPRD_DAT	Read consistent data of a module (user data)	
DPWR_DAT	Write consistent data of a module	
RALRM	Event-driven reading of alarm information (diagnostics, pull/plug, hardware interrupt) as well as DPV1-specific interrupts (update, status, vendor-specific interrupt)	Event-driven reading of interrupt information (diagnostic interrupt)

Read the documentation for the instructions in the STEP 7 online help

Calling instructions for distributed I/O

Multiple calls are required for the instructions of the distributed I/O.

The duration of the call processing is dependent on the load, bus cycle time and transmission rate. Timeouts may occur if these instructions are called in a loop within a cycle.

Exceptions:

● Only one call is necessary for the RALRM instruction "Receive interrupt".

Program blocks for DPV1 (according to PNO standard) [1]:

● "Read data record from a DP slave" RDREC instruction is functionally equivalent to SFC59 (write record)

● "Write data record to a DP slave" WRREC instruction is functionally equivalent to SFC58 (read record)

● "Read interrupt information from a DP slave" RALRM instruction call is made within an interrupt OB

[1] PNO: PROFIBUS user organization

Diagnostics, error and system alarms

<div style="text-align: right">5</div>

5.1 Status and error displays

Introduction

Diagnostics by means of LEDs is an initial tool for error localization. In order to localize errors still further, you usually evaluate the display of the module status in STEP 7 or the diagnostics buffer of the CPU. The buffer contains plain text information on the error that has occurred. For example, you will find the number of the relevant error OB in the plain text information.

LED display

The figure below shows the LED display on the CM DP communication module.
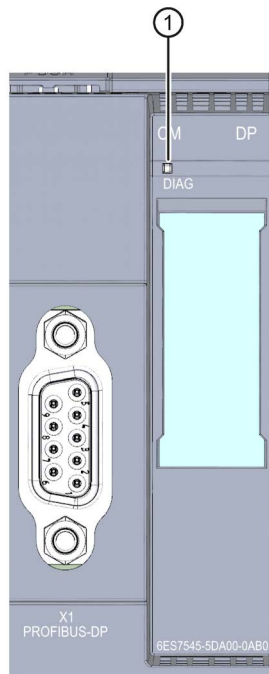
①   DIAG (green/red)

Figure 5-1   LED display on the CM DP communication module

Meaning of the DIAG LED display on the communication module

The CM DP communication module has an LED for monitoring the diagnostics.

DIAG LED

Table 5- 1   DIAG LED fault display

DIAG LED	Meaning
☼ Flashes	Module parameters not assigned
■ On	Module parameters assigned and no diagnostics
☼ Flashes	Diagnostics of subordinate modules (as of firmware version V1.7)

Additional information

You can find more information on diagnostics in the Diagnostics function manual (http://support.automation.siemens.com/WW/view/de/59192926/0/en) for diagnostic options that are available for SIMATIC systems S7-1500, ET 200MP, ET 200SP and ET 200AL.

5.2 DP slave diagnostics

DP V1 slave: Diagnostic interrupt

Transmission of diagnostic data is made as a diagnostic interrupt. Diagnostic interrupts must be acknowledged by the DP master.

Supported diagnostic functions

The CM DP supports the following blocks of the DP diagnostics:

● Standard diagnostics (6 bytes)

● Identifier-related diagnostics (2...17 bytes depending on the number of configured transfer areas)

● Module status (5...35 bytes depending on the number of configured transfer areas)

● Diagnostic interrupt (8 bytes, if any)

User program (DP master)

The "DPNRM_DG" instruction is used to read the diagnostic data of a DP slave (DP single diagnostics) in the DP master.

The diagnostic interrupts for DP V1 slaves are periodically evaluated in the user program of the master via the "RALRM" instruction.

You can find the required parameter assignment for the instruction in the STEP 7 online help.

The following is a structural overview of the diagnostic 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	Manufacturer ID of the slave

Overview of device-specific diagnostics

The device-specific diagnostics data depends on the protocol variant in which the DP slave is operated:

- DP-V1 slave

Table 5- 2   Overview of device-specific diagnostics of the CM DP for 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 diagnostic data	

5.3 Standard diagnostics

Standard diagnostics

The coding of the standard diagnostic bytes is explained below.

