8.2 PROFIBUS

In addition to the CBP communications board, there is the CBP2 with extended functionality. It replaces but remains fully compatible with the CBP.

In the following, "CBP" refers to both boards. Any individual features which a board possesses are specially indicated.

8.2.1 Product description of the CBP communications board

The CBP communications board (Communications board PROFIBUS) is for linking SIMOVERT MASTERDRIVES® to higher-level automation systems via PROFIBUS-DP.

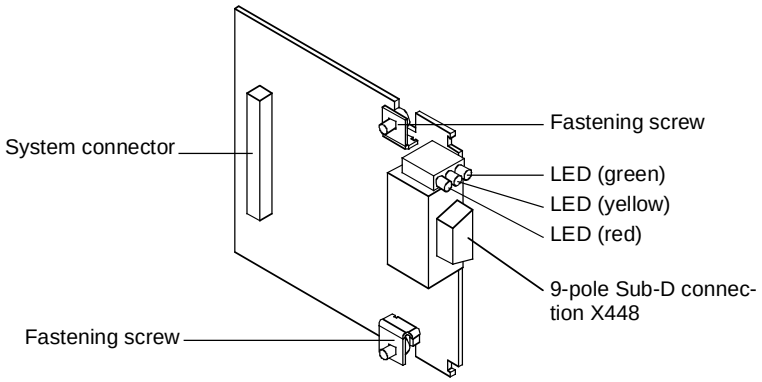


Fig. 8.2-1 View of the communications board

Technical data

The communications board has three LEDs (green, yellow, red) for providing information on the current operating status.

Voltage is supplied from the basic unit through the system's plug-in connector.

The CBP has a 9-pole SUB D socket (X448) which is provided for connecting it up to the PROFIBUS system in accordance with the PROFIBUS standard. All connections of this RS485 interface are short-circuit-proof and floating.

The CBP supports baud rates of 9.6 kbaud to 12 Mbaud and is also suitable for connecting fiber-optic cable by means of optical link plugs (OLPs).

NOTE

For reasons of space, optical link plugs cannot be used for Compact units, types 1 and 2!

Functionality

- Useful data is exchanged with the master according to the "PROFIBUS profile for variable-speed drives", PROFIdrive.
- Acyclical communications channel for transferring parameter values up to a length of 101 words with a SIMATIC S7-CPU.
- Acyclical communications channel for linking the PC-based Drive ES start-up and service tool.
- Automatic adoption of the useful data structure defined in the master.
- Monitoring of the bus interface.
- Supporting of SYNC-type PROFIBUS control commands for synchronized data transfer from the master to several slaves.
- Supporting of FREEZE-type PROFIBUS control commands for synchronized data transfer from several slaves to the master.
- Extremely simple parameterization of the CBP via the PMU of the basic unit.

Extended functionality of the CBP2

- Flexible configuration of the setpoints/actual values up to a maximum of 16 process data words
- Clock synchronization at the isochronous PROFIBUS for synchronization of processing by the master and slaves (MASTERDRIVES MC only)
- Cross traffic for direct data exchange between slaves
- Direct access to a drive by a SIMATIC OP
- USS protocol

Extension by PROFIdrive V3 functions in conjunction with CBP2 from V2.20

- Acyclical parameter channel in accordance with PROFIdrive profile, version 3, with data block 47
- Standard telegrams 1 to 6

For MASTERDRIVES MC and during use of T100 or T300, please pay attention to the note in Section 2.3.2 "TB Blocks".

8.2.2 Description of the CBP's functions on the PROFIBUS-DP

Definition

PROFIBUS is an international, open field bus standard with a wide scope of application in production and process automation. Neutrality and openness are guaranteed by international standards EN 50170 and IEC 61158.

The PROFIBUS-DP enables very fast, time-critical transfer of data on the field level.

With the PROFIBUS, a distinction is made between masters and slaves.

- **Masters** determine data traffic on the bus and are also designated in the literature as active nodes.
  There are two classes of master:
  - DP-Master Class 1 (DPM1):
    These are central stations (e.g. SIMATIC S5, S7 and SIMADYN D) which exchange information with the slaves in defined communications cycles.
  - DP-Master Class 2 (DPM2):
    Units of this type are programming units, planning units or control and monitoring units which are used for configuring, starting up or monitoring systems in operation.
- **Slaves** (e.g. CBP, CB15 etc.) can only acknowledge the messages they receive or transfer messages to a master when the latter requests a slave to do so. Slaves are also designated as passive nodes.

Protocol architecture

The protocol architecture of the PROFIBUS-DP is oriented to the OSI (Open System Interconnection) reference model in accordance with the international standard, ISO 7498, and uses layers 1 and 2 as well as the user interface.

Transmission equipment

When transmission equipment is being selected, criteria such as high transmission speed and simple, inexpensive wiring and cabling is of primary importance. PROFIBUS supports transmission according to RS485 and also transmission by means of fiber-optic cable.

The transmission speed can be selected between 9.6 kbaud and 12 Mbaud. The **same speed is specified for all units** on the bus when the system is started up for the first time.

Bus-access procedure

The PROFIBUS works according to the token-passing procedure, i.e. the masters become token holders for a defined time window in a logical ring. Within this time window, the master can communicate with other masters. Alternatively, it can communicate with slaves by using a lower-level master-slave procedure.

The PROFIBUS-DP mainly uses the master-slave method and data is usually exchanged with the drives cyclically.

Data exchange via PROFIBUS

This enables very rapid data exchange between the higher-level systems (e.g. SIMATIC, SIMADYN D, PC/PGs) and the drives. Access to the drives is always made according to the master-slaves method. The drives are always the slaves and each slave is clearly defined by its address.

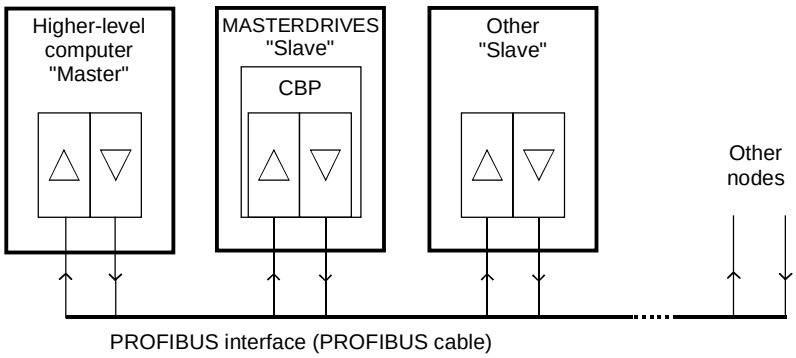


Fig. 8.2-2 PROFIBUS interfaces

The cyclical communications functions are determined by the PROFIBUS-DP basic functions in accordance with EN 50170.

For purposes of parameterization during cyclical data exchange with intelligent drives, acyclical extended communications functions are also used which are defined in PROFIBUS Guideline No. 2.081 (German) or 2.082 (English).

The following illustration contains an overview of the communications functions which are enabled with the CBP.

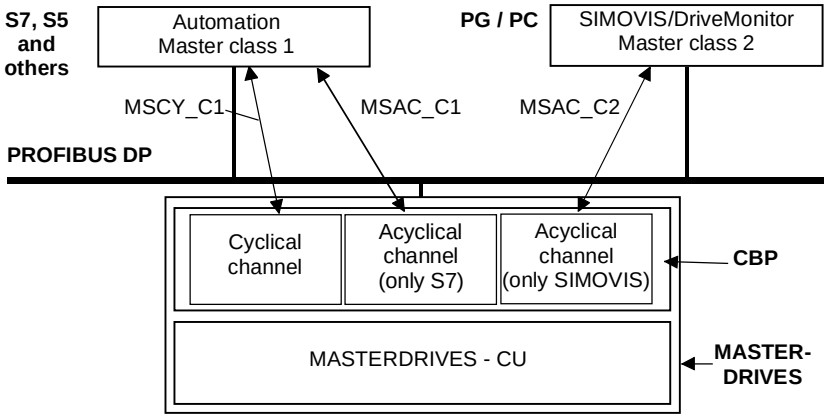


Fig. 8.2-3 Data-traffic channels of the CBP

The following illustration contains an overview of the communications functions which are enabled with the CBP2:

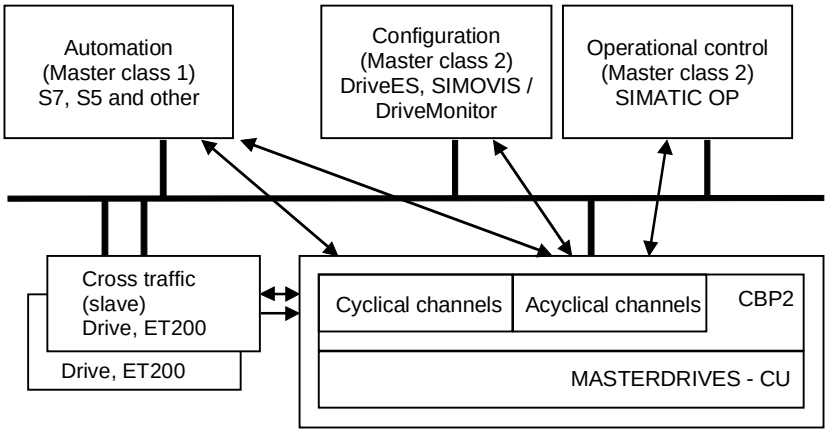


Fig. 8.2-4 Data-traffic channels of the CBP2

8.2.2.1 Cyclical data transmission

DANGER

When interconnecting connectors, binectors, and double word connectors, please note that simultaneous interconnection of a connector, and a double word connector with the same name is not permitted, because when a double word connector (e. g. KK3032) is connected, the meanings of the connectors K3002 and K3003 are swapped round (high-word and low-word exchanged).

On MASTERDRIVES MC and Compact Plus on software version V1.50 and higher and on MASTERDRIVES CUVC on software version V3.23 and higher, simultaneous use of connectors and double word connectors with the same name is mutually interlocked (see also function diagrams [121] and [131]).

Because the binectors are not included in the interlocking (to ensure compatibility for older configurations), their significance changes according to whether the pertinent word or double word is wired.

The structure of useful data as PPOs

Useful data for the **cyclical MSCY_C1 channel** (see Figs. 8.2-3 and 8.2-4) is structurally defined in the PROFIBUS profile for variable-speed drives version 2 as a parameter process data object (PPO).

Frequently, the **cyclical MSCY_C1 channel** is simply called the STANDARD channel as well.

NOTES

Data is exchanged with the MASTERDRIVES in accordance with the specifications of the PNO guideline "PROFIBUS profile for variable-speed drives". PROFIdrive CBP and CBP2 V2.10 implement PROFIdrive version 2 (PNO: Order No. 3071).
CBP2, V2.20 and later, implements PROFIdrive Version 3 (PNO: Order No. 3172) as a compatible expansion. The useful data structure described below is still supported.

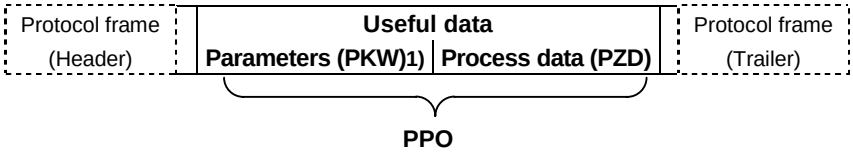
For the drives, the guideline specifies the useful-data structure with which a master can access the drive slaves by means of cyclical MSCY_C1 data transfer. With MSCY_C1 data transfer, useful data is divided up into two areas which can be transmitted in each telegram:

- The process data area (PZD), i.e. control words and setpoints or status information and actual values
- The parameter area (PKW) for reading/writing parameters – e.g. reading out faults – and for reading out information on the characteristics of a parameter such as reading out the min./max. limits etc.

The type of PPO (see next page) used by the PROFIBUS-DP master to communicate with the converter can be configured from the master when the bus system is started up. Which type of PPO is selected depends on the task of the drive in the automation network. The process data are always transmitted. In the drive, they are processed with the highest priority and in the shortest time slots. The process data are used to coordinate the drive with the other units in the automation network, e.g. for power on/off, entering setpoints etc.

With the help of the parameter area, the user can access all the parameters in the converter via the bus system as required. For example, detailed diagnostic information, alarms and so on can be read out. In this way, a higher-level system, (e.g. a PC), can be used to call additional information for visualization of the drive without affecting process data transmission.

The telegrams of cyclical data transfer therefore have the following basic structure:



1) PKW: Parameter identifier value

There are five types of PPO:

- Useful data **without** a parameter area with two words or six words of process data
- or useful data **with** a parameter area and two, six or ten words of process data.

	PKW				**PZD**									
	PKE	**IND**	**PWE**		**PZD1 STW1 ZSW1**	**PZD2 HSW HIW**	**PZD3**	**PZD4**	**PZD5**	**PZD6**	**PZD7**	**PZD8**	**PZD9**	**PZD10**
	1st Word	2nd Word	3rd Word	4th Word	1st Word	2nd Word	3rd Word	4th Word	5th Word	6th Word	7th Word	8th Word	9th Word	10th Word
PPO1														
PPO2														
PPO3														
PPO4														
PPO5														

PKW: Parameter ID value
PZD: Process data
PKE: Parameter ID
IND: Index
PWE: Parameter value

STW: Control word 1
ZSW: Status word 1
HSW: Main setpoint
HIW: Main actual value

Table 8.2-1 Parameter process data object (PPO types)

Dividing the useful data into parameter identifier values and process data enables different tasks to be carried out.

Parameter data area (PKW)

With the PKW (parameter identifier value) part of the telegram, any parameter in the converter can be observed and/or altered. The mechanisms of task/reply IDs necessary for this are described later in the chapter "Mechanisms of PKW processing".

Process data area (PZD)

With the process data part, control words and setpoints (tasks: master → converter) or status words and actual values (replies: converter → master) are transferred.

The transferred process data only have an effect if the control-word bits, the setpoints, the status words and the actual values are routed in the basic unit in accordance with the chapter "Process data wiring".

The following page gives an overview of typical ways of routing process data to the basic unit. For this routing of the data, the term "process data wiring" is often used.

NOTE

The following process data wiring only applies if a technology board has not been mounted.
If a technology board is used (e.g. T400, T300, T100), the process data wiring in the manual for the technology board is to be used.

Telegram: Master → Converter	**PZD**									
(Setpoint channel)	PZD 1 STW1 1st word	PZD 2 HSW 2nd word	PZD 3 3rd word	PZD 4 4th word	PZD 5 5th word	PZD 6 6th word	PZD 7 7th word	PZD 8 8th word	PZD 9 9th word	PZD 10 10th word
Combination values for:										
16-bit process data	3001	3002	3003	3004	3005	3006	3007	3008	3009	3010
16-/32-bit process data (example)	3001	3032		3004	3035		3037		3039	
Alternatives	3001	3032		3004	3005	3036		3038		3010
	3001	3002	3003	3004	3035		3007	3038		3010
Process data quantity for:										
PPO types 1 and 3	PZD2									
PPO types 2 and 4	PZD6									
PPO type 5	PZD10									

Telegram: Converter → Master	**PZD**									
(Actual-value channel)	PZD 1 ZSW1	PZD 2 HIW	PZD 3	PZD 4	PZD 5	PZD 6	PZD 7	PZD 8	PZD 9	PZD 10
Assignment of actual-value parameters for	P734	P734	P734	P734	P734	P734	P734	P734	P734	P734
16-bit process data	P694	P694	P694	P694	P694	P694	P694	P694	P694	P694
	i001	i002	i003	i004	i005	i006	i007	i008	i009	i010
16-/32-bit process data (example)	P734	P734		P734	P734		P734	P734		P734
	P694	P694		P694	P694		P694	P694		P694
	i001	i002 = i003		i004	i005 = i006		i007	i008 = i009		i010

Parameters for FC (CU1), VC (CU2) and SC (CU3)

PZD: Process data
STW: Control word
ZSW: Status word
HSW: Main setpoint
HIW: Main actual value

Table 8.2-2 Fixed assignment and combination values

NOTE

If a second CBP is being operated in the converter, then the "8000" connectors will be applicable for the second CBP instead of the "3000" connectors, and parameter P736 will be applicable instead of parameter P734 (see function diagrams for CB/TB boards in Chapter 12).

CBP2 - Free configuration

Extended functionality of the CBP2 in a SIMATIC STEP7 environment with DriveES:

In addition to the five types of PPO, free configuration of the cyclical data is possible.

Up to 16 process data words can be configured, even with a different number of setpoints and actual values. The consistency ranges can be flexibly adjusted.

A parameter area (PKW) can be configured irrespective of the number of process data items.

CBP2, V2.20 and later, standard telegrams

On version V2.20 and later of the CBP2, cyclic data transmission is implemented via standard telegrams in accordance with PROFIdrive profile, version 3.

The CBP2 supports standard telegrams 1 to 6 (cf. Section 8.2.7.3 "Process data interconnection via standard tele").

8.2.2.2 Acyclical data transfer

Extended DP functions

The PROFIBUS-DP has now been improved to include other methods of data transfer. In addition to cyclical data transfer, the extended PROFIBUS-DP enables the following forms of data transfer as defined in PROFIBUS guidelines No. 2.081 (German) or 2.082 (English):

- Acyclical data transfer at the same time as cyclical data transfer
- Alarm processing

Acyclical data transfer enables:

- the exchange of larger amounts of useful data up to 206 bytes
- a reduction in the number of peripheral addresses in the SIMATIC by means of relocating the PKW area from cyclical to first acyclical data transfer
- as a result, also reduction of the bus cycle time due to shorter telegrams in cyclical data transfer
- simultaneous access by Drive ES (PG/PC) for diagnosis and parameterization by means of the second data transfer

Realization of the extended DP functions

The different masters or the different methods of data transfer are represented in the CBP by corresponding channels (see Fig. 8.2-4):

- **Cyclical data transfer with a Class 1 master (MSCY_C1)**
  Use of DATA-EXCHANGE and the PPO types in accordance with the PROFIdrive profile
- **Acyclical data transfer** with the same **Class 1 master (MSAC_C1)**
  Use of the PROFIBUS functions, DDLM_READ and DDLM_WRITE
  The contents of the transferred data block corresponds to the structure of the parameter area (PKW) in accordance with the USS specification (with data block 100)
  or (for CBP2 V2.20 and later only)
  the structure of the acyclic parameter channel according to PROFIdrive profile, version 3 (with data block 47).
- **Acyclical data transfer with DriveES (Class 2 master; MSAC_C2)**
  The DriveES can access parameters and process data in the basic units acyclically.
- **CBP2: acyclical data traffic with SIMATIC OP (second Class 2 master; MSAC_C2) only**
  SIMATIC OP can access parameters in the basic units acyclically.
- CBP2 V2.20 and later only: Instead of DriveES or SIMATIC OP an external master (Class 2 Master) compliant with acyclic parameter channel according to PROFIdrive profile version 3 with data block 47 can also access the converter.

8.2.2.3 Acyclical master class 1, automation (PLC)

MSAC_C1 channel

Acyclical communication between the DP master Class 1 (DPM1) and the DP slaves takes place via supplementary service access point 51. In a service sequence, the DPM1 establishes a link to the slave, this link being designated MSAC_C1. Establishment of this link is closely related to the link for cyclical data transfer between the DPM1 and the slaves. Once a link has been established, the DPM1 can conduct cyclical data transfer via the MSCY_C1 link and, at the same time, acyclical data transfer via the MSAC_C1 link.

The MSAC_C1 channel enables READING and WRITING of any of the data blocks in the slave. These data blocks are accessed with the PROFIBUS functions, DDLM_Read and DDLM_Write.

For processing parameters, the CBP supports a data block with the index 100 in slot 2. Because the parameters can only be altered infrequently in comparison to the process data, the parameter area of the telegram can be removed from the fast cyclical channel in order to save bus resources.

NOTE

With the CBP2, version V2.20 and later, a class 1 master automation (PLC) can also utilize acyclic parameter access according to PROFIdrive V3, cf. Section 8.2.4 "PROFIdrive V3: Acyclic parameter accessing with data block 47".

Telegram structure The following illustration shows the telegram structure for data transfer via the acyclical MSAC_C1 channel.

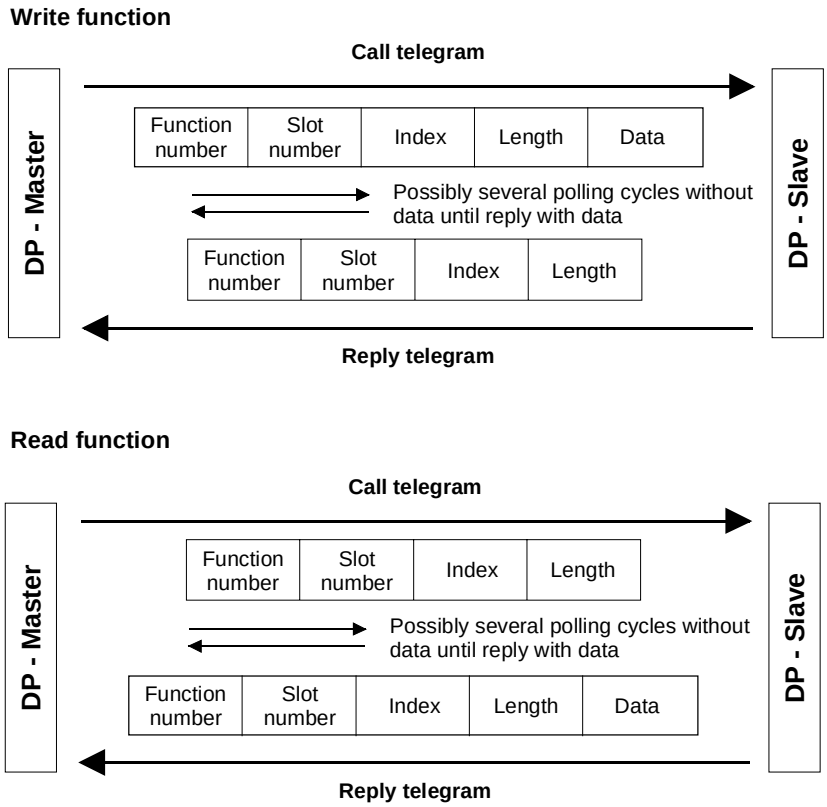


Fig. 8.2-5 Sequence of a Read and Write function

Sequence of a PKW task

The following sequence is necessary for handling a PKW task:

1. With the function DDLM_Write, a PKW task is transferred in the data block with the index 100 to the CBP.
2. A positive acknowledgement of DDLM_Write is awaited.
3. With the function DDLM_Read, the PKW reply is requested by the CBP in the data block with the index 100.
4. The PKW reply to the task is contained in the positive acknowledgement of DDLM_Read.

The contents of the data block with the index 100 corresponds to the structure of the PKW area of the telegram in accordance with the USS specification.

With the PKW (parameter identifier value) area, any parameter in the converter can be visualized and/or altered. The mechanisms of task/reply IDs necessary for this are described later in the chapter "Mechanisms of PKW processing".

In the MSAC_C1 channel, larger amounts of data can be transferred at the same time than by means of PPOs in the cyclical channel. The whole data unit is used exclusively for transmitting parameters.

It offers the same possibilities, however, as in the USS specification, i.e. complete arrays can also be processed with one task (IND = 255). All values of the array are directly transmitted one after the other in a data block. The maximum length of a data block is 206 bytes.

