SIEMENS

SIMATIC NET

S7-300 - PROFIBUS CP 342-5

Equipment Manual

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1.3 Communications services

Supported communications services

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

- **PROFIBUS DP**
  - as DP master class 1 (PROFIBUS DP according to EN 50170 DPV0, DP master)
  - as DP slave (PROFIBUS DP according to EN 50170 DPV0, DP slave)

  Note

  DP master or DP slave

  Please note, however: The CP only supports operation either as DP master or DP slave. You can also deselect DP mode altogether.

- **S7 communication and PG/OP communication**
  - PG functions with uploading / downloading of FM modules, configuration / diagnostics and routing
  - Operator control and monitoring functions (HMI)
    Multiplexing TD/OP connections

    When multiplexing OP connections, the following acyclic services are supported:

    - read once

    - write once

    - read system status list
  - Client and server for data exchange via communication blocks on S7 connections configured at both ends

    The following blocks/functions are available:
    BSEND FB 12, BRCV FB 13,
    PUT FB 14, GET FB 15
    USEND FB 8, URCV FB 9
    C_CNTRL FC 62
    You will find a more detailed description in /5/ (Page 54).

    Note

    The partner station can be an S7-300, S7-400 or PG/PC application with SIMATIC NET OPC server; raw data tags using BSEND/BRECV to WinCC are not supported.

  - Server for data exchange on connections configured at both ends without communications blocks on the S7-300 / C7-300 station

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

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

1.4 Performance data and behavior in operation

1.4.1 Transmission speeds supported

The transmission speed is set with the SIMATIC STEP 7 configuration software. For permitted values, refer to Technical specifications (Page 45).

Note

Remember the cable length

The permitted cable length must be kept to depending on the transmission speed. Refer to the information in /3/ (Page 54).

1.4.2 Characteristic data of the DP interface / DP master

General characteristic data

When operating the CP as a DP master, the following characteristic data is significant:

Characteristic	Explanation / values
Number of operable DP slaves	124 max.
Total number of operable slots	1024 max.
Size of the DP data areas (total): • DP input area • DP output area	 2160 bytes max. 2160 bytes max.
Size of the DP data areas (per DP slave): • DP input area • DP output area	 244 bytes max. 244 bytes max.
Size of the DP diagnostics data:	240 bytes per DP slave
PROFIBUS address range for DP master mode	1 - 125

Execution times of the program blocks for PROFIBUS DP

The following table will help you to calculate the CPU cycle times (OB1) in DP master mode. The table contains the execution time of the program blocks (DP_SEND, DP_RECV) required for DP processing on the S7-300 / C7-300 CPU.

Component	Explanation / guideline values	
Execution time on the CPU 314C-2DP (6ES7 314-6CF00-0AB0)	Per DP_Send block call: • <3.0 ms at 8 bytes • <5.0 ms at 2160 bytes [1)]	Per DP_RECV block call: • <3.3 ms at 8 bytes • <5.8 ms at 2160 bytes [1)]
Execution time on the CPU 317-2PN/DP (6ES7 317-2EJ10-0AB0)	Per DP_SEND block call: • <1.5 ms at 8 bytes • <2.3 ms at 2160 bytes [1)]	Per DP_RECV block call: • <1.7 ms at 8 bytes • <2.8 ms at 2160 bytes 1)

[1)] the following applies at data lengths > 240 bytes: The data is transferred segmented over several block calls.

Note

Time values are guidelines

The times shown for DP master mode should only be considered as guideline values. The values apply only for a mono master configuration when no other services (for example PG functions) are processed on the CP.

Note

DP master mode and S7 slaves (ET-200)

You will find important information on using and configuring (importing the GSD file) S7 slaves (ET200) when operating the CP as DP master on the Internet under the following entry ID:

Link: (https://support.industry.siemens.com/cs/ww/en/view/21628502)

1.4.3 Characteristic data of the DP interface / DP slave

General characteristic data

The following characteristic data is important for successful data transfer from the DP master to the DP slave:

Characteristic		Explanation / values
Generic station description (GSD)	Depending on the CP type, use the following GSD files:	
	CP 342-5 (6GK7 342-5DA02-0XE0)	SIEM80D6.GSD
	CP 342-5 (6GK7 342-5DA03-0XE0)	SI0180D6.GSD

Characteristic		Explanation / values
	You will find GSD files on the Internet at the following address: Link: (https://support.industry.siemens.com/cs/ww/en/view/113652)	
Size of the DP data areas		
	DP input area	240 bytes max.
	DP output area	240 bytes max.
Min. slave interval		0.6 ms
SYNC / FREEZE	CP 342-5 (6GK7 342-5DA03-0XE0)	Is supported
User parameter assignment data		3 bytes; value: 40 00 00 (fixed)
User diagnostics data		0 bytes

Note

Fail-safe

Fail-safe mode is possible only if you use the GSD files listed in the table above.

