Translation of the original operating instructions

PA-CONTROL

Interfaces

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MAN_EN_1006914_PAC_Interfaces_R3b.doc	July 19, 2010	Release of this document (R3b.doc), made from German File “MAN_DE_1006913_PAC _Schnittstellen_R5f.doc” and English File “EN_shb_R3a.doc “.
MAN_EN_1006914_PAC_Interfaces_R3c.doc	July 22, 2010	Some expressions (Flag/Merker) were changed (e.g. pages: 26; 102; 105 and 159)

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We are always grateful for suggestions for improvements and notices of errors.

Content

1. Generalities

1.1 Communication possibilities

Communication between the PA-CONTROL and other systems can be realized in various ways.

The online command interface offers one easy way. Here, the PA-CONTROL is the slave, i.e. it waits for the command, processes and acknowledges it.

The correct hardware port can be selected in accordance with the possible communication partners.

Interfaces for the online command interface:

Control type	Profibus-DP	Interbus-S	RS232-COM1
PA-CONTROL EP	Option	No	Option
PA-CONTROL Single	Option	Option	Standard
PA-CONTROL Compact	Option	Option	Standard
PA-CONTROL control unit	Option	Option	Standard
PA-CONTROL servoTEC	Option	No	Option
PA-CONTROL smart	Option	No	Option

A serial online command port can only be activated via COM1. No COM2 or diagnosis port for the **PA-CONTROL** is provided for this task.

For the proper installation if the IEF-RS232 module and the Profibus DP module, please refer to chapters 2 and 3 in this document and to the operating instructions for the **PA-CONTROL** and **PA-CONTROL EP.**

If communication via Interbus S is planned, the necessary connections are provided with the installation of the IEF Interbus card. To ensure proper installation, please refer to chapter 4 of this document and to the operating instructions for the **PA-CONTROL**.

1.2 Safety

1.2.1 Definition of the alerts

Pay attention to the information and warnings in this User's Manual which are marked as follows:

WARNING

Indicates a potentially hazardous situation or task which, if not avoided, could result in death or serious injuries.

CAUTION

Indicates a potentially hazardous situation or task which, if not avoided, could result in minor or moderate injury, damage to equipment or material. Read the cautions before performing the task.

NOTE Gives additional information.

1.2.2 General safety instructions

WARNING

The system has to be de-energized for all installation, disassembly or repair work. High risk of injuries!

CAUTION

Motor connectors may not be inserted or disconnected under live condition. Risk of burning of the contacts.

CAUTION

Linear modules always have to be operated in connection with suitable safety devices (safety cell, protected areas, light curtain, etc.).

CAUTION

During operation, the heating of the motor, in particular of stepper motors, can cause skin burns when touching the motor. Install a protective device!

NOTE Observe the Manufacturer's Declaration.

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2. Profibus-DP

2.1 General

The additional installation of the IEF module “Profibus-DP” allows the PA-CONTROL to be integrated into a Profibus-DP network. The PA-CONTROL is always the slave in this network. It always receives and sends data to the master in a length of 8 bytes.

The PAC can be run on the Profibus-DP at a baud rate up to 12 Mbaud.

The necessary data for the inclusion of the master control can be taken from the GSE (DSD) file (Device master file) “**IEF_V502.GSE**”.

From the perspective of the Profibus-DP master, there are the following possibilities:

	Operating mode of the PA-CONTROL			
	Home Pos.	Manual Mode	Automatic	Online
Access to inputs and outputs	Yes	Yes	Yes	Yes
Access to flag, register	Yes	Yes	Yes	Yes
Access to system and axis parameters	Yes	No	No	no
Call axis position	Yes	Yes	Yes	yes
Move axes	No	No	No	yes
Start, stop automatic	Yes	No	Yes	No
Cancel automatic	No	No	Yes	No
Start, stop online	Yes	No	No	No
Cancel online	No	No	No	Yes

2.2 Initiation

2.2.1 Installation of the Profibus-DP module

The installation of the Profibus-DP module is described in detail in the operating instructions of the PA-CONTROL and PA-CONTROL EP.

CAUTION

The connection of the PA-CONTROL to a Profibus-DP- network is done based on the "**set-up guidelines of the Profibus**". Please mind the respective regulations.

Once the PA-CONTROL is connected to a Profibus-DP network, the Profibus-DP module is recognized and initialized when the PA-CONTROL is switched on.

Pin assignment of the connection plug

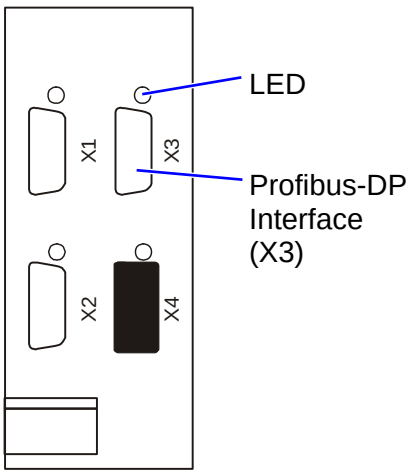
Pin assignment	Signal	Meaning
1	shield	shielding / grounding
2	M24	mass of the 24V output voltage
3	RxD / TxD-P	Reception and send data - Plus
4	CNTR-P	Control signal for repeater (direction control)
5	DGND	Data transmission potential (mass to 5V)
6	VP	Distribution voltage of the moving loads P, (P5V)
7	P24	Output voltage plus 24V
8	RxD / TxD-N	Reception and transmission line for data - N
9	CNTR-N	Control signal for repeater (direction control)

2.2.1.1 Installation in a PA-CONTROL Single / Compact / Control Unit

When installing the IEF Profibus module, keep in mind that only slot X3 is intended for this purpose.

A green LED above the 9-polar Sub-D socket indicates the active status and the data exchange.

For additional information, see the operating instructions for the PA-CONTROL, chapter "Options".



2.2.1.1 Installation of the IEF module “Profibus-DP” in a PA-CONTROL EP

A Prefabs-DP port can only be installed in slot X5.

A green LED above the 9-polar Sub-D socket indicates the active status and the data exchange.

For additional information, see the operating instructions for the PA-CONTROL EP (chapter Options).

For an optional extension, the switch module can be used in a PA-CONTROL EP.

It can be installed in slot X6 or X8.

The IEF switch module as described in chapter 2.2.2.2 takes the address.

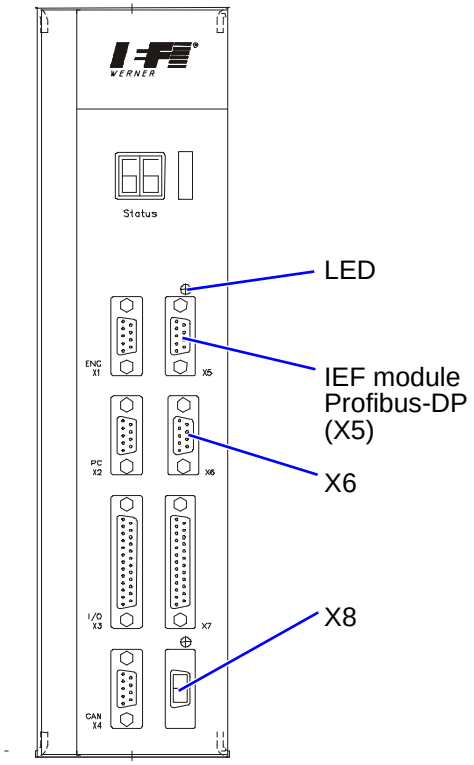


Figure 1: Installation of the Profibus DP module in a PA-CONTROL MP

2.2.1.2 Installation of the IEF module “Profibus-DP” in a PA-CONTROL servoTEC

Installation of the IEF module “Profibus-DP” in slot 2 of CPU5 enables the PA-CONTROL servoTEC, which is connected via connector X25, to work as slave in a Profibus network.

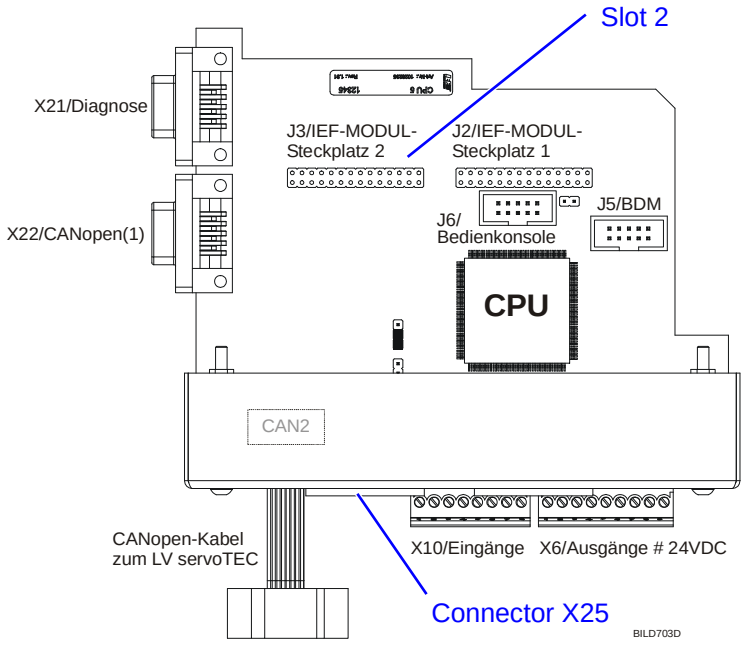


Figure 2: Installation of the Profibus DP module in a PA-CONTROL servoTEC

2.2.1.3 Installation of the IEF module “Profibus-DP” in a PA-CONTROL Smart

A Profibus-DP interface can only be installed in slot X5.
The green LED next to the 9-pole SUB-D connector socket indicates the active status and the data exchange.
For additional information, see the “Options” section of the User's Manual for the “PA-CONTROL Smart”.

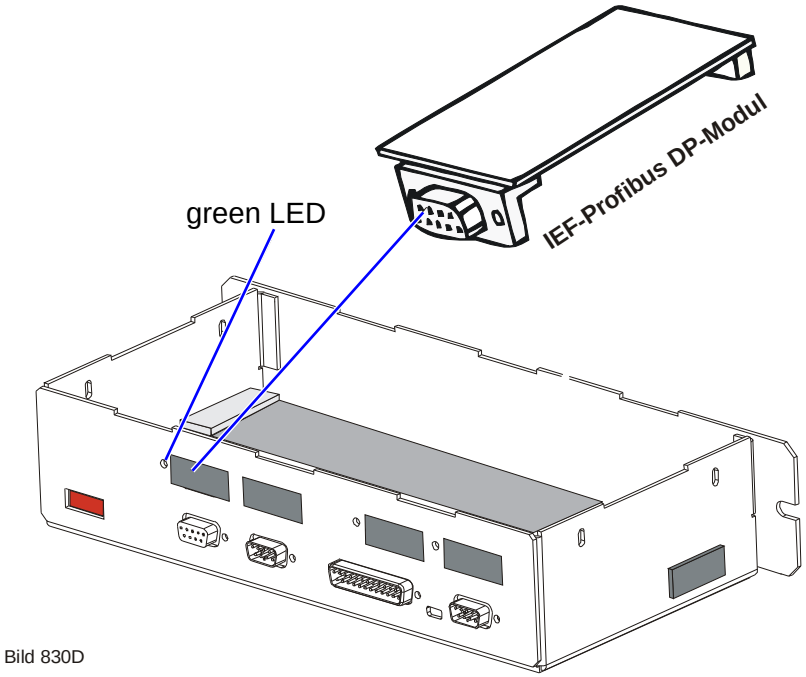


Figure 3: Installation of the Profibus DP module in a PA-CONTROL Smart

2.2.2 Setting the profibus-address

2.2.2.1 Setting with the WinPAC program

In the Profibus-DP network, an address is assigned to each participant when projecting the network. This address is set using the program **WINPAC** in the system parameters of the PA-CONTROL.

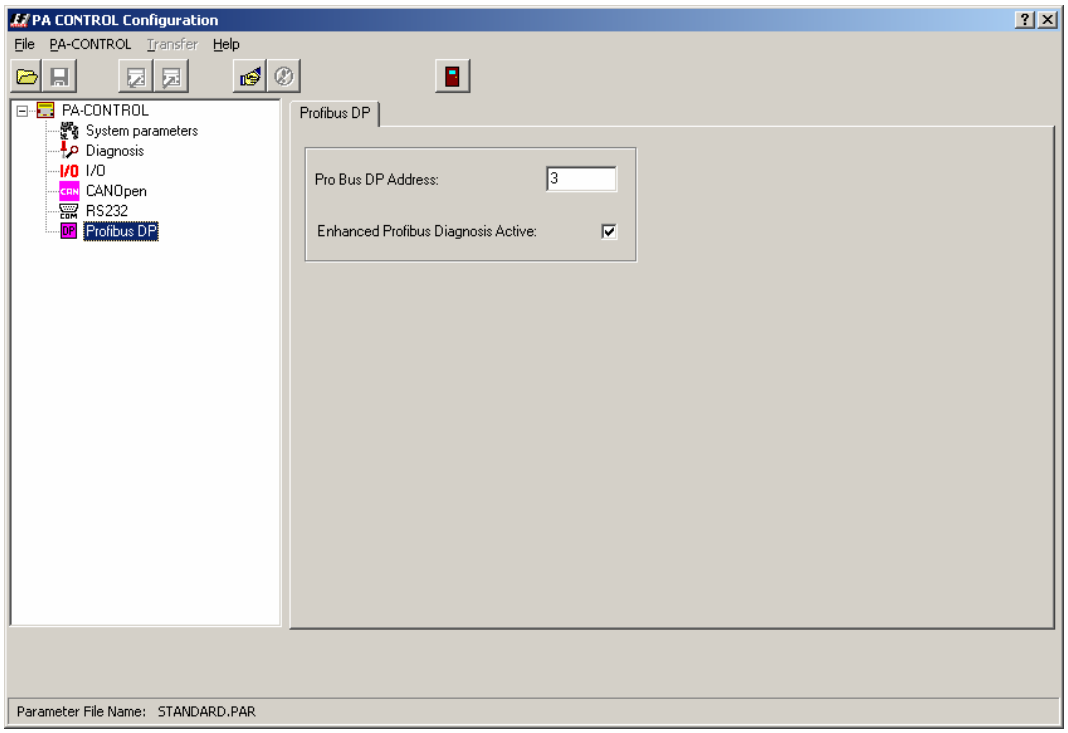
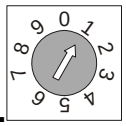
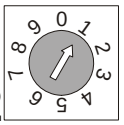
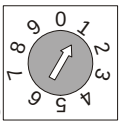


Figure 4: Setting the Profibus address

The address can be set between 2 and 126 in accordance with EN 50 170. Make sure that the address 126 is only used for initiation purposes. No usable data may be transmitted with the address 126.
In the example, the value 3 is entered. The entry of a zero, the default value, means that no Profibus-DP module was activated.

2.2.2.2 Setting the address via the rotary switches of the PA-CONTROL MP

Rotary switch S1 serves to assign the information set with S2 and S3 to a certain IEF module.

S1 	S2 	S3 
Value set	Significance	Significance
0	**No assignment (take-over)**	
1	**Profibus-DP modules**	
	Address 1st digit	Address 2nd digit
2	**Slave CANopen** The control switches to Slave-CAN mode	
	ID-No. 1st digit	ID-No. 2nd digit
3	**RS232 interface**	
	Data bits, parity	Baud rate

If a Profibus-DP interface is available, assignment switch S1 of the control must be turned to position 1. The two rotary switches S2 and S3 then make up the Profibus address.
Example: S2 = 1 and S3 = 6; Profibus address 16 $_{dec}$ is used.

NOTE Address 0 is not intended for Profibus-DP, address 1 is reserved for the master. This means, only addresses 2 to 99 are available.

If a setting is made which cannot be realized (e.g. Profibus module not inserted and assignment switch in position 1), the relevant error message (error number = 205) is output.
If the hardware is error-free, take-over and evaluation of the rotary switches is performed once after the PA-CONTROL MP is switched on. For this purpose, the connection cable of the motor must be inserted.
Examples for set addresses:

S2 (dec)	S2 (dec)	Profibus address (dec)
0	2	2
....	....	....
2	1	21
2	9	29
....	....	....
9	1	91
9	9	99

2.3 Communication

2.3.1 General explanations

The PA-CONTROL is not a passive I/O terminal but an active control with numerous inputs and outputs, possibly several axes to be positioned, different registers and flags. In addition, there are system and axis parameters whose settings considerably influence the processes.
All relevant information must be transmitted via the Profibus-DP. A specific, modular Profibus interface was therefore defined for the PA-CONTROL.

The interface consists of:

Data length	Description	
8 bytes	Standard command interface **"CMD interface"**	Always available
8 bytes	Mode control interface **"CTRL interface"**	1st optional extension
12 bytes	In AUTOMATIC mode: - Flag register interface In HOME POSITION and ONLINE: - Axis interface **"Module/axis interface"**	2nd to 9th optional extension

2.3.2 Example for different extensions

2.3.2.1 Example: No optional extension

8 bytes
CMD interface

2.3.2.2 Example: Optional extension with the CTRL interface

8 bytes	8 bytes
CMD interface	CTRL interface

2.3.2.3 Example: Optional extension with the CTRL interface and 16 module/axis interfaces

8 bytes	8 bytes	12 bytes	12 bytes	…	12 bytes
CMD interface	CTRL interface	Module/axis interface (1st extension)	Module/axis interface (2nd extension)	…	Module/axis interface (8th extension)

2.3.3 Data consistency

Data consistency always exists for the overall module (8, 16, ..., 112 bytes).

2.3.4 Updating send and receive data

The Profibus-DP interface is updated in “PA-CONTROL home position” mode in 10 millisecond cycles. In AUTOMATIC and ONLINE modes, updating is performed in the “action loop” of the AUTOMATIC or ONLINE-interpreter (update time < 10ms).

2.4 CMD interface

Access to the PA-CONTROL is possible via the CMD interface and commands:

	Operating modes of the PA-CONTROL			
	Home position	Manual mode	Automatic *	Online
Access to inputs and outputs	Yes	Yes	Yes	Yes
Access to flag, register	Yes	Yes	Yes	Yes
Access to system and axis parameters	Yes	No	No	No
Call axis position	Yes	Yes	Yes	Yes
Move axes	No	No	No	Yes
Start, stop automatic	Yes	No	Yes	No
Cancel automatic	No	No	Yes	No
Start, stop online	Yes	No	No	No
Cancel online	No	No	No	Yes

2.4.1 Data transfer master → PA-CONTROL

During data transfer from the master to the PA-CONTROL, the following functions are assigned to the bytes of the CMD interface:

8 bytes	**8 bytes**	**12 bytes**		**12 bytes**
IEF standard - CMD - interface	PA-CONTROL - CTRL / STATUS interface	1st extension module/ 1st axis		16th extension module/ 8th axis

16-bit word 0		**16-bit word 1**		**16-bit word 2**		**16-bit word 3**	
High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
PAC byte 0	PAC byte 1	PAC byte 2	PAC byte 3	PAC byte 4	PAC byte 5	PAC byte 6	PAC byte 7
M byte 0	M byte 1	M byte 2	M byte 3	M byte 4	M byte 5	M byte 6	M byte 7
32-bit **command date** MSB LSB				16-bit **command parameter** MSB LSB		**Send flag (bit 15)** **and** **command code (bit 14 – bit 0)**	
Not used		16-bit **command date** MSB LSB					
Examples:							
“Vacant, not used”				“Number of axis”		“Get axis position”	
“Value for the N register (32-bit hex format)”				“Number of N register”		“Set N register to value”	
Requested status of output (0 / 1)				“Number of output”		“Set output to status”	

2.4.2 Data transfer PA-CONTROL → master

During data transfer from the PA-CONTROL to the master, the following functions are assigned to the bytes of the CMD interface:

8 bytes	8 bytes	12 bytes		12 bytes
IEF standard - CMD - interface	PA-CONTROL - CTRL / STATUS interface	1st extension module/ 1st axis		16th extension module/ 8th axis

16-bit word 0		16-bit word 1		16-bit word 2		16-bit word 3	
High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
PAC byte 0	PAC byte 1	PAC byte 2	PAC byte 3	PAC byte 4	PAC byte 5	PAC byte 6	PAC byte 7
M byte 0	M byte 1	M byte 2	M byte 3	M byte 4	M byte 5	M byte 6	M byte 7
32-bit acknowledgment date				PA-CONTROL error flag (bit 15)	PA-CONTROL operating status (bits 7-0)	Flags: - Receive (bit 15) - Command error (bit 14) - End of processing (bit 13) Command error number (bits 12-0)	
MSB			LSB				
		16-bit acknowledgment date					
		MSB	LSB				
Examples:							
“Axis position (32-bit IEEE format)”				See ch. 2.3.2			
“Value of an N register (32-bit hex format)”							
“Not used”		Input word					

2.3.2 Synchronization and data analysis

The processes
- "Processing of I/O data in the master control" (SPC cycle),
- "Update of the Profibus-DP data by the profibus master" and
- "Processing of the profibus commands in the PA-CONTROL"

run asynchronously.

It thus became necessary to define additional flags in the transmission and reception data of the PA-CONTROL:
- **SEND** – Flag (Master send data),
- **RECEIVE** flag (Slave send data) and
- **PROCESSING END** flag (Slave send data).

Two additional flags were added to simplify the analysis of the PA-CONTROL data:
- **COMMAND ERROR** flag (Slave send data) and
- **PA-CONTROL ERROR** flag (Slave send data).

SEND flag
The master control toggles the SEND flag once all the data for the next command have been entered. For the PA-CONTROL, these changes in the SEND flag (from 0 to 1 or from 1 to 0) mean that a new command is pending for processing.

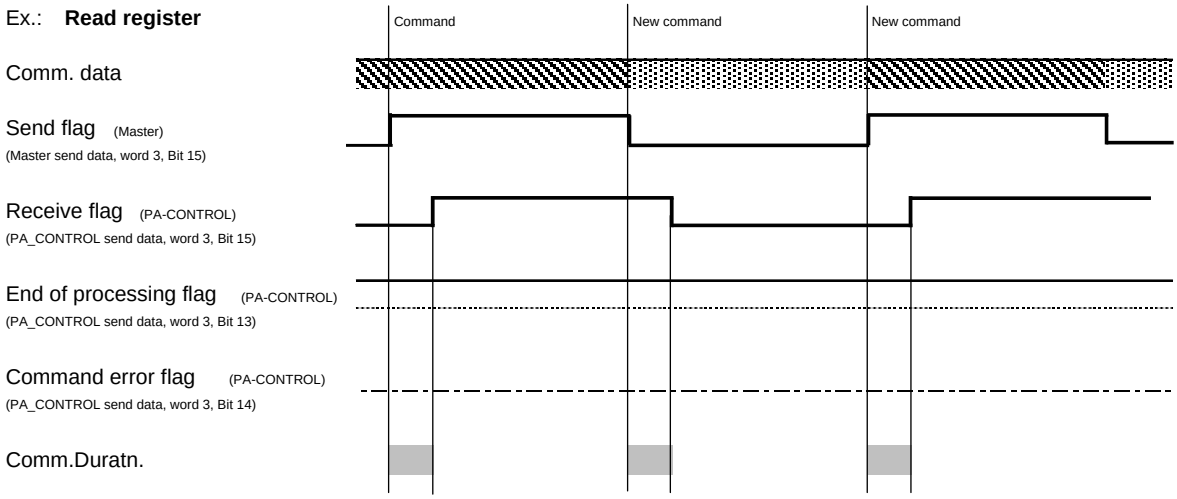
RECEIVE flag and END OF PROCESSING flag
Once the PA-CONTROL has recognized that a new command is pending due to the change in the SEND flag, it starts the processing. The PA-CONTROL enters the acknowledge data in the PA-CONTROL send data.
If the command has already been completed at this point, for instance when a register was set, the PROCESSING END FLAG is set to "1" and the RECEIVE flag is set to the status of the SEND flag.
If the command has not yet been completed at this point, for instance when an axis is moving, the PROCESSING END FLAG is set to "0" and the RECEIVE flag is set to the status of the SEND flag. Once the command has been completely processed, the END OF PROCESSING flag is set to "1" by the PA-CONTROL.