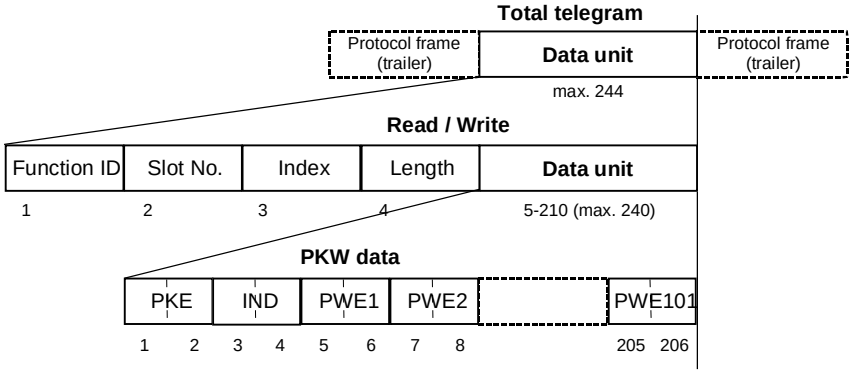


Fig. 8.2-6 Structure of PKW data in cyclical data transfer

NOTE

Process data (PZDs) cannot be stipulated via this acyclical MSAC_C1 channel.

Example for the SIMATIC S7

In the SIMATIC S7, the data block with the index 100 corresponds to the data record DS100.

From the SIMATIC S7 side, data can be exchanged via the MSAC_C1 channel with the system functions SFC 58 "WR_REC" and SFC 59 "RD_REC".

When the system functions are called, the parameter **RECNUM is to be set to 100.**

If the logical address of the CBP is determined by means of SFC 5 "GADR_LGC", the parameters are to be provided with the following when SFC 5 is called:

SUBNETID	=	ID of the planned DP master system in accordance with the hardware configuration
RACK	=	Node / bus address of the CBP
SLOT	=	2
SUBSLOT	=	0
SUBADDR	=	0

The function-block package, DVA_S7 (see also section 8.2.7.2), is a standard method of data exchange between the SIMATIC S7 and the CBP via the acyclical MSAC_C1 channel. The user is provided with a data block as the data interface. This data block has a TRANSMIT MAILBOX and a RECEIVE MAILBOX, thus considerably reducing the expenditure on the application for the user.

8.2.2.4 Acyclical master class 2 - Configuration (DriveES)

MSAC_C2 channel for the Drive ES

The MSAC_C2 channel on the CBP must be reserved for the start-up and service tool Drive ES.

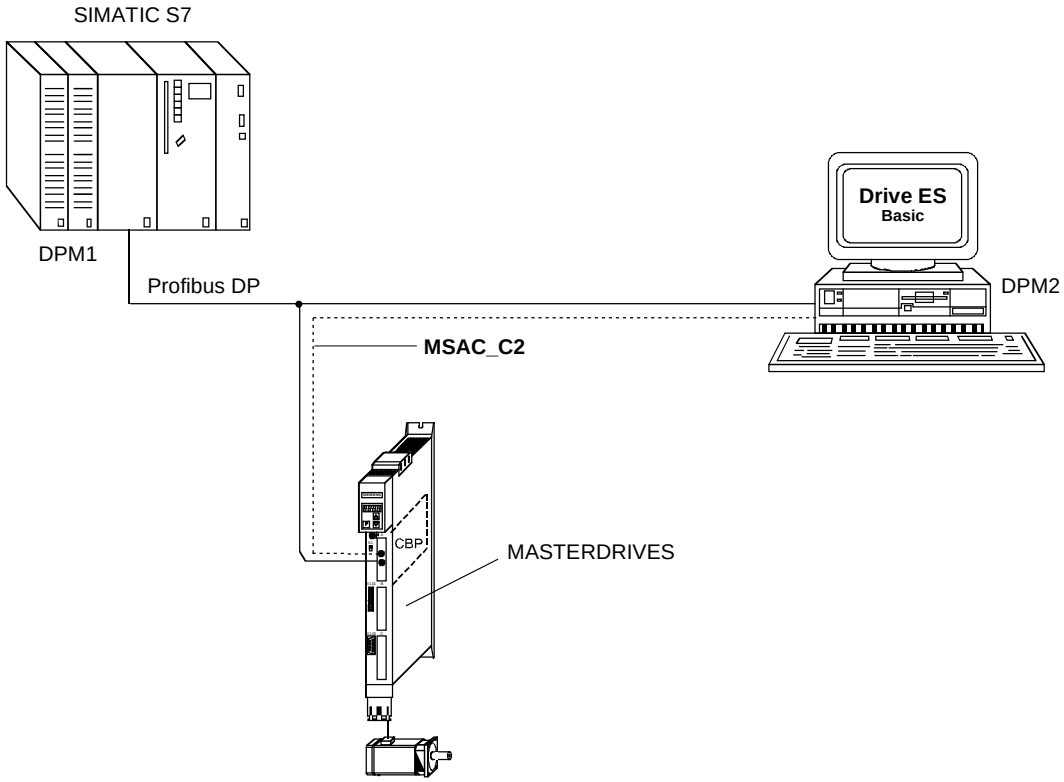


Fig. 8.2-7 Drive ES with Profibus

8.2.2.5 Acyclical master class 2 - Operator control (SIMATIC OP)

Functionality only with CBP2.

With a SIMATIC OP as the PROFIBUS DP master, you can achieve direct access to a drive.

A drive with a CBP2 behaves like a SIMATIC S7 towards a SIMATIC OP. For access to the drive parameters, the following simple illustration applies:

Parameter number = Data block number

Parameter subindex = Data block offset

All SIMATIC OPs and TDs with the final digit 7 are suitable.

ProTool

You can configure SIMATIC OP with "ProTool". The following specific settings for drives are to be entered during configuration with Pro Tool.

Open-loop control

Control units: Protocol always **"SIMATIC S7 - 300/400"**, additional parameters:

Field	**Value**
Network parameter - Profile	**DP**
Network parameter - Baud rate	(as selected)
Communications partner - Address	(the PROFIBUS address of the drive)
Communications partner - Slot/rack	Don't care, 0

Variable

Variables: "General" register:

Field	**Value**
Name	(as selected)
Control unit	(as selected)
Type	Depending on parameter value addresses, e.g.: **INT:** for I2, O2 **DINT:** for I4, O4 **WORD:** for V2, L2
Range	**DB**
DB (data block number)	Parameter number **1 to 3999**
DBB, DBW, DBD (data block offset)	Subindex **0:** for non-indexed parameters **1 to 101:** for indexed parameters
Length	(not activated)
Acquisition cycle	(as selected)
Number of elements	**1**
Places after the decimal point	(as selected)

NOTES

- You can operate a SIMATIC OP together with a drive, irrespective of any automation system which may be present. A simple "point-to-point" connection with only two nodes is possible.
- The "Variable" OP functions can be used for drives. Other functions cannot be used (e.g. "Messages" or "Recipes").
- Access is possible to individual parameter values. Access is not possible to whole arrays, descriptions or texts.
- The parameter values transferred to the OP are the non-standardized internal values of the drive. You can influence the value displayed on the OP with "Functions" in Pro Tool (e.g. "Linear conversion").
- The diagnostic output on the SIMATIC OP is limited. In the case of unsuccessful attempts at access, the CB diagnostic parameter, r732.22. and the following can help you further. See Section "Diagnosis and Troubleshooting".

8.2.3 Mechanisms for processing parameters via the PROFIBUS

Parameter area (PKW)

With the PKW mechanism (for PPO types 1, 2 and 5 and when the acyclical channels, MSAC_C1 and MSAC_C2, are used), you can perform the following tasks:

- Handling and visualizing parameters (read/write)
- Transferring and acknowledging parameter change reports (not realized)

The parameter area always contains at least 4 words.

	Parameter ID			(PKE)		
Bit No.:	15	12	11	10	0	1st word
	AK		SPM	PNU		

	Parameter index		(IND)	
Bit No.:	15	8	7	0
	The structure and significance depend on the type of data transfer (see following pages)			2nd word

Parameter value	(PWE)	
Parameter value **High**	(PWE1)	3rd word
Parameter value **Low**	(PWE2)	4th word

AK: Task ID or reply ID

SPM: Toggle bit for processing the parameter change report

PNU: Parameter number

Table 8.2-3 Structure of the parameter area (PKW)

Parameter ID (PKE), 1st word

The parameter ID (PKE) is always a 16-bit value.

Bits 0 to 10 (PNU) contain the number of the required parameter.

Bit 11 (SPM) is the toggle bit for parameter change reports.

Bits 12 to 15 (AK) contain the task ID or the reply ID.

With regard to the task telegram (master → converter), the significance of the task ID is given in Table 8.2-4. Task IDs 10 to 15 are specifically for MASTERDRIVES and are not specified in the PROFIBUS-DP profile.

With regard to the reply telegram (converter → master), the significance of the reply ID is given in Table 8.2-5. Reply IDs 11 to 15 are specifically for MASTERDRIVES and are not specified in the PROFIBUS-DP profile. Only certain reply IDs are possible, depending on the task ID. If the reply ID has the value 7 (task cannot be executed), an error number is deposited in parameter value 2 (PWE2) in accordance with Table 8.2-6.

Task ID	Significance	Reply ID	
		positive	negative
0	No task	0	7 or 8
1	Request parameter value	1 or 2	↑
2	Change parameter value (word)	1	|
3	Change parameter value (double word)	2	|
4	Request description element [1]	3	|
5	Change description element (not with CBP)	3	|
6	Request parameter value (array) [1]	4 or 5	|
7	Change parameter value (array, word) [2]	4	|
8	Change parameter value (array, double word) [2]	5	|
9	Request the number of array elements	6	|
10	Reserved	-	|
11	Change parameter value (array, double word) and store in the EEPROM [2]	5	|
12	Change parameter value (array, word) and store in the EEPROM [2]	4	|
13	Change parameter value (double word) and store in the EEPROM	2	|
14	Change parameter value (word) and store in the EEPROM	1	↓
15	Read or change text (not with CBP)	15	7 or 8

Table 8.2-4 Task IDs (master -> converter)

Reply ID	Significance
0	No reply
1	Transfer parameter value (word)
2	Transfer parameter value (double word)
3	Transfer description element [1]
4	Transfer parameter value (array, word) [2]
5	Transfer parameter value (array, double word) [2]
6	Transfer the number of array elements
7	Task cannot be executed (with error number)
8	No operator change rights for the PKW interface
9	Parameter change report (word)
10	Parameter change report (double word)
11	Parameter change report (array, word) [2]
12	Parameter change report (array, double word) [2]
13	Reserved
14	Reserved
15	Transfer text (not with CBP)

[1] The required element of the parameter description is specified in IND (2nd word)

[2] The required element of the indexed parameter is specified in IND (2nd word)

Table 8.2-5 Reply IDs (converter -> master)

Example

Source for the ON/OFF1 command (control word 1, bit 0):
P554 (=22A Hex)

Change parameter value (array, word) and store in the EEPROM

	Parameter ID (PKE)				1st word
Bit No.:	15 12	11	10 0		
	AK	SPM	PNU		
	1 1 0 0	0	0 1 0	0 0 1 0	1 0 1 0	Binary value
	C	2	2	A	HEX value

- Bits 12 to 15: Value = 12 (= "C" Hex); change parameter value (array, word) and store in the EEPROM
- Bits 0 to 11: Value = 554 (= "22A" Hex); parameter number without set bit for the parameter change report

No.	Significance	
0	Non-admissible parameter No. (PNU)	If the PNU does not exist
1	Parameter value cannot be changed	If the parameter is a visualization parameter
2	Upper or lower limit exceeded	–
3	Erroneous subindex	–
4	No array	–
5	Incorrect data type	–
6	Setting not allowed (can only be reset)	–
7	Description element cannot be changed	Generally not possible for MASTERDRIVES
11	No operator control rights	–
12	Key word missing	Drive converter parameter "access key" and/or "parameter special access" not correctly set
15	No text array available	–
17	Task cannot be executed due to operating status	Drive converter status does not permit the present task
101	Parameter number deactivated at present	Specific to MASTERDRIVES
102	Channel width too small	Specific to MASTERDRIVES: only for short channels
103	Incorrect number of PKWs	Specific to MASTERDRIVES: only for G-SST1/2 and SCB interface (USS)
104	Parameter value not admissible	Specific to MASTERDRIVES
105	The parameter is indexed	e.g. task: "PWE, change word" for indexed parameters
106	Task not implemented	

Table 8.2-6 Error numbers for the reply "Task cannot be executed" (drive converter parameters)

Comment on error number 103

Error number 103 is only relevant to the G-SST1, 2 interface and the SCB interface. It is transferred in the following two cases:

- If the task involves indices of an indexed parameter (task index equal to 255) or the complete parameter description is requested and a variable telegram length has not been parameterized.
- If the set task is too small for the parameterized number of PKW data in the telegram (e.g. the double word and the PKW number is changed to 3 (words)).

Comment on error 104

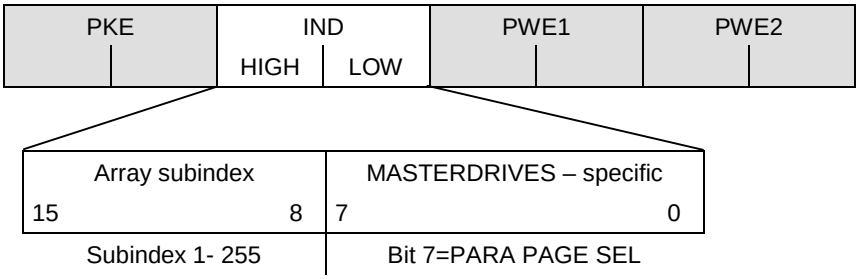
This error number is transferred if the parameter value which is to be adopted has not been assigned a function in the drive converter or cannot be adopted at the time of the change for internal reasons (although it lies within the limits).
This error number always occurs, for example, when only values explicitly entered in a table are valid for a parameter value and are not transferred exactly (e.g. the number of PKW data for the USS interfaces for which only the explicit values 0, 3, 4 and 127 are allowed).

Parameter index (IND) 2nd word

The assignment of the index (**IND**) is to be regarded as a special feature or difference between what is specified in the PPOs and what is specified for the acyclical channels MSAC_C1 and MSAC_C2.

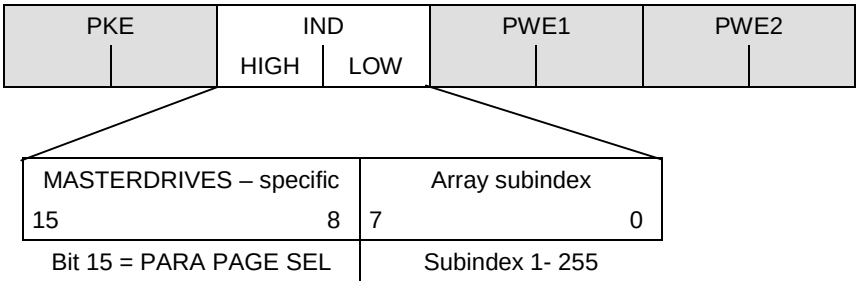
The array sub-index (also designated in shorter form as the sub-index in the PROFIBUS profile) is an 8-bit value and, during cyclical data transfer, is transferred in the most significant byte (bits 8 to 15) of the parameter index (IND). The least significant byte (bits 0 to 7) is not defined in the profile DVA. In the PPO of the CBP, the least significant byte of the parameter index is used in order to be able to address additional technology parameters or parameters of free components in the MASTERDRIVES by means of parameter page selection.

Structure of IND with cyclical communication by means of PPOs



The array subindex is an 8-bit value and, with acyclical data transfer (MSAC_C1), is always transferred in the least significant byte (bits 0 to 7) of the parameter index (IND). The function of parameter-page selection for additional technology parameters or parameters of free components in the MASTERDRIVES is assumed here by the most significant byte (bits 8 to 15) of the parameter index. This structure corresponds to the stipulations of the USS specification.

Structure of IND with acyclical communication via MSAC_C1



The function of the IND

For an indexed parameter, if the subindex in a task is transferred with the values between 1 and 254, the required index of the parameter is transferred. The significance of the individual indices of the parameter can be found in the "Parameter List" of the operating instructions for the converter.

When a description element is being processed, the number of the required element is transferred. The significance of the description elements is given in the PROFIBUS profile "Variable-speed drives", PROFIdrive version V2 (PNO: Order No. 3071).

The value 255 for the array subindex is of special importance. If the array subindex is transferred with 255, all indices of an indexed parameter are transferred simultaneously in one data block.

This function is useful only for acyclical data transfer via MSAC_C1. The transferred data block has the same structure as in the USS specification (see Fig. 8.2-7). The maximum size of a data block is 206 bytes.

The bit for parameter page selection has the following effect:

If this bit is equal to 1, the parameter number (PNU) transferred in the PKW task is provided with an offset of 2000 in the CBP and then passed on.

Parameter designation (acc. to parameter list)	**Serial parameter number**	**Required addressing of the parameter via PROFIBUS**		
		PNU [decimal]	**PNU [hex.]**	**Bit** *)
P000 - P999 (r000 - r999)	0 - 999	0 - 999	0 - 3E7	= 0
H000 - H999 (d000 - d999)	1000 - 1999	1000 -1999	3E8 - 7CF	= 0
U000 - U999 (n000 - n999)	2000 - 2999	0 - 999	0 - 3E7	= 1
L000 - L999 (c000 - c999)	3000 - 3999	1000 - 1999	3E8 - 7CF	= 1

*) Parameter page selection

Example

Source for the ON/OFF command (control word 1, bit 0):
P554 (=22A Hex)

Change parameter value of index 1 (structure of the IND according to PPO)

	Parameter index (IND)				2nd word
Bit No.:	15 ... 8	7 ... 0			
	0 0 0 0	0 0 0 1	0 0 0 0	0 0 0 0	Binary value
	0	1	0	0	HEX value

- Bits 8 to 15: Index of parameter P554
- Bits 0 to 7: Value = 0

Parameter value (PWE) 3rd and 4th words

The parameter value (PWE) is always transferred as a double word (32 bits). In a PPO telegram, only one parameter value can be transferred.

A 32-bit parameter value is composed of PWE1 (most significant word, 3rd word) and PWE2 (least significant word, 4th word).

A 16-bit parameter value is transferred in PWE2 (least significant word, 4th word). In this case, you must set PWE1 (most significant word, 3rd word) to 0 in the PROFIBUS-DP master.

Example for CUMC/ CUVC

Source for the ON/OFF command (control word 1, bit 0): P554 (= 22A Hex)

Change parameter value of index 1 to the value 3100

	Parameter value (PWE)					
Bit No.:	31 … 24		23 … 16		3rd word (PWE1)	(hex)
	0	0	0	0		
Bit No.:	15 … 8		7 … 0		4th word (PWE2)	(hex)
	3	1	0	0		

- Bits 0 to 15: Parameter value for 16-bit parameter or low component for 32-bit parameter
- Bits 16 to 31: Value = 0 for 1-bit parameter or high component for 32-bit parameter

Rules for task/reply processing

- A task or a reply can only relate to one parameter value.
- The master must repeat a task until it receives the appropriate reply.
- The master identifies the reply to a task which has been set:
  - By evaluating the reply ID
  - By evaluating the parameter number, PNU
  - If necessary, by evaluating the parameter index, IND
  - If necessary, by evaluating the parameter value, PWE.
- The task must be sent complete in one telegram; telegrams with split tasks are not permissible. The same applies to the reply.
- With regard to reply telegrams which contain parameter values (actual values), the slave (CBP) always replies with the latest current values if the telegram is repeated.
- If the PKW interface requires no information during cyclical operation (only PZD data are important), the "No task" task must be sent.

WARNING

When you change the initialization function of software version V1.3x to V1.40 and higher, or VC firmware from 3.22 to 3.23 and higher, the behavior of the converter also changes (reverting to the behavior of software versions V1.2x and lower again) as follows:

If the electronics supply is switched off on a converter that is in state "READY" and is connected to an automation system via a field bus (PROFIBUS, CAN, DEVICE-NET, or CC-Link), this causes a fault message for this converter in the automation system.
If the automation system nevertheless sends a control word STW1 with valid authorization (bit 10 = 1) and a pending ON command (bit 0 = 1) to this converter, this can cause the converter to switch on and go straight into "OPERATION" state when the electronics supply is connected at the converter.

8.2.4 PROFIdrive V3: Acyclic parameter accessing with data block 47

NOTE

Acyclic parameter accessing with data block 47 is supported by the CBP2 with firmware version V2.20 and later.

A detailed description of acyclic parameter accessing with data block 47 can be found in PROFIBUS Profiles, PROFIdrive (PNO: Order No. 3172).

General properties

- Compatibility with PKW tasks in accordance with PROFIdrive profile version 2
- 16-bit wide address for each parameter number and subindex
- Transfer of complete arrays or areas thereof, or the entire parameter description
- Transfer of different parameters in one access operation (multi-parameter tasks)
- Only **one** parameter task is processed at a time (no pipelining)
- A parameter task/response must fit into one data block (max. 240 bytes). Tasks/responses are **not split** over several data blocks. The maximum length of data blocks can be less than 240 bytes as a result of slave property or bus configuration.
- **"Multi-parameter"** tasks are defined for optimized, simultaneous access to different parameters (e.g. HMI screen contents).
- Data block 47 can be processed by acyclical channels MSAC_C1 and MSAC_C2.

Subindex 0

The definition of an array has been changed in IEC 61158 as compared to the definition in EN 50170.

The PROFIdrive profile version 2 is compliant with EN 50 170, according to which the subindex of an indexed parameter or array begins with index 1. In the current IEC standard 61158, access to an indexed parameter or array begins with the index 0.

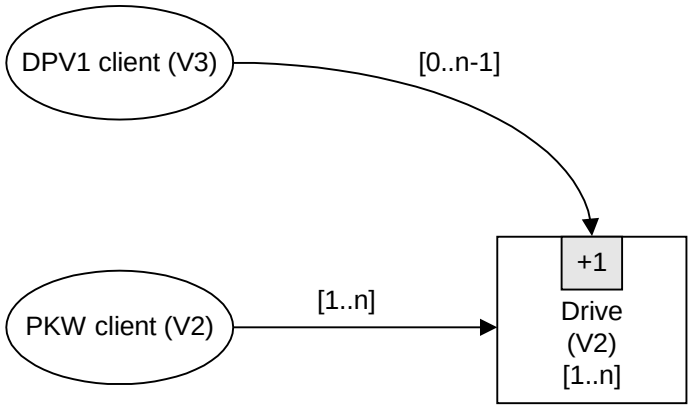
As a consequence, the parameter model and the DPV1 parameter channel had to be adapted in PROFIdrive profile version 3 so as to ensure compliance with the IEC standard.

Compatibility with the PKW mechanism in PROFIdrive profile version 2

MASTERDRIVES still utilizes the parameter model to PROFIdrive V2 on its internal interface. MASTERDRIVES can be accessed via data block 47 as a DPV1 client with the CBP2. For tasks using DB47, the CBP2 thus adds an offset of 1 to the parameter subindex.

Cyclical parameter accessing via PKW and acyclical parameter accessing using data block 100 can still be utilized as before.

MASTERDRIVES MC with parameter model to PROFIdrive profile version 2. In combination with the CBP2, DPV1 can be utilized in accordance with PROFIdrive profile version 3.



Special features / restrictions

- Access operations to simple parameters (i.e. parameters without indices) must be identified by "No. of elements" = 0.
- Changing the sub-areas of an array is not supported by the CBP2, in other words, it is possible to transfer a write task either for one index or for all indices. To alter a complete parameter array, the number of values must be equal to or greater than the array size.
- The editing of texts or descriptions is not supported.
- Reading of several or all texts from a text array via a parameter task is not supported, i.e. only one text from one text array (subindex) can be read with one parameter task.