Execution times of the program blocks for PROFIBUS DP

The following table will help you to calculate the CPU cycle times (OB1) in DP slave mode. The table contains the execution time of the FCs (FC DP_SEND, FC DP_RECV) required for DP processing on the S7-300 / C7-300 CPU.

Component	Explanation / values	
Execution time on the CPU 314C-2DP (6ES7 314-6CF00-0AB0)	Per DP_SEND block call: • <3.0 ms at 8 bytes • <5.0 ms at 240 bytes	Per DP_RECV block call: • <3.3 ms at 8 bytes • <5.8 ms at 240 bytes
Execution time on the CPU 317-2PN/DP (6ES7 317-2EJ10-0AB0)	Per DP_SEND block call: • <1.5 ms at 8 bytes • <2.3 ms at 240 bytes	Per DP_RECV block call: • <1.7 ms at 8 bytes • <2.8 ms at 240 bytes

Note

Time values are guidelines

The times shown for DP slave mode should only be considered as guideline values. The values apply only when no other services (for example PG functions) are processed on the CP.

1.5.2 Project engineering

Configuration and downloading the configuration data

It is possible to download the configuration data to the CP via MPI or PROFIBUS. The following version of STEP 7 is required:

STEP 7 version	Functions of the CP
STEP 7 as of V5.1	The functional range of the following CP type can be configured: • 6GK7342-5DA02-0XE0
• STEP 7 as of V5.4.5 with Hotfix 4 and HSP 1049 • STEP 7 as of V5.5.2 • STEP 7 Professional V11 or higher	The functional range of the following CP type can be configured: • 6GK7342-5DA03-0XE0

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.

Note

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!

Note

Extensive configuration

Before loading an extensive configuration over a previous configuration, you should run a memory reset on the CP.

By doing this, you avoid the configuration storage space on the CP being exceeded. If the configuration storage space on the CP is not adequate, the diagnostics buffer of the CP reports a lack of resources when you download the configuration data.

Replacing a module without a programming device

The CP supports the option of storing the configuration data of the CP on the CPU. If you use this option, this means that module replacement is possible without having to load the configuration data from the PG again.

The configuration data is then stored in load memory of the CPU. Storage of the configuration data is protected from power failure by the battery backup or the EPROM module card in the CPU.

1.6 Compatibility with the previous product

1.6.1 Enhanced functions and modifications

Replacing a module

The CP 342-5 (6GK7 342-5DA03-0XE0) is suitable as a replacement for the following predecessor products:

- CP 342-5 (6GK7 342-5DA00-0XE0)
- CP 342-5 (6GK7 342-5DA01-0XE0)
- CP 342-5 (6GK7 342-5DA02-0XE0)

Functional differences

In the following table, you can see the performance and functional characteristics that differ from the previously available device types.

	CP type 6GK7 342-5-**-0XE0**			
Performance/functional characteristics	**-5DA00-**	**-5DA01-**	**-5DA02-**	**-5DA03-**
Number of connectable DP slaves	64	124	124	124
I/O configuration limits DP master	240 bytes	2160 bytes	2160 bytes	2160 bytes
I/O configuration limits DP slave	86 bytes	240 bytes	240 bytes	240 bytes
Also supports transmission speeds > 1.5 Mbps			●	●
Supports SYNC / FREEZE in DP slave mode				●
Interface in the user program in DP mode	Refer to the information in section Compatibility in the user program in DP mode (Page 24).			

Note

What to do with a slot left empty

If you cannot eliminate gaps in the slots left by replacing modules by closing up the remaining modules, you will need to use a dummy module (6ES7 370-0AA01-0AA0). The dummy module is not configured and does not occupy any address space.

In this case, the address switch on the rear of the module must be set to "Non Address Mode" (NA).

1.6.3 Compatibility in the user program in DP mode

Device-dependent differences on the program block interface

Compared with previous modules, the CP reacts differently in the following ways. Remember the effects in your user program. The following table provides an overview:

Table 1- 3 Changes in response

Topic / relates to		Response of the device types CP 342-5 6GK7 342-5DA00-0XE0 CP 342-5 6GK7 342-5DA01-0XE0	New response of the device types CP 342-5 6GK7 342-5DA02-0XE0 CP 342-5 6GK7 342-5DA03-0XE0
1.	DPSTATUS output parameter in program block DP_RECV		
	DP master mode:	Bit 6: Display of "received data overflow"	Bit 6: is no longer set
	DP slave mode:	Bit 3: Display of "No frame from DP master within the watchdog time" Bit 4: Display of "DP data overflow"	Bit 3: is no longer set Bit 4: is no longer set
2.	DP modes	A distinction is made between STOP and OFFLINE.	The STOP mode is mapped to the OFFLINE mode.
3.	Set current DP mode	- is supported -	With the version of the CP 342-5 described here, the following job parameters are no longer supported for program block DP_CTRL with CTYPE 4: • RUN with AUTOCLEAR • RUN without AUTOCLEAR
4.	Cyclic reading of the input/output data using program block DP_CTRL [1)]	- is supported -	With the version of the CP 342-5 described here, the following services of program block DP_CTRL are no longer supported: CTYPE = 7 CTYPE = 8 These job types are rejected with code 8311H.