COMMAND ERROR flag
If the PA-CONTROL detects an error during processing a command, the respective error code is entered in the area for the command error number, the command error flag is set to "1", and the adaptation of the status of the RECEIVE flag to the master control's SEND flag signals that the command has been recognized but not processed.

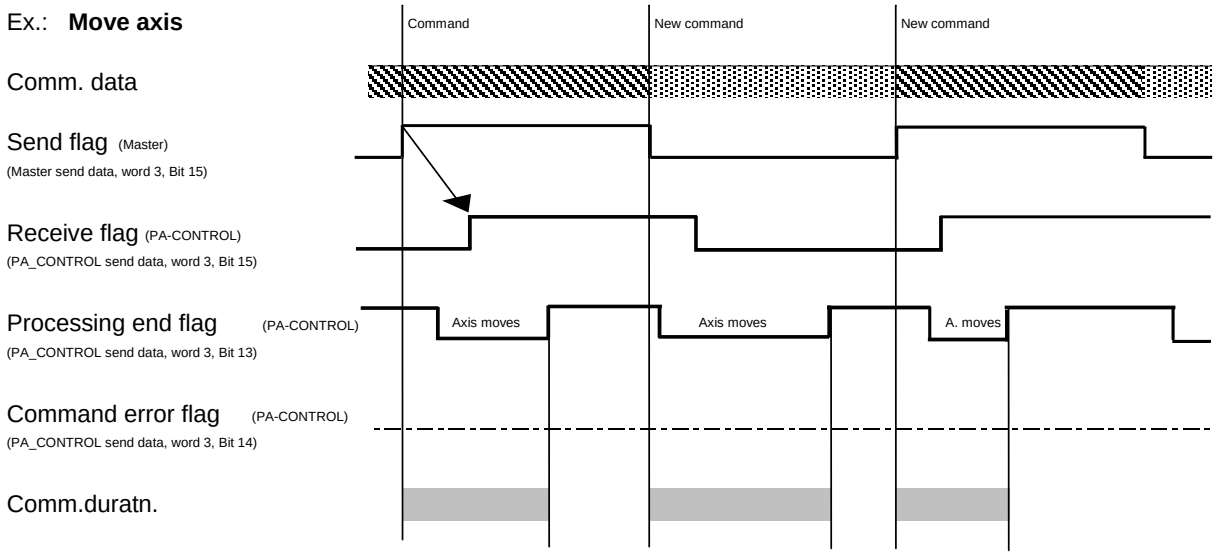
PA-CONTROL ERROR flag
If a general error occurs during the processing of errors in the PA-CONTROL, this bit is set. The master can then retrieve and interpret the error number with the command "cmd_get_error", code "1909".

Examples of the synchronization of communication using flags:

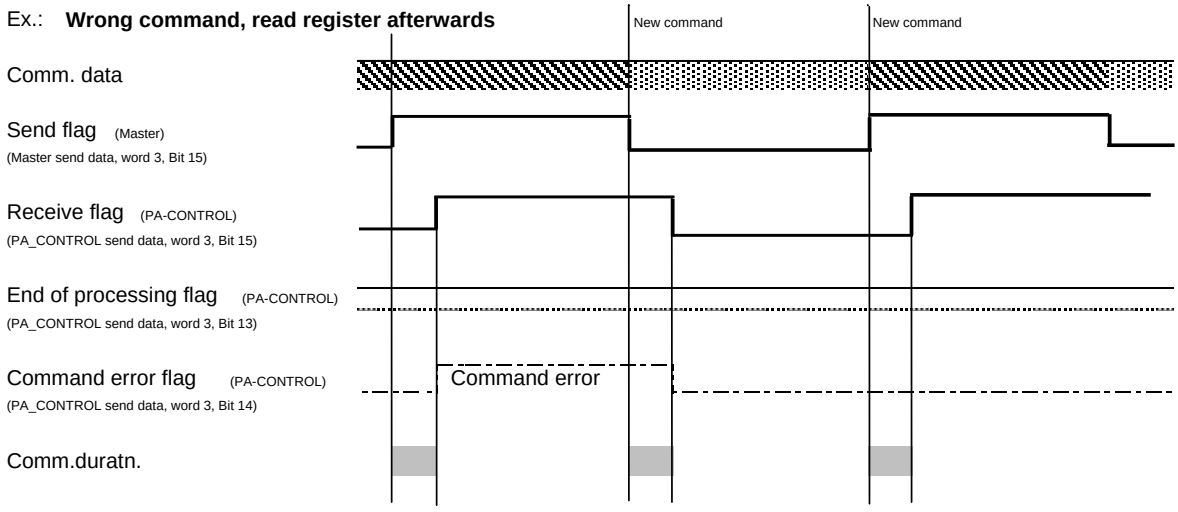
Ex.: **Read register**



Ex.: **Move axis**



Ex.: **Wrong command, read register afterwards**



Assignment of the flags to the acknowledgement data

PA-CONTROL – send data (acknowledge data)

Word 3 (Bit 0-15)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RF	KF	BF		Command error number											

RF : Receive flag
KF : Command error flag
BF : End of processing flag

Command error number: see chapter 6

PA CONTROL: Send data (acknowledgement data)

Word 2 (Bit 0-15)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FE								PA-CONTROL operating status							

FE : Error in **PA-CONTROL**

Code	operating mode (operating status)
00_{dec}	no communication via Profibus-DP possible (not initialized correctly)
01_{dec}	Initial position
02_{dec}	Manual operation via IEF- control panel
10_{dec}	Automatic mode started
11_{dec}	in automatic mode
12_{dec}	in automatic mode and “STOP” recognized
13_{dec}	in automatic mode and process program “Stop”
15_{dec}	in automatic mode and stopped
16_{dec}	in automatic mode and process program “Start” after “Stop”
17_{dec}	in automatic mode and “MALFUNCTION” recognized
18_{dec}	in automatic mode and process program “Malfunction”
19_{dec}	in automatic mode with malfunction and stopped
20_{dec}	Serial manual mode
31_{dec}	Online mode
35_{dec}	Online mode and stopped
39_{dec}	ONLINE mode with malfunction and stopped

Acknowledgement mechanism

SF / RF	KF	BF	Command
SF≠RF	x	x	not recognized yet
SF=RF	1	x	Command error (see command error number)
SF=RF	0	0	Recognized, but not executed yet
SF=RF	0	1	Recognized and executed

2.5 CTRL interface

The “CTRL interface” is used to control and monitor operating modes (AUTOMATIC, ONLINE, ...) of the PA-CONTROL. It has a length of 8 bytes.

2.5.1 Data transfer master → PA-CONTROL

During data transfer from the master to the PA-CONTROL, the following functions are assigned to the bytes of the CTRL interface:

8 bytes	8 bytes	12 bytes		12 bytes
IEF standard - CMD - interface	PA-CONTROL - CTRL / STATUS interface	1st extension module/ 1st axis		8th extension module/ 8th axis

16-bit word 0		16-bit word 1	16-bit word 2	16-bit word 3
Bit	**Assignment of control word Control**	**Not used**	**System error number**	
15	Axis positions and R registers must be treated as “integers”			
14				
…				
…				
5				
4	Start ONLINE			
3	AUTOMATIC START			
2	Cancel (low active)			
1	Stop (low active)			
0	Error reset (low active)			

2.5.2 Data transfer PA-CONTROL → master

During data transfer from the PA-CONTROL to the master, the following functions are assigned to the bytes of the CTRL interface:

8 bytes	8 bytes	12 bytes		12 bytes
IEF standard - CMD - interface	PA-CONTROL - CTRL / STATUS interface	1st extension module/ 1st axis		8th extension module/ 8th axis

16-bit word 0		16-bit word 1	16-bit word 2	16-bit word 3
Bit	**Assignment of status word Control**	**Not used**		
15	Axis positions and R registers are treated as “integers”			
…				
11	ONLINE stopped			
10	ONLINE active			
9	AUTOMATIC stopped			
8	AUTOMATIC active			
...				
2	System error			
1	Battery o.k.			
0	Control ready			

Bit 15 of the “control word” of the control allows to determine whether the axis positions and R register values in the “(axis) modules” are handled in “float” or “integer” format.

When the PA-CONTROL changes to “AUTOMATIC” or “ONLINE” mode, the current setting of this bit is used and remains unchanged. Therefore, this setting can be made only in the “HOME POSITION” mode and is then used.

2.5.3 Axis positions and R registers as “float” or “integer”

Bit 15 of the “control word” of the control allows to determine whether the axis positions and R register values in the “(axis) modules” are handled in “float” or “integer” format. When the PA-CONTROL changes to “AUTOMATIC” or “ONLINE” mode, the current setting of this bit is used and remains unchanged. Therefore, this setting can be made only in the “HOME POSITION” mode and is then used.

2.5.3.1 Axis positions and R registers as “float”

The relevant format for the variable must be set on the PLC.
(For explanations on the “FLOAT” IEEE format, see section *Explanation IEEE format, page 157*).

2.5.3.2 Axis positions and R registers as “integer”

In the “Axis positions and R registers as integer” setting, the current float value is multiplied by 1000 and then output as 32-bit integer, or the 32-bit integer value is divided by 1000 and then used as nominal position or R register.

Example for axis nominal position and actual position:

32-bit integer value = 12345	→	nominal axis position	= 12.345
Current axis position = 25.045	→	actual axis position	= 25045

2.6 Module / axis interface in AUTOMATIC mode

The “module / axis interface” serves for easy reading and writing of flags and registers of the PA-CONTROL in AUTOMATIC mode.

2.6.1 Data transfer master → PA-CONTROL

During data transfer from the master to the PA-CONTROL, the following functions are assigned to the bytes of the module / axis interface in AUTOMATIC mode:

8 bytes	8 bytes	12 bytes	…	12 bytes
CMD interface	CTRL interface	Module / axis interface	⋯	Module / axis interface

Module 1				Module 2	…	Module 8
4 bytes	2 bytes	2 bytes	4 bytes	12 bytes	...	12 bytes
FW 1 M1 to M16	Not used	N1	R1	FW2 N2 R2	...	FW8 N8 R8

NOTE The data received are cyclically copied from the PA-CONTROL into the respective flags and registers. This allows the Profibus-DP master to easily influence flags and registers.

2.6.2 Data transfer PA-CONTROL → Profibus-DP master

During data transfer from the PA-CONTROL to the master, the following functions are assigned to the bytes of the module / axis interface in AUTOMATIC mode:

8 bytes	8 bytes	12 bytes	…	12 bytes
CMD interface	CTRL interface	Module / axis interface	⋯	Module / axis interface

Module 1				Module 2	…	Module 8
4 bytes	2 bytes	2 bytes	4 bytes	12 bytes	...	12 bytes
FW 17 M257 to M272	Not used	N17	R17	FW18 N18 R18	...	FW24 N24 R24

NOTE The contents of the flags and registers are cyclically copied from the PA-CONTROL into the data sent. This allows the Profibus-DP master to easily check flags and registers.

2.7 Module / axis interface in ONLINE mode

The module / axis interface serves for easy control and monitoring of the axes of the PA-CONTROL. The axes can only be controlled in the ONLINE mode.

NOTE

If the Profibus-DP enhancement for axes (1st axis, ... 8th axis) is activated, axis commands via the “CMD interface” are blocked. In this variant, the axes can only be controlled via the module / axis interfaces “1st axis” to “8th axis”.

An error of an axis does not influence the other axes and must be reset via the control word of the axis. If an error occurs on one axis and the other axes are to be stopped, this signal must be realized by the Profibus-DP master.

2.7.1 Data transfer master → PA-CONTROL

During data transfer from the master to the PA-CONTROL, the following functions are assigned to the bytes of the module / axis interface in ONLINE mode:

8 bytes	8 bytes	12 bytes	…	12 bytes
CMD interface	CTRL interface	Module / axis interface	⋯	Module / axis interface

Module / axis interface (PA-CONTROL receive data)			
4 bytes	2 bytes	2 bytes	4 bytes
Control word of the axis	**Acceleration**	**Speed**	**Target position**

32	Reserve
...	
18	Reserve
17	Disable monitoring of limit switches G142 (only MP, PLS 6/7/8)
16	Reset axis error
15	Traverse up to min. traverse range
14	Traverse up to max. traverse range
13	Reset flag and group flag “axis was moved in OFF status”
12	Delete G29 offset(s)
11	Traversing section in negative direction without reference and range check
10	Traversing section in positive direction without reference and range check
9	Traversing (relative/absolute) as long as input is set to “0” (G123 Ix..0), (Default I-No=1)
8	Traversing (relative/absolute) as long as input is set to “1” (G123 Ix..1), (Default I-No=1)
7	Relative traversing *(position)*
6	Absolute traversing *(position)*
5	G29.*[position]*
4	G29.[position]
3	G25 (approach to reference point)
2	Start command
1	Disable DRIVE (G140 / G141)
0	Axis ON

2.7.2 Data transfer PA-CONTROL → Profibus-DP master

During data transfer from the PA-CONTROL to the master, the following functions are assigned to the bytes of the module / axis interface in ONLINE mode:

8 bytes	**8 bytes**	**12 bytes**	…	**12 bytes**
CMD interface	CTRL interface	Module / axis interface	⋯	Module / axis interface

Module / axis interface (PA-CONTROL send data)			
4 bytes	2 bytes	2 bytes	4 bytes
Status word of the axis	**Axis CMD error number**	**Axis error number**	**Current axis position**

32	Reserve
...	Reserve
15	Axis error
14	CMD error
13	One axis of the group has been displaced in DRIVE-DISABLED state
12	Displace too much during DRIVE-DISABLED state
11	Axis has been stopped by G123 action
10	State of positive limit switch
9	State of negative limit switch
8	Axis is referenced
7	ACTIVE
6	FAULT
5	DISABLED
4	IDLE
3	SAFE
2	DRIVE DISABLED
1	HALT
0	DRIVE ENABLED

NOTES

- Control of axes via “Control word of the axis” and other parameters is possible only in “ONLINE” mode of the PA-CONTROL.
  When the PA-CONTROL is switched on, it is in “HOME POSITION” mode. The PLC should set the PA-CONTROL via the “control word and status word of the control” to the “ONLINE” mode.
- In “ONLINE” mode, the axes are independent and do not influence each other. If an error occurs in one axis (e.g. traversing to limit switch, ...) only this axis is stopped and assigned an “AXIS error”. All other axes would continue. Control of the other axes must be realized by the PLC.
- If an error has occurred in an axis, it can be cleared via flag “Control word of the axis : Reset axis error”.
  Exiting the “ONLINE” mode is not required.
- Before the PLC switches the axis on, the PLC should check whether the drive amplifier is supplied with power. Otherwise, the axis will immediately signal an error.
- If several traversing commands are set at the same time, an axis error and command error is generated (flag : CMD error as well as the CMD error number). A traversing command is performed once with the start command.
- An axis can be moved only when it has been referenced. Otherwise, system error E525 (no reference point) is generated.
  Exceptions are the commands “Traverse up to max. traverse range (position) in positive direction” and “Traverse up to max. traverse range (position) in negative direction”, bits 10 and 11 of the control word.
- Changing the speed during traversing is not possible for all axes types (only for: PA-CONTROL MP, LV-servoTEC, flexmoTEC, intelliMOT, dunMOT).
- Changing the position is not possible while the traverse order is being processed. A possible new value which was entered is ignored by the PA-CONTROL and considered only during next positioning.
- If a traverse order is interrupted (STOP-ONLINE, axis-ON=0, ...), it is continued after the “axis-ON” function according to axis parameter “switch on traverse mode”.
- If the enable mode for an axis is set to “1”, this means, set “immediately after initialization” and the axis is switched in ONLINE mode via the “axis-ON” function to the “IDLE / SAFE” state, the axis is again switched “OPERATIONAL” after exiting the ONLINE mode.

2.7.3 Explanation of the control word of the axis in the module / axis interface

NOTE An axis movement (traverse) is interrupted or canceled by removing the traverse command flag (see also the “relative axis traversing” diagram).

2.7.3.1 Axis-ON

The “axis-ON” bit enables or disables the axis according to the settings in the axis parameters (motor current switched on, ...).

- Axis-ON = 1 → axis is enabled
- Axis-ON = 0 → axis is disabled

depending on the axis parameter enable mode:

- HALT
- IDLE (motor current off, ...)
- SAFE (enable AS option, ...)

2.7.3.2 Start command

The Start command bit serves as start signal for the traverse commands. After the traverse command is processed (set status bit), the Start command bit should be set to 0. A new traverse command is first recognized when the control does not process a traverse command and the Start command bit changes from 0 to 1.

2.7.3.3 G25, reference run (+ Start command)

The PA-CONTROL performs a reference run with this axis, depending on the axis parameters (reference run, reference speed, ...) currently set.

2.7.3.4 G26, set axis to position and reference (+ Start command)

The axis is set to position (Profibus-DP master → PA-CONTROL - axis module - axis position). The status bits “axis enabled for movement” and “axis is referenced” are set. The software limit switches (axis parameter traverse range maximum, minimum) are maintained unchanged.

2.7.3.5 G29, set axis to position (+ Start command)

The axis is set to position (Profibus-DP master → PA-CONTROL - axis module - axis position). The status bit “axis is referenced” is not changed.
The software limit switches (axis parameter traverse range maximum, minimum) are shifted according to the position displacement.

2.7.3.6 Absolute traversing (+ Start command)

The PA-CONTROL uses the position (Profibus-DP master → PA-CONTROL - axis module - axis position) as absolute position and moves the axis to this position.
The data field Speed of axis (Profibus-DP master → PA-CONTROL - axis module - speed of axis) is used as speed.

2.7.3.7 Relative traversing (+ Start command)

The PA-CONTROL takes over the position (Profibus-DP master → PA-CONTROL - axis module - axis position), adds this position to the current position and moves the axis to this newly calculated position.
The data field Speed of axis (Profibus-DP master → PA-CONTROL - axis module - speed of axis) is used as speed.

2.7.3.8 Traverse up to max. traverse range in positive direction (+ Start command)

The axis is moved with the speed of axis (Profibus-DP master → PA-CONTROL - axis module - speed of axis) in positive direction. The maximum range results from the position (Profibus-DP master → PA-CONTROL - axis module - axis position).

NOTE

- The axis does not have to be referenced.
- The command is suitable for realizing manual traversing for machine set-up functions.

2.7.3.9 Traverse up to max. traverse range in negative direction (+ Start command)

The axis is moved with the speed of axis (Profibus-DP master → PA-CONTROL - axis module - speed of axis) in negative direction. The maximum range results from the position (Profibus-DP master → PA-CONTROL - axis module - axis position).

NOTE

- The axis does not have to be referenced.
- The command is suitable for realizing manual traversing for machine set-up functions.

2.7.3.10 Traversing as long as input is “1” (+ absolute/relative traversing + Start command)

This command can be activated in addition to command “Absolute traversing” and “Relative traversing”. Traversing is immediately terminated when the input changes from “1” to “0”. The position at which the axis comes to a standstill is then the current actual position from which the next traversing can be started.
If the input is not set to “1” before traversing starts, it will not start at all and is thus terminated already.
At the start of ONLINE mode, input number “1” is entered as input (default).
If traversing should start depending on a different input, the required input number must be transferred via the IEF standard command interface with the command “cmd_put_condition_move_axis”.

2.7.3.11 Traversing as long as input is “0” (+ absolute/relative traversing + Start command)

This command can be activated in addition to command “Absolute traversing” and “Relative traversing”. Traversing is immediately terminated when the input changes from “0” to “1”. The position where the axis comes to a standstill is then the current position from which the next traversing can be started.
If the input is not set to “0” before traversing starts, it will not start at all and is thus terminated already.
At the start of ONLINE mode, input number “1” is entered as input (default).
If traversing should start depending on a different input, the required input number must be transferred via the IEF standard command interface with the command “cmd_put_condition_move_axis”.

2.7.3.12 Reset flag and group flag “axis has been displaced during OFF” (+ Start command)

2.7.3.13 Delete G29 position offset(s) (+ Start command)

Resets position displacement from command “G29 - set axis to position”.

2.7.3.14 Traverse up to max. traverse range (+ Start command)

The PA-CONTROL uses the axis parameter “Max. traverse range” as absolute position and moves the axis to this position.

NOTE The axis has to be referenced.

The data field Speed of axis (Profibus-DP master → PA-CONTROL - axis module - speed of axis) is used as speed.

2.7.3.15 Traverse up to min. traverse range (+ Start command)

The PA-CONTROL uses the axis parameter “Min. traverse range” as absolute position and moves the axis to this position.

NOTE The axis has to be referenced.

The data field Speed of axis (Profibus-DP master → PA-CONTROL - axis module - speed of axis) is used as speed.

2.7.3.16 Reset axis error

If an axis error (following error, motor voltage, ...) is set in the status word, the error can be reset with this flag.

2.7.3.17 Deactivate limit switch monitoring

With rotational axes (turntables, ...) it may be required that the limit switch is used as reference switch at the beginning only and then must be passed over during traversing. This command can be used for all traverse commands (except G25) to disable limit switch monitoring. The flag is updated during take-over of the “START command”.

NOTE Only possible with axis types “MP, PLS6, PLS7, PLS8 and PLS9”.

2.7.4 Explanation of the status word of the axis in the module / axis interface

2.7.4.1 DRIVE ENABLED

The motor is supplied with current, a possibly available holding brake is open. A servo motor controls the position.

2.7.4.2 HALT

A traverse command was interrupted and the drive stands still. A servo motor controls the position.

2.7.4.3 DRIVE DISABLED

The drive is without power.

2.7.4.4 IDLE

The PA-CONTROL has canceled the drive enable (hardware or software). If the drive is still moving, it is reduced to speed “0”.
If a holding brake is available, it is activated and the current in the motor is switched off.

- PLS7 / PLS9 : Hardware enable
- CAN-servoTEC : Software enable
- PLS-EP / PLS-EP-CAN : Software enable

2.7.4.5 DISABLED

The drive is without power. During switching on, the drive is not moved, but the current position is used as actual position (G140/G141).

2.7.4.6 SAFE

If an “axis SAFE output” is assigned to the drive in the axis parameters of the PA-CONTROL (safety function “starting lockout” (AS), “speed monitoring”, “power supply contactor off”), the output is set after the drive was previously “DISABLED”.
The drive is switched off, a possible holding brake and safety function are enabled.