8.2.4.1 Comparison between parameter tasks to PROFIdrive version 2 and 3

	PKW to PROFIdrive profile V2	DPV1 parameter tasks to PROFIdrive profile V3	Remarks
Task reference	-	New! 8-bit	Task/response identification
Task identifier	Request/change value/des./texts 4-bit	Request/change 8-bit	Distinction value/description/text as additional attribute
No. of parameters	-	New! 8-bit	Multi-parameter tasks
Parameter number	0..1999 (11 bits)	Content as for PKW 16-bit	Parameter number = 0 not allowed
Subindex	1..255 (8 bits)	Content as for PKW - 1 16-bit	Offset in subindex due to modified array definition: DPV1 subindex = PKW subindex – 1
No. of elements	- (always "1")	New 8-bit	Access to simple parameters (nonindexed parameters) is defined in DB47 with "No. of elements" = 0.
Attribute	-	New 8-bit	Distinction value/description/text
Total length	2 words	5 words	

8.2.4.2 Example of "Request parameter value", simple

Parameter task:

			Offset
Task header	Task reference	Task identifier = Request parameter	0
	Axis = 0	No. of parameters = 1	2
Parameter address	Attribute = value	No. of elements = 0 (!)	4
	Parameter number		
	Subindex = 0 (don't care)		
			10

Positive parameter response with word:

Response header	Task ref. mirrored	Response identifier = Request parameter (+)	0
	Axis mirrored	No. of parameters = 1	2
Parameter value	Format = word	No. of values = 1	4
	Value		6
			8

Positive parameter response with double word:

Response header	Task ref. mirrored	Response identifier = Request parameter (+)	0
	Axis mirrored	No. of parameters = 1	2
Parameter value	Format = double word	No. of values = 1	4
	Value		6
			10

Negative parameter response:

Response header	Task ref. mirrored	Response identifier = Request parameter (-)	0
	Axis mirrored	No. of parameters = 1	2
Parameter value	Format = error	No. of values = 1	4
	Error value		6
			8

8.2.4.3 Example of "Change parameter value", simple

Parameter task:

			Offset
Task header	Task reference	Task identifier = Change parameter	0
	Axis = 0	No. of parameters = 1	2
Parameter address	Attribute = value	No. of elements = 0 (!)	4
	Parameter number		
	Subindex = 0 (don't care)		
Parameter value	Format = word	No. of values = 1	10
	Value		12
			14

Positive parameter response:

Response header	Task ref. mirrored	Response identifier = Change parameter (+)	0
	Axis mirrored	No. of parameters = 1	2
			4

Negative parameter response:

Response header	Task ref. mirrored	Response identifier = Change parameter (-)	0
	Axis mirrored	No. of parameters = 1	2
Parameter value	Format = error	No. of values = 1	4
	Error value		6
			8

8.2.4.4 Example of "Request parameter value", more than one array element

Parameter task:

			Offset
Task header	Task reference	Task identifier = Request parameter	0
	Axis = 0	No. of parameters = 1	2
Parameter address	Attribute = value	No. of elements = 5	4
	Parameter number		
	Subindex = 0		
			10

Positive parameter response:

Response header	Task ref. mirrored	Response identifier = Request parameter (+)	0
	Axis mirrored	No. of parameters = 1	2
Parameter value	Format = word	No. of values = 5	4
	Value 1		6
	Value 2		
	Value 3		
	Value 4		
	Value 5		
			16

Negative parameter response:

Response header	Task ref. mirrored	Response identifier = Request parameter (-)	0
	Axis mirrored	No. of parameters = 1	2
Parameter value	Format = error	No. of values = 1	4
	Error value		6
			8

8.2.4.5 Example of "Change parameter value", more than one array element

NOTE

Changing the sub-areas of an array is not supported by the CBP2, in other words, it is possible to transfer a write task either for one index or for all indices. To alter a complete parameter array, the number of values must be equal to or greater than the array size.

The following example shows a write operation to one parameter with 5 subindices.

Parameter task:

			Offset
Task header	Task reference	Task identifier = Change parameter	0
	Axis = 0	No. of parameters = 1	2
Parameter address	Attribute = value	No. of elements = 5	4
	Parameter number		
	Subindex = 0		
Parameter value	Format = word	No. of values = 5	10
	Value 1		12
	Value 2		
	Value 3		
	Value 4		
	Value 5		
			22

Positive parameter response:

Response header	Task ref. mirrored	Response identifier = Change parameter (+)	0
	Axis mirrored	No. of parameters = 1	2
			4

Negative parameter response:

Response header	Task ref. mirrored	Response identifier = Change parameter (-)	0
	Axis mirrored	No. of parameters = 1	2
Parameter value	Format = error	No. of values = 1	4
	Error value		6
			8

8.2.4.6 Example of "Request parameter value", multi-parameter

Parameter task:

			Offset
Task header	Task reference	Task identifier = Request parameter	0
	Axis = 0	No. of parameters = 3	2
1st parameter address	Attribute = value	No. of elements = 1	4
	Parameter number		
	Subindex = 7		
2nd parameter address	Attribute = value	No. of elements = 100	10
	Parameter number		
	Subindex = 0		
3rd parameter address	Attribute = value	No. of elements = 2	16
	Parameter number		
	Subindex = 13		
			22

Parameter response (+): All part accesses o.k.

Response header	Task ref. mirrored	Response identifier = Request parameter (+)	0
	Axis mirrored	No. of parameters = 3	2
1st parameter value(s)	Format = word	No. of values = 1	4
	Value		6
2nd parameter value(s)	Format = word	No. of values = 100	8
	Value 1		10
	Value 2		
	...		
	Value 100		
3rd parameter value(s)	Format = double word	No. of values = 2	210
	Value1		212
	Value2		
			220

Parameter response (-): First and third part access o.k., second part access errored

Response header	Task ref. mirrored	Response identifier = Request parameter (-)	0
	Axis mirrored	No. of parameters = 3	2
1st parameter value(s)	Format = word	No. of values = 1	4
	Value		6
2nd parameter value(s)	Format = error	No. of values = 1	8
	Error value		10
3rd parameter value(s)	Format = double word	No. of values = 2	12
	Value1		14
	Value2		22

8.2.4.7 Example of "Change parameter value", multi-parameter

Parameter task:

			Offset
Task header	Task reference	Task identifier = Change parameter	0
	Axis = 0	No. of parameters = 3	2
1st parameter address	Attribute = value	No. of elements = 1	4
	Parameter number		
	Subindex = 7		
2nd parameter address	Attribute = value	No. of elements = 100	10
	Parameter number		
	Subindex = 0		
3rd parameter address	Attribute = value	No. of elements = 2	16
	Parameter number		
	Subindex = 0		
1st parameter value(s)	Format = word	No. of values = 1	22
	Value		24
2nd parameter value(s)	Format = word	No. of values = 100	26
	Value 1		28
	Value 2		
	...		
	Value 100		
3rd parameter value(s)	Format = double word	No. of values = 2	228
	Value1		230
	Value2		
			238

Parameter response (+): All part access o.k.

Response header	Task ref. mirrored	Response identifier = Change parameter (+)	0
	Axis mirrored	No. of parameters = 3	2
			4

Parameter response (-): First and third part access o.k., second part access errored

Response header	Task ref. mirrored	Response identifier = Change parameter (-)	0
	Axis mirrored	No. of parameters = 3	2
1st parameter value(e)	Format = zero	No. of values = 0	4
2nd parameter value(e)	Format = error	No. of values = 2	6
	Error value		8
	Errored subindex		10
3rd parameter value(e)	Format = zero	No. of values = 0	12
			14

8.2.4.8 Request description, individual

Parameter task:

			Offset
Task header	Task reference	Task identifier = Request parameter	0
	Axis = 0	No. of parameters = 1	2
Parameter address	Attribute = description	No. of elements = 1	4
	Parameter number		
	Subindex = n		
			10

Positive parameter response with word (e.g. ID code):

Response header	Task ref. mirrored	Response identifier = Request parameter (+)	0
	Axis mirrored	No. of parameters = 1	2
Parameter value	Format = word	No. of values = 1	4
	Value		6
			8

Positive parameter response with text:

Response header	Task ref. mirrored	Response identifier = Request parameter (+)	0
	Axis mirrored	No. of parameters = 1	2
Parameter value	Format = byte	No. of values = 16	4
	Byte 1	Byte 2	6
	...	...	
	Byte 15	Byte 16	
			22

Negative parameter response:

Response header	Task ref. mirrored	Response identifier = Request parameter (-)	0
	Axis mirrored	No. of parameters = 1	2
Parameter value	Format = error	No. of values = 1	4
	Error value		6
			8

8.2.4.9 Request description, total

Parameter task:

			Offset
Task header	Task reference	Task identifier = Request parameter	0
	Axis = 0	No. of parameters = 1	2
Parameter address	Attribute = description	No. of elements = 0 (don't care)	4
	Parameter number		
	Subindex = 0 (!)		
			10

Positive parameter response:

Response header	Task ref. mirrored	Response identifier = Request parameter (+)	0
	Axis mirrored	No. of parameters = 1	2
Parameter value	Format = byte	No. of values = (Bytes)	4
	ID code		6
	(etc.)		
	...		
	...	...	
			6 + description

Negative parameter response:

Response header	Task ref. mirrored	Response identifier = Request parameter (-)	0
	Axis mirrored	No. of parameters = 1	2
Parameter value	Format = error	No. of values = 1	4
	Error value		6
			8

8.2.4.10 Request text, individual

Parameter task:

			Offset
Task header	Task reference	Task identifier = Request parameter	0
	Axis = 0	No. of parameters = 1	2
Parameter address	Attribute = text	No. of elements = 1	4
	Parameter number		
	Subindex = n		
			10

Positive parameter response:

Response header	Task ref. mirrored	Response identifier = Request parameter (+)	0
	Axis mirrored	No. of parameters = 1	2
Parameter value	Format = byte	No. of values = 16	4
	Byte 1	Byte 2	6
	...	...	
	Byte 15	Byte 16	
			22

Negative parameter response:

Response header	Task ref. mirrored	Response identifier = Request parameter (-)	0
	Axis mirrored	No. of parameters = 1	2
Parameter value	Format = error	No. of values = 1	4
	Error value		6
			8

8.2.5 Mounting methods / CBP slots

NOTE

The CBP can be directly built into Compact PLUS units. In all other types of unit in this series, it is mounted on the CUMC or CUVC or it can be connected in the electronics box with an adaptation board.

8.2.5.1 CBP mounting slots in MC Compact PLUS units

NOTE

You can mount the CBP optional board (Communications board PROFIBUS) in any slot. Bear in mind, however, that an encoder board always needs slot C.

Position of the slots

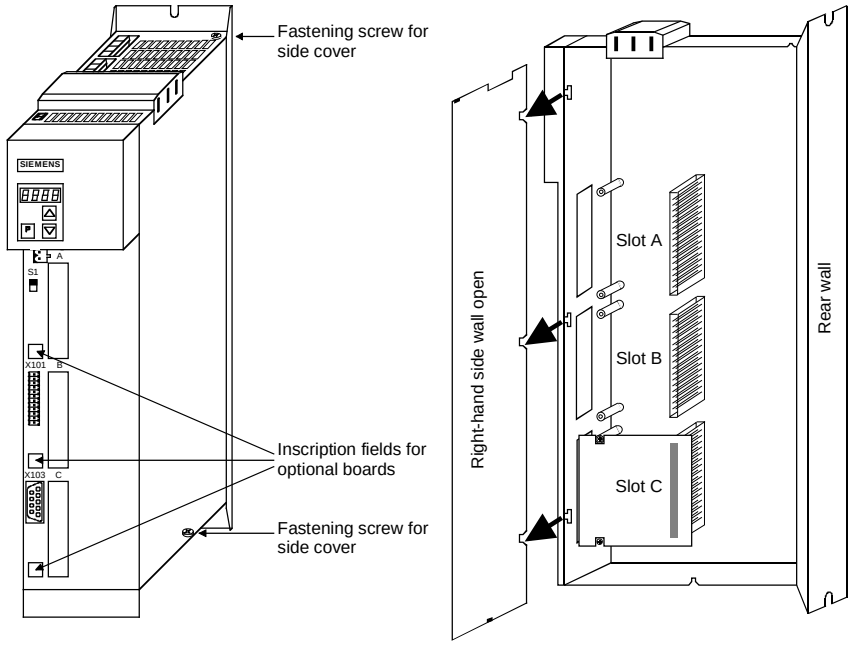


Fig. 8.2-8 Position of the slots (with side wall on the right removed)

DANGER

Due to the DC link capacitors, hazardous voltages are still present in the converter up to 5 minutes after it has been disconnected from the power supply. Before opening the converter, wait until the capacitors have completely discharged.

A maximum of two CBPs can be operated in the Compact PLUS type unit. The following configurations are defined (see function diagrams in Chapter 12):

- If two CBPs are inserted, the CBP which is inserted into the slot with the lower slot letter is considered the **first** CB/TB.
- If two CBPs are inserted, the CBP which is inserted into the slot with the higher slot letter is considered the **second** CB/TB.

8.2.5.2 CBP slots in Compact units and chassis-type units with the CUs of function classes Motion Control (CUMC) and Vector Control (CUVC)

Slots

In the electronics box of Compact and chassis-type converters and inverters, there are up to six slots available for mounting an optional board. The slots are designated with the letters A to G. There is no slot B, however, in these types of unit; it is only used in Compact PLUS type units.

If you wish to use slots D to G, you must first mount the LBA (Local Bus Adapter, Order No. 6SE7090-0XX84-4HA0) and the corresponding adaption board ADB (Order No. 6SX7010-0KA00).

NOTE

You can operate the CBP optional board (Communications board PROFIBUS) in any slot. Bear in mind, however, that an encoder board always needs slot C and that the LBA has to use a particular sequence of slots.

The CBP can be mounted on the adaptation board in both slots, i.e. at the BOTTOM and/or at the TOP.

Position of the slots

The slots are located at the following positions:

♦ Slot A	CU board	Top
♦ Slot C	CU board	Bottom
♦ Slot D	Adaptation board in mount. pos. 2	Top
♦ Slot E	Adaptation board in mount. pos. 2	Bottom
♦ Slot F	Adaptation board in mount. pos. 3	Top
♦ Slot G	Adaptation board in mount. pos. 3	Bottom

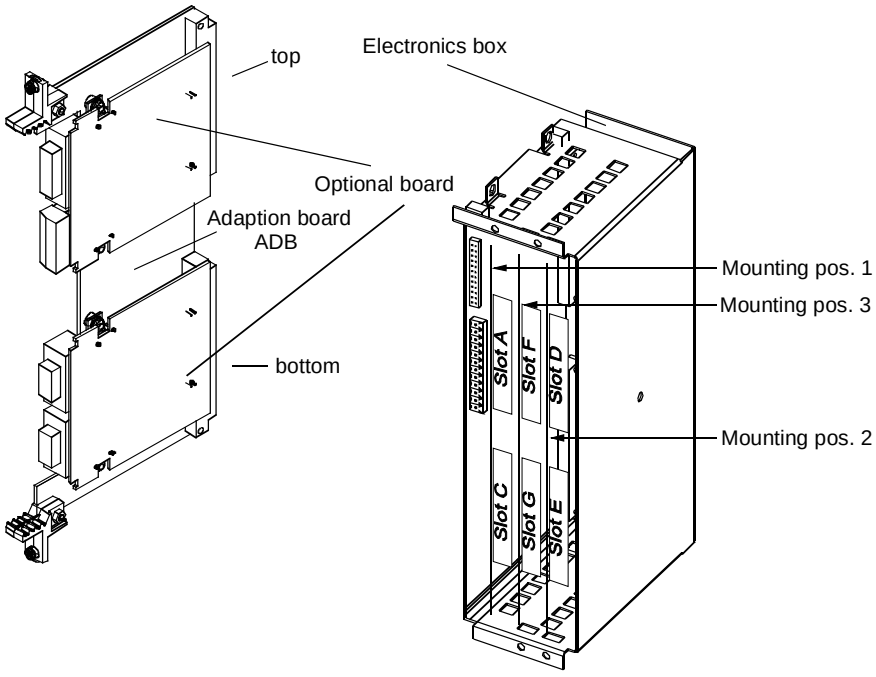


Fig. 8.2-9 Adaptation board with optional boards and position of the slots for Compact units and chassis-type units

DANGER

Due to the DC link capacitors, hazardous voltages are still present in the converter up to 5 minutes after it has been disconnected from the power supply. Before opening the converter, wait until the capacitors have completely discharged.

For technical reasons, certain sequences for using the slots are stipulated for the LBA.

If only one adaptation board with optional boards is inserted in the electronics box, it must always be inserted in slot +1.B2 (ON THE RIGHT), i.e. mounting position 2.

If a technology board T100 / T300 or T 400 is inserted in the electronics box in addition to the adaptation board with CBP, it must be inserted in slot +1.B2 (mounting position 2). In this case, the adaptation board with CBP is inserted in slot +1.B3 (mounting position 3).

A maximum of either two CBPs or one CBP plus one T100/T300/T400 technology board can be operated in the electronics box of the converter. The following configurations are defined (see function diagrams in Chapter 12):

- The CBP is regarded as the first CB/TB if one of the following configurations exist:
  - Exactly one CBP is inserted in slots A to G on the electronics box and no T100/T300/T400 technology board is inserted.
  - If two CBPs are inserted, the CBP which is inserted in the slot with the lower slot letter.
- The CBP is regarded as the second CB/TB if one of the following configurations is present:
  - A T100/T300/T400 technology board is inserted and the CBP in the electronics box is inserted in slots A to G.
  - In the case of two CBPs, the one inserted in the slot with the higher slot letter.

8.2.5.3 CBP slots in Compact and chassis-type units with the CUs of function classes FC (CU1), VC (CU2) or SC (CU3)

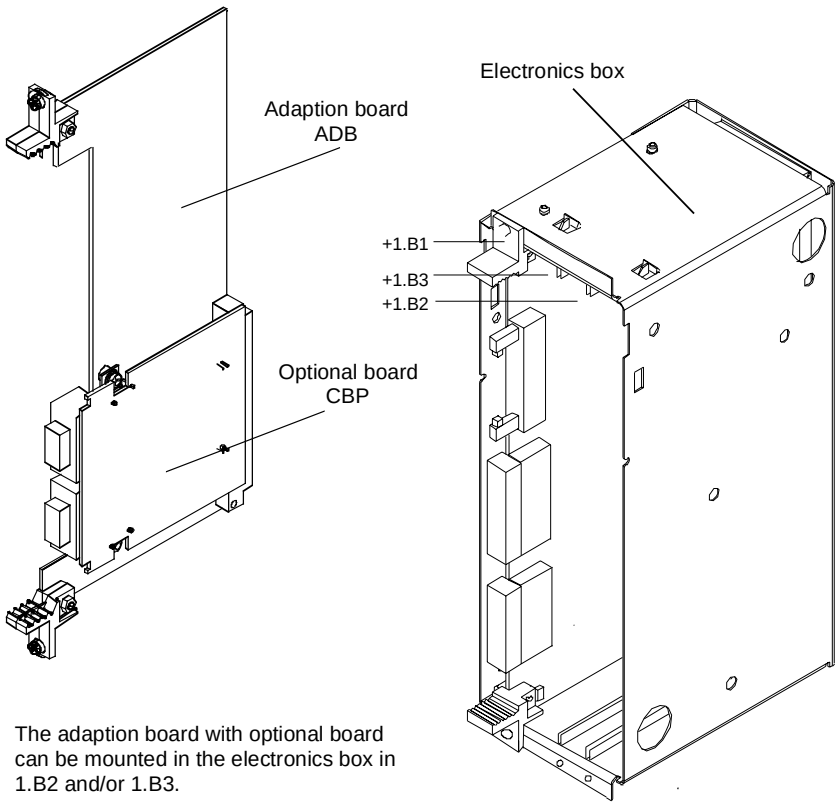


Fig. 8.2-10 Electronics box with free slots (+1.B2 and +1.B3) and adaptation board with CBP

On the adaptation board ADB (Order No. 6SX7010-0KA00), **only one** CBP can be mounted in slot X198, i.e. at the BOTTOM.

If the CBP is mounted with adaptation board, the LBA (Local Bus Adapter, LBA, Order No. 6SE7090-0XX84-4HA0) must first be mounted.

NOTE

If only one optional board is used, it must always be inserted in slot +1.B2 (on the RIGHT) in the electronics box.

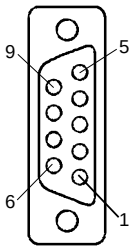
If, in addition to the CBP, a technology board (T100 / T300 or T400) is inserted in the electronics box, it must be inserted in slot +1.B2. In this case, the CBP is inserted in slot +1.B3.

8.2.6 Connecting up the CBP to the PROFIBUS

8.2.6.1 Assignment of plug-in connector X448

Connecting up

The CBP optional board has a 9-pin Sub-D socket (X448) which is provided for connecting the CBP to the PROFIBUS system. The connections are short-circuit proof and floating.



Pin	Designation	Significance	Area
1	SHIELD	Ground connection	
2	-	Not connected	
3	RxD/TxD-P	Receive/transmit data P (B/B´)	RS485
4	CNTR-P	Control signal	TTL
5	DGND	PROFIBUS data reference potential (C/C´)	
6	VP	Power supply Plus	5 V ± 10 %
7	-	Not connected	
8	RxD/TxD-N	Receive/transmit data N (A/A´)	RS485
9	-	Not connected	

Table 8.2-7 Pin assignment of X448 connection

8.2.6.2 Connecting up the bus cable by means of the RS485 bus connecting system

With the PROFIBUS, data transfer according to RS485 is most frequently used. A twisted, shielded copper cable with one pair of wires is used.

Up to a maximum of 124 units can be connected to a PROFIBUS phase. In one bus segment, up to 32 units can be connected together in a linear structure. If there are more than 32 nodes, repeaters (power amplifiers) must be used in order to link up the individual bus segments.

Maximum cable lengths

The maximum cable length depends on the baud rate (transmission speed).

The maximum cable length can be increased by using repeaters but no more than three repeaters may be connected in series.

The maximum cable lengths given in the following table can only be ensured if PROFIBUS bus cables are used (e.g. Siemens PROFIBUS-cable with MRPD 6XV 1830-0AH10).

Baud rate	Max. cable length in a segment [m]	Max. distance between 2 stations [m]
9.6 to 187.5 kbaud	1000	10000
500 kbaud	400	4000
1.5 Mbaud	200	2000
3 to 12 Mbaud	100	1000

Table 8.2-8 Permissible cable length of a segment with RS485 repeaters

Rules for laying cables

When you are laying the bus cable, you must not:

- twist it
- stretch it
- or squash it

In addition to this, you must take into account any influences on electromagnetic compatibility (EMC).

For further information, see for example Chapter 3 of the Compendium or the description "Instructions for Design of Drives in Conformance with EMC Regulations" (Order No. 6SE7087-6CX87-8CE0).

Bus connectors

You need bus connectors in order to connect the PROFIBUS to a CBP. There are different types of bus connector with degree of protection IP20. Their different uses are shown in the table below.

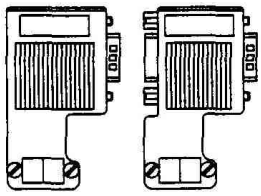
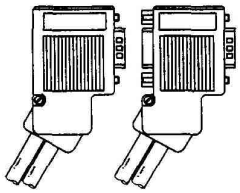
Order No.	6ES7 972-0BA11-0XA0 6ES7 972-0BB11-0XA0	6ES7 972-0BA40-0XA0 6ES7 972-0BB40-0XA0
Appearance		
PG socket	0BA11: no 0BB11: yes	0BA40: no 0BB40: yes
Max. baud rate	12 Mbaud	12 Mbaud
Terminating resistor	Can be connected as required	Can be connected as required
Outgoing cable	Vertical	slanting
Interfaces • PROFIBUS nodes • PROFIBUS cable	• 9-pole Sub-D socket • 4 terminal blocks for wires up to 1.5 mm^2	• 9-pole Sub-D socket • 4 terminal blocks for wires up to 1.5 mm^2
Connectable diameter of PROFIBUS cable	8 ± 0.5 mm	8 ± 0.5 mm
Recommended for • **IM 308-B** • **IM 308-C** • **S5-95U** • **S7-300** • **S7-400** • **M7-300** • **M7-400** • **CBP**	● ● ● ● ● ●	 ● ● ● ●

Table 8.2-9 Structure and application of bus connectors with IP20 protection

For more information on ordering and additional descriptions, see the A&D AS catalog "Industrial Communication" IK 10 (Order No. E86060-K6710-A101-A6).