Byte 0: Station status 1

Table 5- 3   Structure of station status byte 1

Bit no.	Name	Explanation
7	Master_Lock	The DP slave was configured by a different DP master. The DP slave can only be accessed read-only by the DP master configured as productive.
		This bit is set by the DP master when its bus address does not match the configured address.
6	Parameter_Fault	The most recently received parameter frame was corrupt or not permitted. This bit is set by the DP slave.
		Remedy: Check the parameter assignment with respect to invalid parameters.
5	Invalid_Slave_Response	This bit is set by the DP master if an implausible response has been received by the DP slave.
4	Service_Not_Supported	This bit is set by the DP master if a function is called by the master that is not supported by the DP slave.
		Remedy: Disable the parameter assignment of the required function at the master.
3	Ext_Diag	This bit is set by the slave.
		• Bit =1: Diagnostic data is available in the diagnostic area specific to the slave. The diagnostic data can be evaluated in the user program of the master.
		• Bit =0: A status message can be available in the diagnostic area specific to the slave. The status message can be evaluated in the user program of the master.
2	Slave_Config_Check_Fault	The configuration data sent by the DP master is rejected by the DP slave.
		Cause: Configuration error. Remedy: Change the configuration.
1	Station_Not_Ready	The DP slave is not yet ready for productive data exchange.
		This is a temporary condition and cannot be influenced by the DP master.
0	Station_Non_Existent	The DP slave is not responding on the bus.
		This bit is set by the DP master 1 (the slave permanently sets this bit to 0). If the bit is set, the diagnostic bits contain the status of the last diagnostic alarm or the initial value.

Byte 1: Station status 2

Table 5- 4   Structure of station status byte 2

Bit no.	Name	Explanation
7	Deactivated	The DP slave was shown as inactive in the local parameter set and will not be cyclically queried.
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	The watchdog is activated on the DP slave. The bit is set by the slave.
2	Status_From_Slave	Bit =1: The diagnostics comes from the DP slave. The bit is permanently set by the slave to 1.
1	Static_Diag	Static diagnostics If the DP slave sets this bit, the DP master must fetch the diagnostic data from the DP slave until the DP slave resets this bit. The DP slave sets this bit, for example, if it cannot perform data transfer.
0	Parameter_Request	The DP slave sets this bit when it has to be re-parameterized and configured. If bit 0 and bit 1 are both set, bit 0 has the higher priority.

Byte 2: Station status 3

Table 5- 5   Structure of station status byte 3

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

Byte 3: Master address

The address of the DP master that has configured this DP slave is entered in the "Master_Add" byte.

If the DP slave was not configured by a DP master, the DP slave sets address 255 in this byte.

Bytes 4 and 5: Manufacturer ID of the slave ("Ident_Number")

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

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

5.4 Device-specific diagnostics with DP-V1

Device-specific diagnostics

The device-specific diagnostics of DP V1 slaves is available in two variants:

- Interrupt type
- Status type

The two variants differ in the coding of byte 1, bit 7 of the device-specific diagnostic data. The distinction is component-specific.

Byte 0: Header

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

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

Byte 1: "Interrupt type" variant

Table 5- 6   Structure of byte 1 of the device-specific diagnostics ("Interrupt type" variant)

Bit no.	Meaning	
7	Value	Meaning
	0	**Interrupt**
6...0	**Alarm_Type**	
	0	- Reserved -
	1	Diagnostic interrupt
	2	Process interrupt
	3	Pull interrupt
	4	Plug interrupt
	5	Status interrupt
	6	Update interrupt
	7...31	- Reserved -
	32...126	Manufacturer-specific
	127	- Reserved -

Older status interrupts can be overwritten by newer ones when status interrupts occur in rapid succession.

Byte 1: "Status type" variant

Table 5- 7   Structure of byte 1 of the device-specific diagnostics ("Status type" variant)

Bit no.	Meaning	
7	Value	Meaning
	1	**Status message**
6...0	**Status_Type**	
	0	- Reserved -
	1	Status message
	2	Module_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 overall device.

Byte 3: "Interrupt specifier" variant

Table 5- 8   Structure of byte 3 of the device-specific diagnostics ("Interrupt specifier" variant)

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

Byte 3: "Status specifier" variant

Table 5- 9   Structure of byte 3 of the device-specific diagnostics ("Status specifier" variant)

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 diagnostic data: General coding

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

Bytes 4...62: Module-specific diagnostics for "Status type" and "Modul_Status"

In the case of the "Status type" variant of device-specific diagnostics from DP V1 slaves (see byte 1, bit 7) and the "Module_Status" setting (see byte 1, bits 0...6) two status bits are provided here for each slot (= module). Unneeded bits are set to 0.