2.7.4.7 FAULT

A drive error has occurred. For a description of the error, see the axis error number (nth axis - error number).

2.7.4.8 ACTIVE

The control processes a traversing task for this axis (absolute, relative traversing, ...). The flag is cleared at the earliest when the section has been completely traversed and the Start command canceled.
The axis was referenced with command G25 or G26 or the axis has an absolute measuring system. The axis can be moved.

2.7.4.9 State of negative limit switch

Current status of limit switch:

- "0" → Limit switch actuated
  (CAUTION: Also for axis parameter limit switch type "NO")
- "1" → Limit switch not actuated (CAUTION: Also for axis parameter limit switch type "NO")

2.7.4.10 State of positive limit switch

Current status of limit switch:

- "0" → Limit switch actuated
  (CAUTION: Also for axis parameter limit switch type "NO")
- "1" → Limit switch not actuated (CAUTION: Also for axis parameter limit switch type "NO")

2.7.4.11 Axis has been stopped by G123 action

During the last traversing task in which the G123 function (traverse as long as input status) was active, traversing was aborted by the G123 action.

2.7.4.12 Axis has been displaced during OFF

The axis was displaced during the last OFF status. The axis parameter "Maximum position displacement after axis-OFF" serves as criterion whether a displacement took place or not. This flag is influenced only if the "switch on traverse mode" for this axis was set to value "4" (see WINPAC Help - ...). If this flag was set, the axis is not and cannot be moved. In this case, a traverse command which was interrupted will not be continued. The master at the Profibus-DP must delete the flag and initiate the corresponding actions.

2.7.4.13 Axis of the group has been displaced during OFF

An axis of the group (see axis parameter) was displaced in the "axis is OFF" status.

2.7.4.14 CMD error

The flag is set when a Start command which cannot be realized is activated. The flag is deleted during the next Start command.
Example:

- Absolute / relative traversing without referencing the axis
- Start command without traversing CMD

2.7.4.15 Axis error

This bit is set when an axis error has occurred. For the error number, see status message "PA-CONTROL → Profibus-DP master - axis module - error No.".
List of error numbers: See Operating Manual PA-CONTROL, *chapter 7, Error List of PA-CONTROL (E001...E999)*.

2.7.5 Acceleration of axis in module / axis interface

The parameter serves as default for acceleration (value in per mill, value range 1 to 65535). The actual current acceleration results from the default, multiplied by the “Acceleration” axis parameter.

$$\text{Current acceleration} = \frac{\text{“Acceleration of axis” * “Acceleration axis parameter”)}}{1000}$$

The current acceleration could become higher than the “Acceleration axis parameter”.

NOTE During reference run, traversing is performed with the accelerations and speeds set in the axis parameters.

2.7.6 Speed of axis in module / axis interface

The parameter serves as default for the speed with which the axis is moved (value in per mill, value range 1 to 1000). The actual current speed results from the default, multiplied with the “Traversing speed” axis parameter.

$$\text{Current speed} = \frac{\text{“Speed of axis” * “Traversing speed axis parameter”}}{1000}$$

NOTE During reference run, traversing is performed with the accelerations and speeds set in the axis parameters.

The speed can be changed during traversing for axis types PLS-MP, servoTEC, linMOT or intelliMOT.

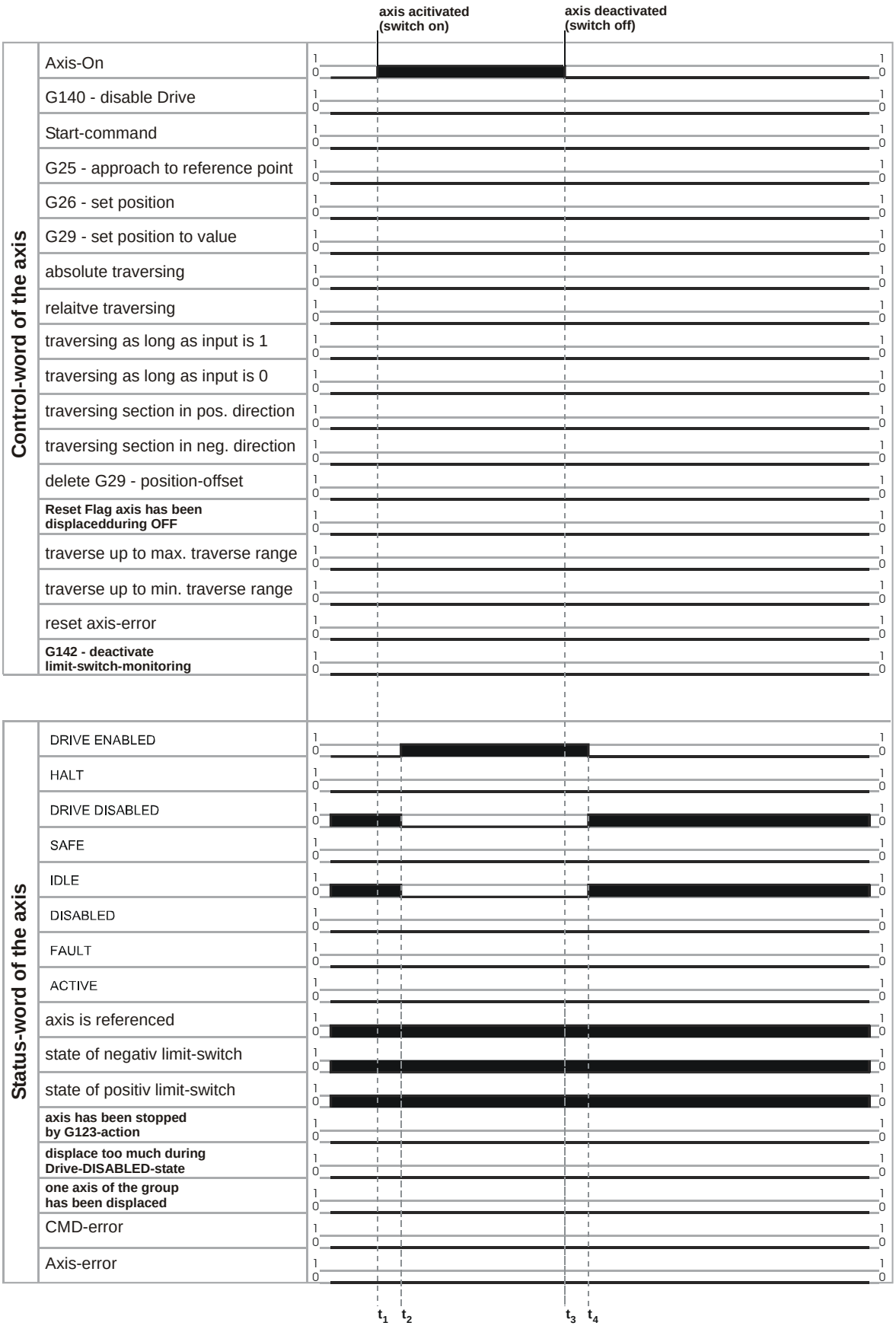
2.7.7 Position of axis in module / axis interface

This value is used as position default for traversing actions (absolute, .relative, maximum, ...).
The position can be transferred as float or integer number.
Error number of axis in module / axis interface
List of error numbers: See Operating Manual PA-CONTROL, *chapter 7, Error List of PA-CONTROL (E001...E999)*.

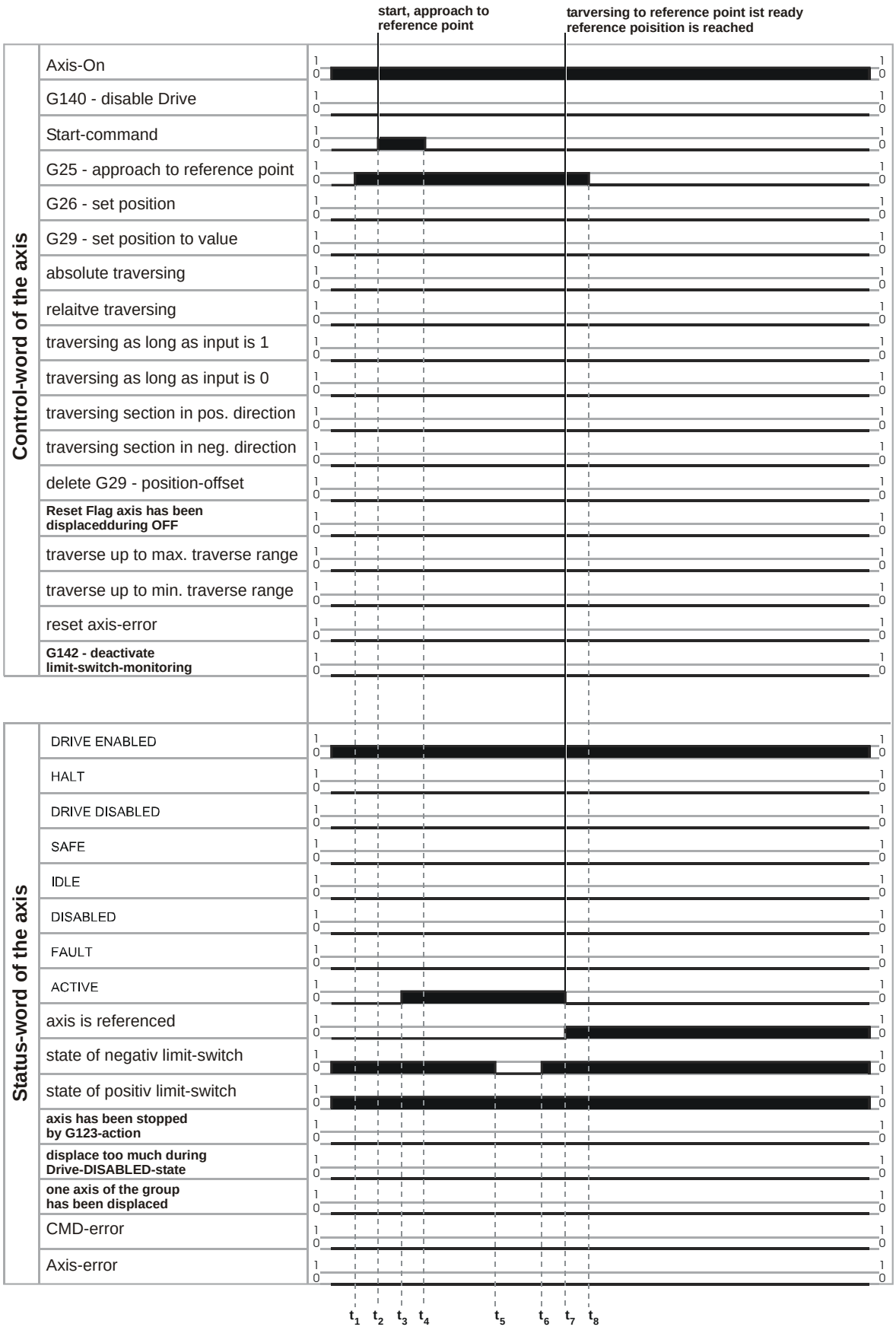
2.7.8 Current position of axis in module / axis interface

2.7.9 Diagrams for control of the axes via module / axis interface

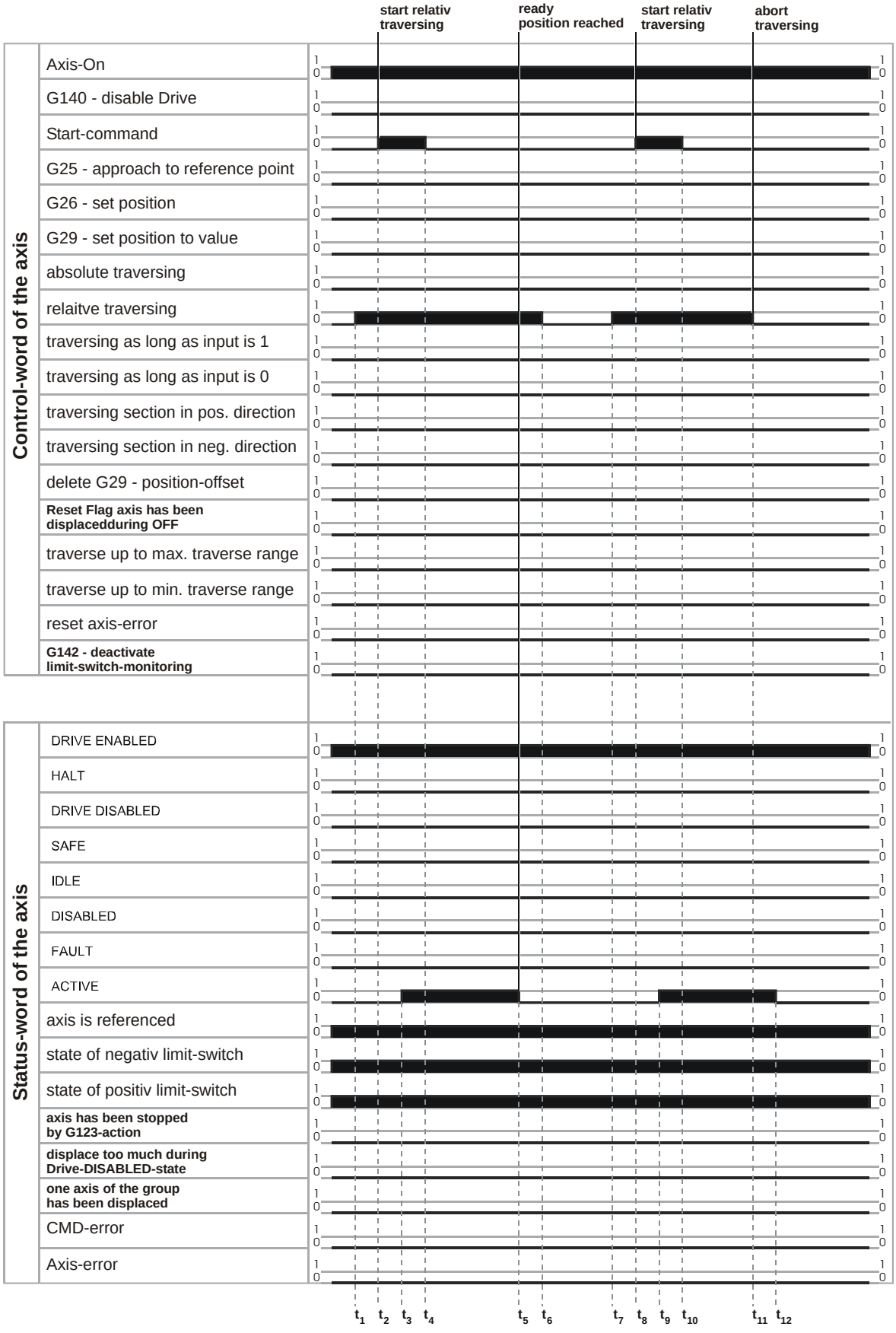
2.7.9.1 Axis ON / OFF



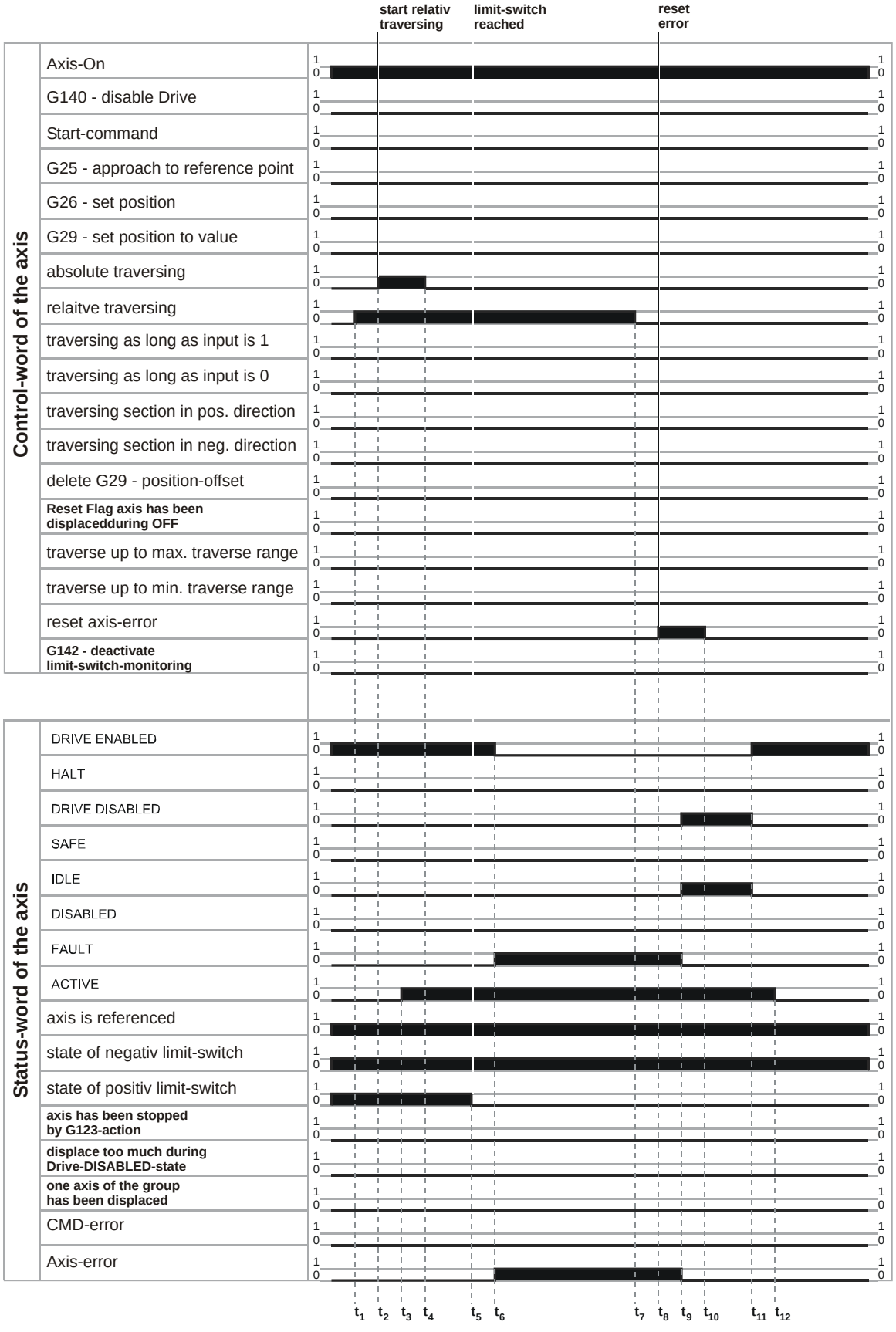
2.7.9.2 Referencing of axis



2.7.9.3 Axis - relative traversing



2.7.9.4 Axis - relative traversing with limit switch error



2.8 Diagnosis with WINPAC

Several diagnosis windows are available in WINPAC to diagnose Profibus-DP receive and send data:

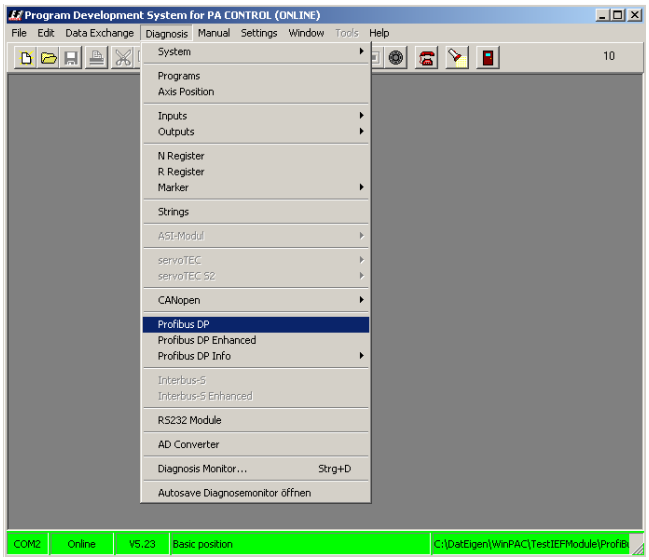


Figure 5: WINPAC diagnosis window

2.8.1 CMD interface

The current contents of the receive and send data are shown in the “Diagnosis > Profibus-DP” window.
The “Diagnosis: Enhanced Profibus-DP” window shows the receive and send data of the last 20 actions. This means that the sequence of an action, e.g. Get input word status, can be displayed.

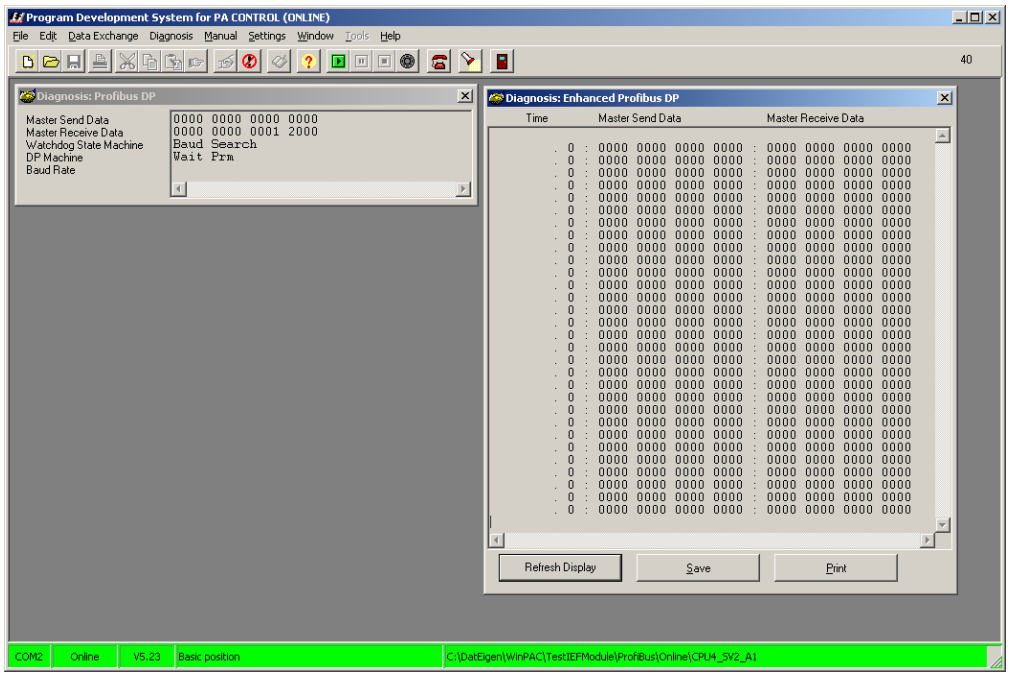


Figure 6: Profibus DP and Enhanced Profibus DP diagnosis windows

2.8.2 CTRL interface

The “Diagnosis: Profibus-DP CTRL-Info” window shows the current contents of the data fields of the CRTL interface.