Installing the bus cable

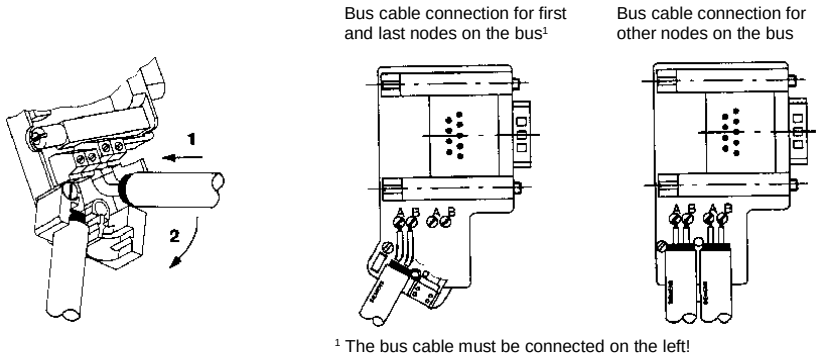


Fig. 8.2-11 Connecting up the bus cable to the bus connector

Bus termination

Each bus segment must be fitted with a resistor network, the bus termination, at each end.

If the recommended bus connectors can be used, the bus termination can be connected or disconnected by means of switches.

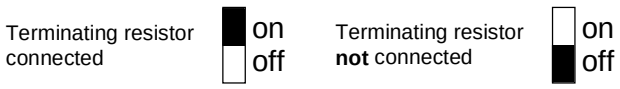


Fig. 8.2-12 Switch positions for connected or disconnected bus termination resistor

If these bus connectors are not used, the user must ensure installation of a bus termination network at the first and last bus station in accordance with the following illustration.

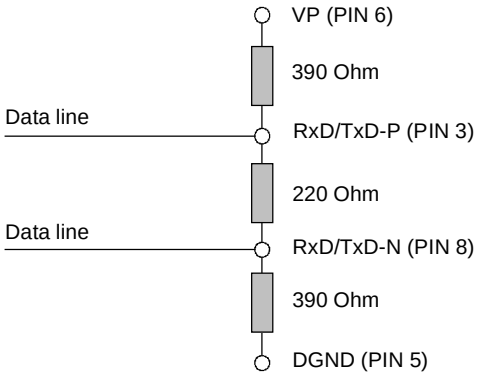


Fig. 8.2-13 Bus termination network

NOTICE

A bus segment must always be terminated at both ends with a matching resistor. This is not the case, for example, if the last slave with bus connector is not live. Because the bus connector obtains its voltage from the station, the matching resistor has no effect.

Make sure that the stations at which the matching resistor is connected is always supplied with voltage.

Pulling out the bus connector

You can pull out the bus connector with looped-through bus cable from the PROFIBUS-DP interface at any time without interrupting data transfer on the bus.

Connection example

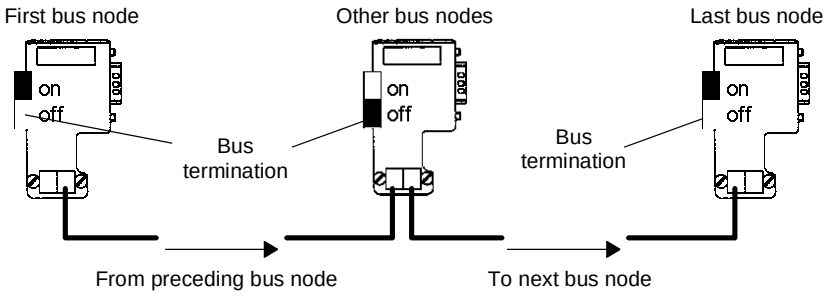


Fig. 8.2-14 Bus segment in linear structure (max. 32 stations per segment)

8.2.6.3 Connecting the bus cable with the fiber-optic cable system

For applications in an environment which is subjected to a high level of interference, fiber-optic cables can also be used with the PROFIBUS-DP. The specification of fiber-optic-cable transmission is defined in PROFIBUS guideline No. 2.021.

For connecting fiber-optic cables to the CBP, an OLP (Optical Link Plug) can be used which provides integrated conversion of the RS485 signals in fiber-optic cables and vice versa.

Area of application

With the optical link plugs (OLPs), optical PROFIBUS networks in ring form can easily be created (single-fiber ring with plastic fiber-optic cables).

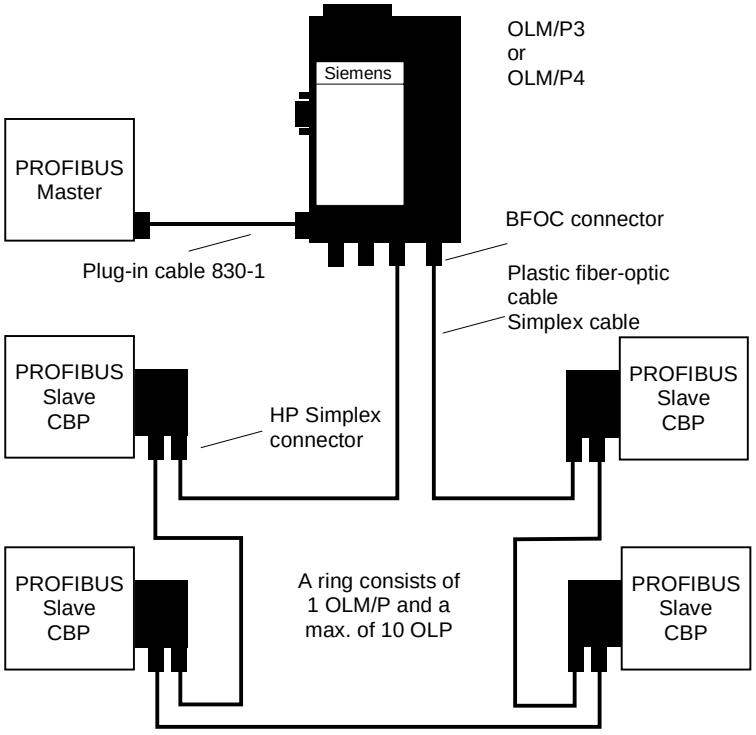


Fig. 8.2-15 Example of a system configuration with OLPs

The OLP can be directly plugged into the 9-pole SUB-D socket of the CBP. Power is supplied to the OLP via the 9-pole SUB-D connector of the CBP.

The transmission reliability of PROFIBUS networks is greatly increased by using fiber-optic cable instead of twisted two-wire cable. As a result, the network is insensitive to interference due to EMC problems or overvoltages.

Considerable cost savings are achieved by using plastic fiber-optic cables which are also easy to fit. Additional grounding is no longer necessary either.

Functions

- Connection of a PROFIBUS slave to an optical single-fiber ring
- Cable length between 2 OLPs with plastic fiber-optic cable from 1 m to 25 m
- Maximum circumference of a single-fiber ring: 275 m
- Transmission rate of 93.75 kbit/s to 1.5 Mbit/s; can be adjusted by means of plug-in jumpers (this can be checked through inspection windows in the connector housing)
- OLP single-fiber rings can be integrated in PROFIBUS networks by means of OLM/Ps

Requirements for use

- One OLM/P per single-fiber ring is necessary as a coordinator.

Ordering data

OLP / OLM for PROFIBUS	Order No.
OLP Optical link plug for creating optical single-fiber rings with plastic fiber-optic cables; including 2 HP Simplex connectors and mounting instructions	6GK1 502-1AA00
OLM/P3 Optical link module for plastic fiber-optic cables, 3-channel version with signaling contact, including 2 BF OC connectors	6GK1 502-3AA10
OLM/P4 Optical link module for plastic fiber-optic cables, 4-channel version with signaling contact, including 4 BFOC-connectors	6GK1 502-4AA10

For more information on ordering and additional descriptions, see the A&D AS catalog "Industrial Communication" IK 10 (Order No. E86060-K6710-A101-A6).

8.2.6.4 Shielding of the bus cable / EMC measures

In order to ensure interference-free operation of the PROFIBUS-DP, especially in the case of data transmission with RS485, the following measures are imperative:

Shielding

- For the PROFIBUS bus cable, the shield in the bus connector should be connected to the CBP. Shielding is also provided by the shield clamps (in the event of Compact units) or by the shield clamps and cable ties (in the event of chassis-type units) on the converter housing. The following illustrations show you how to use the shield clamps. When removing the insulation from the various core ends, please ensure that the solid copper core is not damaged.
- Please ensure that the shield of each bus cable is connected to protective earth, both where it enters the cabinet as well as at the converter housing.

NOTE

Bus cables are to be laid at an angle of 90 ° to power cables if it is necessary that the two kinds of cable intersect.

NOTE

The bus cables must be twisted and shielded and are to be laid separately from the power cables at a minimum distance of 20 cm. The braided shield and, if necessary, the underlying foil shield as well, are to be connected on both sides through a large surface area so that they are highly conductive, i.e. the shield of the bus cable between two converters is to be connected to the converter housing at both ends of the cable. The same applies to the shielding of the bus cable between the PROFIBUS-DP master and the converters.

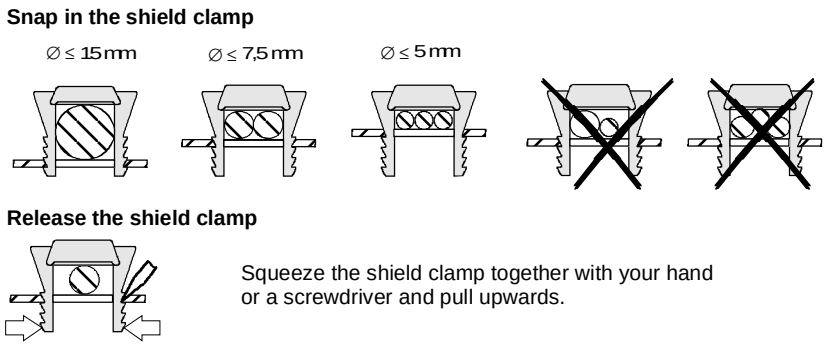


Fig. 8.2-16 Using the shield clamps

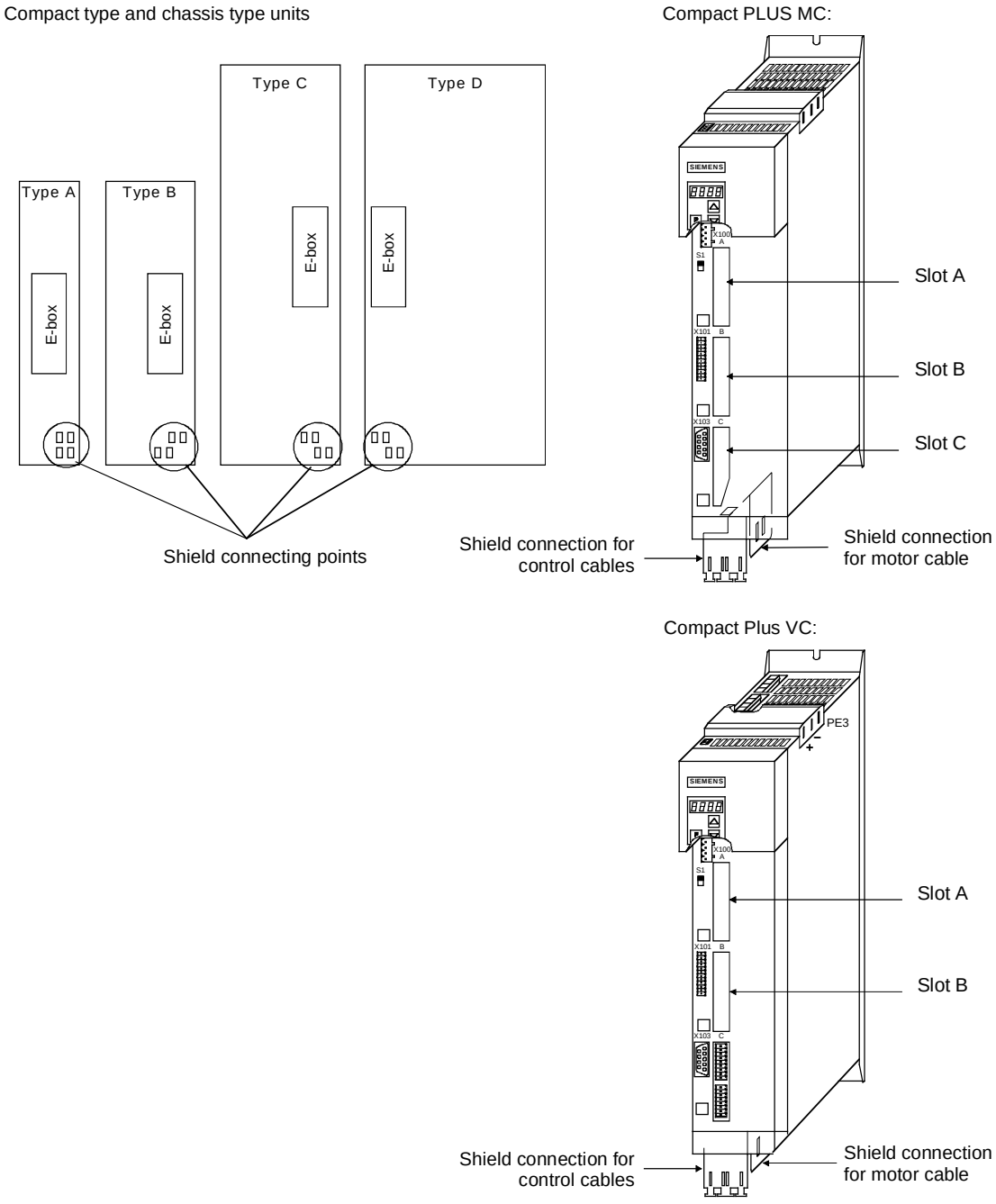


Fig. 8.2-17 Position of the shield connecting points

If so many control cables are used that two shield clamps are insufficient, the "EMC shielded housing" option is to be used.

Potential equalization

- Please avoid differences in potential (e.g. as a result of different power supply levels) between the converters and the PROFIBUS-DP master.
- Use equipotential bonding cables:
  - 16 mm^2 Cu equipotential bonding cables up to 200 m
  - 25 mm^2 Cu equipotential bonding cables over 200 m
- Route the equipotential bonding cables so that there is the smallest possible surface between the equipotential bonding cables and signal cables.
- Connect equipotential bonding cables to the ground/protective conductor through the largest possible surface area.

Laying cables

Instructions for laying cables:

- Bus cables (signal cables) must not be laid close to and parallel to power cables.
- Signal cables and the associated equipotential-bonding cables must be laid as closely together as possible and kept as short as possible.
- Power cables and signal cables must be laid in separate cable ducts.
- Shields must be connected through the largest possible surface area.

For more information on electromagnetically compatible installation of systems, see for example Chapter 3 of the Compendium or the description "Instructions for Design of Drives in Conformance with EMC Regulations" (Order No. 6SE7087-6CX87-8CE0).

8.2.7 Starting up the CBP

NOTE

With regard to basic parameterization, please note the differences to the types of unit with the older function classes FC (CU1), VC (CU2) and SC (CU3). These differences are described below.

In order to make these differences clear, the parameter numbers and other deviations are either printed in dark gray or have a dark-gray background.

8.2.7.1 Basic parameterization

NOTE

For the CBP optional board, it is not necessary to adjust the baud rate.

Basic parameterization with Compact PLUS, CUMC and CUVC

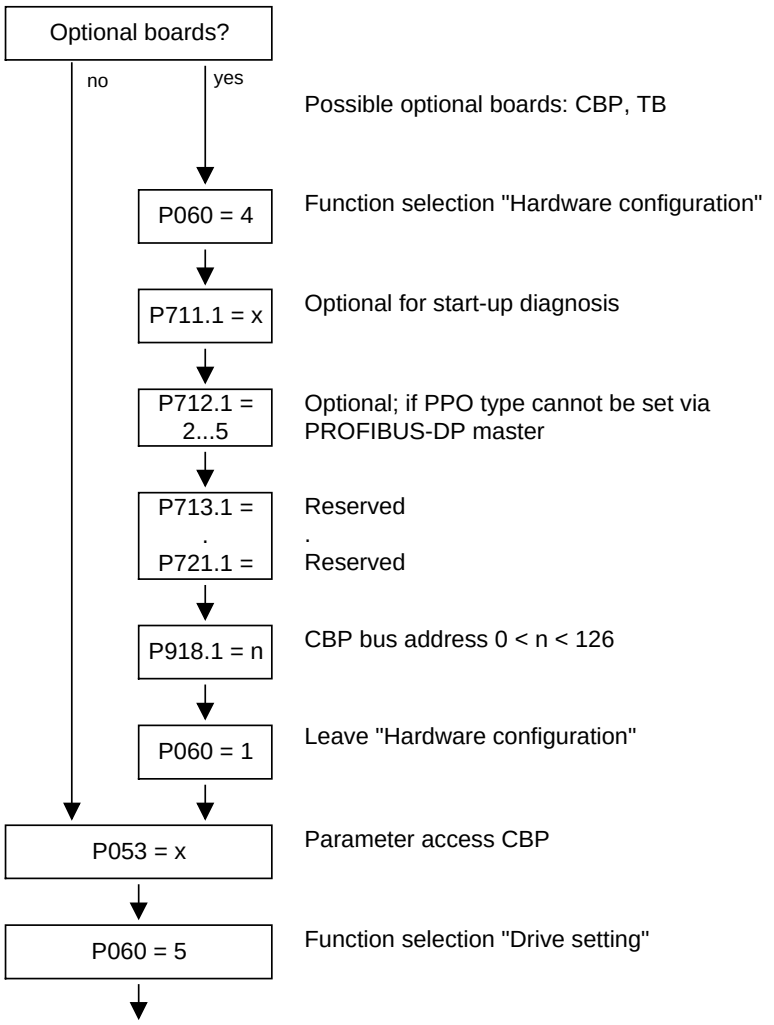


Fig. 8.2-18 Parameterization of "Hardware configuration" for Compact PLUS, CUMC and CUVC

In the case of MASTERDRIVES MC (CUMC) and MC+ (Compact+) from firmware version V1.4 onwards, the CB parameters P918 and P711 to P721 can also be changed in the "Drive setting" status (P060 = 5).

Basic parameterization for FC (CU1), VC (CU2) and SC (CU3)

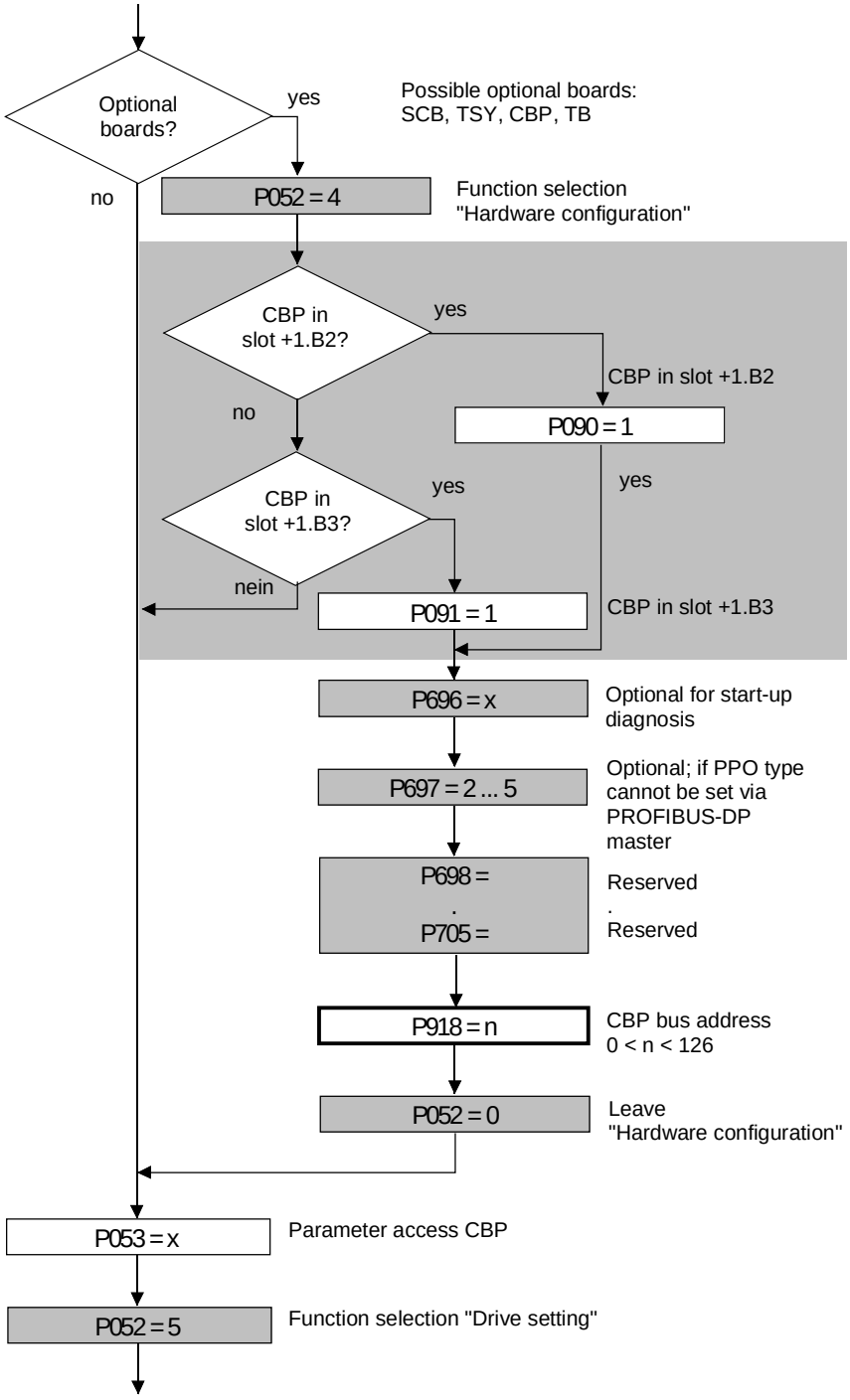


Fig. 8.2-19 Parameterization of "Hardware configuration" for FC (CU1), VC (CU2) and SC (CU3)

NOTE

All grayed out parameters are only valid for units with the functions FC (CU1), VC (CU2) and SC (CU3).

NOTE

The following conventions apply to all parameters with index (e.g. P918.x) given below:

- Index 1 is valid for the first CBP
- Index 2 is valid for the second CBP

To determine which CBP is the first and which the second, see Section 8.2.4 "Mounting methods / CBP slots".

P053 (parameter access)
This parameter is significant for the CBP if you wish to set or change parameters of the converter (including technology) by means of the PKW part of the PROFIBUS telegrams. In this case, please set parameter P053 to an uneven number (e.g. 1, 3, 7 etc.). With parameter P053, you can define the positions (PMU, CBP etc.) from which parameters may be altered. Example: P053 = 1: Parameter access only CBP = 3: Parameter access CBP+PMU = 7: Parameter access CBP+PMU+SCom1 (OP) If changing parameters (= parameter access) has been enabled via the CBP (P053 = 1, 3 etc.), all other parameter settings can be made from the PROFIBUS-DP master via the bus. For the additional setting of parameters which concern data transfer via the PROFIBUS-DP (e.g. process data (PZD) combination), you must know the PPO type used for the transfer of useful data.