Topic / relates to		Response of the device types CP 342-5 6GK7 342-5DA00-0XE0 CP 342-5 6GK7 342-5DA01-0XE0	New response of the device types CP 342-5 6GK7 342-5DA02-0XE0 CP 342-5 6GK7 342-5DA03-0XE0
12.	Jobs with DP_SEND and DP_RECV [1)]	DP slave mode: To start job processing, the program blocks DP_SEND **and** DP_RECV must be activated at least once. DP master mode: To start received data processing, the program block DP_RECV must be activated at least once.	Depending on the use, it is adequate to activate program block DP_SEND or DP_RECV to activate job processing. In DP master mode, at least of the two program blocks must be activated at least once.
13.	Receive buffer length to short for AG_RECV	If the receive buffer is too small, data is received until the buffer size is reached. The call is acknowledged with error code 8185H.	If the receive buffer is too small, no data is received. The call is acknowledged with error code 80B1H.
14.	• Responder functionality of the DP master (class 1) • DP master (class 2) passes jobs to DP master (class 1) Functions: • "DDLM_GET_Master_Diag" • "DDLM_Act_Param"	- supported by DP master as responder -	- DP master without responder functionality -

[1)] See also the STEP 7 online help on the SIMATIC NET program blocks for PROFIBUS DP.

Note on 8: Consistency in the data acceptance between CP and user program

Depending on the behavior in the user program, you can consider different areas as consistent data areas on the transfer interface between CP and user program.

- Variant 1: NDR bit is evaluated on the program block interface

  You can assume consistency over the entire DP data area used.

- Variant 2: NDR bit is not evaluated on the program block interface

  You can assume data consistency in a contiguous, non-overlapping 32-byte area.

  ("Non-overlapping" means: 32-byte areas must be counted or taken into account from the start address "0" of the DP data area under consideration.)

Table 1- 4 Consistency range in DP master mode

Access method in the user program	Maximum area size with data consistency
Variant 1	2160 bytes
Variant 2	32 bytes

Table 2- 2 LED display schemes

SF (red)	BUSF (red)	RUN (green)	STOP (yellow)	CP operating mode
Startup and operating statuses				
○	○	☼	●	Starting up (STOP → RUN)
○	○	●	○	Running (RUN)
○	○	●	☼	Stopping (RUN → STOP) The time required for the signaled mode change depends on the size of the STEP 7 project; this can take up to 1 minute in large projects. On completion of the mode change, the data exchange with the DP slaves continues.
○	○	○	●	Stopped (STOP) In STOP mode, configuring and performing diagnostics on the CP remain possible.
●	○	○	●	Stopped (STOP) with error(s). In this state, the CPU or intelligent modules in the rack remain accessible using PG functions.
○	●	●	○	Running (RUN) with problems on PROFIBUS.
○	☼	●	○	Running (RUN) with problems on the DP slaves.
Updating firmware				
○	○	○	☼	• Ready to begin loading firmware. (Operating mode active for a period of 10 s) or • CP is in DP slave mode and is not involved in cyclic data exchange with the DP master.
○	○	☼	○	Loading firmware.
●	●	○	○	Invalid firmware was loaded.
●	●	○	☼	Cp waits for firmware update. (CP has incomplete firmware)
Errors				
☼	☼	☼	☼	Module fault / system error (The two unlabeled LEDs also flash in this status.)

2.2 Mode selector

Controlling the mode

There are different ways in which you can control the operating status of the CP, as follows:

- Mode selector
- STEP 7 configuration software:
  - SIMATIC Manager / menu command: PLC > Display Accessible Nodes
  - NetPro / menu command: PLC > Operating Mode...
  - HW Config / menu command: PLC > Operating Mode...
  - NCM Diagnostics / menu command: Operating Mode

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 enters the configured and/or loaded data in the work memory. The CP then changes to STOP.

  Diagnostics of the CP is possible.

- Change from RUN to STOP

  The CP changes to STOP with the following response:

  - Established connections (FDL and S7 connections) are terminated.
  - Configuration and diagnostics of the CP are possible.
  - The following applies to DP mode:

    - DP slave mode: The CP is no longer in data transfer.

    - DP master mode: the mode is "OFFLINE".