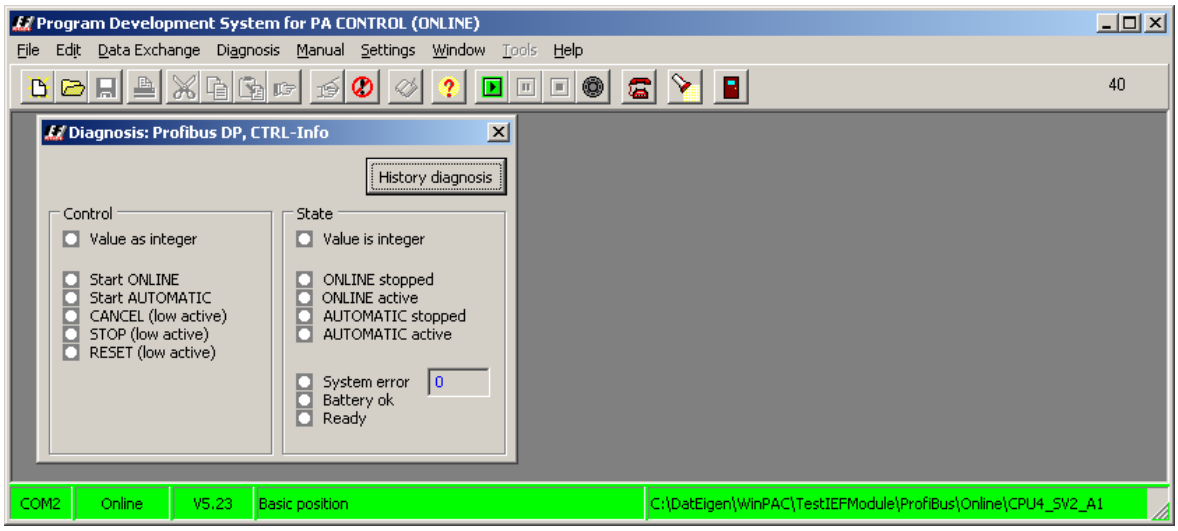


Figure 7: “Profibus-DP CTRL-Info” diagnosis window

To view changes in the CTRL interface in chronological sequence, use the “History Diagnosis” to display the last 20 actions.

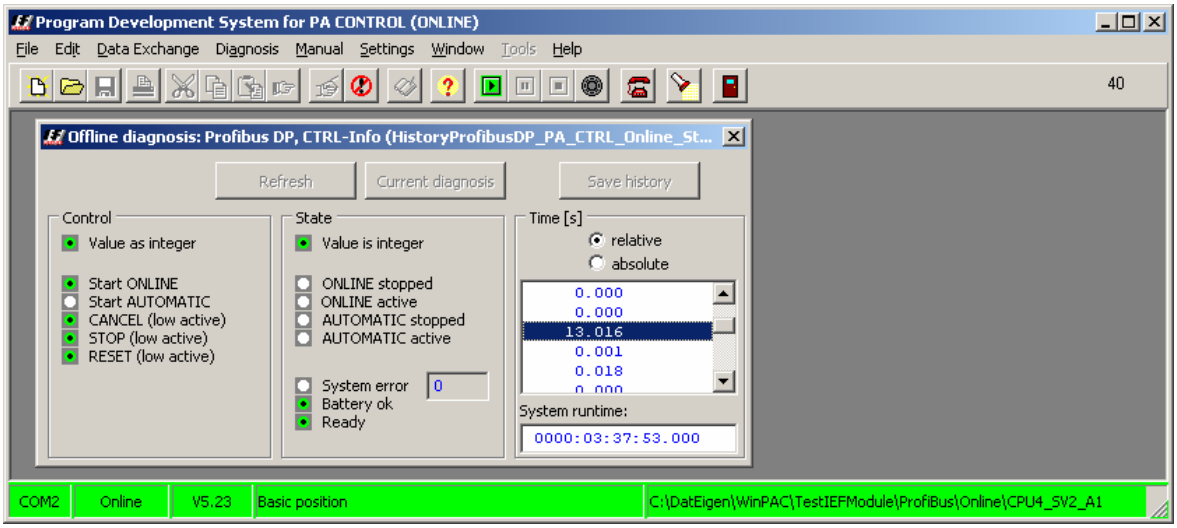


Figure 8: History diagnosis window

2.8.3 Module / axis interface

The “Diagnosis: Profibus-DP, Module-Axis-Info” window shows the current contents of the data fields of the module / axis interface.

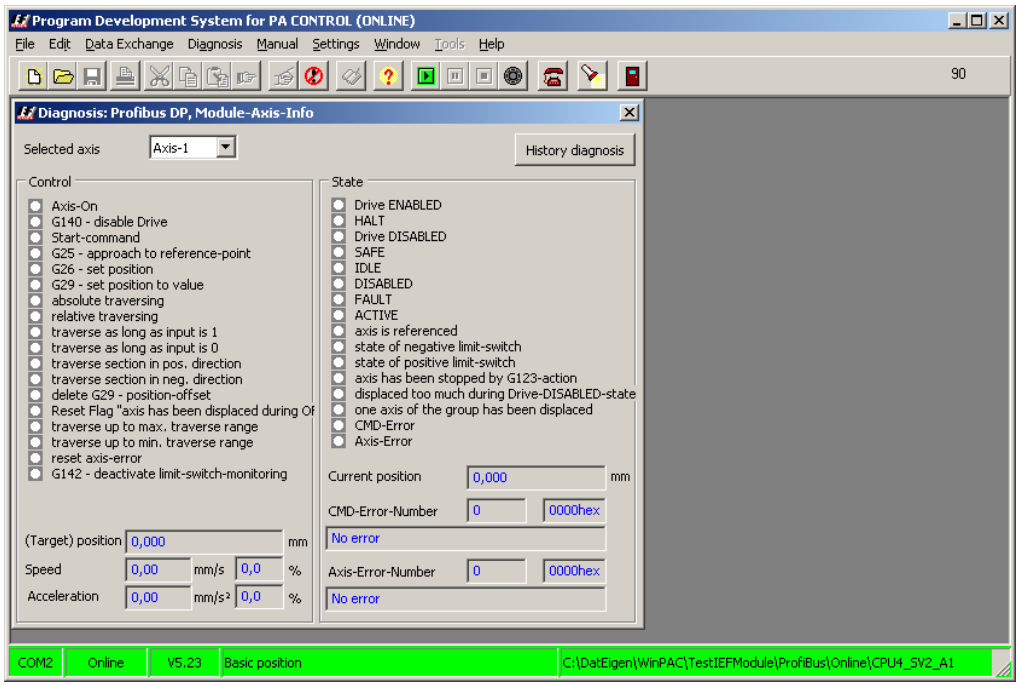


Figure 9: Diagnosis, Axis-Info

To view changes in the CTRL interface in chronological sequence, use the “History Diagnosis” to display the last 20 actions.

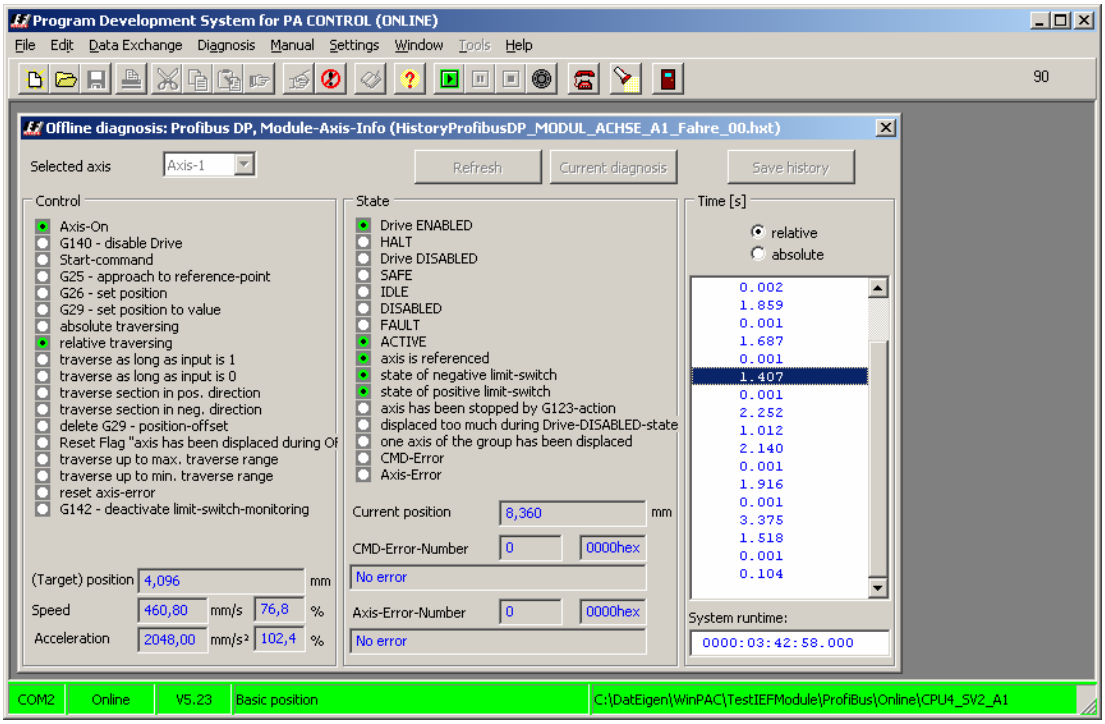


Figure 10: Diagnosis, History Axis-Info

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3. Serial port RS 232

3.1 Generalities

When equipping the PA-CONTROL with a serial port RS232-COM1, this port can be activated as an online command port.

For instance, it can be used to communicate with a PC using a defined protocol. The PA-CONTROL is always the slave at this port.

From the perspective of the master, there are the following possibilities:

	Operating mode of the PA-CONTROL			
	Home position	Manual Mode	Automatic	Online
Access to inputs and outputs	Yes	Yes	Yes	Yes
Access to flag, register	Yes	Yes	Yes	Yes
Access to system and axis parameters	Yes	No	No	no
Call axis position	Yes	Yes	Yes	yes
Move axes	No	No	No	yes
Start, stop automatic	Yes	No	Yes	No
Cancel automatic	No	No	Yes	No
Start, stop online	Yes	No	No	No
Cancel online	No	No	No	Yes

The transmission format of the RS232 port COM1 is set in the standard to 9600 baud, 1 start bit, 7 data bits, 1 stop bit and no parity. The port can be set to other formats; this is described in the following pages.

Except for the control symbols STX (01_{hex}), SOH (02_{hex}), ETX (03_{hex}) and EOT (04_{hex}), only ASCII symbols (20_{hex} to $7F_{hex}$) are transmitted via the port.

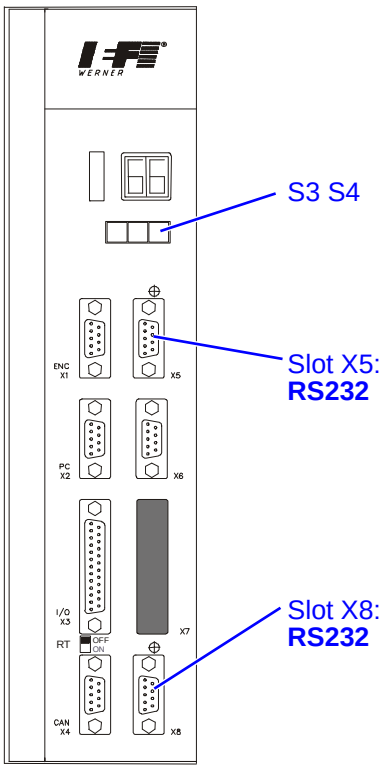
All number values are converted into ASCII symbols (itoa(), ftoa(), str, etc.) for the transmission.

In the protocol, an XOR sum of the digits is implemented to ensure successful data transmission. It can be replaced by the value “0” if necessary.

3.2 The COM1 serial port in the PA-CONTROL

3.2.1 Installation of the COM1 in the PA-CONTROL MP

The standard version of the PA-CONTROL MP does not have a serial interface intended as serial command interface.
The diagnosis interface in slot X2 is reserved exclusively for diagnosis purposes and programming.
The installation of the IEF-RS232 module is allowed in slots X5 and X8.
For more information see the “Options” section of the Operating Instructions for the PA-CONTROL MP.



3.2.1.1 PA-CONTROL MP, Setting the Transmission Format

With the introduction of the PA-CONTROL MP, an option has been integrated in the control to realize part of the required settings via the rotary switch.

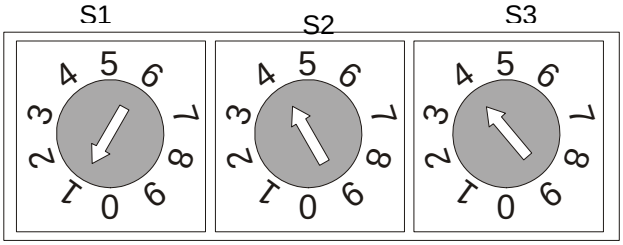


Bild810D

Rotary switch S1 is used to assign the numeric values set with switches S2 and S3 to the address setting for Profibus DP, for the ID number on the CANopen bus or for the characteristics of the RS232 interface.
The following is valid for the RS232 interface: The transmission format can be selected with rotary switch S2 and the transmission speed of the interface with rotary switch S3.

S2	Transmission format	S3	Transmission speed
1	8 data bits. 1 stop bit, no parity	1	110 baud
2	7 data bits. 1 stop bit, no parity	2	300 baud
3	7 data bits. 1 stop bit, even parity	3	1200 baud
4	7 data bits. 1 stop bit, odd parity	4	2400 baud
5	8 data bits. 1 stop bit, no parity, CTS active	5	4800 baud
6	7 data bits. 1 stop bit, no parity, CTS active	6	9600 baud
7	7 data bits. 1 stop bit, even parity, CTS active	7	19200 baud
8	7 data bits. 1 stop bit, odd parity, CTS active	8	38400 baud (not yet available)

If the hardware is error-free, the take-over and evaluation of the switch module is performed once after the PA-CONTROL MP is switched on. The motor connection cable must be inserted for this purpose.

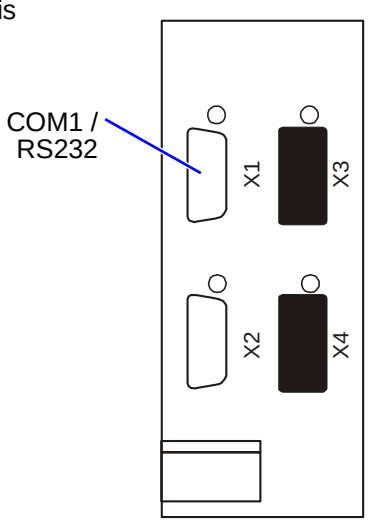
3.2.2 Installation of the COM1 in a PA-CONTROL Single / Compact / Control Unit

The basic version of the PA-CONTROL's **CPU-4** is equipped with the COM1/RS232 as depicted.

Only this port is intended for us as a serial command port.

Additional RS232 ports can be installed in slots X3 and X4.

For additional information, see the operating instructions for the PA-CONTROL EP (chapter Options).



3.2.3 Installation of the RS232 interface in a PA-CONTROL servoTEC

The functional scope of the PA-CONTROL servoTEC can be enhanced by numerous options, e.g. the IEF module RS232 interface.

NOTE Not all options are possible at the same time, depending on the basic configuration of the equipment and the available free installation areas.

	Description of option	CPU5
IEF modules	COM 1 / 2 interface	X
	COM 3 / 4 interface	X

3.2.3.1 Arrangement of the IEF modules on the CPU5

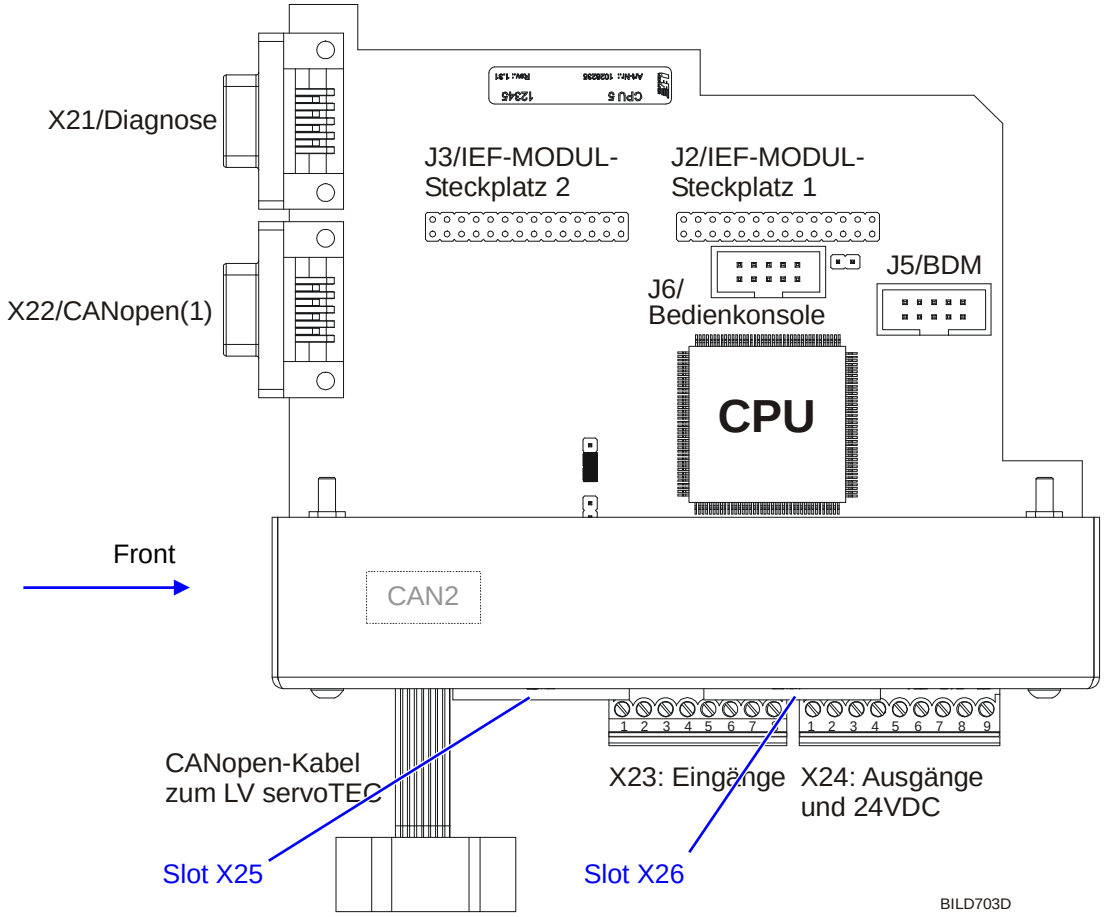


Figure 11: Overview of CPU5

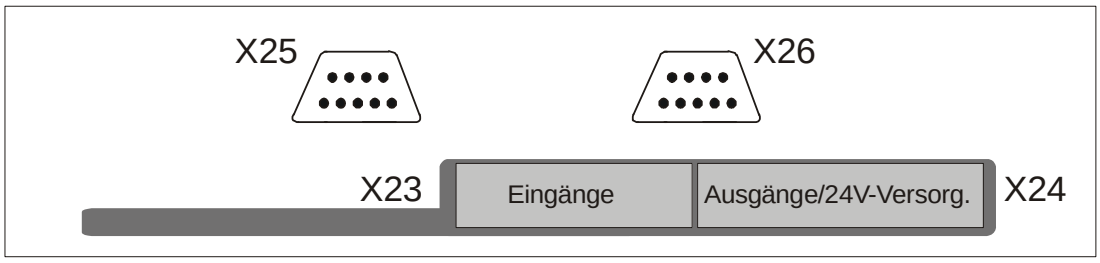
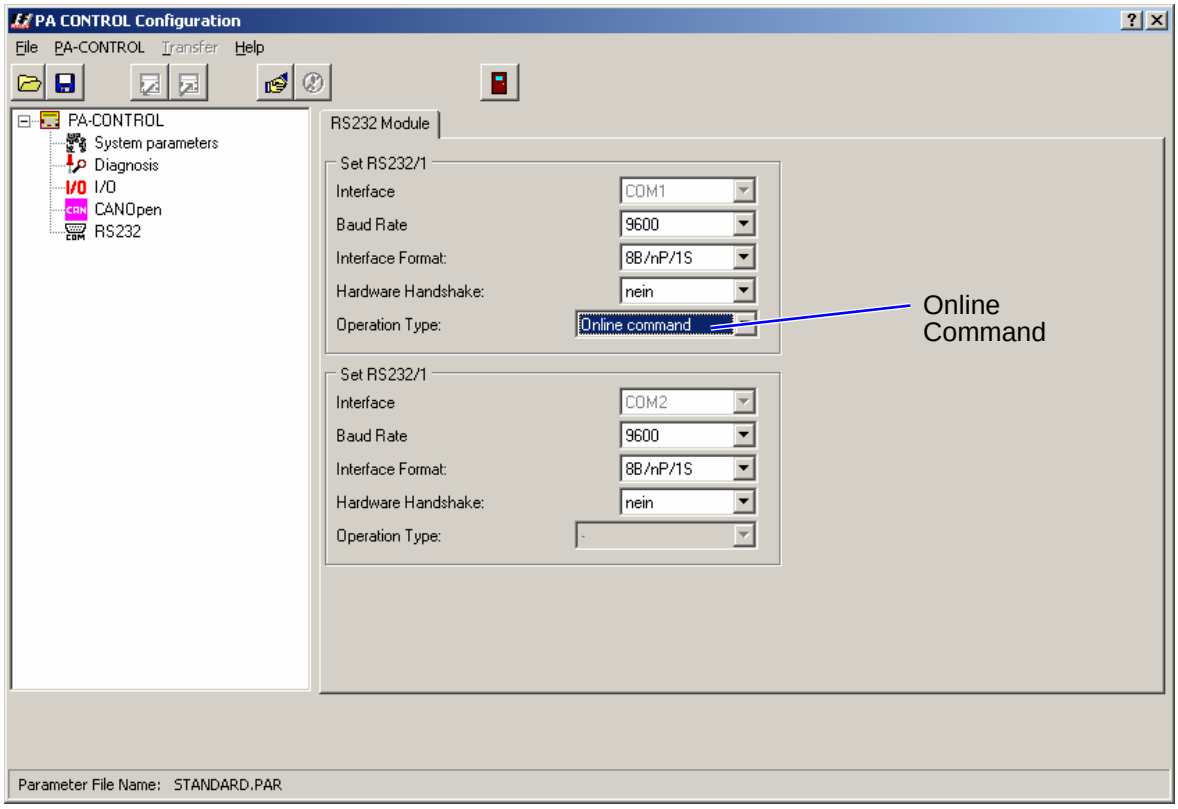


Figure 12: Ports of CPU5

X26 (internal slot J2)	All IEF modules except Profibus
X25 (internal slot J3)	All IEF modules

3.2.4 Setting the transmission format with the WinPAC program

The transmission format of the RS232 port can also be set with the **WinPAC** program.



NOTE Make sure that the operating mode “online command” is selected for the operating mode in the list field of the same name.

3.3 Principle of data transmission

SOH, STX, ETX, and EOT are used as control symbols for the transmission. The individual data fields are separated by a semicolon. The sequence of the parameters is set. All data fields must be present for the transmission. If a data field has no function (empty value), enter a 0.