P060	**P052**
Function selection "Hardware setting"	

P090 (board position 2) or P091 (board position 3)
You can also change these parameters if the CBP exchanges useful data via the PROFIBUS-DP. In this way, you can isolate the PROFIBUS-DP interface from the converter with the appropriate parameterization. In this case, the CBP changes over to the PROFIBUS-DP status "Static Diagnosis", i.e. the CBP causes the PROFIBUS-DP master to exit the data-exchange mode and only to request diagnostic telegrams from the CBP.

P918.x (CBP Bus Address)	**P918 (CBP Bus Address)**
The CBP accepts the address set in parameter P918 only after voltage recovery or a reset. After the CBP has been parameterized, it is no longer possible to change the address. Any attempt to do so leads to fault number F080. An address change only becomes effective after the power supply to the electronics box has been turned off and then turned on again!	

P711.x (CBP Parameter 1)	P696 (CBP Parameter 1)
With this parameter, you can activate special diagnostic information for start-up and service. During normal operation, P711 / P696 has the value 0 (default setting).	

P712.x (CBP Parameter 2)	P697 (CBP Parameter 2)
If you are using a PROFIBUS-DP master system where it is possible to set the identification byte and thus specify the type of PPO (e.g. IM308B/C for SIMATIC S5), you do not need to do anything with P712 / P697 (simply bypass this parameter P712 / P697)! If you are using a PROFIBUS-DP master system where it is not possible to specify the PPO type at the converter by means of the identification byte (e.g. CP5431 for SIMATIC S5), you can specify a PPO type with parameter P712 / P697. With the default setting (P712 / P697= 0), the CBP automatically sets the type of PPO. P712 / P697 = 0: PPO1 (default setting) = 1: PPO1 = 2: PPO2 = 3: PPO3 = 4: PPO4 = 5: PPO5	

P713.x (CB Parameter 3)	P698 (CBP Parameter 3)
Only CBP2 Communications protocol: P713 / P698 = 0: PROFIBUS (Default setting) (P713 / P698 = 1: reserved) P713 / P698 = 2: USS Only selected parameters are relevant (see below). A change from the PROFIBUS to the USS protocol and vice versa does not come into effect until after the voltage has been switched off and then on again.	

P714.x (CB Parameter 4)	P699 (CBP Parameter 4)
Only CBP2 Write requests of a SIMATIC OP are stored permanently (EEPROM) or temporarily (RAM). P714 / P699 = 0: EEPROM (default setting) P714 / P699 = 1: RAM	

P715.x (CB Parameter 5)	P700 (CBP Parameter 5)
Only CBP2 Failure of a cross-traffic relationship is signaled as a fault or alarm. P715 / P700 = 0: Fault (default setting) In the event of failure, transmission of all setpoints to the basic unit is stopped. This leads to fault F082 P715 / P700 = 1: Alarm The failure is only signaled by alarm A088. With regard to the missing setpoints, those last received are retained.	

NOTE

After the above settings have been made, the CBP is logged-on in the converter and is ready to establish connections to the PROFIBUS-DP. It is not yet possible to process the process data via the PROFIBUS-DP after this has been done.

This additionally requires the type of process data interconnection described in the following section 8.2.6.2.

USS

For USS-relevant parameter numbers, only CBP2 with P713.x = 2:

CBP2 parameter number	Meaning	Corresponds to Scom/ SCB parameter number
P918.x	Bus address	P700
P718.x (CB parameter 8)	Baud rate 6 = 9.6 kbaud 7 = 19.2 kbaud 8 = 38.4 kbaud	P701
P719.x (CB parameter 9)	Number of PKWs	P702
P720.x (CB parameter 10)	Number of PZDs	P703
P722.x	Telegram failure time	P704

Further information on the USS protocol can be found in Section 8.1, USS.

8.2.7.2 Process data interconnection in the units

Definition

Process data interconnection involves the linking up of setpoints and control bits to the RAM interface. The transferred process data only become effective when the used bits of the control words as well as the setpoints, status words and actual values are allocated (connected) to the dual-port RAM interface.

The CBP stores the received process data at fixed pre-determined addresses in the dual-port RAM. Each item of process data (PZDi, i = 1 to 10) is assigned a connector (e.g. 3001 for PZD1). The connector is also used to determine whether the PZDi (i = 1 to 10) is a 16-bit value or a 32-bit value.

With the help of selector switches (e.g. P554.1 = selector switch for bit 0 of control word 1), the setpoints or the individual bits of the control words can be assigned to a particular PZDi in the dual-port RAM. In order to do this, the connector belonging to the required PZDi is assigned to the selector switch.

NOTE

In function classes CUMV, CUVC and Compact PLUS, the control words STW1 and STW2 are also available in bit form on so-called binectors (explanations of BICO systems can be found in Chapter 4 "Function Blocks and Parameters").

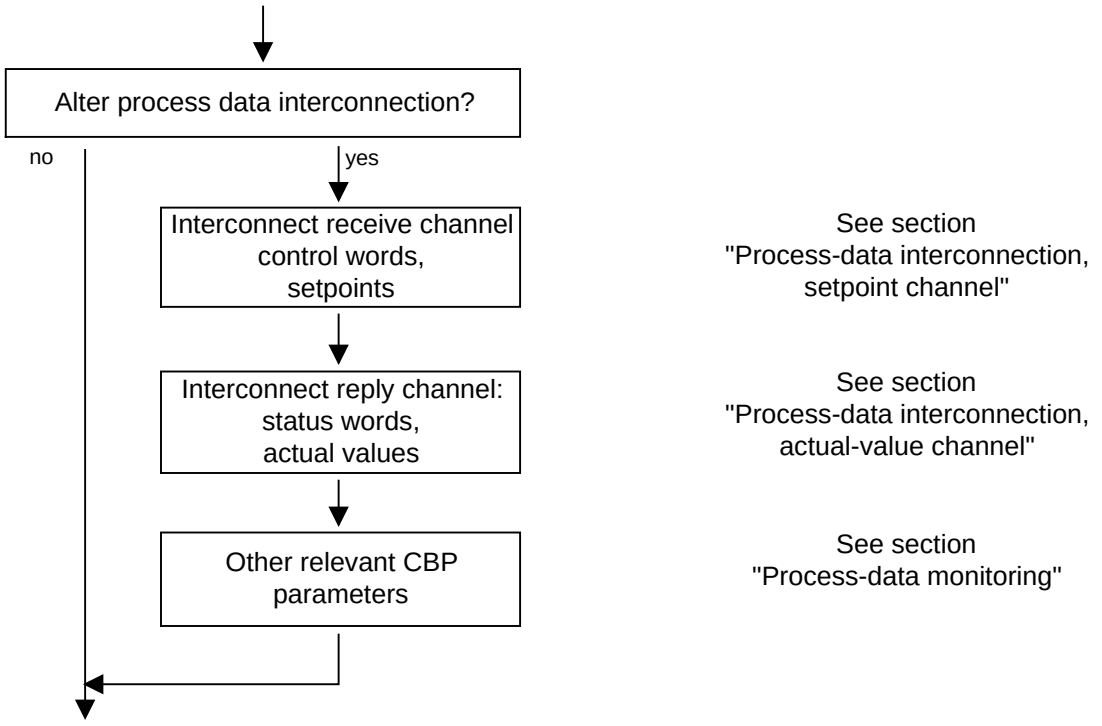


Fig. 8.2-20 Procedure for changing process data

NOTICE

Rewiring from 16 to 32 bit and vice versa should not be done while the equipment is in operation, because the changeover takes several milliseconds, during which time the data on the bus are not consistent (high and low can change places).

Examples The following pages contain examples of how the transferred data are allocated in the units by means of process data interconnection.

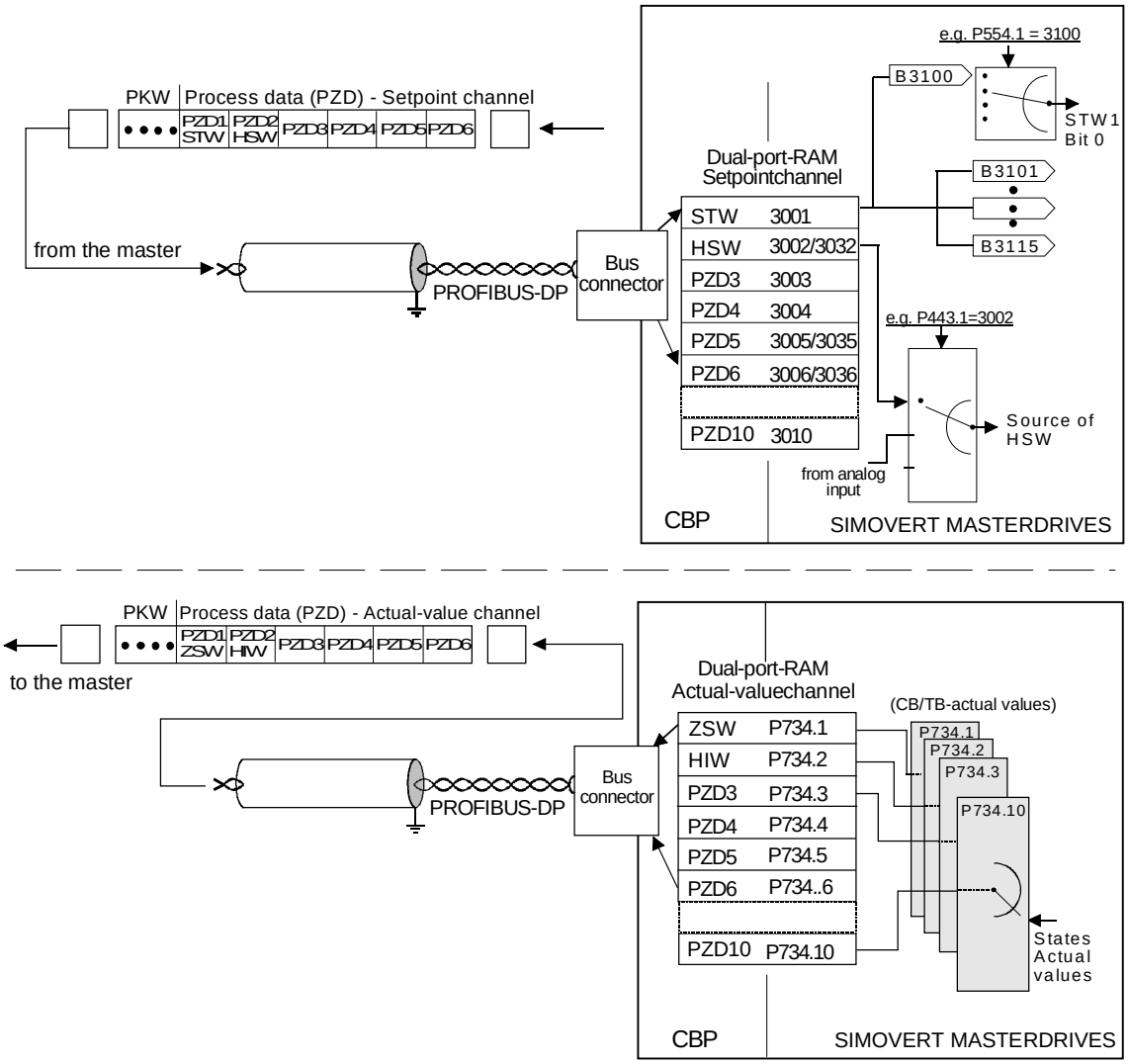


Fig. 8.2-21 Example of process data interconnection of the first CB board in function classes Motion Control Compact PLUS, CUMC and CUVC

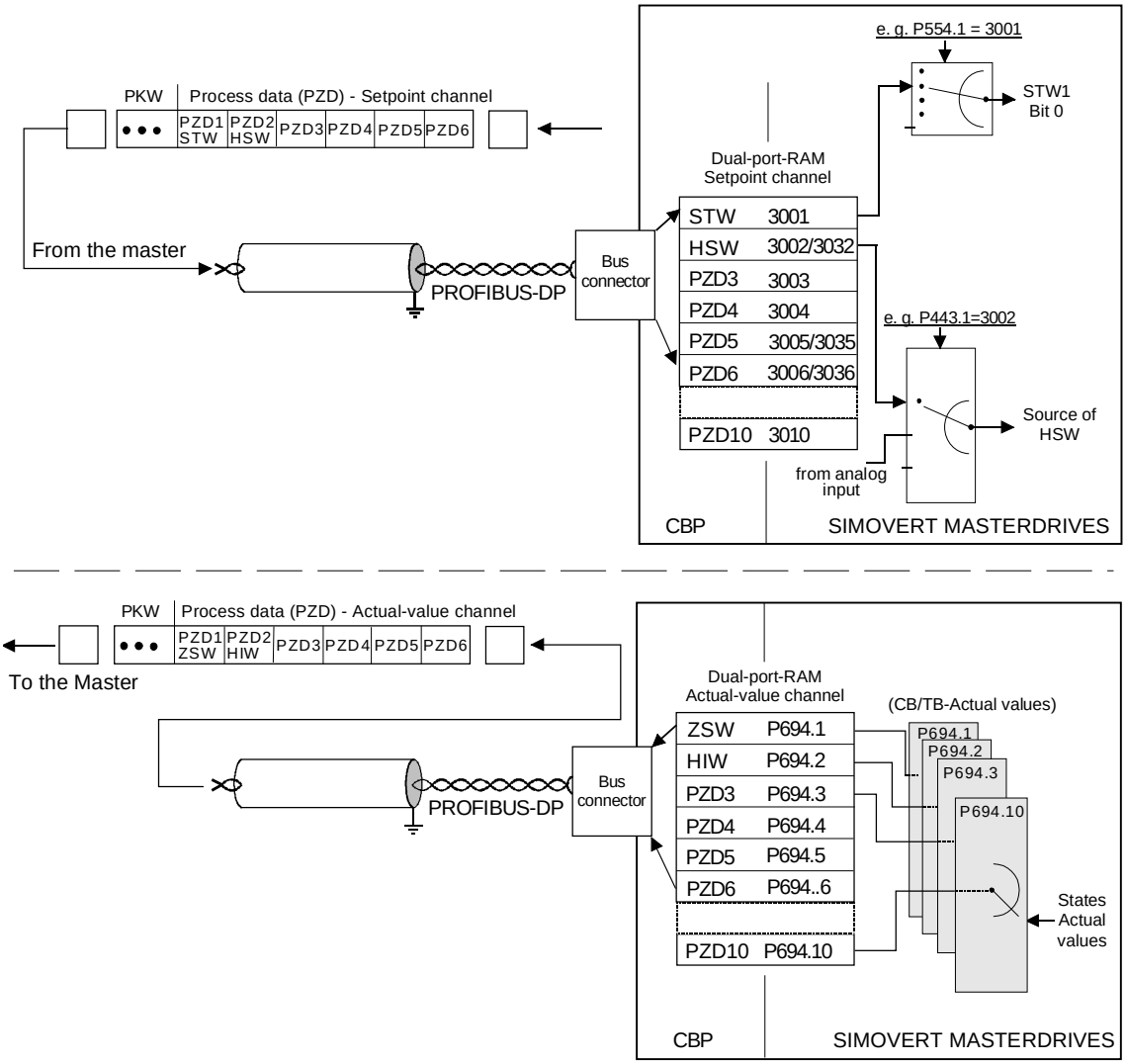


Fig. 8.2-22 Example of process data interconnection for function classes FC (CU1), VC (CU2) and SC (CU3)

Process data interconnection, setpoint channel Master → Converter

- The "tens digit" of the connector is used to distinguish between a 16-bit process data item (e.g. 3002) and a 32-bit process data item (e.g. 3032).
- If a process data item is transferred as a 16-bit quantity, assign the required PZDi-relevant connector for a 16-bit process data item to the selector switch (see "Process data linkage"). (Example: If a 16-bit process data item is assigned to PZD2, the relevant connector is 3002).
- If a process data item is transferred as a 32-bit process data item, assign the required PZDi-relevant connector for a 32-bit process data item to the selector switch (see "Process data interconnection"). For this, use the connector of the least-significant PZDi (Example: If a 32-bit process data item is assigned to PZD2 + PZD3, the relevant connector is 3032)
- The first word (associated connector : 3001 or the binectors 3100 to 3115) of the received process data is always assigned to control word 1 (STW1).
- The second word is always assigned to the main setpoint (HSW).
- If the main setpoint is transferred as a 32-bit process data item, it is also assigned to word 3. In this case, the most-significant part of the main setpoint is transferred in word 2 and the least-significant part is transferred in word 3.
- If a control word 2 (STW2) is transferred, the fourth word (relevant connector = 3004 or binectors 3400 to 3415) is always assigned to STW2.

NOTE

In PPO types 1 and 3, the PZD part only consists of two words. Here, only control word 1 and the main setpoint (as 16-bit value) can be linked up to the dual-port RAM interface.

- The connector for the setpoint channel is always a 4-digit one. The connectors assigned to the process data (PZD1 to PZD10) are shown in the function diagram of the relevant CU board.
  The connectors are entered at the PMU as 4-digits values (e.g. 3001). When parameterization is done via the PROFIBUS-DP, the connector is entered via the bus and also via the PMU (e.g. connector 3001 is transferred as 3001_{hex}).

NOTE

Process data interconnection of the setpoint channel can also be carried out via the PROFIBUS-DP if P053 has previously been set to an uneven value.

Please bear in mind that control word 1 (STW1) has the value 0 during the parameterization phase (process data interconnection)!

Interlocking of connectors and double connectors

MC V1.50 and higher / CUVC V3.23 and higher

DANGER

When interconnecting connectors, binectors, and double word connectors, please note that simultaneous interconnection of a connector, and a double word connector with the same name is not permitted, because when a double word connector (e. g. KK3032) is connected, the meanings of the connectors K3002 and K3003 are swapped round (high-word and low-word exchanged).

On MASTERDRIVES MC and Compact Plus on software version V1.50 and higher and on MASTERDRIVES CUVC on software version V3.23 and higher, simultaneous use of connectors and double word connectors with the same name is mutually interlocked (see also function diagrams [121] and [131]).

Because the binectors are not included in the interlocking (to ensure compatibility for older configurations), their significance changes according to whether the pertinent word or double word is wired.

Example for the setpoint channel

PZD interconnection for the bits of control word 1 (STW1), the main setpoint (HSW) and the bits of control word 2 (STW2).

At the converter via PMU		Meaning
P*554*.1 = 3100	P*554*.1 = 3001	Control word 1 bit 0 (Src ON/OFF1) via DPR interface (word 1)
P*555*.1 = 3101	P*555*.1 = 3001	Control word 1 bit 1 (SrcON/OFF2) via DPR interface (word 1)
P*443*.1 = 3002	P*443*.1 = 3002	16-bit main setpoint (Src Main Setpoint) via DPR interface (word 2)
P*588*.1 = 3411	P*588*.1 = 3004	Control word 2 bit 28 (Src No Ext Warn1) via DPR interface (word 4)

If the factory setting of the converter is used, the above example of parameterization is a functioning way of interconnecting process data (setpoints).

- *Italics:*
  Parameter number (if the PMU is a decimal number, via PROFIBUS-DP as an equivalent HEX number).
- Single underline:
  Index (if the PMU is a decimal number, via PROFIBUS-DP as an equivalent HEX number).
- Double underline:
  Interconnection value: defines whether the parameter selected by the *parameter number* is transferred as a 16-bit value or as a 32-bit value and at which position in the PZD-setpoint telegram (PZDi), the parameter is transferred.
  - White background = MASTERDRIVES Compact PLUS, CUMC or CUVC (first CBP)
  - Grey background = MASTERDRIVES FC (CU1), VC (CU 2) or SC (CU 3)

Process data interconnection, actual-value channel

The actual-value process data (PZDi, i = 1 to 10) are assigned to the appropriate status words and actual values by the indexed parameter P734.i / P694.i (CB/TB actual values). Each index stands for a process data item (e.g. 5 → PZD5 etc.). Please enter the number of the connector or parameter whose value and corresponding process data item you wish to transfer in parameter P734 / P694 under the relevant index.

The status word is always to be transferred in the PZD1 word of the PZD reply (actual-value channel), and the main actual value in PZD2. What additional items are assigned to the PZD (PZD1 up to, if necessary, PZD10) is not specified. If the main actual value is transferred as a 32-bit value, then it is assigned to PZD2 and PZD3.

Example for the actual-value channel PZD interconnection for status word 1 (ZSW1), the main actual value (HIW) and status word 2 (ZSW2).

At the converter via PMU		Meaning
P*734*.1 = 32	P*694*.1 = 968	Status word 1 (K032 / P968) is transferred in the actual-value channel by means of PZD1.
P*734*.2 = 151	P*694*.2 = 218	The actual speed n/f (KK151 / P218) is transferred in the actual-value channel by means of PZD2 (here, as a 16-bit quantity; PZD3 is empty).
P*734*.4 = 33	P*694*.4 = 553	Status word 2 (K033 / P553) is transferred in the actual-value channel by means of PZD4.

Example: 32-bit main actual value

P*734*.2 = 151	P*694*.2 = 218	The actual speed n/f (KK151 / P218) is transferred in the actual-value channel by means of PZD2 ...
P*734*.3 = 151	P*694*.3 = 218	... **and** as a 32-bit value by means of PZD3.

- *Italics:*
  P734 / P694 (CB/TB actual value), if PMU is shown as a decimal number, transferred via PROFIBUS-DP as an equivalent HEX (2B6 Hex).
- Single underline:
  Index (if PMU is a decimal number, via PROFIBUS-DP as an equivalent HEX number): Specifies at which position in the PZD actual-value telegram the actual value selected by the parameter number is transferred.
- Double underline:
  Parameter number of the required actual value.
  - White background = MASTERDRIVES Compact PLUS, CUMC or CUVC (first CBP)
  - Grey background = MASTERDRIVES FC (CU1), VC (CU 2) or SC (CU 3)

NOTE

If actual values are transferred as a 32-bit data item, you must enter the appropriate connector number at two consecutive words (indices).

8.2.7.3 Process data interconnection via standard telegrams

Definition

PROFIdrive profile version V3 defines standard telegrams for cyclical data exchange.

Telegram selection

Process data can be interconnected for standard telegrams by means of a Script file.

Structure of standard telegrams

See also PROFIdrive version 3 (PNO: Order No. 3172).

Standard telegram 1:

PZD number	1	2
Setpoint	STW1	NSOLL_A

PZD number	1	2
Actual value	ZSW1	NIST_A

Standard telegram 2:

PZD number	1	2	3	4
Setpoint	STW1	NSOLL_B		STW2

PZD number	1	2	3	4
Actual value	ZSW1	NIST_B		ZSW2

Standard telegram 3:

PZD number	1	2	3	4	5
Setpoint	STW1	NSOLL_B		STW2	G1_STW

PZD number	1	2	3	4	5	6	7	8	9
Actual value	ZSW1	NIST_B		ZSW2	G1_ZSW	G1_XIST1		G1_XIST2	

Standard telegram 4:

PZD number	1	2	3	4	5	6
Setpoint	STW1	NSOLL_B		STW2	G1_STW	G2_STW

PZD number	1	2	3	4	5	6	7	8	9	...
Actual value	ZSW1	NIST_B		ZSW2	G1_ZSW	G1_XIST1		G1_XIST2		...

...	...	10	11	12	13	14
...	...	G2_ZSW	G2_XIST1		G2_XIST2	

Standard telegrams 5 and 6 are derived from standard telegrams 3 and 4 for the Dynamic Servo Control (DSC) function.