Note

Longer transition times in complex systems

Depending on the extent of the configuration, it can take up to 1 minute before the CP reaches the "OFFLINE" mode.

Further information

Read the explanations relating to the topic of "Downloading the configuration to the target system" in the /1/ (Page 53) manual.

Configuration and operation

4

4.1 Configuring in third-party systems

Configuring in third-party systems via GSD file

To allow configuration as DP slave in third-party systems, a GSD file is available. You will find this on the following page of Siemens Industry Online Support:
Link: (https://support.industry.siemens.com/cs/ww/en/view/113652)

The protocol variant DP-V1 or DP-V0 is decided during operation by the setting of the connected DP master.

4.2 Loading with modified transmission speed

Startup response with modified transmission speed

If you change the transmission speed when downloading the configuration data, expect a significantly longer startup delay on the CP. The startup delay can run into several minutes.

Note

Clear/reset CP

Reset the CP memory before you download configuration data with a different transmission speed.

To reset memory, use the corresponding function in the configuration tool or in special diagnostics, see manual/1/ (Page 53)

4.3 DP mode

DP data exchange

If the central CPU is in STOP mode, substitute values are transferred in the DP data exchange.

The following applies: Default value = 0

4.4 Interface in the user program (status of blocks)

Status displays with the program block AG_SEND

For the CP 342-5 (6GK7 342-5DA03-0XE0), note the following over and above the information in /4/ (Page 54), Release 03/2010:

DONE	ERROR	STATUS	Meaning
0	1	8315H	Possible additional meaning: This error code can also occur with bus problems (for example physical disturbances due to bad cable connections or different settings for the transmission speed on the nodes).

Status displays with the program block DP_DIAG

For the CP 342-5 (6GK7 342-5DA03-0XE0), note the following over and above the information in /4/ (Page 54), Release 03/2010:

DONE	ERROR	STATUS	Possible with DTYPE	Meaning
1	0	0000H	0, 1 and 4-9	Job completed without error Note: With DTYPE 2, 3 and 10, error-free execution is indicated by a status code other than "0". Below (see table DP_DIAG codes in /4/ (Page 54)), you will see the detailed status codes for error-free execution for the range: **82**XXH If an error occurs in execution, you receive status codes in the following ranges: **80**XXH, **83**XXH, **8F**XXH
1	0	8248H	2, 3, 10	Job completed without error Note: This is the default code for the named diagnostics types if there is no special situation to signal.

Diagnostics and upkeep

5



⚠ CAUTION

Hot surfaces

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

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

⚠ WARNING

Cleaning the housing

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

Do not use any liquids or solvents.

5.1 Loading firmware

Firmware update

If new firmware versions are available for the CP, you will find these on the Internet pages of Siemens Industry Online Support:
Link: (https://support.industry.siemens.com/cs/ww/en/ps/15673/dl)

Save the firmware file to the file system of your PG/PC.

For the CP 342-5 with firmware version V6.0.66 the speed for updating the firmware was increased to 1.5 Mbps. Load the firmware file as follows:

- Load the firmware file only via the PROFIBUS interface (direct connection).
- When loading use the PROFIBUS connecting cable 6ES7 901-4BD00-0XA0 or an equivalent PROFIBUS cable.

  Max. length: 200 m

  Note: The use of an MPI cable is not permitted.
- When loading us the Firmware Loader:

  Windows Start menu > "All Programs > Siemens Automation > SIMATIC > STEP 7 > NCM S7 > Firmware Loader"

Loading with the Firmware Loader

The Firmware Loader opens with the Start dialog.

1. Click the "Next" button.

   The Firmware Loader opens the "Step 1" dialog.
2. Select the firmware to be loaded from the file system of your PG/PC using the "Browse" button.

   The selected file with supplementary information is displayed in the Firmware Loader.

   After selecting the firmware file click "Next".

   The Firmware Loader opens the "Step 2" dialog.
3. As the interface via which you want to load the firmware on the CP select the option "PROFIBUS direct" and click "Next".

   The Firmware Loader opens the dialog "Step 3".
4. Check the configuration of the PG/PC.

   Click the "Modify" button to set the access point of the application and the interface parameter assignment in the "Set PG/PC Interface" diaöog.

   The "Set PG/PC interface" dialog opens.

   Make the following settings for the access point of the application and the interface parameter assignment of the PC CP:

   – CP 342-5 (5DA03): FWL_FAST_LOAD

     This profile "FWL_FAST_LOAD" is supported as of SIMATIC STEP 7 V5.5 SP1.

   Confirm the changes with "OK".
5. Check the settings.

   Click "Next".

   The Firmware Loader opens the dialog "Step 4".
6. Note the specifications of point 1 ... 6 in the dialog for step 4 of the Firmware Loader!