Function	Name	Number of symbols
Sequence start (start of transmission)	SOH (01_{hex})	1
Start of text	STX (02_{hex})	1
Command code	**CMD**	**4**
Separation symbols	;	1
Command parameter	**PAR_1**	**1-n**
Separation symbols	;	1
Data type command date	**TYP_PAR_2**	**1**
Separation symbols	;	1
Command date	**PAR_2**	**1-n**
End of text	ETX (03_{hex})	1
XOR sum of the digits	CHECK	1-3
End of transmission	EOT (04_{hex})	1

Principle:

SOH STX [CMD] ; [PAR_1] ; [TYP_PAR_2] ; [PAR_2] ETX [CHECK] EOT

Note: Command code, command parameter, data type and command date are transmitted as ASCII $_{(hex)}$ symbols.

Command code: 4 ASCII symbols that represent the command to be performed (see chapter commands), e.g.: “Get position of the axis”, “set output”, “ start AUTOMATIC”, etc.

Command parameter: Number of the desired element of the control, e.g.: Number of the output, number of the axis, etc.

Data types command date: To process the command, the transmitted command date has to be converted into a data type for the control (integer, float).

“0”: Command date is converted into an integer (N register, system parameters, etc.)

“1”: Command date is converted into a float number (axis position, R register, axis parameters, etc.)

Command date: Value transmitted, e.g.: new registry value, target position for an axis, etc.

The lists of possible parameters are saved in the command description.

3.3.1 Acknowledgement by PA-CONTROL:

Function	Name	Number of symbols
Sequence start (start of transmission)	SOH (01_{hex})	1
Start of text	STX (02_{hex})	1
Command error number	**QUIT**	**1-n**
Separation symbols	;	1
End of processing flag	**BE**	**1**
Separation symbols	;	1
Operating status of the PA-CONTROL	**STATUS**	**1-n**
Separation symbols	;	1
PA-CONTROL error number	**ERROR**	**1-n**
Separation symbols	;	1
Data types for acknowledgement date	**TYP_QUIT**	**1**
Separation symbols	;	1
Acknowledgement date	**Q_PAR**	**1-n**
End of text	ETX (03_{hex})	1
XOR sum of the digits	CHECK	1-3
End of transmission	EOT (04_{hex})	1

Principle:

SOH STX [QUIT] ; [BE] ; [STATUS] ; [ERROR] ; [TYP_QUIT] ; [Q_PAR] ETX [CHECK] EOT

Note: The data for command error numbers, processing end flag, operating status of the PA-CONTROL, error number, data type and acknowledgement date are transmitted as ASCII $_{(hex)}$ symbols.

Command error number : If a command is unknown or cannot be processed in this operating status or if there is an error in the command data, the PA-CONTROL enters the respective error number. If there are no errors, the command error number returned is “0”.

End of processing flag: If a command cannot be completed (moving an axis), the command is nonetheless acknowledged immediately. The “end of processing flag” is set to “0” upon acknowledgement.
If the end of processing is to be checked by the master, another acknowledgement is requested when the end recognition symbol EOT(04_{hex}) – also called the poll command – is sent.
The master can (has to) repeat the process until the end of processing flag is set to “1”.

Operating status of the PA-CONTROL: current operating status of the PA-CONTROL, e.g.: “home position”, “automatic”, etc.

PA-CONTROL error number: If an error occurs during the processing of programs or the performance of a drive command or if a hardware configuration error is present (PA-CONTROL flashes with Exxx), the respective error number is entered here.

Data type for acknowledgement date : see data type command date

Acknowledgement date: result of a command, e.g.: “Position of the axis”, “Content of the N register”, etc.

3.4 Examples

3.4.1 Describing integer register N5 with content 12345

Send data:

Command code	CMD	**0906**
Command parameter	PAR_1	**5**
Data type command date	TYP:PAR_2	**0**
Command date	PAR_2	**12345**

Principle: SOH STX [CMD] ; [PAR_1] ; [TYP_PAR_2] ; [PAR_2] ETX [CHECK] EOT

Data sequence *SOH STX 0 9 0 6 ; 5 ; 0 ; 1 2 3 4 5 ETX **7** EOT*

Data sequence $_{ASCII}$ 01 02 30 39 30 36 3B 35 3B 30 3B 3132 33 34 35 03 37 04

Acknowledgement data:

Command error number	QUIT	0
End of processing flag	BE	1
Operating status of the PAC	STATUS	1
PA-CONTROL error number	ERROR	0
Data type for acknowledgement date		TYP_QUIT 0
Acknowledgement date	Q_PAR	12345

Principle:

SOH STX [QUIT] ; [BE] ; [STATUS] ; [ERROR] ; [TYP_QUIT] ; [Q_PAR] ETX [CHECK] EOT

Data sequence:

*SOH STX 0 ; 1 ; 1 ; 0 ; 0 ; 1 2 3 4 5 ETX **5 7** EOT*

Data sequence $_{ASCII}$:

01 02 30 3B 31 3B 31 3B 30 3B 30 3B 31 32 33 34 35 03 35 37 04

3.4.2 Complex example 1 / command sequence

The following commands are to be worked off one after the other:

- Get the status of input 5 — Code **1900**,
- Read integer register 2 — Code **1906**,
- Describe the integer register 3 with the number 333 — Code **0906** and
- Read real number register 1 — Code **1907**.

For this sequence of commands, the command date and acknowledge date are displayed.

Command 1 of the command sequence, “Get the status of input 5”

Send data:

Command code	CMD	**1900**
Command parameter	PAR_1	**5**
Data type command date	TYP:PAR_2	**0**
Command date	PAR_2	**0**

Principle: SOH STX [CMD] ; [PAR_1] ; [TYP_PAR_2] ; [PAR_2] ETX [CHECK] EOT

Data sequence $_{ASCII}$: 01 02 31 39 30 30 3B 35 3B 30 3B 30 03 36 04

Acknowledgement data:

Principle:

SOH STX [QUIT] ; [BE] ; [STATUS] ; [ERROR] ; [TYP_QUIT] ; [Q_PAR] ETX [CHECK] EOT

Data sequence $_{ASCII}$: 01 02 30 3B 31 3B 31 3B 30 3B 30 3B 31 03 35 37 04

Command error number	QUIT	0
End of processing flag	BE	1
Operating status of the PAC	STATUS	1
PA-CONTROL error number	ERROR	0
Data type for acknowledgement date	TYP_QUIT	0
Acknowledgement date	Q_PAR	1

The acknowledgement date tells you: Input 5 = logical 1

Command 2 of the command sequence, “Read integer register 2”

Send data:

Command code	CMD	**1906**
Command parameter	PAR_1	**2**
Data type command date	TYP:PAR_2	**0**
Command date	PAR_2	**0**

Principle: SOH STX [CMD] ; [PAR_1] ; [TYP_PAR_2] ; [PAR_2] ETX [CHECK] EOT

Data sequence $_{ASCII}$: 01 02 31 39 36 30 3B 32 3B 30 3B 30 03 36 04

Acknowledgement data:

Principle:

SOH STX [QUIT] ; [BE] ; [STATUS] ; [ERROR] ; [TYP_QUIT] ; [Q_PAR] ETX [CHECK] EOT

Data sequence $_{ASCII}$: 01 02 30 3B 31 3B 31 3B 30 3B 30 3B 32 32 32 03 35 38 04

Command error number	QUIT	0
End of processing flag	BE	1
Operating status of the PAC	STATUS	1
PA-CONTROL error number	ERROR	0
Data type for acknowledgement date	TYP_QUIT	0
Acknowledgement date	Q_PAR	222

The acknowledgement date tells you: Content of integer register 2 = 222.

Command 3 of the command sequence, “Describe the integer register 3 with number 333”

Send data:

Command code	CMD	**0906**
Command parameter	PAR_1	**3**
Data type command date	TYP:PAR_2	**0**
Command date	PAR_2	**333**

Principle: SOH STX [CMD] ; [PAR_1] ; [TYP_PAR_2] ; [PAR_2] ETX [CHECK] EOT

Data sequence $_{ASCII}$: 01 02 30 39 30 36 3B 33 3B 30 3B 33 33 33 03 34 04

Acknowledgement data:

Principle:

SOH STX [QUIT] ; [BE] ; [STATUS] ; [ERROR] ; [TYP_QUIT] ; [Q_PAR] ETX [CHECK] EOT

Data sequence $_{ASCII}$: 01 02 30 3B 31 3B 31 3B 30 3B 30 3B 33 33 33 03 35 39 04

Command error number	QUIT	0
End of processing flag	BE	1
Operating status of the PAC	STATUS	1
PA-CONTROL error number	ERROR	0
Data type for acknowledgement date	TYP_QUIT	0
Acknowledgement date	Q_PAR	333

The acknowledgement date tells you: The integer register 3 was described with the number 333.

Command 4 of the command sequence, “Read real number register 1”

Send data:

Command code	CMD	**1907**
Command parameter	PAR_1	**1**
Data type command date	TYP:PAR_2	**1**
Command date	PAR_2	**0**

Principle: SOH STX [CMD] ; [PAR_1] ; [TYP_PAR_2] ; [PAR_2] ETX [CHECK] EOT

Data sequence $_{ASCII}$: 01 02 31 39 37 31 3B 33 3B 30 3B 30 03 36 04

Warning: For this command, mind the set data type “real number / floating point number”

Acknowledgement data:

Principle:

SOH STX [QUIT] ; [BE] ; [STATUS] ; [ERROR] ; [TYP_QUIT] ; [Q_PAR] ETX [CHECK] EOT

Data sequence $_{ASCII}$:

01 02 30 3B 31 3B 31 3B 30 3B 31 3B 36 34 30 2E 30 30 30 30 03 32 31 04

Command error number	QUIT	0
End of processing flag	BE	1
Operating status of the PAC	STATUS	1
PA-CONTROL error number	ERROR	0
Data type for acknowledgement date	TYP_QUIT	1
Acknowledgement date	Q_PAR	640.0000

The acknowledgement date tells you: The content of the real number register 1 was 640.0000 at the time of the query.

3.4.3 Complex example 2 / command sequence

The following commands are to be worked off one after the other:

- Start online mode — Code **0603**,
- Move axis 2 to absolute position 5520.0 — Code **0A87**,
- Check the move of the axis during drive — 1. “Poll command”
- Check the move of the axis during drive — 2. “Poll command”
- Check the move of the axis at the end of drive — 3. “Poll command”

Command 1 in the command sequence, “Start online mode”

Send data:

Command code	CMD	**0603**
Command parameter	PAR_1	**0**
Data type command date	TYPE: PAR_2	**0**
Command date	PAR_2	**0**

Principle: SOH STX [CMD] ; [PAR_1] ; [TYP_PAR_2] ; [PAR_2] ETX [CHECK] EOT

Data sequence $_{ASCII}$: 01 02 30 41 30 33 3B 30 3B 30 3B 30 03 31 34 04

Acknowledgement data:

Principle:

SOH STX [QUIT] ; [BE] ; [STATUS] ; [ERROR] ; [TYP_QUIT] ; [Q_PAR] ETX [CHECK] EOT

Data sequence $_{ASCII}$: 01 02 30 3B 31 3B 33 31 3B 30 3B 30 3B 30 03 38 04

Command error number	QUIT	0
End of processing flag	BE	1
Operating status of the PAC*	STATUS	31
PA-CONTROL error number	ERROR	0
Data type for acknowledgement date	TYP_QUIT	0
Acknowledgement date	Q_PAR	0

The acknowledgement date tells you: Online mode

Note:

A list of the possible operating statuses of the PA-CONTROL is printed within the command description of the command “cmd_get_state, command code 190B”.

Command 2 of the command sequence, “Move axis 2 to absolute position 5520.0”

Send data:

Command code	CMD	**0A87**
Command parameter	PAR_1	**2**
Data type command date	TYP:PAR_2	**1**
Command date	PAR_2	**5552.0**

Principle: SOH STX [CMD] ; [PAR_1] ; [TYP_PAR_2] ; [PAR_2] ETX [CHECK] EOT

Data sequence $_{ASCII}$: 01 02 30 41 38 37 3B 32 3B 31 3B 35 35 35 32 2E 30 03 31 34 04

Acknowledgement date after the start of the command:

Principle:

SOH STX [QUIT] ; [BE] ; [STATUS] ; [ERROR] ; [TYP_QUIT] ; [Q_PAR] ETX [CHECK] EOT

Data sequence $_{ASCII}$:

01 02 30 3B 30 3B 33 31 3B 30 3B 31 3B 31 32 35 35 2E 30 30 30 03 33 38 04

Command error number	QUIT	0
End of processing flag	BE	0
Operating status of the PAC	STATUS	31
PA-CONTROL error number	ERROR	0
Data type for acknowledgement date	TYP_QUIT	1
Acknowledgement date	Q_PAR	1255.000

The acknowledgement date tells you: The axis was started, and the position when the axis started was 1255.000.

Acknowledgement data during drive received after output of 1st "poll command":

Data sequence:

01 02 30 3B 30 3B 33 31 3B 30 3B 31 3B 31 35 31 36 2E 39 35 30 03 34 32 04

Command error number	QUIT	0
End of processing flag	BE	0
Operating status of the PAC	STATUS	31
PA-CONTROL error number	ERROR	0
Data type for acknowledgement date	TYP_QUIT	1
Acknowledgement date	Q_PAR	1516.950

The acknowledgement date tells you: The axis was started. When the poll command was output, the axis was at position 1516.950.

Acknowledgement data during drive received after output of 2nd "poll command":

Data sequence:

01 02 30 3B 30 3B 33 31 3B 30 3B 31 3B 32 36 33 34 2E 37 35 30 03 33 36 04

Command error number	QUIT	0
End of processing flag	BE	0
Operating status of the PAC	STATUS	31
PA-CONTROL error number	ERROR	0
Data type for acknowledgement date	TYP_QUIT	1
Acknowledgement date	Q_PAR	2634.750

The acknowledgement date tells you: The axis was started. When the poll command was output, the axis was at position 2634.750.

Acknowledgement data at the end of drive received after output of 3rd "poll command":

Data sequence:

01 02 30 3B 31 3B 33 31 3B 30 3B 31 3B 35 35 35 32 2E 30 30 30 03 33 35 04

Command error number	QUIT	0
End of processing flag	BE	1
Operating status of the PAC	STATUS	31
PA-CONTROL error number	ERROR	0
Data type for acknowledgement date	TYP_QUIT	1
Acknowledgement date	Q_PAR	5552.000

The acknowledgement date tells you: The axis has reached target position. It is at the target position 5552.000.

4. Interbus-S

4.1 Generalities

The following applications are made possible with the installation of the optional Interbus-S card (IBS2) in the devices of the PA-CONTROL family.

The PA-CONTROL is integrated as a slave in the 2-line remote bus in an Interbus-S system. The PA-CONTROL occupies 64 bits or data points in the Interbus-S.

In order to accommodate the many possibilities and requirements of the PA-CONTROL, various meanings have been assigned to the 64 bits (see the section “commands, use of the data words” in the same chapter)

From the perspective of the Interbus-S master, there are the following possibilities:

	Operating mode of the PA-CONTROL			
	Home position	Manual Mode	Automatic	Online
Access to inputs and outputs	Yes	Yes	Yes	Yes
Access to flag, register	Yes	Yes	Yes	Yes
Access to system and axis parameters	Yes	No	No	no
Call axis position	Yes	Yes	Yes	yes
Move axes	No	No	No	yes
Start, stop automatic	Yes	No	Yes	No
Cancel automatic	No	No	Yes	No
Start, stop online	Yes	No	No	No
Cancel online	No	No	No	Yes

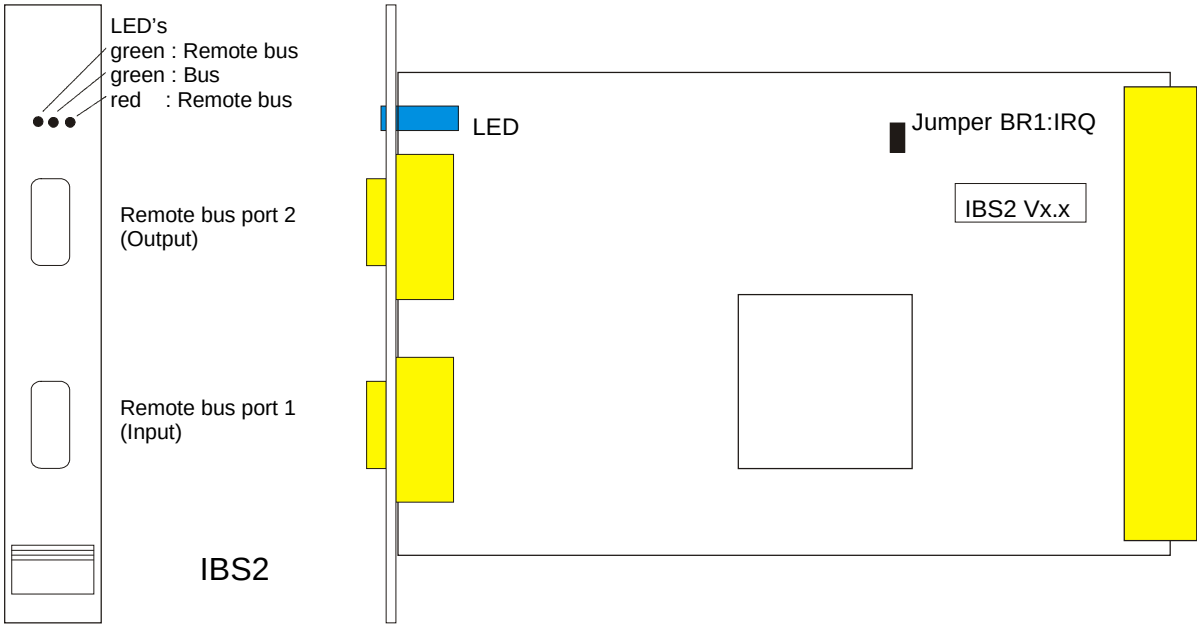
CAUTION

The connection of the PA-CONTROL to an Interbus-S network is done based on the “**set-up guidelines of the Interbus**”. Please mind the respective regulations.

4.2 Initiation

4.2.1 Installation of the Interbus-S card

The Interbus-S card is a EURO bus card and can be inserted in any slot of the PA-CONTROL's EURO bus. It is automatically recognized when the PA-CONTROL is switched on.



Pin assignment	Remote bus port 1	Pin assignment	Remote bus port 2
1	TPDO2	1	TPDO2
2	TPDI1	2	TPDI2
3	GND	3	GND
4	not assigned	4	not assigned
5	not assigned	5	BR
6	/TPDO1	6	/TPDO2
7	/TPDI1	7	/TPDI2
8	not assigned	8	not assigned
9	not assigned	9	BR

NOTE Always use the remote bus cable according to the specifications of Phoenix Contact.

4.2.2 Use of data words

The PA-CONTROL is not a passive I/O terminal, but an active control with numerous inputs and outputs, sometimes several axes to be positioned, various registers and flags. In addition, there are system and axis parameters whose settings considerably influence the flows.

All of this information must be transmitted via the Interbus-S. For this reason, a specific 64-bit protocol was defined for the PA-CONTROL.

Data transmission *Master → PA-CONTROL*:

16-Bit-word 0		16-Bit-word 1		16-Bit-word 2		16-Bit-word 3	
High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
PAC byte 0	PAC byte 1	PAC byte 2	PAC byte 3	PAC byte 4	PAC byte 5	PAC byte 6	PAC byte 7
M byte 0	M byte 1	M byte 2	M byte 3	M byte 4	M byte 5	M byte 6	M byte 7
32-bit **command date** MSB LSB				16-Bit-**Command parameter** MSB LSB		**Send flag (Bit15) and command code (Bit 14 – Bit 0)**	
Not used		16-bit **command date** MSB LSB					
Examples							
“empty, not used”				“number of the axis”		“Get axis position”	
“value for the N register (32 bit hex format)”				“number of the N register”		“set n register to value	
desired status of the output (0/1)				“number of the output”		“set output to status”	

Data transmission *PA-CONTROL → Master* :

16-Bit-word 0		16-Bit-word 1		16-Bit-word 2		16-Bit-word 3	
High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
PAC byte 0	PAC byte 1	PAC byte 2	PAC byte 3	PAC byte 4	PAC byte 5	PAC byte 6	PAC byte 7
M byte 0	M byte 1	M byte 2	M byte 3	M byte 4	M byte 5	M byte 6	M byte 7
32-bit acknowledge date MSB LSB				PA-CONTROL error flag (bit 15)	PA-CONTROL Operating state (Bits 7-0)	Flags: - Receive (Bit 15) - Command error (bit 14) - Processing end (bit 13) Command error number (Bits 12-0)	
		16-bit acknowledge date					
		MSB LSB					
Examples							
“Axis position (32 bit IEEE format)”				See ch. 2.3.2			
“value of an N register (32 bit hex format)”							
“not used”		Input word					

4.2.3 Synchronization and data analysis

The processes

- "Processing of I/O data in the master control" (SPC cycle),
- "Update of the Interbus-S data by the Interbus-S master" and
- "Processing the Interbus-S command in the PA-CONTROL"

run asynchronously. It thus became necessary to define additional flags in the transmission and reception data of the PA-CONTROL:

- **SEND** – Flag (Master send data),
- **RECEIVE** flag (Slave send data) and
- **PROCESSING END** flag (Slave send data).

Two additional flags were added to simplify the analysis of the PA-CONTROL data:

- **COMMAND ERROR** flag (Slave send data) and
- **PA-CONTROL ERROR** flag (Slave send data).

SEND flag :

The master control toggles the SEND flag once all the data for the next command have been entered. For the PA-CONTROL, these changes in the SEND flag (from 0 to 1 or from 1 to 0) mean that a new command is pending for processing.

RECEIVE flag and END OF PROCESSING flag :
Once the PA-CONTROL has recognized that a new command is pending due to the change in the SEND flag, it starts the processing. The PA-CONTROL enters the acknowledge data in the PA-CONTROL send data.

If the command has already been completed at this point, for instance when a register was set, the PROCESSING END FLAG is set to "1" and the RECEIVE flag is set to the status of the SEND flag.

If the command has not yet been completed at this point, for instance when an axis is moving, the PROCESSING END FLAG is set to "0" and the RECEIVE flag is set to the status of the SEND flag. Once the command has been completely processed, the END OF PROCESSING flag is set to "1" by the PA-CONTROL.