Standard telegram 5:

PZD number	1	2	3	4	5	6	7	8	9
Setpoint	STW1	NSOLL_B		STW2	G1_STW	XERR		KPC	

PZD number	1	2	3	4	5	6	7	8	9
Actual value	ZSW1	NIST_B		ZSW2	G1_ZSW	G1_XIST1		G1_XIST2	

Standard telegram 6:

PZD number	1	2	3	4	5	6	7	8	9	10
Setpoint	STW1	NSOLL_B		STW2	G1_STW	G2_STW	XERR		KPC	

PZD number	1	2	3	4	5	6	7	8	9	...
Actual value	ZSW1	NIST_B		ZSW2	G1_ZSW	G1_XIST1		G1_XIST2		...

... ...

10	11	12	13	14
G2_ZSW	G2_XIST1		G2_XIST2	

Signals:

Signal No.	Meaning	Abbreviation	Length 16/32-bit	Sign
1	Control word 1	STW1	16	
2	Status word 1	ZSW1	16	
3	Control word 2	STW2	16	
4	Status word 2	ZSW2	16	
5	Speed setpoint A	NSOLL_A	16	with
6	Actual speed A	NIST_A	16	with
7	Speed setpoint B	NSOLL_B	32	with
8	Actual speed B	NIST_B	32	with
9	Encoder 1 control word	G1_STW	16	
10	Encoder 1 status word	G1_ZSW	16	
11	Encoder 1 actual position 1	G1_XIST1	32	
12	Encoder 1 actual position 2	G1_XIST2	32	
13	Encoder 2 control word	G2_STW	16	
14	Encoder 2 status word	G2_ZSW	16	
15	Encoder 2 actual position 1	G2_XIST1	32	
16	Encoder 2 actual position 2	G2_XIST2	32	
25	Control deviation	XERR	32	with
26	Position controller gain factor	KPC	32	with

8.2.7.4 Process data monitoring

NOTE

Please note the different parameter numbers for the types of unit with the older function classes FC (CU1), VC (CU2) and SC (CU3).

In order to make these differences clear, these parameter numbers are either printed in dark gray or have a dark-gray background.

P722.x (CB/TB TlgOFF)	**P695 (CB/TB TlgOFF)**
With parameter P722. / P695, you can determine whether entering of process data into the dual-port RAM by the CBP is to be monitored by the converter. For parameter P722 ♦ Index 1 is applicable for the first CBP and ♦ Index 2 is applicable for the second CBP. To determine which CBP is the first one and which is the second one, see section 8.2.4 "Mounting methods / CBP slots".	

If process data monitoring has been activated, a fault in the DP master is followed by a reaction of the converter, irrespective of the reply-monitoring time in the CBP.

&	**P722.x ≠ 0**	**P722.x = 0**	**P695 ≠ 0**	**P695 = 0**
Response monitor active	Reaction Yes	Reaction No	Reaction Yes	Reaction No
Response monitor inactive	Reaction No	Reaction No	Reaction No	Reaction No

Table 8.2-10 Process data monitoring depending on P722.1/P695 and the response monitor t_{WD}

When the DP master is being configured, it is specified whether telegram traffic with the master is to be monitored by the slave (CBP). If response-monitoring is active, the PROFIBUS-DP master passes on a time value t_{WD} (watchdog time) to the CBP when a connection is made.

If the response-monitoring time expires, the CBP ceases to write process data into the dual-port RAM. When this is combined with P722.x / P695, it is therefore possible to plan your process data monitoring.

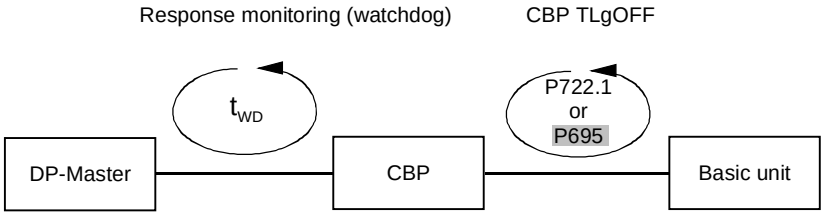


Fig. 8.2-23 Effect of t_{WD} and P722.1 / P695

Response-monitoring time t_{WD}

P722.x P695	Yes		No		
	CPU (AG) in STOP	IM308B/C in STOP or Simatic "Supply off	CPU (AG) in STOP	IM 308B/C in STOP	Simatic "Supply off"
0 ms	Converter continues to run with the useful data last received. Alarm A083	Converter continues to run with the useful data last received. Alarm A083/A084	Converter continues to run with the useful data last received.	Converter continues to run with the useful data last received. Alarm A083	Converter continues to run with the useful data last received.
10 ms	Fault trip with F082 after: Watchdog time + 10 ms	Fault trip with F082 after: Watchdog time + 10 ms	Converter continues to run with the useful data last received. Fault trip with F082 after restart of CPU.	Fault trip with F082 after: 10 ms	Converter continues to run with the useful data last received.

Table 8.2-11 Interaction of P722 / P695 and response monitoring (watchdog)

Always set parameter P722.x / P695 to 10 for operation with the CBP. Monitoring of process data is thus activated/deactivated by the value of the response-monitoring (watchdog) time solely via the PROFIBUS-DP! The converter monitors entering of process data into the dual-port RAM from the instant at which the CBP enters process data into the dual-port RAM for the first time. Fault F082 can only be tripped after this instant!

Process data whose complete control word (PZD1) has the value zero is not passed on by the CBP to the dual-port RAM (warning A083)!

A fault is followed by a fault trip after

- Watchdog time + 10 ms
- The 10 ms correspond to the value 10 of parameter P722 / P695 and can be neglected with respect to the response-monitoring value.
- For additional operation with a Class II master, please bear in mind the information in the section "Diagnosis with the Class II master" of Chapter 8.2.8.4.

DANGER

If the "ON" command (bit 0) is interconnected with the dual-port RAM interface, the following must be done for safety reasons:

An "OFF2" or "OFF3" command must be additionally parameterized to the terminal strip/PMU as otherwise the converter cannot be powered down by means of a defined command when there is a communications breakdown!

8.2.8 Settings for the PROFIBUS-DP master (Class 1)

PROFIBUS units have different performance characteristics.
In order to ensure that all master systems can correctly communicate with the CBP in all the ways possible, the characteristic features of the CBP are summarized in the form of an electronic data sheet (data file).

These so-called master files describe the characteristic features of a type of unit clearly and completely in an exactly specified format.

For the different master systems, the characteristics are summarized in a standardized master file (GSD) and, for the SIMATIC, in a type-description file specific to the SIMATIC.

Master file (GSD)

The CBP2 V2.20 supports PROFIdrive version 3. The device master file (GSD) is stored as an ASCII file (SIEc8045.GSD) on the floppy disk supplied with the CBP.

The GSD allows you to configure standard telegrams 1 to 6. It has been generated according to revision 4 for PROFIBUS DP-V2.

To ensure complete compatibility between CBP and CBP2 V2.10, PPO types can still be used for configuring purposes, as described below.

The CBP2 V2.20 can also be operated on the device master file for the CBP and CBP2 V2.1 (SIEM8045.GSD).

Type-description file

The type-description file is also available as an ASCII file (SI8045AX.200 and SI8045TD.200) on the floppy disk which accompanies the CBP.

Selecting the type of PPO

So-called identification bytes are transferred in the configuration telegram of the PROFIBUS-DP master. These bytes determine the type of PPO for the useful-data telegram.

These bytes can be assigned different values for selecting a particular type of PPO (except for PPO type 1). For PPO type 4, for example, either identification byte 0 = 245 and identification byte 1 = 0 can be entered or only identification byte 0 = 245. If an unknown combination of identification bytes is received, the CBP sets the bit "parameterization error" in the diagnostic telegram to the PROFIBUS-DP master.

PPO	Identification byte 0			Identification byte 1			Identification byte 2			Identification byte 3			COMET200
type	Dec	Hex	COM	Dec	Hex	COM	Dec	Hex	COM	Dec	Hex	COM	Version
1	243	F3	4AX	241	F1	2AX							V4.x/V5.x
2	243	F3	4AX	243	F3	4AX	241	F1	2AX	0	0	0	V4.x/V5.x
2	243	F3	4AX	243	F3	4AX	241	F1	2AX				V4.x/V5.x
2	243	F3	4AX	245	F5	6AX							V5.x
3	241	F1	2AX	0	0	0							V4.x/V5.x
3	0	0	0	241	F1	2AX							V4.x/V5.x
3	241	F1	2AX										V4.x/V5.x
4	0	0	0	243	F3	4AX	241	F1	2AX	0	0	0	V4.x/V5.x
4	0	0	0	243	F3	4AX	241	F1	2AX				V4.x/V5.x
4	0	0	0	243	F5	6AX							V5.x
4	245	F5	6AX	0	0	0							V5.x
4	245	F5	6AX										V5.x
5	243	F3	4AX	243	F3	4AX	243	F3	4AX	241	F1	2AX	V4.x/V5.x
5	243	F3	4AX	243	F3	4AX	241	F1	2AX	243	F3	4AX	V4.x/V5.x
5	243	F3	4AX	249	F9	10AX							V5.x

Table 8.2-12 Values for the identification bytes

8.2.8.1 Operating the CBP with a SIMATIC S5

When the CBP is used with a **SIMATIC S5**, it is operated as a **standard DP slave**.
As possible master boards, the IM308 B or the IM308 C can be used, or even the CP5431 in limited form.
The planning tools COM ET200 or COM PROFIBUS are available for configuring the master station.

If older versions of these planning tools are used, you must copy the master file or type-description file from the accompanying floppy disk into the appropriate sub-directory of the planning software.

COM ET200 up to Version V4.x

When configuring the CBP, please use the SI8045TD.200 type-description file on the floppy disk.

Please copy the type-description file into the directory containing the COM ET 200 files in the PG/PC.

Example

CD C:\COMET200
COPY A:\SI8045TD.200 C:

The type of PPO is selected in the configuration mask of COM ET200 up to Version V4.x by entering identification bytes in accordance with the above table of identification bytes.

COM ET200 WIN and COM PROFIBUS

When configuring the CBP, please use the SI8045AX.200 type-description file on the floppy disk only if the CBP has not yet been included in the supplied version of the COM package.

Then copy the type-description file into the "TYPDAT5X" directory of the COM installation in the PG/PC.

From COM PROFIBUS V3.2 onwards, the CBP is included as standard and the type-description files on the floppy disk are then of no significance.

When a CBP is being configured (pull out the selector buttons "DRIVES" on the bus cable) and the suggested slave address is confirmed, a selection mask called "Slave characteristics" appears on the screen. It has the following appearance:

The required type of PPO is selected with this planning tool from a selection table called "Required configuration". This table appears automatically when the menu item "Configure" is selected.

More information on how to configure data exchange between a CBP and a SIMATIC S5 can be found in the description accompanying the DVA_S5 module package.

Using the DVA_S5 module package

The DVA_S5 module package (variable-speed drives with the SIMATIC S5) implements data transfer between SIMATIC and SIMOVERT slaves in accordance with the PROFIBUS profile for variable-speed drives and thus facilitates creation of the user program. A data module with the same appearance is always provided as the data interface, irrespective of which S5-CPU the program runs on. The programmer, therefore, does not need any detailed knowledge of the SIMATIC S5 system architecture or of the system functions which may be required.

The DVA_S5 module package can be obtained from A&D WKF Fürth/Germany under MLFB 6DD1800-0SW0.

8.2.8.2 Operating the CBP with a SIMATIC S7

CBP as S7 slave

The CBP can be operated in two ways with a **SIMATIC** S7:

- As a standard DP slave
- As a standard DP slave with extended functionality for SIMATIC S7

Integrated PROFIBUS interfaces

The CPUs with integrated PROFIBUS interface such as CPU315-2DP, CPU413-2DP, CPU414-2DP or CPU416-2DP etc. can be used as the possible S7 master.

The master station as well as the whole PROFIBUS network is configured in the STEP 7 hardware manager.

CBP as a standard DP slave

Requirement: STEP 7 from V3.0 upwards

If your STEP 7 hardware catalog does not yet contain the entry "MASTERDRIVES CBP", proceed as follows:

Copy the type-description file S18045AX.200 from the supplied floppy disk into the STEP 7 index STEP7 à S7DATA à GSD.

From STEP 7 version V4.01, the CBP is contained as standard in the hardware catalog, i.e. from version V4.01 onwards, the floppy disks are of no significance.

In the "Extras" menu of the SIMATIC hardware configuration, then select the menu item "Update GSD files" and carry out this command.

You will find the CBP in the "Hardware catalog" menu under "PROFIBUS-DP à Further field devices à Simovert". It appears there under the name "MASTERDRIVES CBP".

CBP as a standard DP slave with extended functionality

To enable the CBP to be connected as a standard DP slave with extended functionality for SIMATIC S7 (e. g. acyclical communication with SIMOVIS/DriveMonitor) to the PROFIBUS-DP, a so-called DVA_S7 object manager has to be installed as an add-on to STEP 7. The DVA_S7 object manager is part of the DVA_S7 module package.

STEP7 basis software, Version V3.1 and upwards, is a requirement for installation of the DVA_S7-OM.

The DVA_S7-OM takes on the function of a master file or type-description file and supplements the unit characteristics stored there with all the necessary S7 characteristics.

S7 diagnosis

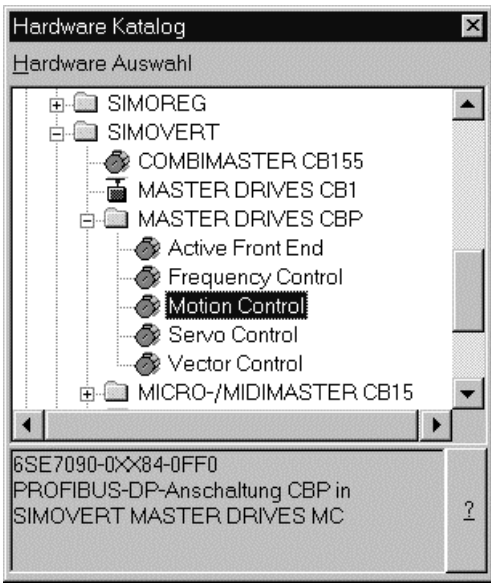
If the CBP is configured in SIMATIC S7 using the DVA_S7 object manager, a diagnosis alarm is automatically generated for the converter fault in the S7-CPU. This diagnosis alarm is derived from bit 3 of the status word (collective fault) and results in a **STOP of the S7-CPU if the OB82 (diagnostics organization block) is not programmed.**
For the correct processing of the diagnosis alarm, the status word of the converter always has to be transferred unchanged as the first word from the converter to the CBP (see section "Process data interconnection").

NOTE

When a converter fault occurs, the CBP2 does not generally trigger a diagnosis alarm.

The behavior of the S7-CPU during complete failure of a configured drive or during an interruption in the bus cable can be controlled by programming the relevant system organization modules OB86 and OB122. If these system modules are not programmed, the S7-CPU also goes into the STOP state if a configured drive fails or if a bus is interrupted. Refer to Chapter 3 of the programming manual for the S7-300/400 for detailed descriptions on the indicated system organization modules.

After installation of the DVA_S7-OM , the CBP is shown as follows in the hardware catalog:



The type of PPO is selected in the hardware manager from the register "Configuration" of the "Characteristics – DP slave" mask which is automatically shown on the screen when the selection (e.g. Motion Control) is confirmed.

More information on planning data exchange between a CBP and a SIMATIC S7 can be found in the description accompanying the DVA_S7 module package.

If the DVA_S7 module package is not used, the system features regarding data consistency have to be observed by the user program. In particular, this means that access can only be made via the system functions SFC14 and SFC15 to all consistent data areas > 4 bytes.

The PKW and the PZD parts are regarded as two independent consistent data areas.

	PKW	PZD (4, 12 or 20 bytes)
PPO1	(8 bytes)	(4 bytes)
PPO2	(8 bytes)	(12 bytes)
PPO3	–	(4 bytes)
PPO4	–	(12 bytes)
PPO5	(8 bytes)	(20 bytes)

CP342-5DP

At the present time, the CBP can be operated with a CP342-5DP only as a standard DP slave because S7 functions are not yet supported by the CP342-5DP. In order to operate the CBP as a standard slave, the equipment master file or the type-description file must be incorporated into the STEP7 basic software (see integrated DP interfaces).

The DVA_S7 module package

The SIMATIC DVA_S7 module package (variable-speed drives on SIMATIC S7) implements data transfer between the drive and SIMATIC S7 in accordance with the PROFIBUS profile for variable-speed drives and thus facilitates creation of the user program. A data module with the same appearance is always provided as the data interface, irrespective of which S7 CPU the program runs on. The programmer does not therefore need any detailed knowledge of the SIMATIC S7 system architecture or of the necessary system functions.

As already mentioned, the DVA_S7 object manager is part of the scope of supply of the DVA_S7 module package.

The DVA_S7 module package can be obtained from A&D WKF Fürth/Germany under MLFB 6SX 7005-0CB00.

8.2.8.3 Operating the CBP with a non-Siemens system

When used with a non-Siemens master system, the CBP can be operated only as a standard DP slave.

Required master file

The equipment master file (GSD file) on the floppy disk contains all the information which a DP master system needs for integrating the CBP as a standard DP slave in its PROFIBUS configuration.

If the non-Siemens master system allows direct integration of a master file, the SIEM8045.GSD file can be copied into the relevant sub-directory.

If this is not possible, the required information will have to be taken from the SIEM8045.GSD file.

8.2.8.4 Operating the CBP2 with extended functions with a SIMATIC S7

The extended functions "Cross traffic" and "Clock synchronization" are described in detail in PROFIBUS Profile Drive Technology, Version 3.

DriveES SlaveOM

The functions described here presuppose the planning tool, STEP7, and driveES with the slave OM for the CBP2.

- Free configuration: Up to 16 process data can be configured in each case, separated into setpoints and actual values.
- Cross traffic: Direct slave-to-slave communication without going the long way round via the DP master.
- Clock synchronization: Synchronization of master and slave applications at the isochronous PROFIBUS.

Free configuration is possible with all DP masters which are configured with STEP7.

Cross traffic and clock synchronization presuppose DP masters which support this functionality, i.e. all S7-CPUs, for example, with the characteristic "equidistance".

Configuration

For free configuration and cross traffic, carry out configuration completely with the slave OM in the "Configuration" register. In the drive, only correct interconnection of the setpoints and actual values has to be carried out.

Clock synchronization

Configure Clock synchronization with the slave OM in the "Clock synchronization" register. In addition, some parameters in the drive have to be set (MASTERDRIVES MC only).

Detailed help can be obtained in the on-line help for the slave OM.

8.2.8.5 CBP2 with cross traffic operated with a SIMATIC S7

The cross traffic function enables direct slave-to-slave communication on the PROFIBUS without having to go the long way round via the DP master. A DP master, however, is needed "to keep time".

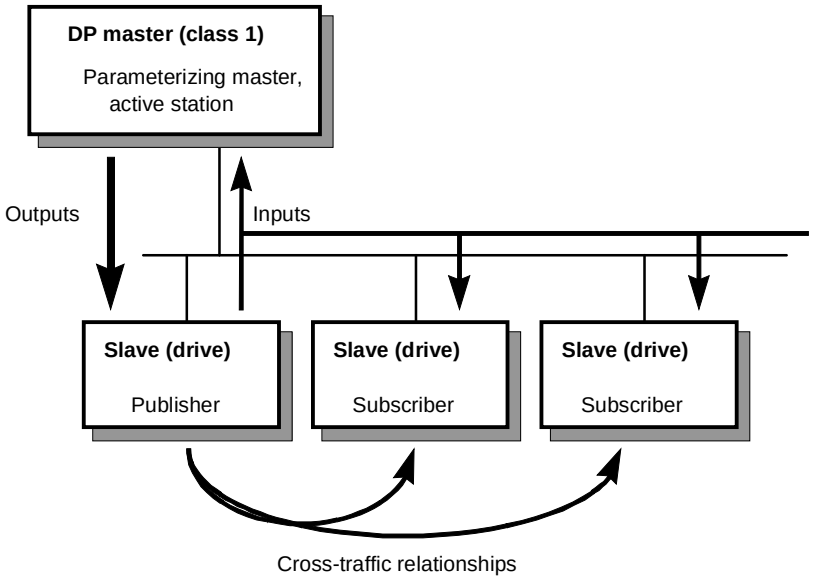


Fig. 8.2-24 Cross traffic

Configurations

With cross traffic, you can configure communication between DP slaves in various ways, e.g.

- "Broadcast": Stipulation of a master setpoint from a master drive to all drives.
- "Peer-to-peer": Passing on a setpoint from one drive to the next.

Definitions:

Encoder

- Cross-traffic encoder (publisher): All inputs of a DP slave capable of cross traffic are transmit data in relation to cross traffic. They can be received by the DP master or by DP slaves capable of cross traffic. Transmitting takes place automatically by means of a broadcast. Explicit configuration of the cross-traffic encoder is not necessary.

Receiver

- Cross-traffic receiver (subscriber): The sources for the setpoints are specified by means of configuration. The outputs of the DP master or the inputs of a DP slave as the cross-traffic encoder are possible sources (in the case of drives, their actual values). There are no restrictions on the way in which master outputs and slave inputs are mixed (with word granularity).

Drives capable of cross traffic can also receive data from themselves (feedback loop).

You need:

- STEP7 from Version 5.0 with Servicepack 2 or Servicepack 4 (Servicepack 3 is not suitable) or Version 5.1
- DriveES with slaveOM for CBP2
- S7-Profibus-Master with the "equidistance" property
- DP slaves which are capable of cross traffic as communication partners (e.g. drives or ET200)
- CBP2

Cross traffic is independent of the basic unit used. The functionality is completely provided in the CBP2.

You can configure cross traffic with the slave OM in the mask, "Configuration".

Quantities

Receive/transmit data: maximum of 16 words of setpoints/actual values per drive, can be divided up in any way on DP master and DP slaves capable of cross traffic.

Number of transmission channels: a broadcast channel which the DP master and any number of DP slaves can receive.

Number of receive channels: max. eight.

Example

The following illustration contains a cross-traffic configuration with two cross-traffic encoders (publishers) and a drive with CBP2 as the cross-traffic receiver (subscriber).

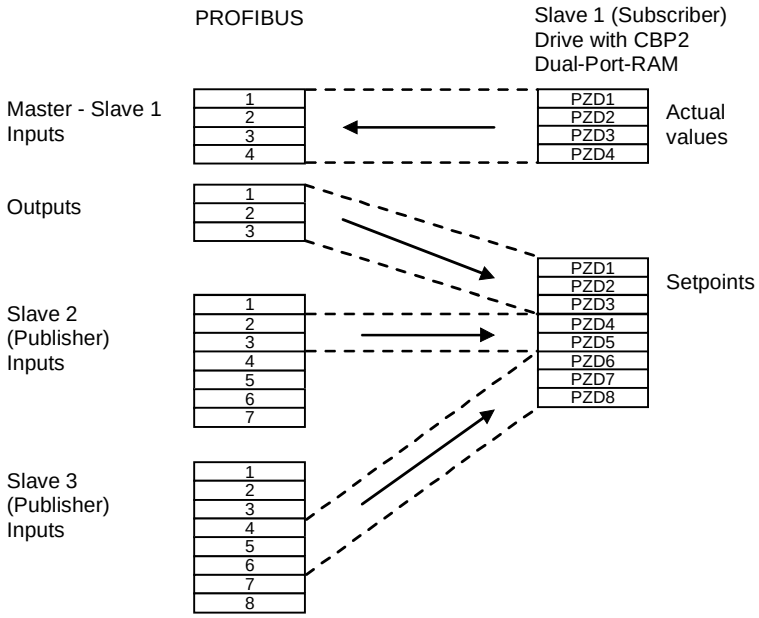


Fig. 8.2-25 Example of a cross-traffic configuration

8.2.8.6 CBP2 with clock synchronization operated with a SIMATIC S7

Only applies to MASTERDRIVES MC, not VC.