Table 5- 10   Structure of the bytes for the module-specific diagnostic data

Byte	Bit assignment							
Bit	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 respective status bits are coded as follows:

Table 5- 11   Meaning of the values of the status bits

Value	Meaning
00	Data valid
01	Data invalid - error (e.g. short-circuit)
10	Data invalid - wrong module
11	Data invalid - no module plugged

Technical specifications

6

6.1 Technical specifications

Technical specifications of the CM DP (6ES7545-5DA00-0AB0) communication module

	6ES7545-5DA00-0AB0
Product type designation	ET 200SP, CM DP
General information	
Hardware version	FS01
HW functional status	FS01
Engineering with	
STEP 7 TIA Portal can be configured/integrated as of version	V13 Update 3
Installation type/mounting	
Rack mounting possible	No
Rail mounting possible	Yes; standard DIN rail
Supply voltage	
Type of supply voltage	24 VDC
Rated value (DC)	24 V
Valid range low limit (DC)	19.2 V
Valid range high limit (DC)	28.8 V
Reverse polarity protection	Yes
Interfaces	
Number of interfaces PROFIBUS	1
1. interface	
Interface hardware	
• RS 485	Yes
Protocols	
• SIMATIC communication	Yes
• PROFIBUS DP master	Yes
• PROFIBUS DP slave	Yes
Interface hardware	
RS 485	
Transmission rate, max.	12 Mbps
Max. cable length	100 m

	6ES7545-5DA00-0AB0
Protocols	
PROFIBUS DP master	
Services	
• PG/OP communication	Yes
• S7 routing	Yes
• Data record routing	Yes
• Isochronous mode	No
• Constant bus cycle time	No
• Number of DP slaves	125
• Activation/deactivation of DP slaves	Yes
PROFIBUS DP slave	
Transmission rate, max.	12 Mbps
Automatic baud rate search	Yes
Address area, max.	120
User data per address area, max.	128 bytes
Services	
• PG/OP communication	Yes, only with active interface
• Routing	Yes, only with active interface
• S7 communication	Yes, only with active interface
• Direct data exchange (data exchange broadcast)	Yes, no subscriber possible - only passive publisher
• DPV1	Yes
Transfer memory	
• Inputs	244 bytes
• Outputs	244 bytes
Interrupts/diagnostics/status information	
Diagnostic alarms	
Diagnostics	Yes
Diagnostic indicator LED	
For module diagnostics	Yes; green/red DIAG LED
Electrical isolation	
Between backplane bus and interface	Yes
Ambient conditions	
Ambient temperature in operation	
Horizontal installation, min.	0 °C
Horizontal installation, max.	60 °C
Vertical installation, min.	0 °C
Vertical installation, max.	50 °C

	6ES7545-5DA00-0AB0
Dimensions	
Width	35 mm
Height	117 mm
Depth	75 mm
Weights	
Weight, approx.	80 g

Dimension drawing A

A.1 Dimension drawing of the CM DP communication module

This section contains a dimension drawing of the module mounted on a mounting rail. Observe the dimensions when installing in cabinets, control rooms, etc.
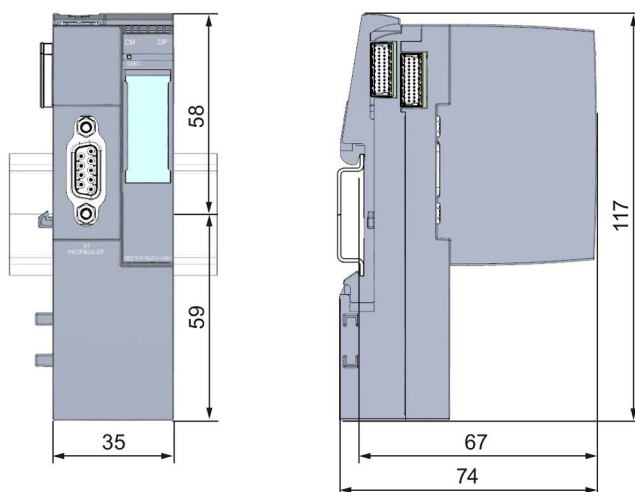
Dimension drawing of the CM DP communication module

Figure A-1   Dimension drawing CM DP