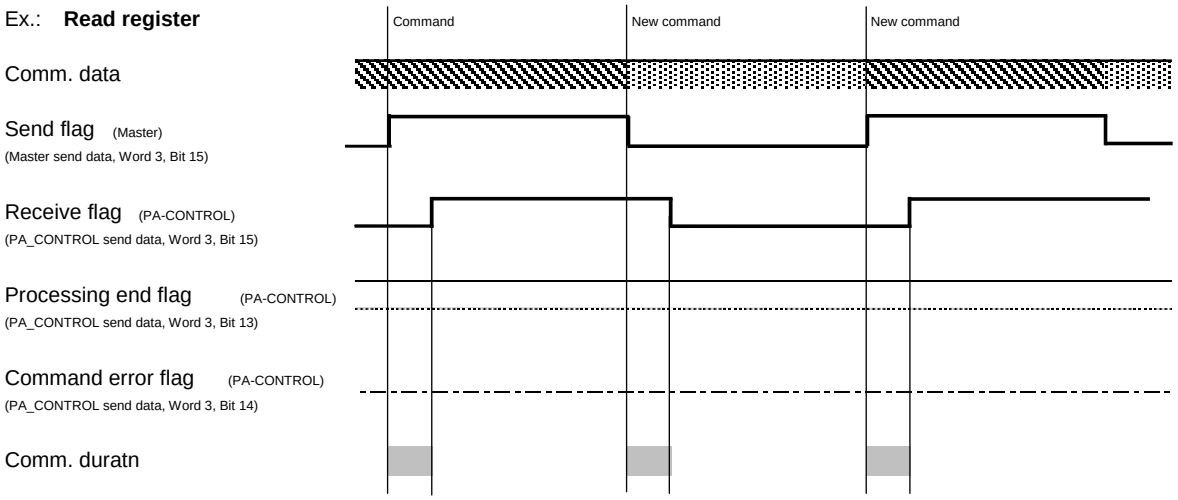
COMMAND ERROR flag:
If the PA-CONTROL detects an error during processing a command, the respective error code is entered in the area for the command error number, the command error flag is set to "1", and the adaptation of the status of the RECEIVE flag to the master control's SEND flag signals that the command has been recognized but not processed.

PA CONTROL ERROR flag:

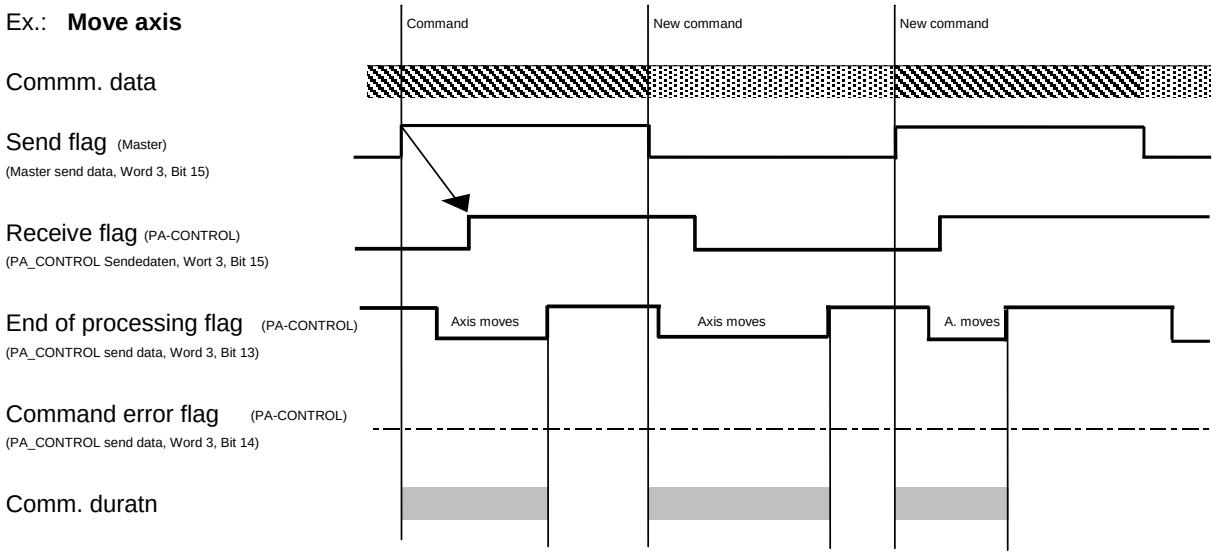
If a general error occurs during the processing of errors in the PA-CONTROL, this bit is set. The master can then retrieve and interpret the error number with the command "cmd_get_error", code "1909".

Examples of the synchronization of communication using flags:

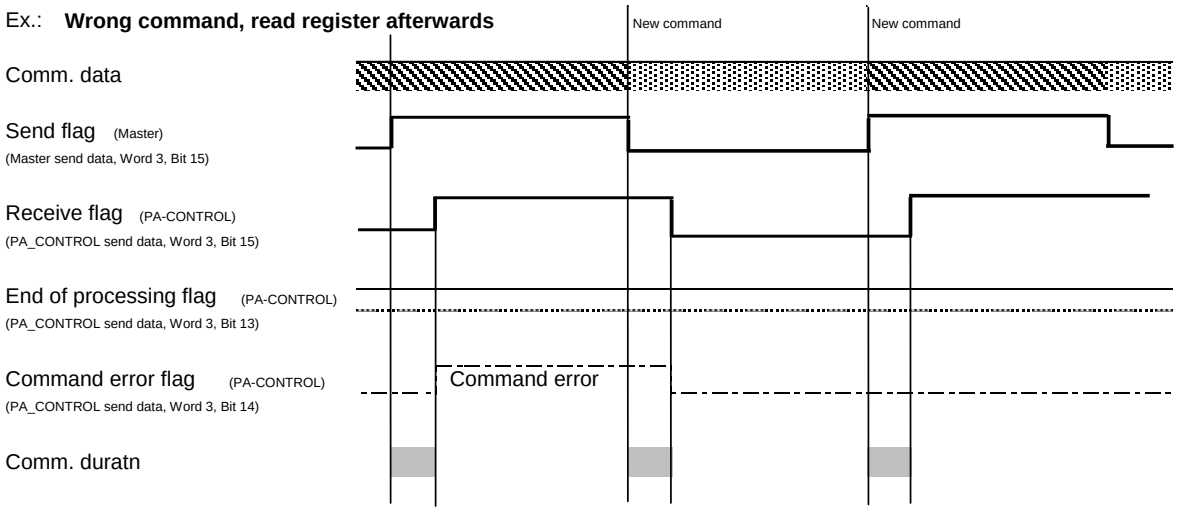
Ex.: **Read register**



Ex.: **Move axis**



Ex.: **Wrong command, read register afterwards**



Assignment of the flags to the acknowledgement data

PA-CONTROL – send data (acknowledge data)

Word 3 (Bit 0-15)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RF	KF	BF		Command error number											

RF : Receive flag
KF : Command error flag
BF : End of processing flag

Command error number: see chapter 6

PA CONTROL: Send data (acknowledgement data)

Word 2 (Bit 0-15)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FE								PA-CONTROL operating status							

FE : Error in **PA-CONTROL**

Code operating mode (operating status)
00_{dec} no communication via Interbus-S possible (not initialized correctly)
01_{dec} Initial position
02_{dec} Manual operation via IEF- control panel
10_{dec} Automatic mode started
11_{dec} in automatic mode
12_{dec} in automatic mode and “STOP” recognized
13_{dec} in automatic mode and process program “Stop”
15_{dec} in automatic mode and stopped
16_{dec} in automatic mode and process program “Start” after “Stop”
17_{dec} in automatic mode and “MALFUNCTION” recognized
18_{dec} in automatic mode and process program “Malfunction”
19_{dec} in automatic mode with malfunction and stopped

20_{dec} Serial manual mode

31_{dec} Online mode
35_{dec} Online mode and stopped
39_{dec} ONLINE mode with malfunction and stopped

Acknowledgement mechanism

SF / RF	KF	BF	Command
SF≠RF	x	x	not recognized yet
SF=RF	1	x	Command error (see command error number)
SF=RF	0	0	Recognized, but not executed yet
SF=RF	0	1	Recognized and executed

Explanation IEEE-format

	Word 0																Word 1															
Hex	**Byte 0**				**Byte 1**				**Byte 2**				**Byte 3**				**Byte 4**				**Byte 5**				**Byte 6**				**Byte 7**			
Ex.:	4				4				2				0				2				0				0				0			
Bit	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	V	Exponent								Mantissa																						
2nd Pot.		2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}	2^{-16}	2^{-17}	2^{-18}	2^{-19}	2^{-20}	2^{-21}	2^{-22}	2^{-23}
Value		128	64	32	16	8	4	2	1																							

Prefix " V "

0: Prefix is "+" (plus)
1: Prefix is "-" (minus)

CAUTION DEFINITION IEEE FORMAT

Exponent " e "

$$e = \sum_{i=0}^{7} Bit * 2^i$$

Mantissa " f "

$$f = \sum_{i=-1}^{-23} Bit * 2^i$$

Number

$$\text{Real number} = V(\pm)\ [\ \{1+f\} * 2^{e-127}\ ]$$

Examples:

40 16 00 00	corresponds to the real number	+	0,34375
41 20 00 00		+	10,00000
43 48 00 00	"	+	200,00000
44 20 20 00	"	+	640,00000
44 A8 00 00	"	+	20480,00000

4.2.4 Complex example

The following commands are to be worked off one after the other:

- Get the status of input 5 Code **1900**,
- Read integer register 2 Code **1906**,
- Describe the integer register 3 with the number 333 Code **0906** and
- Read real number register 1 Code **1907**.

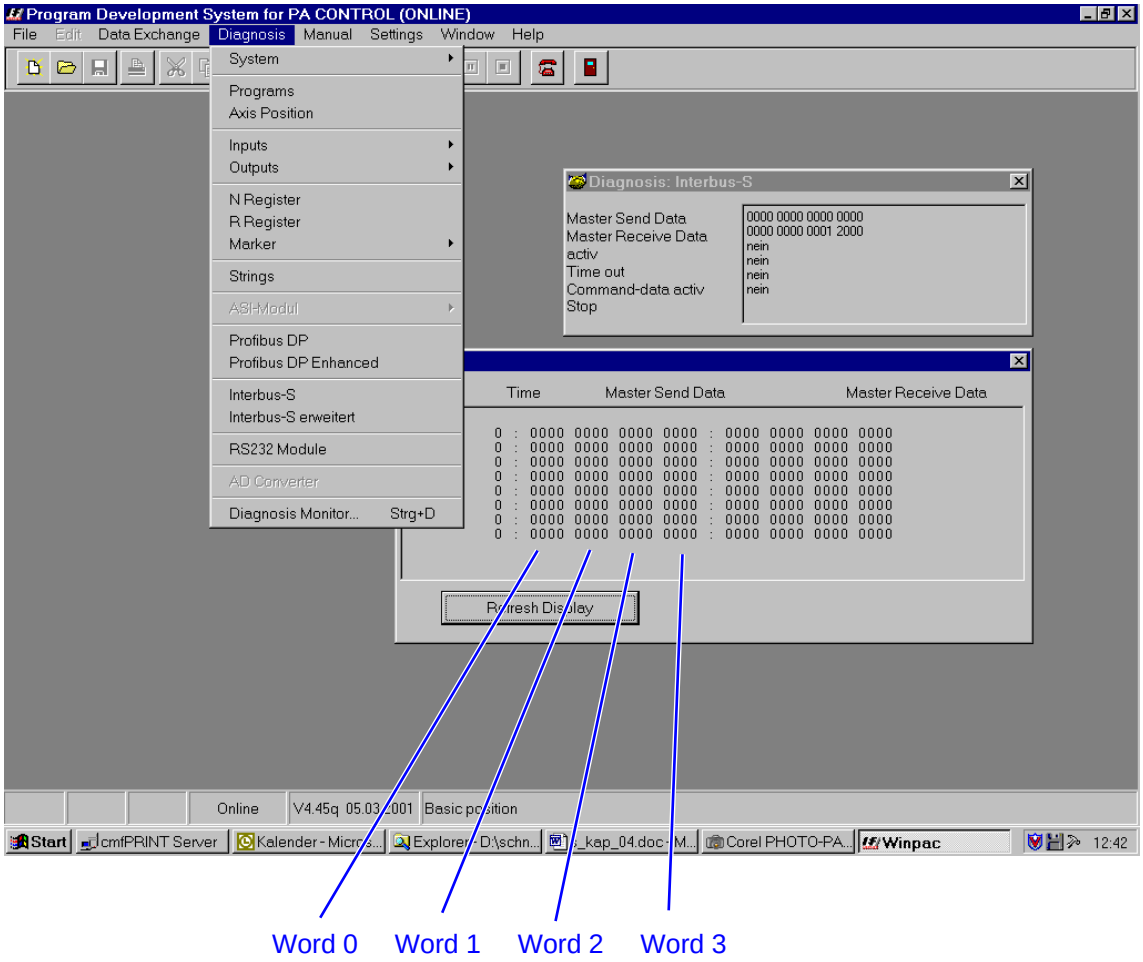
For this sequence of commands, the command date and acknowledge date are displayed.

Action	Master send data (hex)	PA-CONTROL – send data (hex)
	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
Get the status of input 5 (Command code & parameter) SEND flag toggle	00 00 00 00 00 05 19 00 00 00 00 00 00 05 99 00	
Reply of the PA-CONTROL		00 00 00 01 00 01 A0 00
Read integer register 2 (Command code & parameter) SEND flag toggle	00 00 00 00 00 02 99 06 00 00 00 00 00 02 19 06	
Reply of the PA-CONTROL		00 BC 61 4E 00 01 02 00 (corresponds to the number **12345678)**
Describe integer register 2 (Command code & parameter) SEND flag toggle	00 00 01 4D 00 03 09 06 00 00 01 4D 00 03 89 06	
Reply of the PA-CONTROL		00 00 01 4D 00 01 A0 00 The number **333** was loaded to register N2
Read real number register 1 (Command code & parameter) SEND flag toggle	00 00 00 00 00 01 99 07 00 00 00 00 00 01 19 07	
Reply of the PA-CONTROL		44 20 20 00 00 01 02 00 The real number register contains the number **640.0**

4.2.5 Diagnosis

With the automatic recognition of the Interbus-S card, configuration is also done.

The diagnosis is done with the aid of the WINPAC program development system.

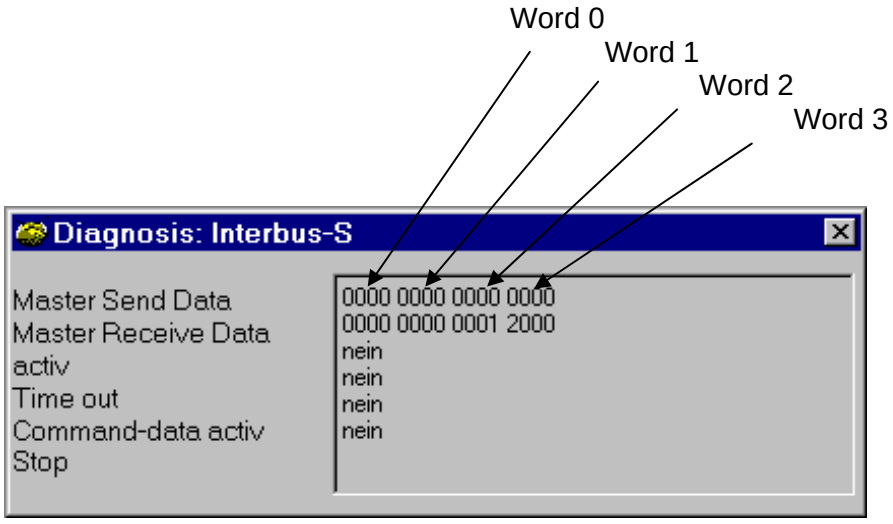


In the **Diagnosis** menu, the two windows

Diagnosis: Interbus-S and **Diagnosis Interbus-S extended**

can be displayed.

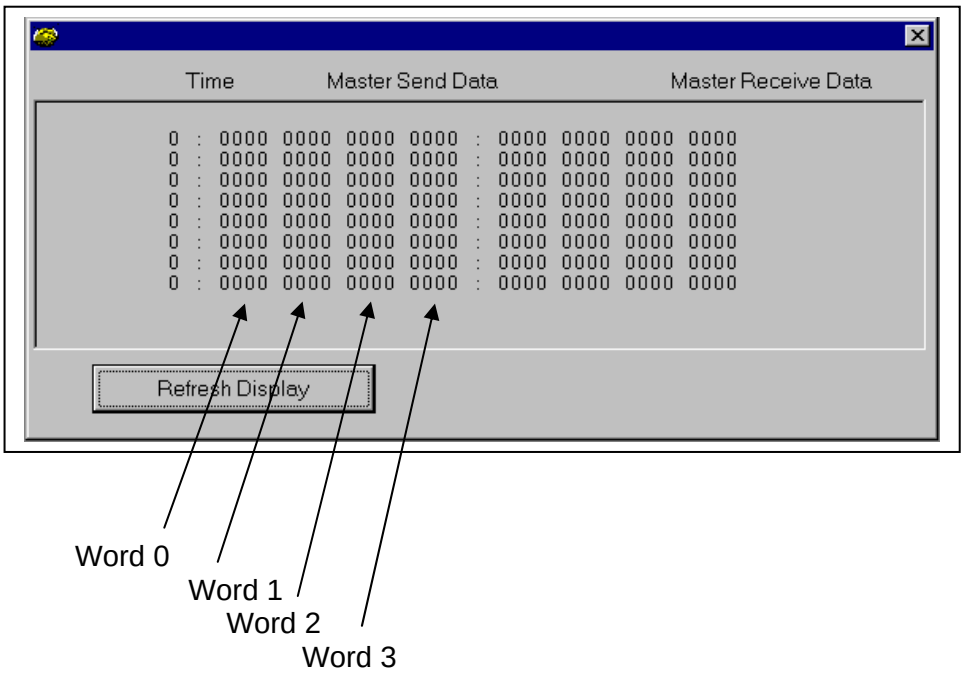
Diagnosis: Interbus S



Active:	The Interbus-S master transfers new data via the bus
Time out:	The Interbus-S master has not sent any new data via the bus for more than 10 seconds.
Command data active:	The master control has transmitted PA-CONTROL commands.
Emergency stop:	The Interbus-S master has set all data to “0”. Once communication has been activated, this means “EMERGENCY STOP”.

Diagnosis: Interbus-S extended

In the window “diagnosis: Interpose-S extended”, the last 8 communication events are saved. The time resolution is n * 10ms.



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5. Commands

5.1 Command overview

5.1.1 Commands for changing operating modes

Validity	Initial position	Manual	Automatic	Online
0600			**X**	
0602	**X**			
0603	**X**			

Command	Code (hex)	Brief description of commands
cmd_stop	0600	“STOP” automatic, “STOP” positioning (corresponds to “STOP” key)
cmd_start_auto	0602	Go from initial position to automatic operation and process the “Start” program
cmd_start_online	0603	Go from initial position into ONLINE mode

5.1.2 Commands for the transmission of system parameters

Validity	Initial position	Manual	Automatic	Online
All commands	**X**			

Command	Code (hex)	Brief description of commands
cmd_set_system_parameter	0700	Transfers the system parameters from the Master to the PA-CONTROL
cmd_get_system_parameter	1700	Gets the system parameters from the Master to the PA-CONTROL
cmd_get_system_parameter_max	1701	Gets the maximum limit values of the system parameters
cmd_get_system_parameter_min	1702	Gets the minimal limit values of the system parameters

5.1.3 Commands for the transmission of axis parameters

Validity	Initial position	Manual	Automatic	Online
All commands	**X**			

Command	Code (hex)	Brief description of commands
cmd_set_axis_parameter	0800	Transfers the axis parameters from the master to the PA-CONTROL
cmd_get_axis_parameter	1800	Gets the axis parameters from the master to the PA-CONTROL
cmd_get_axis_parameter_max	1801	Gets the maximum limit values of the axis parameters
cmd_get_axis_parameter_min	1802	Gets the minimum limit values of the axis parameters

5.1.4 PA-CONTROL – elements – commands

Validity	Initial position	Manual	Automatic	Online
All commands	**X**	**X**	**X**	**X**

Command	Code (hex)	Brief description of commands
cmd_get_single_input	1900	Query the status of an input
cmd_get_input_word	1901	Query status of an input word (16 inputs)
cmd_put_single_output	0902	Set status of an output
cmd_get_single_output	1902	Query status of an output
cmd_put_output_word	0903	Overwrite output word
cmd_get_output_word	1903	Read output word (16 outputs)
cmd_put_single_flag	0904	Change status of a flag
cmd_get_single_flag	1904	Query status of a flag
cmd_put_flag_word	0905	Overwrite flag word
cmd_get_flag_word	1905	Read flag word

Continuation PA-CONTROL element commands

Command	Code (hex)	Brief description of commands
cmd_put_int_reg	0906	Write to integer register
cmd_get_int_reg	1906	Read integer register
cmd_put_float_reg	0907	Write to real number register
cmd_get_float_reg	1907	Read real number register
cmd_reset_error	0909	RESET system error
cmd_get_error	1909	Get error number from PA-CONTROL
cmd_get_stat	190B	Get current operating mode from PA-CONTROL
cmd_get_actual_pos	190C	Get current position of axis
cmd_get_actual_speed	190D	Get current traverse speed
cmd_get_rotation_control_pos	190D	Get current shaft encoder position (only PA-CONTROL EP)
cmd_get_max_towfault	190F	Get maximum towfault occurred (only PA-CONTROL EP)
cmd_get_status_axis	1910	Get status of a defined axis
cmd_get_status_all_axis	1911	Get status of all axes
cmd_get_axis_traverse_area_min	1913	Get the min. traverse area of an axis
cmd_get_axis_traverse_area_max	1914	Get the max. traverse area of an axis
cmd_get_axis_following_error	1915	Get current towfault of an axis (only PA-CONTROL EP)
cmd_get_temperature	1920	Get the current cooler temperature of a power output stage (only PA-CONTROL EP)
cmd_get_extended_status_axis	1921	Get the extended status of a defined axis
cmd_send_system_flag	934	Get the system flag from the PA-CONTROL
cmd_send_system_n_reg	935	Get system N register from the PA-CONTROL
cmd_send_sende_r_reg	0937	Get system R register from the PA-CONTROL

*

5.1.5 Commands for automatic mode

Validity	Initial position	Manual	Automatic	Online
0A41			**X**	

Command	Code (hex)	Brief description of commands
cmd_abort_auto	0A41	Abort automatic mode and change to initial position (e.g. stop positioning)

5.1.6 Commands for online mode

Validity	Initial position	Manual	Automatic	Online
All commands				**X**

Command	Code (hex)	Brief description of commands
cmd_abort_online	0A81	Abort ONLINE mode
cmd_put_no_referenc	0A83	Suppress reference drive (G25.A0)
cmd_put_start_referenc	0A84	Start reference drive for axis (G25.A1)
cmd_put_position_null	0A85	Set absolute counter of X axis to zero (G26.A1)
cmd_put_set_position	0A86	Set scale of X axis (G29.A1)
cmd_pos_axis_absolut	0A87	Traverse axis to absolute position
cmd_pos_axis_relativ	0A89	Move axis to a relative value
cmd_set_speed	0A8D	Set speed for axis i
cmd_set_acceleration	0A8E	Set acceleration for axis i
cmd_start_manuell_axis_absolut	0A90	Manual traversing: START axis absolute
cmd_start_manuell_axis_relativ	0A91	Manual traversing: START axis relative

Continuation of the commands for online mode

Command	Code (hex)	Brief description of commands
cmd_control_move_axis	0A92	Get the current position of an axis
cmd_stop_axis	0A93	Stop the current drive of an axis
cmd_start_axis_absolut	0A94	Traverse axis to absolute position
cmd_start_axis_relativ	0A95	Move axis to a relative value
cmd_set_measuring_mode	0AA0	Activates the measuring mode for an axis
cmd_reset_axis_measuring_mode	0AA1	Deactivates the measuring mode for an axis
cmd_put_limit_switch_monitoring_on_off	0AA2	Switch limit switch monitoring off or on
cmd_put_condition_move_axis	0AA3	Move the axis during the next traversing “as long as condition is fulfilled”

5.2 Command description

cmd_xxx

Each command consists of a command code, a command parameter and a command date independent from the transmission type. The PA-CONTROL sends the acknowledgement data consisting of the command acknowledgement, the operating status and the acknowledgement date to the master. For a detailed description of the data transmitted, see the chapters for Profibus DP, Interbus S and RS232.