8.2.8.7 CBP2 with clock synchronization on a PROFIBUS master in accordance with PROFIdrive V3

Only applies to MASTERDRIVES MC, not VC.

8.2.9 MASTERDRIVES as PROFIdrive V3-Slave

MASTERDRIVES VC from V3.3, with CBP2 from V2.2, can be parameterized as a PROFIdrive V3 slave. Applications with isochronous Profibus, in particular DSC, apply to MASTERDRIVES MC only, not MASTERDRIVES VC.

8.2.10 Diagnosis and troubleshooting

NOTE

With regard to basic parameterization, please note the differences to the types of unit with the older function classes FC (CU1), VC (CU2) and SC (CU3). These differences are described below.

In order to make these differences clear, the parameter numbers and other deviations are either printed in dark gray or have a dark-gray background.

8.2.10.1 Evaluating the possibilities of hardware diagnosis

LED displays

The three LED displays are located on the front of the CBP. These are as follows:

- CBP operating (red)
- Data exchange with the basic unit (yellow)
- Transfer of useful data via the PROFIBUS (green)

Diagnostic LEDs give the user rapid information on the status of the CBP at any particular instant.
More detailed diagnostic information can be read out directly from the diagnostics memory of the CBP by means of a diagnostic parameter.

NOTE

During normal operation, all three LEDs light up synchronously and for the same length of time (flashing)!

The stationary status of an LED (on or off) indicates an unusual operating status (parameterization phase or fault)!

LED	Status	Diagnostic information
Red	Flashing	CBP operating; voltage supply on
Yellow	Flashing	Fault-free data exchange with the basic unit
Green	Flashing	Fault-free cyclical useful data traffic with a master, class 1, via PROFIBUS

Table 8.2-13 LED display of the CBP

LED	Status	Diagnostic information
Red Yellow Green	Flashing Flashing Off	No cyclical useful data traffic with a master, class 1, via PROFIBUS –DP due to e.g. EMC interference, bus connector pulled out, polarity reversal of connections, node number not supplied with useful data by the master. Acyclical useful data traffic with a master, class 2 (DriveES, SIMOVIS/DriveMonitor, SIMATIC OP) does not affect the green LED.

Table 8.2-14 Online operation without useful data

LED	Status	Diagnostic information
Red	Off/On	Voltage supply for CBP cut off; replace CBP or basic unit
Yellow	Off/On	Data exchange with the basic unit not possible; replace CBP or basic unit
Green	Off/On	No cyclical useful data traffic with a master, class 1, via PROFIBUS is possible; PROFIBUS cable not connected or defective

Table 8.2-15 Fault display CBP

In the following, all exceptional operating conditions are listed which are displayed as such by the CBP.

LED	Status	Diagnostic information
Red Yellow Green	Flashing Off On	CBP is waiting for the basic unit to begin initialization
Red Yellow Green	On Off Flashing	CBP is waiting for the basic unit to complete initialization
Red Yellow Green	Flashing On Off	Checksum error in flash EPROM of the CBP (Download firmware again or replace CBP)
Red Yellow Green	Flashing On On	Error in RAM test of the CBP Replace CBP (external RAM, DPRAM or SPC3-RAM defective)
Red Yellow Green	Flashing Off Off	Only CBP2 DP slave software detects serious fault Note fault number in r732.8 and inform Customer Service

Table 8.2-16 Exceptional operating conditions

LED	Status	Diagnostic information
Red Yellow Green	Off Off Flashing	Only CBP2 USS protocol has been set

Table 8.2-17 USS

8.2.10.2 Fault and alarm display on the basic unit

If faults occur during communication between the PROFIBUS and the CBP, corresponding fault or alarm messages are displayed on the PMU or on the OP of the basic unit.

Alarms

Alarm number		Meaning
First CB/TB	Second CB	
A 081	A 089	The ID byte combinations sent by the DP master in the configuration telegram do not correspond with the permitted ID byte combinations (see table 8.2-12) Consequence: No connection established with the PROFIBUS-DP master; new configuration is necessary.
A 082	A 090	No valid PPO type can be established from the configuration telegram from the DP master. Consequence: No connection established with the PROFIBUS-DP master, new configuration is necessary.
A 083	A 091	No net data or invalid net data (e.g. complete control word STW1=0) are being received by the DP master. Consequence: The process data are not being transferred to the DPR. If parameter P722 (P695) is not equal to zero, this will result in fault message F 082 being tripped (see chapter "Process data monitoring".
A 084	A 092	Telegram traffic between DP master and CBP has been interrupted (e.g. cable break, bus connector disconnected or DP master switched off). Consequence: If parameter P722 (P695) is not equal to zero, this will result in fault message F 082 being tripped (see chapter "Process data monitoring").
A 086	A 094	Failure of heartbeat counter recognized by basic unit. Consequence: Interruption of communication to the automation system
A 087	A 095	DP slave software detects serious fault. Fault number in diagnostic parameter r732.8 Consequence: Communication no longer possible. Secondary fault F082

Alarm number		Meaning
First CB/TB	Second CB	
A 088	A 096	Only CBP2 At least one configured cross-traffic encoder is not yet active or has failed. For details, see CBP2 diagnostic parameters. Consequence: If a encoder is still not active, the relevant setpoints are set to null as a substitute. If a cross-traffic encoder fails, transmission of the setpoints to the basic unit may be interrupted, depending on the setting in P715. Secondary fault F082.

Table 8.2-18 Alarm display on the basic unit

Assignment

The alarm number for the first CB/TB applies to the following configurations:

- Exactly one CBP has been plugged into slots A to G in the electronics box and no T100/T400 technology board has been plugged in
- If two CBPs have been plugged in, the alarm number applies to the one which has been plugged into the slot with the lower slot letter.

The alarm number for the second CB applies to the following configurations:

- One T100/400 technology board has been plugged in and the CBP in the electronics box has been plugged into slots A to C.
- If two CBPs have been plugged in, the alarm number applies to the one which has been plugged into the slot with the higher letter.

NOTE

The alarm A 082 / A 090 can also be displayed on the basic unit the first time the CBP is started as long as telegrams are not being exchanged with a DP master, e.g. because the bus cable has not yet been connected.

Fault displays

Fault number		Meaning
First CB/TB	Second CB	
F080	F085	Fault in the dual-port RAM Remedy: CBP probably defective, i.e. replace CBP
F081 Fault value (r949) = 0	F081 Fault value (r949) = 2	Fault in the heartbeat counter. The heartbeat counter is no longer being incremented by the CBP due to an internal fault. The CBP is not plugged in correctly or is defective Remedy: Check the connection. If necessary, replace CBP
F082 Fault value (r949) = 1	F082 Fault value (r949) = 2	Telegram failure in the dual-port-RAM (DPR). The telegram failure monitoring time set by means of parameter P722 (P695) has expired (see chapter "Process data monitoring"). The bus has been interrupted or all net data are transferred with 0 (see also A083) Remedy: Check bus cable incl. connecting plug. In the DP-master, assign values not equal to zero to control word STW1.

Table 8.2-19 Fault display on the basic unit

Assignment

The fault number for the first CB/TB applies to the following configurations:

- Exactly one CBP has been plugged into slots A to G in the electronics box and no T100/T300/T400 technology board has been plugged in.
- If two CBPs have been plugged in, the fault number applies to the one which has been plugged into the slot with the lower slot letter.

The fault number for the second CB applies to the following configurations:

- One T100/T300/T400 technology board has been plugged in and the CBP in the electronics box has been plugged into slots A to C
- If two CBPs have been plugged in, the fault number applies to the one which has been plugged into the slot with the higher letter.

8.2.10.3 Evaluating CBP diagnostic parameters

(For CBP2 diagnosis, see section 8.2.8.6)

NOTE

Please note that, for types of unit with the older function classes FC (CU1), VC (CU2) and SC (CU3), indexed parameter r731.i is to be used appropriately instead of r732.i

In order to support start-up and for service purposes, the CBP stores diagnostic information in a diagnostics buffer. The diagnostic information can be read out with the indexed parameter r732.i (CB/TB diagnosis).

If two CBPs are plugged-in in the electronics box, the diagnostic area for the second CBP begins in parameter r732 from index 33 onwards, i.e. in order to read out the diagnostic information of the second CBP, an offset of 32 must be added to the index of the first CBP as well (see table 8.2-19).

CBP diagnostic parameters

Area of the first CBP	
Meaning	**Parameter No.**
CBP_Status	P732.1
SPC3_Status	P732.2
SPC3_Global_Controls	P732.3
Counter: telegrams received without faults (only DP standard)	P732.4 (Low)
Reserved	P732.4 (High)
Counter "TIMEOUT"	P732.5 (Low)
Reserved	P732.5 (High)
Counter "CLEAR DATA"	P732.6 (Low)
Reserved	P732.6 (High)
The following diagnostic entries are overwritten if PROFIBUS-DP telegram diagnosis is selected by means of P711 / P696 (CB parameter 1)	
Counter: Heartbeat-counter fault	P732.7 (Low)
Reserved	P732.7 (High)
Number of bytes for special diagnosis	P732.8 (Low)
Reserved	P732.8 (High)
Mirroring slot Identifier 2	P732.9 (Low)
Mirroring slot Identifier 3	P732.9 (High)
Mirroring P918 (CB bus address), only low part	P732.10 (Low)
Reserved	P732.10 (High)
Counter re-configuration by CU	P732.11 (Low)
Counter initializations	P732.11 (High)
Fault detection DPS manager fault (8 bits)	P732.12 (Low)
Reserved	P732.12 (High)

Area of the first CBP	
Meaning	**Parameter No.**
Determined PPO type (8 bits)	P732.13 (Low)
Reserved	P732.13 (High)
Mirroring "DWORD-Specifier-ref"	P732.14
Mirroring "DWORD-Specifier-act"	P732.15
Counter DPV1:DS_WRITE, positive acknowledgement	P732.16 (Low)
Reserved	P732.16 (High)
Counter DPV1: DS_WRITE, negative acknowledgement	P732.17 (Low)
Reserved	P732.17 (High)
Counter DPV1:DS_READ, positive acknowledgement	P732.18 (Low)
Reserved	P732.18 (High)
Counter DPV1:DS_READ, negative acknowledgement	P732.19 (Low)
Reserved	P732.19 (High)
Counter DP/T: GET DB99, positive acknowledgement	P732.20 (Low)
Counter DP/T: PUT DB99, positive acknowledgement	P732.20 (High)
Counter DP/T: GET DB100, positive acknowledgement	P732.21 (Low)
Counter DP/T: PUT DB100, positive acknowledgement	P732.21 (High)
Counter DP/T: GET DB101, positive acknowledgement	P732.22 (Low)
Counter DP/T: PUT DB101, positive acknowledgement	P732.22 (High)
Counter DP/T-service negative acknowledgement	P732.23 (Low)
Counter DP/T: application relation, positive acknowledgement	P732.23 (High)
Reserved	P732.24
Gen-Date: day, month	P732.25
Gen-Date: year	P732.26
Software version	P732.27
Software version	P732.28
Software version: flash EPROM checksum	P732.29
Reserved	:
Reserved	P732.31

Area of the second CBP	
Meaning	**Parameter No.**
CBP_Status	P732.33
SPC3_Status	P732.34
SPC3_Global_Controls	P732.35
	:
Software-Version: Flash-EPROM-Checksum	P732.61
Reserved	:
Reserved	P732.64

Table 8.2-20 CBP diagnostics buffer

8.2.10.4 Meaning of information in the CBP diagnostic channel

(For CBP2 diagnosis, see section 8.2.8.6)

P732.1 (090H, CBP_Status)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit

- Bit 0
  "CBP Init": CBP is presently being initialized or is waiting for initialization from the BASE BOARD
  (normal operation: not set)
- Bit 1
  "CBP Online": CBP selected via board mounting position 2" (DPRAM Offset Address 0x54) or via board mounting position 3" (DPRAM Offset Address 0x55) by the BASE BOARD
  (normal operation: set)
- Bit 2
  "CBP Offline": CBP selected neither via board mounting position 2" (DPRAM Offset Address 0x54) nor via board mounting position 3" (DPRAM Offset Address 0x55) by the BASE BOARD
  (normal operation: not set)
- Bit 3
  Value range exceeded "CB bus address" (P918) (BASE BOARD).
  (normal operation: not set)
- Bit 4
  Diagnostic mode activated [CB parameter 1 (P711 / P696) <> 0].
  (normal operation: not set)
- Bit 8
  Incorrect identification byte transferred (incorrect configuration telegram from the PROFIBUS DP master).
  (normal operation: not set)
- Bit 9
  Incorrect PPO type (incorrect configuration telegram from the PROFIBUS DP master).
  (normal operation: not set).
- Bit 10
  Correct configuration received from the PROFIBUS DP master
  (normal operation: set).
- Bit 12
  Fatal error detected by the DPS manager SW
  (normal operation: not set)
- Bit 13
  Program in endless loop in main c (is only escaped from if a reset is made)
- Bit 15
  Program in communications online loop (is only escaped from if re-initialization is carried out by the BASE BOARD)

P732.2 (092H, SPC3_Status)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit

- Bit 0 — Offline/Passive Idle
  0 = SPC3 is offline (normal operation)
  1 = SPC3 is in passive-idle
- Bit 1 — Reserved
- Bit 2 — Diag-Flag
  0 = Diagnostics buffer collected by the master
  1 = Diagnostics buffer not collected by master
- Bit 3 — RAM Access Violation, memory accessed > 1.5kByte
  0 = No address violation (normal operation)
  1 = With addresses >1536 bytes, retreat made from respective address 1024 and access is made under this new address
- Bits 4,5 — DP-State 1..0
  00 = Status "Wait_Prm"
  01 = Status"Wait_Cfg"
  10 = Status"DATA_EX"
  11 = Not possible
- Bits 6,7 — WD-State 1..0
  00 = Status"Baud_Search"
  01 = Status"Baud_Control"
  10 = Status"DP_Control"
  11 = Not possible from PROFIBUS DP master
- Bits 8,9,10,11 — Baud rate 3..0
  0000 = 12 mbaud
  0001 = 6 mbaud
  0010 = 3 mbaud
  0011 = 1.5 mbaud
  0100 = 500 kbaud
  0101 = 187.5 kbaud
  0110 = 93.75 kbaud
  0111 = 45.45 kbaud
  1000 = 19.2 kbaud
  1001 = 9.6 kbaud
  Rest = Not possible
- Bits 12,13, 14,15 — SPC3-Release 3..0:
  0000= Release 0
  Rest = Not possible

P732.3 (094H, SPC3_Global_Controls)

Bits remain set until the next DP global command.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit

- Bit 0 Reserved
- Bit 1 1 = Clear_Data telegram received
- Bit 2 1 = Unfreeze telegram received
- Bit 3 1 = Freeze telegram received
- Bit 4 1 = Unsync telegram received
- Bit 5 1 = Sync telegram received
- Bits 6,7 Reserved

P732.4 (Low-Byte), 096H
Counter for telegrams received error-free (only DP standard)
Counter for received DP net telegrams

P732.5 (Low-Byte), 098H
Counter TIMEOUT
Counter is incremented if the "TIMEOUT" signal is identified.
This occurs if, for example, the bus connector is pulled out when response-monitoring has been activated (at the DP master).

P732.6 (Low-Byte), 09AH
Counter CLEAR DATA
Is incremented if the "CLEAR DATA" is identified (see also P732.3).
Occurs, for example, if the IM308B is set in "STOP".

P732.7 (Low-Byte), 09CH
Counter Heartbeat-Counter Error
Is incremented if the heartbeat-counter is not changed by the BASE-/TECH-BOARD within approx. 800 ms.

P732.8 (Low-Byte), 09EH
Number of bytes during special diagnosis
Number of bytes entered after P732.9 during special diagnosis selected by means of CB parameter 1.

732.9 (Low-Byte), 0A0H
Mirroring slot Identifier 2
Read out of the DPRAM during run up: Offset Address 054H, with VC,FC and SC, corresponds to parameter P090.

732.9 (High-Byte), 0A1H
Mirroring slot Identifier 3
Read out of the DPRAM during run up: Offset Address 055H, with VC,FC and SC, corresponds to parameter P091.

P732.10 (Low-Byte), 0A2H
Mirroring P918
Read out of the DPRAM during run up: "CB Bus address" (only Low-byte)

P732.11 (Low-Byte), 0A4H
Counter Re-configuration by CU
Re-configuration requested by BASE BOARD in online mode

732.11 (High-Byte), 0A5H
Counter Initialization
Is incremented during run through of the initialization routine

P732.12 (Low Byte), 0A6H
DPS Manager Error
Error detection in the event of a fatal DPS manager error

P732.13 (Low-Byte), 0A8H
PPO type
PPO type detected from configuration telegram

P732.13 (High-Byte), 0A9H
Reserved

P732.14, 0AAH u. 0ABH
Mirroring "DWORD-Specifier-ref"
Read out of the DPRAM during run up: updated cyclically

P732.15, 0ACH u. 0ADH
Mirroring "DWORD-Specifier-act
Read out of the DPRAM during run up: updated cyclically

732.16 (Low-Byte), 0AEH	Counter DS_WRITE acknowledgement negatively
P732.16 (High-Byte), 0AFH	Reserved
732.17 (Low-Byte), 0B0H	Counter DS_WRITE acknowledged positively
P732.17 (High-Byte), 0B1H	Reserved
732.18 (Low-Byte), 0B2H	Counter DS_READ acknowledged negatively
P732.18 (High-Byte), 0B3H	Reserved
P732.18 (High-Byte), 0B3H	reserved
P732.19 (Low-Byte), 0B4H	Counter DS_READ acknowledged positively
P732.19 (High-Byte), 0B5H	reserved
P732.20 (Low-Byte), 0B6H	Counter GET DB99 acknowledged positively
P732.20 (High-Byte), 0B7H	Counter PUT DB99 acknowledged positively
732.21 (Low-Byte), 0B8H	Counter GET DB100 acknowledged positively
P732.21 (High-Byte), 0B9H	Counter PUT DB100 acknowledged positively
732.22 (Low-Byte), 0BAH	Counter GET DB101 acknowledged positively
P732.22 (High-Byte), 0BBH	Counter PUT DB101 acknowledged positively
732.23 (Low-Byte), 0BCH	Counter DPT-Service acknowledged negatively
P732.23 (High-Byte), 0BDH	Counter Applic positively acknowledged Increment during set-up DPT service application relation
P732.24 (Low-Byte), 0BEH	reserved
P732.24 (High-Byte), 0BFH	reserved
P732.25 0C0H and 0C1H	Creation date Day and month when CBP firmware created (Display: 0304 = 03.04.)
P732.26 0C2H and 0C3H	Creation data Year when CBP firmware created (Display = Year)
P732.27 0C4H and 0C5H	Software-Version Software version V X.YZ (Display X)
P732.28 0C6H and 0C7H	Software-Version Software version V X.YZ (Display YZ)
P732.29 0C8H and 0C9H	Flash-EPROM Checksum Is read out of the flash EPROM during run-up

8.2.10.5 Additional methods of diagnosis for start-up personnel

(See section 8.2.8.7 for extended CBP2 diagnosis)

NOTE

The CB parameters, P711 to P721, have two indices. The following convention applies to this:

Index 1 is valid for the first CBP

Index 2 is valid for the second CBP

In order to determine which CBP is the first and which the second, see Section 8.2.4 "Mounting methods / CBP slots".

CB parameter 1 Telegram diagnosis

With P711 / P696 (CB parameter 1), special diagnostic entries for the CBP diagnostics buffer can be selected. If P711 / P696 is set to a value not equal to zero during parameterization of the CBP by the converter, telegram contents of the PROFIBUS-DP telegram are cyclically entered into the CBP diagnostics buffer, depending on the set value.

The entries are made in rising sequence beginning with r732.9 (r732.10, r732.11 etc.) in the same way as the corresponding useful data are transferred via the PROFIBUS-DP, namely high-byte before low-byte, high-word before low-word. The original entries (i.e. when P711 / P696 = "0") are overwritten, beginning with r732.9.

Entries r732.1 to 732.8 retain their meaning.

Detailed knowledge of PROFIBUS-DP telegrams is needed in order to evaluate these diagnostic entries.

It is only possible to set parameter P711 / P696 when the "Hardware Configuration" function is being selected (P060 or. P052).

NOTE

Parameter P711 / P696 is only to be set to a value other than zero for diagnostic purposes because continuous transfer of diagnostic information to the DPRAM reduces the data throughput rate of the CBP!

The original entries in parameter r732 / r731 are overwritten, beginning with r732.9 / r731.9.

PMU:

P711 / P696 = 0	Telegram diagnosis = Off
P711 / P696 = 1 to 26	Telegram diagnosis = ON

Telegram entries

P711 P696	= 0	No supplementary diagnosis (default setting)		
The following entries apply to cyclical data transfer via MSZY-C1				
P711 P696	= 1	PPO useful data in the CBP receive buffer	Useful-data telegram (master → converter)	Length depends on PPO type
P711 P696	= 2	PPO useful data in the CBP transmit buffer	Useful-data telegram (converter → master)	Length depends on PPO type
P711 P696	= 3	Configuration buffer	Useful-data telegram (master → converter)	Length = 25 bytes
P711 P696	= 4	Parameterization buffer	Parameterization telegram (master → converter)	Length = 10 bytes
The following entries apply to cyclical data transfer via MSAC-C1				
P711 P696	= 10	Useful data of the DS100	Data unit in DS_WRITE to DS100	Max. 32 bytes
P711 P696	= 11	Useful data of the DS100	Data unit in DS_READ to DS100	Max. 32 bytes
The following entries apply to acyclical data transfer via MSAC-C2				
P711 P696	= 21	Useful data in the DB99	Data unit in PUT to the DB99	Max. 32 bytes
P711 P696	= 22	Useful data in the DB99	Data unit in GET to DB99	Max. 32 bytes
P711 P696	= 23	Useful data in the DB100	Data unit in PUT to DB100	Max. 32 bytes
P711 P696	= 24	Useful data in the DB100	Data unit in GET to DB100	Max. 32 bytes
P711 P696	= 25	Useful data in the DB101	Data unit in PUT to DB101	Max. 32 bytes
P711 P696	= 26	Useful data in the DB101	Data unit in GET to DB101	Max. 32 bytes

Table 8.2-21 Selection of PROFIBUS-DP telegram entries

Example 1

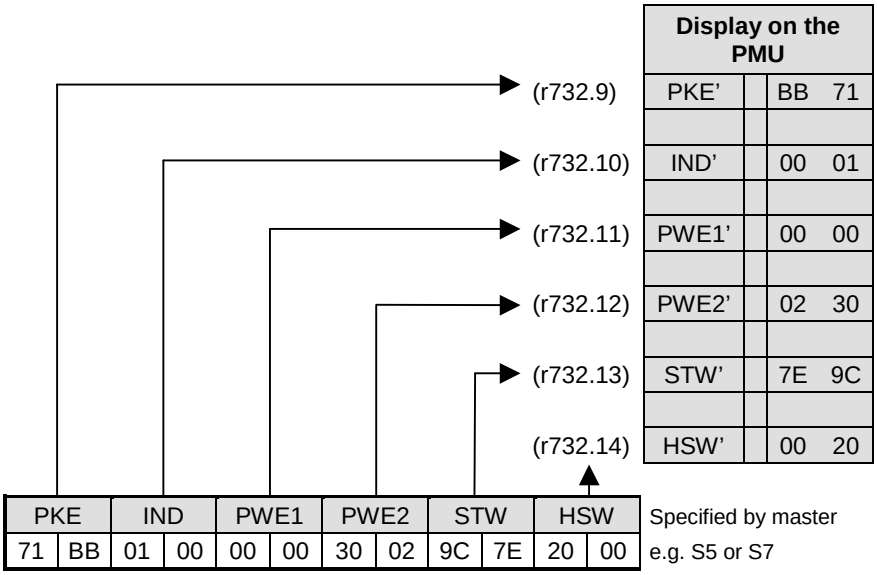
Parameter P711 / P696 = 1
The useful data (PPO) received from the DP master via the cyclical standard channel MSCY_C1 are entered in the diagnostics buffer.