Master send data:

Command code**:**	The code of the command to be carried out is entered in the master send data.
Command parameters:	The command parameter contains the number of the receiver, e.g. the number of the output, a register or an axis, etc. The maximum allowable command parameter is dependent on the configuration of the **PA-CONTROL.** If the entered value is too high, the **PA-CONTROL** responds with following error message: “value not allowed”.
Command date:	The value or status for the command parameter is entered in the command date, e.g. set / reset a flag or output, new value of a register, absolute or relative position of an axis.
Description:	Purpose and detailed explanation of the command.

Command code, command parameter and command date are displayed for every command!

The use data are first provided for sending a message to the **PA-CONTROL** via Profibus DP. If the data are complete, the send flag **SF** is changed (master word 3, bit 15). The data entered are taken over by the PA-CONTROL when the SF is changed. The SF can have the status 0 or 1.

Master receive data:

Operating status:	Home position, automatic, manual or online mode.
Acknowledgement date**:**	Value or status requested by the master. This may be current positions, traverse speeds, the statuses of flags, inputs and outputs, or the content of registers. **It is represented relative to the operating status or the acknowledgement date**

For examples of the commands, the data are displayed in various forms. The hexadecimal display is for transmission via Profibus DP and Interbus, and the decimal display is for the RS232 port. The data transmission for RS232 is in ASCII format.

Example :

Master send data:	Profibus/Interbus	RS232
Command code:	**1800**$_{hex}$	# **1800**
Command parameter	**021F** $_{hex}$	# **0543**$_{dec}$
Command date:	**0000** $_{hex}$	# **00000**$_{dec}$

Once completed without error:

Master **receive data:**

Acknowledgement date:	**0000 0000** $_{hex}$	# **0.0000**$_{dec}$

5.2.1 Commands for changing operating modes

cmd_stop

5.2.1.1 cmd_stop

Command code:	**0600**$_{hex}$ or **0600**
Command parameter:	--
Command date:	--
Acknowledgement date:	--
Description:	The command can be used in automatic mode and online mode.

1. The **PA-CONTROL** is in automatic mode and is being stopped.
The program execution is being stopped, and all running positionings are being stopped. The program flow will be continued again from the stopped place after a repeated start - **cmd_start_auto.**

The coding for automatic mode stopped (15) is only entered in operating mode when all axes have stopped and the stop program is finished. Running PAB programs are continued if they do not contain any drive commands.

2. The **PA-CONTROL** is in online mode and is being stopped.

The running positionings are stopped. Once the axes have reached standstill, the coding for “online mode stopped” (35) is entered in the operating status.

Example of application: Stop of automatic mode of the **PA-CONTROL**

Master send data:

	Profibus/Interbus		RS232
Command code:	**0600**$_{hex}$	#	**0600**
Command para. :	**0**$_{hex}$	#	**0**$_{dec}$
Command date:	**0**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Operating status:	**000F**$_{hex}$	#	**15**$_{dec}$

Result: Automatic mode is stopped.

cmd_start_auto

5.2.1.2 cmd_start_auto

Command code:	**0602**$_{hex}$	or **0602**
Command parameter:	--	
Command date:	--	
Acknowledgement date:	--	
Description:	The **PA-CONTROL** is in initial position and the automatic mode is started. The program defined as START-program is processed.	

Example of application:

Master send data:		Profibus/Interbus		RS232
	Command code:	**0602**$_{hex}$	#	**0602**
	Command para.:	**0** $_{hex}$		# **0**$_{dec}$
	Command date:	**0** $_{hex}$		# **0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Operating status:	**000B**$_{hex}$	#	**11**$_{dec}$

Result: Automatic mode is running.

cmd_start_online

5.2.1.3 cmd_start_online

Command code:	**0603_{hex}**	or **0603**
Command parameter:	--	
Command date:	--	
Acknowledgement date:	--	
Description:	The **PA-CONTROL** is in initial position and the online mode is started.	

Important note: Please keep in mind that one input has to be provided as the external stop and must have power for this operating mode!

Master send data:

	Profibus/Interbus		RS232
Command code:	**0603_{hex}**	#	**0603**
Command para.:	**0_{hex}**	#	**0_{dec}**
Command date:	**0_{hex}**	#	**0_{dec}**

PA-CONTROL acknowledgement data for error-free completion of command:

Operating status:	**$001F_{hex}$**	#	**31_{dec}**

Result: The PA-CONTROL was put into online status.

5.2.2 Commands for the transmission of system parameters

cmd_set_system_parameter

5.2.2.1 cmd_set_system_parameter

Command code:	**0700_{hex}**	or **0700**
Command parameter:	**0001_{hex} – $FFFF_{hex}$**	or **1_{dec} – 65535** $_{dec}$
Command date:	**0000_{hex} – FFFF $FFFF_{hex}$**	or **0_{dec} – +/-2147483647** $_{dec}$
Acknowledgement date:	**0000_{hex} – FFFF $FFFF_{hex}$**	or **0_{dec} – +/- 2147483647** $_{dec}$
Description:	The command transfers the system parameters from the master to the **PA-CONTROL**. The system parameters are transmitted as command parameters of the master send data. The command date contains the setting values.	

The following command parameters are possible:

Command parameters		System parameter
01_{hex}	/ 01_{dec}	Language
02_{hex}	/ 02_{dec}	Number of axes
03_{hex}	/ 03_{dec}	Start input number
(04_{hex})	/ 04_{dec}	Stop input number
05_{hex}	/ 05_{dec}	Manual release input number
06_{hex}	/ 06_{dec}	Readiness output number
07_{hex}	/ 07_{dec}	Malfunction output number
08_{hex}	/ 08_{dec}	Autostart
09_{hex}	/ 09_{dec}	currently not used
$0A_{hex}$	/ 10_{dec}	currently not used
$0B_{hex}$	/ 11_{dec}	currently not used
$0C_{hex}$	/ 12_{dec}	currently not used
$0D_{hex}$	/ 13_{dec}	currently not used
$0E_{hex}$	/ 14_{dec}	currently not used
$0F_{hex}$	/ 15_{dec}	Teleservice activate input number
10_{hex}	/ 16_{dec}	Teleservice contact output number
11_{hex}	/ 17_{dec}	Profibus DP address
12_{hex}	/ 18_{dec}	currently not used
13_{hex}	/ 19_{dec}	Profibus diagnosis active
14_{hex}	/ 20_{dec}	Basic operating mode of the **PA-CONTROL**

Example of application: Input 1 should be defined as the “start input number”.

Master send data:

	Profibus/Interbus		RS232
Command code:	**0700_{hex}**	#	**0700**
Command para. :	**0003_{hex}**	#	**3_{dec}**
Command date:	**$0000\ 0001_{hex}$**	#	**1_{dec}**

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

$0000\ 0001_{hex}$	#	**1_{dec}**

Result: Input **1** was successfully defined and transmitted as the “start input number”.

cmd_get_system_parameter

5.2.2.2 cmd_get_system_parameter

Command code:	**1700**$_{hex}$	or **1700**
Command parameter:	**0001**$_{hex}$ - **FFFF**$_{hex}$	or **1**$_{dec}$ – **65535** $_{dec}$
Command date:	--	
Acknowledgement date:	**0000**$_{hex}$ **– FFFF FFFF**$_{hex}$	or **0**$_{dec}$ – **+/- 2147483647** $_{dec}$
Description:	With this command, the system parameters are retrieved from the **PA-CONTROL** into the master. The system parameters are transmitted as command parameters of the master send data. The command date contains the setting values.	

For possible command parameters, see command **0700**

Example of application: Query the settings of the system parameter “language”.

Master send data:

	Profibus/Interbus		RS232
Command code:	**1700**$_{hex}$	#	**1700**
Command para.:	**0001** $_{hex}$	#	**1**$_{dec}$
Command date:	**0000 0000** $_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

0000 0003$_{hex}$	#	**3**$_{dec}$

Result: French is the set language.

cmd_get_system_parameter_max

5.2.2.3 cmd_get_system_parameter_max

Command code:	**1701**$_{hex}$	or **1701**
Command parameter:	**0000**$_{hex}$ - **FFFF**$_{hex}$	or **1**$_{dec}$ – **65535** $_{dec}$
Command date:	--	
Acknowledgement date:	**0000**$_{hex}$ **– FFFF FFFF**$_{hex}$	or **0**$_{dec}$ – **+/- 2147483647** $_{dec}$
Description:	The command gets the maximum limit values from the **PA-CONTROL** to the Master. The settings of the system parameters for the PA-CONTROL are possible between two limit values (min./max.). Depending on the configuration of the PA-CONTROL, the limit values may vary, for instance for the number of the axes. With this command, the maximum valid limit values can be called.	

For possible command parameters, see command **0700**

Example of application: get the max. number of axes from the PA-CONTROL

Master send data:

	Profibus/Interbus		RS232
Command code:	**1701**$_{hex}$	#	**1701**
Command para.:	**0002** $_{hex}$	#	**2**$_{dec}$
Command date:	**0000 0000**		**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

0000 0004$_{hex}$ # **00004**$_{dec}$

Result: A maximum of 4 axes can be addressed

cmd_get_system_parameter_min

5.2.2.4 cmd_get_system_parameter_min

Command code:	**1702**$_{hex}$	or **1702**
Command parameter:	**0000**$_{hex}$ - **FFFF**$_{hex}$	or **1**$_{dec}$ – **65535** $_{dec}$
Command date:	--	
Acknowledgement date:	**0000$_{hex}$ – FFFF FFFF$_{hex}$**	or **0**$_{dec}$ – **+/- 2147483647** $_{dec}$
Description:	The command gets the minimum limit values from the **PA-CONTROL** to the Master. The settings of the system parameters for the **PA-CONTROL** are possible between two limit values (min./max.). Depending on the configuration of the **PA-CONTROL**, the limit values may vary, for instance for the number of the axes. With this command, the valid minimum limit values can be called.	
Example of application:	get the max. number of axes from the PA-CONTROL	

Master send data:

	Profibus/Interbus		RS232
Command code:	**1702**$_{hex}$	#	**1702**
Command para.:	**0002** $_{hex}$	#	**2**$_{dec}$
Command date:	**0000 0000** $_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

0000 0000$_{hex}$ # **0**$_{dec}$

Result: The PA-CONTROL is a control unit. No axes are connected.

5.2.3 Commands for the transmission of axis parameters

cmd_set_axis_parameter

cmd_set_axis_parameter

Command code:	**0800**$_{hex}$	or **0800**
Command parameter:	**0101**$_{hex}$ – **10FF**$_{hex}$	or **0257**$_{dec}$ – **4351**$_{dec}$
Command date:	**32 bit real number,** parameter	
Acknowledgement date:	--	
Description:	The command transfers the axis parameters from the master to the **PA-CONTROL**. The axis numbers and the axis parameter numbers are transmitted in the command parameter of the master transmission data. The command date for Profibus-DP and Interbus-S contains the setting values in IEEE format. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”.	

The command parameter consists of two parts. The first part contains the number of the axis, while the second describes the axis parameter. The values belonging to the axis parameter is entered in the command date.

Axis number: part 1 of the command parameter

01_{hex}	/ 01_{dec}	Axis 1
02_{hex}	/ 02_{dec}	Axis 2
.....		
10_{hex}	/ 16_{dec}	axis 16

Axis parameter: part 2 of the command parameter

01_{hex}	/ 01_{dec}	Traverse speed
02_{hex}	/ 02_{dec}	Reference speed
03_{hex}	/ 03_{dec}	Manual speed
04_{hex}	/ 04_{dec}	Creep speed
05_{hex}	/ 05_{dec}	Start-Stop speed
06_{hex}	/ 06_{dec}	Acceleration
07_{hex}	/ 07_{dec}	Gear factor
08_{hex}	/ 08_{dec}	Minimum traverse area
09_{hex}	/ 09_{dec}	Maximum traverse area
$0A_{hex}$	/ 10_{dec}	Motor phase current
$0B_{hex}$	/ 11_{dec}	Motor standstill current
$0C_{hex}$	/ 12_{dec}	P share / not used at present
$0D_{hex}$	/ 13_{dec}	I share / not used at present
$0E_{hex}$	/ 14_{dec}	D share / not used at present
$0F_{hex}$	/ 15_{dec}	Encoder impulses per revolution

Continuation next page

Continuation axis parameters:

10_{hex}	/ 16_{dec}	Position window / not used at present
11_{hex}	/ 17_{dec}	Maximum towfault
12_{hex}	/ 18_{dec}	Distance limit switch / zero impulse / not used at present
13_{hex}	/ 19_{dec}	Nominal speed / not used at present
14_{hex}	/ 20_{dec}	P current regulator / not used at present
15_{hex}	/ 21_{dec}	I current regulator / not used at present
16_{hex}	/ 22_{dec}	Regulator type / not used at present
17_{hex}	/ 23_{dec}	Flow reference drive / not used at present
18_{hex}	/ 24_{dec}	Direction of rotation
19_{hex}	/ 25_{dec}	Rotation monitoring activated
$1A_{hex}$	/ 26_{dec}	Motor steps / rotation
$1B_{hex}$	/ 27_{dec}	Full motor steps / rotation
$1C_{hex}$	/ 28_{dec}	Axis limit switch exchanged
$1D_{hex}$	/ 29_{dec}	Display unit
$1E_{hex}$	/ 30_{dec}	Ramp type
$1F_{hex}$	/ 31_{dec}	Invert shaft encoder direction
20_{hex}	/ 32_{dec}	Limit switch type “closer”
21_{hex}	/ 33_{dec}	Distance zero point to reference switch
22_{hex}	/ 34_{dec}	Synchronization to shaft encoder
23_{hex}	/ 35_{dec}	Take-over of shaft encoder
24_{hex}	/ 36_{dec}	Activate brake in measuring mode
25_{hex}	/ 37_{dec}	Absolute pos. system activated*
26_{hex}	/ 38_{dec}	Absolute pos. system transmission cycle clock*
27_{hex}	/ 39_{dec}	Absolute pos. system break clock*
28_{hex}	/ 40_{dec}	Absolute pos. system analysis code*
29_{hex}	/ 41_{dec}	Absolute pos. system multiturn*
$2A_{hex}$	/ 42_{dec}	Absolute pos. system number data bits via SSI*
$2B_{hex}$	/ 43_{dec}	Absolute pos. system bit 25 function*
$2C_{hex}$	/ 44_{dec}	Absolute pos. system feed*
$2D_{hex}$	/ 45_{dec}	Absolute pos. system offset to reference point*
$2E_{hex}$	/ 46_{dec}	Absolute pos. system invert direction*
$2F_{hex}$	/ 47_{dec}	Absolute pos. system increments / rotation*
30_{hex}	/ 48_{dec}	Absolute pos. system max. number of revolutions*
31_{hex}	/ 49_{dec}	Absolute pos. system number of data bits for position analysis*
32_{hex}	/ 50_{dec}	Enable mode for axes

***** Note: For parameter info for the absolute position system, see opt. documentation “absolute position system”

Example of application: The acceleration 200 is to be loaded into the PA-CONTROL from the master for axis 3.

Master send data:

	Profibus/Interbus		RS232
Command code:	**0800**$_{hex}$	#	**0800**
Command para.:	**0306** $_{hex}$	#	**774**$_{dec}$
Command date:	**4348 0000** $_{hex}$	#	**200.00**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4348 0000	#	**200.00**$_{dec}$

Result: The acceleration 200.00 was successfully transmitted for axis 3.

cmd_get_axis_parameter

5.2.3.1 cmd_get_axis_parameter

Command code:	**1800**$_{hex}$	or **1800**
Command parameter:	**0101**$_{hex}$ – **10FF**$_{hex}$	or **0257**$_{dec}$ – **4351**$_{dec}$
Command date:	--	
Acknowledgement date:	**32 bit real number,** value of the axis parameter	
Description:	With this command, the axis parameters are retrieved from the **PA-CONTROL** into the master. The axis numbers and the axis parameter numbers are transmitted in the command parameter of the master transmission data. The queried values are transmitted in IEEE format in the acknowledgement date of the **PA-CONTROL** for Profibus-DP and Interbus-S. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”. For possible parameters, see command **0800**	

Example of application: There should be a query of whether the shaft encoder direction is inverted for axis 2.

Master send data:

	Profibus/Interbus		RS232
Command code:	**1800**$_{hex}$	#	**1800**
Command para.:	**021F** $_{hex}$	#	**0543**$_{dec}$
Command date:	**0** $_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

0000 0000$_{hex}$ # **0.00000**$_{dec}$

Result: The shaft encoder direction is not inverted.

cmd_get_axis_parameter_max

5.2.3.2 cmd_get_axis_parameter_max

Command code:	**1801**$_{hex}$ or **1801**
Command parameter:	**0101**$_{hex}$ – **10FF**$_{hex}$ or **0257**$_{dec}$ – **4351**$_{dec}$
Command date:	--
Acknowledgement date:	**32 bit real number,** maximum limit values
Description:	The command gets the maximum limit values of the axis parameters from the **PA-CONTROL** to the master. The axis numbers and the axis parameter numbers are transmitted in the command parameter of the master transmission data. The queried values are transmitted in IEEE format in the acknowledgement date of the **PA-CONTROL** for Profibus-DP and Interbus-S. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”. For possible parameters, see command **0800**
Example of application:	The traverse speed of axis 3 is to be loaded from the **PA-CONTROL**.

Master send data:

	Profibus/Interbus		RS232
Command code:	**1801**$_{hex}$	#	**1801**
Command para.:	**0301** $_{hex}$	#	**769**$_{dec}$
Command date:	**0** $_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4743 5000$_{hex}$ # **50000.00**$_{dec}$

Result: The maximum traverse speed of axis 3 was successfully transmitted. It is: 50000.00

cmd_get_axis_parameter_min

5.2.3.3 cmd_get_axis_parameter_min

Command code:	**1802**$_{hex}$	or **1802**
Command parameter:	**0101**$_{hex}$ – **10FF**$_{hex}$	or **0257**$_{dec}$ – **4351**$_{dec}$
Command date:	--	
Acknowledgement date:	**32 bit real number,** minimum limit values	
Description:	With this command, the axis parameters are retrieved from the **PA-CONTROL** into the master. The axis numbers and the axis parameter numbers are transmitted in the command parameter of the master transmission data. The queried values are transmitted in IEEE format in the acknowledgement date of the **PA-CONTROL** for Profibus-DP and Interbus. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”. For possible parameters, see command **0800**	

Example of application: The minimum acceleration of axis 4 is to be loaded from the **PA-CONTROL**.

Master send data:

	Profibus/Interbus		RS232
Command code:	**1802**$_{hex}$	#	**1802**
Command para.:	**0406** $_{hex}$	#	**1030**$_{dec}$
Command date:	**0** $_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

45DA C000$_{hex}$ # **7000.000**$_{dec}$

Result: The minimum acceleration of axis 4 was successfully transmitted. It is: 7000.00

5.2.4 PAC – element commands

cmd_get_single_input

5.2.4.1 cmd_get_single_input

Command code:	**1900**$_{hex}$	or **1900**
Command parameter:	**0001**$_{hex}$ – **0400**$_{hex}$	**0001**$_{dec}$ - **1024**$_{dec}$
Command date:	--	
Acknowledgement date:	**0000**$_{hex}$ **, 0001**$_{hex}$ or **0000** $_{dec}$ **, 0001**$_{dec}$	
Description:	The **PA-CONTROL** returns the current status of an input. The status can be 1 or 0.	

Example of application: The current status of input 13 is to be queried

Master send data:

	Profibus/Interbus		RS232
Command code:	**1900**$_{hex}$	#	**1900**
Command para.:	**000D** $_{hex}$	#	**13**$_{dec}$
Command date:	**0000** $_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

0001$_{hex}$ # **1**$_{dec}$

Result: The current status of input 13 is “1”

cmd_get_input_word

5.2.4.2 cmd_get_input_word

Command code:	**1901**$_{hex}$	or **1901**
Command parameter:	**0001**$_{hex}$ – **0400**$_{hex}$	**0001**$_{dec}$ - **1024**$_{dec}$
Command date:	--	
Acknowledgement date:	**0000$_{hex}$ - FFFF$_{hex}$**	or **0**$_{dec}$ - **65535** $_{dec}$

Description:

The **PA-CONTROL** returns the current status of an input word. With the requested input, the input word is defined in which the input is located. An input word always contains the status of 16 continuous inputs.

Input word 1: I1...I16
Input word 2: I17...I32
Input word 3: I33...I48
etc.
The status of an input can be “1” (set) or “0” (not set).

Example of application:

The current status of the input word 1 should be displayed completely. The selection is to be made with I1 to I16. For our example, we select input I10.

Master send data:

	Profibus/Interbus		RS232
Command code:	**1901**$_{hex}$	#	**1901**
Command para.:	**000A** $_{hex}$	#	**10**$_{dec}$
Command date:	**0000** $_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

8D03$_{hex}$	#	**36099**$_{dec}$

Result:

The following inputs have the logical status “1” in input word 1: input 1, 2, 9, 11, 12 and 16

cmd_put_single_output

5.2.4.3 cmd_put_single_output

Command code:	**0902_{hex}**	or **0902**
Command parameter:	**0001_{hex}** – **0400_{hex}**	**0001_{dec}** - **1024_{dec}**
Command date:	**0000_{hex} , 0001_{hex}**	or **0_{dec} , 1_{dec}**
Acknowledgement date:	**0000_{hex} , 0001_{hex}**	or **0_{dec} , 1_{dec}**
Description:	In the **PA-CONTROL**, a certain output is set or reset. Once this command has been performed, the status of the output may be 1 or 0.	

Example of application: Output O13 shall be set, (O13:=1).

Master send data:

	Profibus/Interbus		RS232
Command code:	**0902_{hex}**	#	**0902**
Command para.:	**000D** $_{hex}$	#	**13_{dec}**
Command date:	**0000** $_{hex}$	#	**1_{dec}**

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

0001_{hex} # **1_{dec}**

Result: Output 13 is set to logical “1”.

cmd_get_single_output

5.2.4.4 cmd_get_single_output

Command code:	**1902**$_{hex}$	or **1902**
Command parameter:	**0001**$_{hex}$ – **0400**$_{hex}$	**0001**$_{dec}$ - **1024**$_{dec}$
Command date:	--	
Acknowledgement date:	**0000**$_{hex}$ **, 0001**$_{hex}$	or **0** $_{dec}$ **, 1**$_{dec}$
Description:	The **PA-CONTROL** returns the current status of the requested output. The status can be 1 (set) or 0 (not set).	

Example of application: The current status of output O243 shall be inquired.