PPO type = 1
Four words, PKW part plus control word 1 (STW1) and the main setpoint (HSW), are received. The PKW part is placed, beginning with the PKE, in parameter r732.9; STW1 and also the HSW are placed from parameter r732.13 onwards (high part at the least significant address).

In the following example, a WRITE request from the DP master is shown with the value "3002" in parameter P443.

The control word is specified with $9C7E_{Hex}$ in the DP master and 2000_{Hex} is specified as the setpoint.

The values in r732 are displayed in Motorola format, i.e. high-byte and low-byte are shown inverted in relation to what is displayed in the other parameters.



Visualization parameter r733

In order to visualize the received **process data** (PZD), parameter r733 can also be used. In parameter r733, all process data are displayed normally, i.e. in Intel format, in the same way as they are used in the MASTERDRIVES.

The PKW interface cannot be visualized by means of parameter r738 and r739.

The index ranges used in parameters r733, r738 and r739 are shown in the function diagrams in the appendix.

NOTE

In the examples and in the following tables, information with an apostrophe (e.g. PKE') means that, with these values, the high-byte and the low-byte are swapped round in relation to the original value, as for example in the programmable controller.

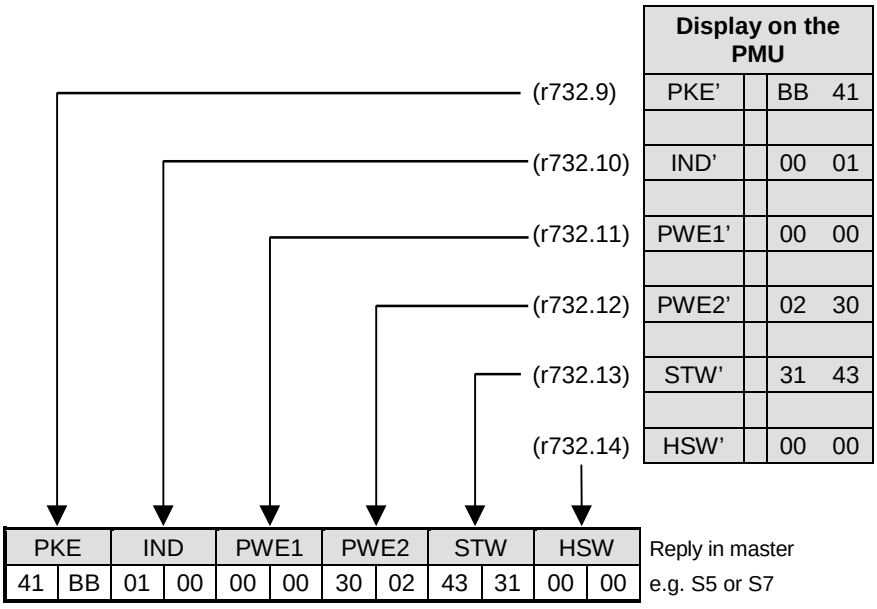
Example 2

Parameter P711 / P696 = 2
The useful data (PPO) sent to the DP master via the standard cyclical channel MSCY_C1 are entered into the diagnostics buffer.

PPO-type = 1
Four words are sent, PKW part plus status word 1 (ZSW1) and the main actual value (HIW). The PKW part is stored, beginning with the PKE, in parameter r732.9 and ZSW1 as well as the HIW from parameter r732.13 onwards (high part at the least significant address).

In the following example, the reply (to the DP master) to the WRITE request in example 1 is shown in parameter P443 with the value "3002".
The status word is returned by the converter with 4331_{Hex}; 0000_{Hex} is given as the actual value.

The values in r732 are displayed in Motorola format, i.e. high-byte and low-byte are shown inverted in relation to what is displayed in the other parameters.



Telegram contents (communication with Master 1)

Display in r732	When P711 = 1 or 2		When P711 = 3	When P711 = 4		When P711 = 10	When P711 = 11
	PPOs 1,2, or5	PPOs 3 or 4	Different dependi ng on PPO	Parameteri z. telegram			
ii 09	PKE'	PZD1'	00 04	Byte 2 u 1		PKE'	PKE'
ii 10	IND'	PZD2'	AD 00	Byte 4 u 3		IND'' 2)	IND'' 2)
ii 11	PWE1'	PZD3' *	04 C4	Ident-No.		PWE1'	PWE1'
ii 12	PWE2'	PZD4' *	00 00	Byte 8 u 7		PWE2'	PWE2'
ii 13	PZD1'	PZD5' *	40 BB	Byte 10 u 9		PWE3'	PWE3'
ii 14	PZD2'	PZD6' *	00 04	xxx		PWE4'	PWE4'
ii 15	PZD3' *	xxx	8F 00	xxx		PWE5'	PWE5'
ii 16	PZD4' *	xxx	C2 C0	xxx		PWE6'	PWE6'
ii 17	PZD5' *	xxx	per PPO	xxx		PWE7'	PWE7'
ii 18	PZD6' *	xxx	per PPO	xxx		PWE8'	PWE8'
ii 19	PZD7' **	xxx	per PPO	xxx		PWE9'	PWE9'
ii 20	PZD8' **	xxx	per PPO	xxx		PWE10'	PWE10'
ii 21	PZD9' **	xxx	per PPO	xxx		PWE11'	PWE11'
ii 22	PZD10' **	xxx	1)	xxx		PWE12'	PWE12'
ii 23	xxx	xxx	xxx	xxx		PWE13'	PWE13'
ii 24	xxx	xxx	xxx	xxx		PWE14'	PWE14'

1) The 25 bytes with slot-oriented S7 type identifications are always entered, even if the CBP is configured with identification bytes by an S5 or a non-Siemens master.

2) As regards IND', high-byte and low-byte are inverted in relation to the IND': this is based on a different definition of the useful data for PPOs and acyclically transferred sets of data.

* only for PPO2 and 4

** only for PPO5

Structure and content of the parameterization telegram									
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
DP-Statu s	WD_ Fac 1	WD_ Fac 2	TSDR - min	PNO-Ident-No.		Grou p-Ident	DPV1 - Statu s 1	DPV1 - Statu s 2	DPV1 - Statu s 3

Table 8.2-22 Telegram contents in parameter r732i09 which can be read out (communication with Master 1)

Telegram contents (communication with SIMOVIS / DriveMonitor)

Display im r732	When P711 = 21	When P711 = 22	When P711 = 23	When P711 = 24	When P711 = 25	When P711 = 26
ii 09	PZD rights	PZD rights	PKE'	PKE'	PZD1'	PZD1'
ii 10	xxx	xxx	IND''	IND''	PZD2'	PZD2'
ii 11	xxx	xxx	PWE1'	PWE1'	PZD3'	PZD3'
ii 12	xxx	xxx	PWE2'	PWE2'	PZD4'	PZD4'
ii 13	xxx	xxx	PWE3'	PWE3'	PZD5'	PZD5'
ii 14	xxx	xxx	PWE4'	PWE4'	PZD6'	PZD6'
ii 15	xxx	xxx	PWE5'	PWE5'	PZD7'	PZD7'
ii 16	xxx	xxx	PWE6'	PWE6'	PZD8'	PZD8'
ii 17	xxx	xxx	PWE7'	PWE7'	PZD9'	PZD9'
ii 18	xxx	xxx	PWE8'	PWE8'	PZD10'	PZD10'
ii 19	xxx	xxx	PWE9'	PWE9'	PZD11'	PZD11'
ii 20	xxx	xxx	PWE10'	PWE10'	PZD12'	PZD12'
ii 21	xxx	xxx	PWE11'	PWE11'	PZD13'	PZD13'
ii 22	xxx	xxx	PWE12'	PWE12'	PZD14'	PZD14'
ii 23	xxx	xxx	PWE13'	PWE13'	PZD15'	PZD15'
ii 24	xxx	xxx	PWE14'	PWE14'	PZD16'	PZD16'

Table 8.2-23 Telegram contents in parameter r732i09 which can be read out (communication with SIMOVIS/DriveMonitor)

CB parameter 3 (DPRAM monitor)

By means of CB parameter 3, i.e. P713 / P698, a hex monitor can be activated with which addresses of the dual-port RAM can be read out on the CBP.

DANGER

Parameter P713 / P698 is to be reserved exclusively for suitably trained start-up personnel.

In order to use the hex monitor to best effect, appropriate detailed knowledge of the structure of the dual-port RAM is necessary.
In P713 / P698, only the offset address (decimal) is entered.

If CB Parameter 3 is set to a value other than "0", 12 bytes are cyclically entered in diagnostic parameter r732 from r732.9 onwards. This is done from the absolute address set in CB parameter 3 (decimal) onwards.
CB Parameter 3 has the highest priority and disables entries by CB parameter 1.

Diagnosis with PROFIBUS Class II Master

A Class II master (normally a PG programming unit) can be used for start-up and diagnosis. During start-up/testing, the Class II master assumes the function of the Class I master for the selected station. The exchange of useful data with the slave, however, is not cyclical.

8.2.10.6 CBP2 diagnostic parameters

Meaning of standard diagnosis with P711.x = 0

Parameter No.	Content (high byte)	Content (low byte)
r732.1	CBP2 status (same content as CBP)	
r732.2	DPC31 status (same content as CBP, SPC3 status)	
r732.3	Global control (same content as CBP)	
r732.4	Counter: CLEAR DATA (alteration if, e.g. SIMATIC in "Stop")	Counter: fault-free cyclical telegrams
r732.5	Counter: Heartbeat counter fault from basic unit	Counter: Watchdog state changed (alteration during plugging/unplugging of connector or C1 master is coming/going)
r732.6	Mirroring: Slot identifier 3	Mirroring: Slot identifier 2
r732.7	PNO identification (0x8045)	
r732.8	Number of valid bytes in r732.9 to r732.24 when P711.x > 0 (special diagnosis) or: fault number DP slave software for alarm A087	
	r732.9 to r732.24 have a different meaning in the case of special CB diagnosis with P711.x > 0	
r732.9	Cross traffic: address encoder 1	Encoder 2
r732.10	Encoder 3	Encoder 4
r732.11	Encoder 5	Encoder 6
r732.12	Encoder 7	Cross traffic: address encoder 8
r732.13	CBP2 itself works as a cross-traffic encoder	PPO type (0xFF: no PPO)
r732.14	Cross traffic: number of configured encoders	Cross traffic: Score Board, one bit per encoder (Bit 0 = Encoder 1, ... Bit 7=Encoder 8) 0: Encoder inactive 1: Encoder configured and active
r732.15	Counter: repeated cyclical PKW request	Counter: new cyclical PKW task
r732.16	Counter: C1 DS100 Write/Read negative	Counter: C1 DS100 Write/Read positive
r732.17	Counter: DriveES Write/Read negative	Counter: DriveES Write/Read positive
r732.18	Counter: DriveES Control negative	Counter: DriveES Control positive
r732.19	Counter: DriveES Setpoints negative	Counter: DriveES Setpoints positive
r732.20	Counter: S7 Protocol negative	Counter: S7 Protocol positive
r732.21	Counter: Abort C2 master	Counter: Initiate C2 master
r732.22	S7 protocol access fault: For fault number, see following table	
r732.23	S7 protocol access fault: Data block number or parameter number	
r732.24	S7 protocol access fault: Data block offset or index word	
r732.25	Generating date: Day	Generating date: Month
r732.26	Generating date: Year	
r732.27	Software version	
r732.28	Software version	
r732.29	Software version: Flash-EPROM checksum	

Fault S7 protocol (r732.22), fault numbers < 150 correspond to PKW fault numbers:

No.	Cause	Remedy (e.g. in ProTool)
	No. 0 .. 199: S7 task has been changed into a parameter task. Fault detection in the BASE/TECH BOARD. Additional info in r732.23, r732.24: parameter number, index word.	
0	There is no parameter number	Check data block number
1	Parameter value cannot be altered	-
2	Top or bottom limit exceeded	-
3	There is no subindex	Check data block offset
4	Access to single value with array identifier	Set data block offset = 0
5	Access to word with double word task or vice versa	Use correct type of data (e.g. INT for word, DINT for double word)
6	Setting not allowed (can only be reset)	-
7	Description element cannot be altered	(should not occur here)
11	No parameter change rights	-
12	Keyword missing	-
15	There is no text array	-
17	Task cannot be executed due to operating status	-
101	Parameter number deactivated at the moment	-
102	Channel width too small	(should not occur here)
103	PKW number incorrect	(should not occur here)
104	Parameter value not permissible	-
105	Access to array parameter with single identifier	Set data block offset > 0
106	Task not implemented	-
	No. 200-209: S7 task is formally defective. Error detection in the COM BOARD. Additional info in r732.23, r732.24: data block number, data block offset	
200	Error in variables address (no addiional info)	Permissible: range of "Data block"
201	Data block number not permissible	Permissible: 1...31999
202	Data block offset not permissible	Permissible: 0...116, 10001...10116, 20000...20010
203	Non-permissible "Type" during access to parameter value	Permissible: CHAR. BYTE, INT, WORD, DINT, DWORD, REAL
204	Non-permissible "Number of elements" during access to parameter value	Permissible: effective 2 or 4 byte
205	Non-permissible "Type" during access to text	Permissible: CHAR, BYTE
206	Non-permissible "Type" during access to description	Permissible: CHAR. BYTE, INT, WORD, DINT, DWORD, REAL
207	Non-permissible odd "Number of elements" in the case of type CHAR or BYTE	Correct the "Number of elements"
208	Non-permissible change of text/description	-
209	Inconsistency in the write task: "Type" and "Number of elements" does not match "Type of data" and "Length of data"	(Defective communications partner)

No.	Cause	Remedy (e.g. in ProTool)
	No. 220: S7 task has been changed into a parameter task. Reply from BASE/TECH BOARD is defective. Error detection in the COM BOARD. Additional info in r732.23, r732.24: data block number, data block offset.	
220	Parameter reply does not match task	(Defective BASE/TECH BOARD)
	No. 240: Fault detection in the COM BOARD; without additional info	
240	Reply too long for reply telegram	(Defective communications partner)

Diagnosis of clock synchronization with "SIMOLINK" diagnostic parameter r748 (MASTERDRIVES MC only):

r748.x	(Content of SIMOLINK SLB)	Content of PROFIBUS CBP2
r748.1	Number of error-free synchronizing telegrams	
r748.2	CRC error	Internal
r748.3	Number of timeout errors	Internal
r748.4	Last bus address signaled	Internal
r748.5	Address of the node which sends the special telegram "Timeout"	Internal
r748.6	Active SYNC-interrupt delay	Internal
r748.7	Position of the node in the ring	Internal (deviation of pulse period, configured on CU and set via PROFIBUS)
r748.8	Number of nodes in the ring	Maximum permissible deviation of the pulse period
r748.9	Synchronism deviation (65535: Synchronization not active) should fluctuate between 65515 and 20	
r748.10	Corrected pulse period in units of 100 ns	
r748.11	T0 counter (0 if synchronization active)	Internal
r748.12	Internal	Internal
r748.13	Internal	Internal
r748.14	Timer	Internal
r748.15	Bus cycle time implemented	
r748.16	Internal	Internal

8.2.10.7 Special CBP2 diagnosis for start-up personnel

Special diagnosis with P711.x > 0

Image of the C1 master telegrams

P711.x	Display in r732.9..24 (32 bytes)	
1	Output: PKW and setpoints from the master	Maximum 32 bytes
2	Input: PKW and actual values to the master	Maximum 32 bytes
3	Configuring telegram from the master	Byte 0 – 31
50	End identifier: 0x5A, 0xA5	Byte 32 - 63
51		Byte 64 - 95
52		Byte 96 - 127
53		Byte 128 - 159
54		Byte 160 - 191
55		Byte 192 - 223
56		Byte 224 - 244
4	Parameterizing telegram from the master	Byte 0 – 31
60	End identifier: 0x5A, 0xA5	Byte 32 - 63
61		Byte 64 - 95
62		Byte 96 – 127
63		Byte 128 – 159
64		Byte 160 – 191
65		Byte 192 – 223
66		Byte 224 – 244

Diagnosis of configuration and parameterization

P711.x	r732.x	
30	r732.9	Result of parameterizing telegram evaluation (see table)
	r732.10	Result of evaluating cross-traffic parameterization (see table)
	r732.11	Result of configuring telegram evaluation (see table)
	r732.12	PPO type 1-5; if free configuration, then 0xff
	r732.13	Length of the input data to the master (without PKW) in bytes
	r732.14	Length of the output data from the master (without PKW) in bytes
	r732.15	Double-word specifier setpoints
	r732.16	Double-word specifier actual values
	r732.17	Free memory in the multi-port RAM of the DPC31 in bytes

The value output in parameter P732.9 (P711.x = 30) arises due to bit-by-bit OR linking of the following parameters. In the case of errors in the block for cross-traffic parameterization, the detailed fault codes are to be entered in parameter P732.10. Only if P732.10 contains the value 0 can the clear causes of the fault be read out of P732.9. If P732.10 <> 0, the content of P732.9 is falsified and the errors leading to abort cannot be clearly determined!

Value	Meaning
0x0000	Parameterizing telegram is error free
0x0001	Unknown master, length of para. telegram <10 and <>7
0x0002	Unknown para. block. The following are supported: 0xE1 – Equidistance, 0xE2 – Cross traffic
0x0004	It was not possible to fully identify the para. telegram
0x0008	It was not possible to set up the parameter buffer in the DPC31. (Memory size insufficient!)
0x0010	The block for equidistance parameterization has an incorrect length (24 + 4 = 28 bytes)
0x0020	The CU has not opened the RCC channel (no CU SW-version with equidistance capability) or cannot process the RCC channel
0x0040	Non-permissible parameter (e.g. bus cycle time and pulse frequency do not correlate)
0x0080	Tbase-dp is larger than 16 bits after de-normalization
0x0100	Tdp is larger than 16 bits
0x0200	Tdx is larger than Tdp
0x0400	The free computing time is not sufficient. (Tdp-Tdx is too small)
0x0800	The para. telegram contains an invalid value for Isochronous Mode Supported (permissible values 0, 0xE1)
0x1000	Unknown equidistance mode set by the BASEBOARD

Table 8.2-24 Paramter-telegram evaluation r732.9 / P711 = 30

Value	Meaning
0x0000	Parameterizing block cross-traffic error-free
0x1001	Default return value
0x1002	The version of the filter table is not supported. Identifier 0xE2 is supported.
0x1004	The data area of the CBP2 (16 word PZD) is exceeded.
0x1008	The pick-off has an odd number of bytes. Only word-by-word pick-offs are permitted.
0x1010	The maximum number of pick-offs has been exceeded. (A maximum of 8 pick-offs are allowed, including pick-off of own data)
0x1020	No links have been configured in the cross-traffic parameterizing block
0x1040	A pick-off does not indicate the beginning of a process data word
0x1080	The permissible telegram length which is to be read has been exceeded (maximum 244 bytes).
0x1100	The reserved memory area in the multi-Port RAM has been exceeded.
0x1200	Non-permissible publisher address 1-125
0x1400	Several links to a publisher are not permissible.

Table 8.2-25 Parameter-telegram evaluation, cross-traffic, r732.10 / P711 = 30

Diagnosis of the setpoint source (especially during cross traffic)

P711.x	r732.x	Content	High byte	Low byte
31	r732.9	Setpoint source: 0: Master 1 to 8: cross-traffic encoder 9: -	Setpoint 2	Setpoint 1
	P732.10		Setpoint 4	Setpoint 3
	P732.11		Setpoint 6	Setpoint 5
	P732.12		Setpoint 8	Setpoint 7
	P732.13		Setpoint 10	Setpoint 9
	P732.14		Setpoint 12	Setpoint 11
	P732.15		Setpoint 14	Setpoint 13
	P732.16		Setpoint 16	Setpoint 15
	P732.17	Byte offset of the setpoint within the setpoint source (value range 0 to 30)	Setpoint 2	Setpoint 1
	P732.18		Setpoint 4	Setpoint 3
	P732.19		Setpoint 6	Setpoint 5
	P732.20		Setpoint 8	Setpoint 7
	P732.21		Setpoint 10	Setpoint 9
	P732.22		Setpoint 12	Setpoint 11
	P732.23		Setpoint 14	Setpoint 13
	P732.24		Setpoint 16	Setpoint 15

Diagnosis of clock synchronization

P711.x	r732.x	Content
32	r732.9	Interrupt enable by BASEBOARD
	r732.10	RCC parameter 1
	r732.11	RCC parameter 2
	r732.12	Synchronization mode from the BASEBOARD

8.2.11 Appendix

Technical data

Order number	CBP: 6SE7090-0XX84-0FF0 CBP2: 6SE7090-0XX84-0FF5
Size (length x width)	90 mm x 83 mm
Degree of pollution	Degree of pollution 2 acc. to IEC 664-1 (DIN VDE 0110/T1), Moisture condensation during operation is not permissible
Mechanical strength In stationary use • displacement • acceleration During transport • displacement • acceleration	To DIN IEC 68-2-6 (if board is correctly mounted) 0.15 mm in the frequency range 10 Hz to 58 Hz 19.6 m/s^2 in the frequency range > 58 Hz to 500 Hz 3.5 mm in the frequency range 5 Hz to 9 Hz 9.8 m/s^2 in the frequency range > 9 Hz to 500 Hz
Climatic class	Class 3K3 to DIN IEC 721-3-3 (during operation)
Method of cooling	Natural air cooling
Permissible ambient or coolant temperature • during operation • during storage • during transport	 0° C to +70° C (32° F to 158° F) -25° C to +70° C (-13° F to 158° F) -25° C to +70° C (-13° F to 158° F)
Permissible moisture stress	Relative humidity ≤ 95 % during transport and storage ≤ 85 % during operation (condensation not permissible)
Supply voltage	5 V ± 5 %, max. 600 mA, internally from the basic unit
Output voltage	5 V ± 10 %, max. 100 mA, electrically isolated supply (X448/Pin 6) • for bus termination of the serial interface or • for supplying an OLP (Optical Link Plug)
Data transfer rate	max. 12 MBaud

Table 8.2-26 Technical data

Block diagram of the CBP

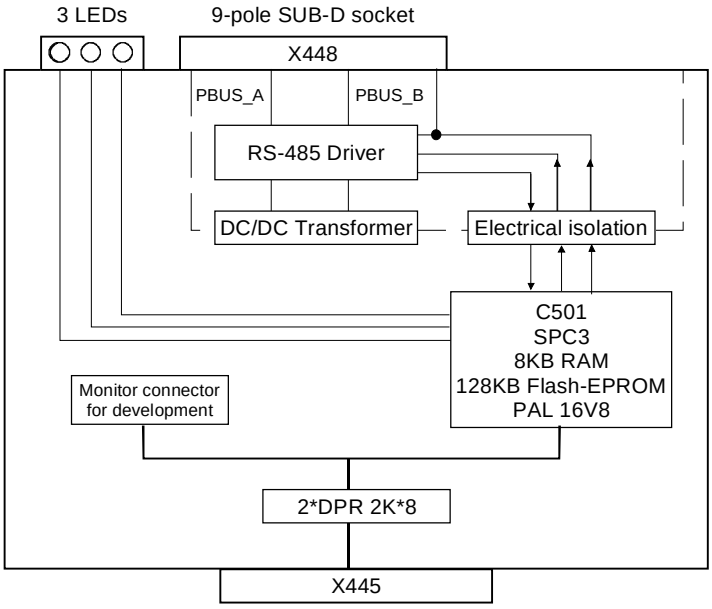


Fig. 8.2-26 Block diagram of the CBP