Master send data:

	Profibus/Interbus		RS232
Command code:	**1902**$_{hex}$	#	**1902**
Command para.:	**00F3** $_{hex}$	#	**243**$_{dec}$
Command date:	**0000** $_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

0001$_{hex}$	#	**1**$_{dec}$

Result: The current status of output O243 is “1”

cmd_put_output_word

5.2.4.5 cmd_put_output_word

Command code:	**0903**$_{hex}$	or **0903**
Command parameter:	**0001**$_{hex}$ – **0400**$_{hex}$	**0001**$_{dec}$ - **1024**$_{dec}$
Command date:	**0000$_{hex}$ - FFFF$_{hex}$**	or **0**$_{dec}$ - **65535** $_{dec}$
Acknowledgement date:	**0000$_{hex}$ - FFFF$_{hex}$**	or **0**$_{dec}$ - **65535** $_{dec}$

Description: An output word is transferred to the **PA-CONTROL.** With the transmitted output in the command parameter, the output word is determined. With the transmission of the command date, the status of the overall output word is always changed:

Output word 1: O1...O16

Output word 2: O17...O32

Output word 3: O33...O48 etc.

Example of application: Sets the outputs 17, 21 and 26 to 30. Output 25 is used to select the output word

Master send data:

	Profibus/Interbus		RS232
Command code:	**0903**$_{hex}$	#	**0903**
Command para.:	**0019** $_{hex}$	#	**25**$_{dec}$
Command date:	**3E11** $_{hex}$	#	**15889**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

3E11$_{hex}$ # **15889**$_{dec}$

Result: Outputs 17, 21 and 26 to 30 were set to logical “1”.

cmd_get_output_word

5.2.4.6 cmd_get_output_word

Command code:	**1903**$_{hex}$	or **1903**
Command parameter:	**0001**$_{hex}$ – **0400**$_{hex}$	**0001**$_{dec}$ - **1024**$_{dec}$
Command date:	--	
Acknowledgement date:	**0000$_{hex}$ - FFFF$_{hex}$**	or **0**$_{dec}$ - **65535** $_{dec}$

Description:

The **PA-CONTROL** returns the current status of an output word. With the requested output, the output word is defined in which the output is located. An output word always contains the status of 16 continuous outputs.
Output word 1: O1...O16
Output word 2: O17...O32
Output word 3: O33...O48
etc.

The status of an output can be 1 (set) or 0 (not set).

Example of application:

The current status of the output word 3 should be displayed completely. The output word is selected with O33.

Master send data:

	Profibus/Interbus		RS232
Command code:	**1903**$_{hex}$	#	**1903**
Command para.:	**0021** $_{hex}$	#	**33**$_{dec}$
Command date:	**0000** $_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

5555$_{hex}$ # **21845**$_{dec}$

Result:

The following outputs have the logical status “1” in input word 3: output 33, 35, 37, 39, 41, 43, 45 and 47

cmd_put_single_flag

5.2.4.7 cmd_put_single_flag

Command code:	**0904_{hex}**	or **0904**
Command parameter:	**0001_{hex}** – **0400_{hex}**	**0001_{dec}** - **1024_{dec}**
Command date:	**0000_{hex} , 0001_{hex}**	or **0_{dec} , 1_{dec}**
Acknowledgement date:	**0000_{hex} , 0001_{hex}**	or **0_{dec} , 1_{dec}**
Description:	In the **PA-CONTROL**, a certain flag is set or reset. The status can be 1 or 0.	

Example of application: Flag 11 is to be set (M11:=1)

Master send data:

	Profibus/Interbus		RS232
Command code:	**0904_{hex}**	#	**0904**
Command para.:	**000B** $_{hex}$	#	**11_{dec}**
Command date:	**0000** $_{hex}$	#	**1_{dec}**

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

0001_{hex} # **1_{dec}**

Result: Flag M11 is set to logical “1”.

cmd_get_single_flag

5.2.4.8 cmd_get_single_flag

Command code:	**1904_{hex}**	or **1904**
Command parameter:	**0001_{hex}** – **0400_{hex}**	**0001_{dec}** - **1024_{dec}**
Command date:	--	
Acknowledgement date:	**0000_{hex} , 0001_{hex}**	or **0_{dec} , 1_{dec}**
Description:	The **PA-CONTROL** returns the current status of a selected flag. The status can be 1 (set) or 0 (not set).	

Example of application: Gets the status of the flag M243

Master send data:

	Profibus/Interbus		RS232
Command code:	**1904_{hex}**	#	**1904**
Command para.:	**00F3** $_{hex}$	#	**0243_{dec}**
Command date:	**0000** $_{hex}$	#	**0_{dec}**

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

0001_{hex}	#	**1_{dec}**

Result: Flag M243 is set to logical “1”.

cmd_put_flag_word

5.2.4.9 cmd_put_flag_word

Command code:	**0905**$_{hex}$	or **0905**
Command parameter:	**0001**$_{hex}$ – **0400**$_{hex}$	**0001**$_{dec}$ - **1024**$_{dec}$
Command date:	**0000$_{hex}$ - FFFF$_{hex}$**	or **0**$_{dec}$ - **65535** $_{dec}$
Acknowledgement date:	**0000$_{hex}$ - FFFF$_{hex}$**	or **0**$_{dec}$ - **65535** $_{dec}$

Description: The number of a flag is transmitted to the **PA-CONTROL** in the command parameter**.** With the transferred flag, the flag word is defined in which the flag is located. The command changes the flag word completely changes according to the content of the command date.

Flag word 1: M1...M16
Flag word 2: M17...MF32
Flag word 3: M33...M48
etc.

Example of application: In flag word 2, the flags 18, 21 – 25, 27 and 31 are set at logical “1”, and all others are set at logical “0”. M17 is used for addressing.

Master send data:

	Profibus/Interbus		RS232
Command code:	**0905**$_{hex}$	#	**0905**
Command para.:	**0011** $_{hex}$	#	**17**$_{dec}$
Command date:	**45F2** $_{hex}$	#	**17906**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

45F2$_{hex}$ # **17906**$_{dec}$

Result: Flag word 2 was set according to the info in the command date.

cmd_get_flag_word

5.2.4.10 cmd_get_flag_word

Command code:	**1905**$_{hex}$	or **1905**
Command parameter:	**0001**$_{hex}$ – **0400**$_{hex}$	**0001**$_{dec}$ - **1024**$_{dec}$
Command date:	--	
Acknowledgement date:	**0000**$_{hex}$ **- FFFF**$_{hex}$	or **0**$_{dec}$ - **65535** $_{dec}$
Description:	The **PA-CONTROL** returns the current status of a flag word. With the requested flag, the flag word is defined in which the flag is located. A flag word always contains the status of 16 continuous flags. Flag word 1: M1...M16 Flag word 2: M17...M32 Flag word 3: M33...M48 etc. The status of a flag can be logical “1” (set) or “0” (not set).	

Example of application: Query flag word 3, addressing by flag 33

Master send data:

	Profibus/Interbus		RS232
Command code:	**1905**$_{hex}$	#	**1905**
Command para.:	**0021** $_{hex}$	#	**33**$_{dec}$
Command date:	**0000**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

0F0F$_{hex}$ # **3855**$_{dec}$

Result: Flag word 3 was queried. Flags 33-36 and 41-44 are set to lo0gical “1”.

cmd_put_int_reg

5.2.4.11 cmd_put_int_reg

Command code:	**0906_{hex}**	or **0906**
Command parameter:	**0001_{hex} – 0400_{hex}**	**0001_{dec} - 1024_{dec}**
Command date:	**0000_{hex} – FFFF FFFF$_{hex}$**	or **0_{dec} – +/-2147483647** $_{dec}$
Acknowledgement date:	**0000_{hex} – FFFF FFFF$_{hex}$**	or **0_{dec} – +/-2147483647** $_{dec}$

Description: The command changes the current value of an integer register to the new value.

If a non-defined register is addressed, the request is acknowledged with an error message.

Example of application: The value 12589 is entered in integer register N97.

Master send data:

	Profibus/Interbus		RS232
Command code:	**0906_{hex}**	#	**0906**
Command para.:	**0061_{hex}**	#	**97_{dec}**
Command date:	**0000 312D$_{hex}$**	#	**12589_{dec}**

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

0000 312D$_{hex}$ # **12589_{dec}**

Result: The value 12589 was entered in integer register N97.

cmd_get_int_reg

5.2.4.12 cmd_get_int_reg

Command code:	**1906**$_{hex}$	or **1906**
Command parameter:	**0001**$_{hex}$ – **0400**$_{hex}$	**0001**$_{dec}$ - **1024**$_{dec}$
Command date:	--	
Acknowledgement date:	**0000$_{hex}$ – FFFF FFFF$_{hex}$**	or **0**$_{dec}$ – **+/-2147483647** $_{dec}$

Description: The command returns current value of an integer register.

If a non-defined register is called up, the request is acknowledged with an error message.

Example of application: The content of integer register N129 is to be queried

Master send data:

	Profibus/Interbus		RS232
Command code:	**1906**$_{hex}$	#	**1906**
Command para.:	**0081** $_{hex}$	#	**129**$_{dec}$
Command date:	**0000 0000**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

0001 58A0$_{hex}$ # **88224**$_{dec}$

Result: The value 88224 was read out of integer register N129.

cmd_put_float_reg

5.2.4.13 cmd_put_float_reg

Command code:	**0907**$_{hex}$	or **0907**
Command parameter:	**0001**$_{hex}$ – **0400**$_{hex}$	**0001**$_{dec}$ - **1024**$_{dec}$
Command date:	**32 bit real number,** becoming register content	
Acknowledgement date:	**32 bit real number,** new register content	
Description:	The command changes the current value of real number register. If a non-defined register is addressed, the request is acknowledged with an error message.	
	The new value is transmitted in IEEE format for Profibus-DP and Interbus-S. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”.	

Example of application: Real number register R27 is to be set to the value 10.000.

Master send data:

	Profibus/Interbus		RS232
Command code:	**0907**$_{hex}$	#	**0907**$_{dec}$
Command para.:	**001B** $_{hex}$	#	**27**$_{dec}$
Command date:	**4120 0000**$_{hex}$	#	**10.0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4120 0000$_{hex}$	#	**10.00000**$_{dec}$

Result: The value 10.000 was entered in integer register N27.

cmd_get_float_reg

5.2.4.14 cmd_get_float_reg

Command code:	**1907**$_{hex}$	or **1907**
Command parameter:	**0001**$_{hex}$ – **0400**$_{hex}$	**0001**$_{dec}$ - **1024**$_{dec}$
Command date:	--	
Acknowledgement date:	**32 bit real number,** current register content	
Description:	The command returns current value of a real number register. If a non-defined register is called up, the request is acknowledged with an error message. The acknowledgement date for Profibus-DP and Interbus-S contains the value in the IEEE format. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”.	

Example of application: The entered value for real number register R37 is requested.

Master send data:

	Profibus/Interbus		RS232
Command code:	**1907**$_{hex}$	#	**1907**$_{dec}$
Command para.:	**0025** $_{hex}$	#	**0037**$_{dec}$
Command date:	**0**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

42DE 38D5 $_{hex}$# **111.11100**$_{dec}$

Result: The content of real number register R37 is 111.111.

cmd_reset_error

5.2.4.15 cmd_reset_error

Command code:	**0909_{hex}** or **0909**
Command parameter:	--
Command date:	--
Acknowledgement date:	**$0000\ 0000_{hex}$ – 0000 FFFF $_{hex}$** or **0_{dec} – 65535_{dec}**
Description:	Errors in the PA-CONTROL are divided into three error categories:

1. **CPU error messages** (error number 1 – 99), errors that can only be reset with Power off / on
2. **System error hardware** (error number 100 – 499), errors that are partially reset when the operating modes online or automatic are put into home position
3. **Error in online or automatic mode** (error number 500 – 999),
   errors that are principally reset when the operating modes online or automatic are put into home position.

The command “cmd_reset_error”, **0909_{hex}** is provided to reset errors in error class 2. This command can only be carried out in home position. Non-fulfilment of this prerequisite is treated as an inadmissible command.

When an error occurs in the online mode, the command “cmd_get_error”, **1909_{hex}** can be used to determine the cause of the error and thus the error class. If the error class admits resetting the error, this can be done with the command “cmd_reset_error”, **0909_{hex}**.

Some system errors such as hardware configuration errors and defective power packs, short circuits in the motor cable or empty batteries cannot be reset. Acknowledge these errors with the command “cmd_reset_error” and the command error – command not executable **0015_{hex}** – “command not executable”. In this case, the error number also appears again in the acknowledgement date.

Example of application: System error reset

Master send data:		Profibus/Interbus		RS232
	Command code:	**0909**$_{hex}$	#	**0909**
	Command para.:	**0000** $_{hex}$	#	**0**$_{dec}$
	Command date:	**0**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:		
0000 0000 $_{hex}$	#	**0**$_{dec}$

Result: System error was reset

cmd_get_error

5.2.4.16 cmd_get_error

Command code:	**1909**$_{hex}$	or **1909**
Command parameter:	--	
Command date:	--	
Acknowledgement date:	**0000 0000**$_{hex}$ **– 0000 FFFF**$_{hex}$	or **0**$_{dec}$ **– 65535**$_{dec}$

Description:

If an error occurs in the configuration of the **PA-CONTROL** or during the program flow, the error can be called up with the command. The error number is transmitted in the acknowledgement date.

Certain errors can be reset with the command "cmd_reset_error", **0909**$_{hex.}$

The description of the possible errors is listed in a table. (See chapter "technical appendix" of the **PA-CONTROL** documentation).

Example of application: System error message shall be retrieved.

Master send data:

	Profibus/Interbus		RS232
Command code:	**1909**$_{hex}$	#	**1909**
Command para.:	**0000** $_{hex}$	#	**0**$_{dec}$
Command date:	**0**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

0211 $_{hex}$	#	**529**$_{dec}$

Result: Error number 529 refers to a limit switch that has been set off (positive traverse direction) or a cable tear of the limit switch.

cmd_get_state

5.2.4.17 cmd_get_state

Command code:	**190B**$_{hex}$ or **190B**
Command parameter:	--
Command date:	--
Acknowledgement date:	--
Description:	The current operating mode is requested from the **PA-CONTROL.**

The acknowledgement data contain the current operating status. Also see chapters 2.3.1.2, 3.2 and 4.3.1.2

The following operating statuses are possible:

01_{hex}	in home position
02_{hex}	manual mode
10_{hex}	automatic mode started
11_{hex}	in automatic mode
12_{hex}	in automatic mode and “STOP” recognized
13_{hex}	in automatic mode, STOP program is being processed
15_{hex}	in automatic mode and stopped
16_{hex}	in automatic mode progr. “START after STOP” running
17_{hex}	in automatic mode and malfunction recognized
18_{hex}	in automatic mode malfunction program is being processed
19_{hex}	in automatic mode with malfunction and stopped
20_{hex}	manual mode, serial
30_{hex}	online mode started
31_{hex}	online mode,
32_{hex}	online mode, STOP recognized
35_{hex}	Online mode and stopped
37_{hex}	online mode and malfunction recognized
39_{hex}	online operation, malfunction recognized and stopped

Example of application: Operating mode of the PA-CONTROL is requested

Master send data:	Profibus/Interbus		RS232
Command code:	**190B**$_{hex}$	#	**190B**
Command para.:	**0** $_{hex}$	#	**0**$_{dec}$
Command date:	**0**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:			
	0010 $_{hex}$	#	**16**$_{dec}$

Result: The automatic mode was started.

cmd_get_actual_pos

5.2.4.18 cmd_get_actual_pos

Command code:	**190C**$_{hex}$	or **190C**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	--	
Acknowledgement date:	**32 bit real number**	
Description:	The command returns current position of an axis in the acknowledgement date. If an axis non-defined in the parameter is called up, the request is acknowledged with an error message. The acknowledgement date for Profibus-DP and Interbus-S contains the value in the IEEE format. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”.	

Example of application: Get current position of axis 2

Master send data:

	Profibus/Interbus		RS232
Command code:	**190C**$_{hex}$	#	**190C**
Command para.:	**0002** $_{hex}$	#	**2**$_{dec}$
Command date:	**0**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4548 0000 $_{hex}$ # **5000.000**$_{dec}$

Result: The current position of axis 2 is 5000.00 units.

cmd_get_actual_speed

5.2.4.19 cmd_get_actual_speed

Command code:	**190D**$_{hex}$	or **190D**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	--	
Acknowledgement date:	**32 bit real number**	
Description:	The command supplies the current traverse speed in the acknowledgement date. If an axis non-defined in the parameter is called up, the request is acknowledged with an error message. The acknowledgement date for Profibus-DP and Interbus-S contains the value in the IEEE format. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”.	

Example of application: Get current traverse speed of axis 1!

Master send data:

	Profibus/Interbus		RS232
Command code:	**190D**$_{hex}$	#	**190D**
Command para.:	**0001** $_{hex}$	#	**1**$_{dec}$
Command date:	**0000**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4548 0000 $_{hex}$	#	**4500.000**$_{dec}$

Result: The current traverse speed of the axis is 4500.0 AE/s.

cmd_get_actual_rotation_control_pos

5.2.4.20 cmd_get_actual_rotation_control_pos

Command code:	**190E**$_{hex}$	or **190E**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	--	
Acknowledgement date:	**32 bit real number**	
Description:	The command returns current shaft encoder position of axis. If an axis non-defined in the parameter is called up, the request is acknowledged with an error message. The acknowledgement date for Profibus-DP and Interbus-S contains the value in the IEEE format. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”.	

Example of application: Get current shaft encoder position of axis 1

Master send data:

	Profibus/Interbus		RS232
Command code:	**190E**$_{hex}$	#	**190E**
Command para.:	**0002** $_{hex}$	#	**2**$_{dec}$
Command date:	**0000**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4348 0000 $_{hex}$ # **200.000**$_{dec}$

Result: The current shaft encoder position of axis 1:
200.00 AE.

cmd_get_max_towfault

5.2.4.21 cmd_get_max_towfault

Command code:	**190F**$_{hex}$	or **190F**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	--	
Acknowledgement date:	**32 bit real number**	
Description:	The command returns the maximum towfault of an axis. The towfault is the divergence of desired value to actual value within one movement. If an axis non-defined in the parameter is called up, the request is acknowledged with an error message. The acknowledgement date for Profibus-DP and Interbus-S contains the value in the IEEE format. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”.	

Example of application: Get max. towfault of axis 1

Master send data:

	Profibus/Interbus		RS232
Command code:	**190F**$_{hex}$	#	**190F**
Command para.:	**0002** $_{hex}$	#	**1**$_{dec}$
Command date:	**0000**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4120 0000 $_{hex}$	#	**10.000**$_{dec}$

Result: The maximum towfault of axis 1 is:
10.0 steps

cmd_get_status_axis

5.2.4.22 cmd_get_status_axis

Command code:	**1910**$_{hex}$	or **1910**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	--	
Acknowledgement date:	**0000$_{hex}$ - FFFF$_{hex}$**	or **0**$_{dec}$ - **65535** $_{dec}$

Description: The current status of an axis is requested. If an axis non-defined in the parameter is called up, the request is acknowledged with an error message.

The following statuses of the axis are possible:

0 : Axis standing, in position,
1 : Axis moving,
2 : Axis standing still, was stopped,
4 : Axis standing still and with malfunction,
8 : Axis in measuring mode

Example of application: Get current status of axis 4

Master send data:

	Profibus/Interbus		RS232
Command code:	**1910**$_{hex}$	#	**1910**
Command para.:	**0004**$_{hex}$	#	**4**$_{dec}$
Command date:	**0000**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

0002 $_{hex}$	#	**2**$_{dec}$

Result: The current status of axis 4 is 2, i.e. the axis was stopped and is still.

cmd_get_status_all_axis

5.2.4.23 cmd_get_status_all_axis

Command code:	**1911**$_{hex}$	or **1911**
Command parameter:	--	
Command date:	--	
Acknowledgement date:	**0000$_{hex}$ - FFFF$_{hex}$**	or **0**$_{dec}$ - **65535**$_{dec}$
Description:	The status of all configured axes is requested.	

In Word 0 of the acknowledge data the current status of all axis is transferred. The following is applied:

Bit 0 = axis 1
Bit 1 = axis 2
...
Bit 15 = Axis 16

Status:

Bit = 0 ➔ axis still, in position
Bit = 1 ➔ axis running

Example of application: The status of all 8 configured axes is to be requested.

Master send data:

	Profibus/Interbus		RS232
Command code:	**1911**$_{hex}$	#	**1911**
Command para.:	**0000**$_{hex}$	#	**0**$_{dec}$
Command date:	**0000**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

0000 00D0 $_{hex}$ # **00208**$_{dec}$

Result: Axes 5, 7 and 8 are running. Axes 1, 2, 3, 4 and 6 are in position.

cmd_get_axis_traverse_area_min

5.2.4.24 cmd_get_axis_traverse_area_min

Command code:	**1913**$_{hex}$	or **1913**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	--	
Acknowledgement date:	**32 bit real number**	

Description:

In the axis parameters, a minimum and maximum value is saved for the traverse area.

If the **PA-Control** is in a traverse mode, e.g. AUTOMATIC, the limit values for the traverse area can only be accessed via this command.

The acknowledgement data contain the minimum value for the traverse area of an axis as a real number. The value is displayed in IEEE format for Profibus-DP and Interbus-S. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”.

The axes are selected in the command parameter:

1 = axis 1
2 = axis 2
...
7 = Axis 7

Example of application: Get the value for the minimum traverse area of axis 2

Master send data:

	Profibus/Interbus		RS232
Command code:	**1913**$_{hex}$	#	**1913**
Command para.:	**0002**$_{hex}$	#	**2**$_{dec}$
Command date:	**0000**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4348 0000 $_{hex}$ # **200.0**$_{dec}$

Result: Axis 1 has a minimum traverse area of 200.0 AE.

cmd_get_axis_traverse_area_max

5.2.4.25 cmd_get_axis_traverse_area_max

Command code:	**1914**$_{hex}$	or **1914**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	--	
Acknowledgement date:	**32 bit real number**	

Description:

In the axis parameters, a minimum and maximum value is saved for the traverse area.

If the **PA-Control** is in a traverse mode, e.g. AUTOMATIC, the limit values for the traverse area can only be accessed via this command.

The acknowledgement data contain the maximum value for the traverse area of an axis as a real number. The value is displayed in IEEE format for Profibus-DP and Interbus-S. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”.

The axes are selected in the command parameter:

1 = axis 1
2 = axis 2
...
7 = Axis 7

Example of application: Get the value for the maximum traverse area of axis 4

Master send data:

	Profibus/Interbus		RS232
Command code:	**1914**$_{hex}$	#	**1914**
Command para.:	**0004**$_{hex}$	#	**4**$_{dec}$
Command date:	**0**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

461C 4000 $_{hex}$ # **10000.00**$_{dec}$

Result: The axis 4 has a maximum traverse area of 10000.00 AE.

cmd_get_axis_following_error

5.2.4.26 cmd_get_axis_following_error

Command code:	**1915**$_{hex}$	**1915**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	--	
Acknowledgement date:	**0000**$_{hex}$ **- FFFF**$_{hex}$	

Description:

This command is only used in **PA-CONTROL EP.**

The **PA-CONTROL EP** is equipped with a rotation control for step motors. A shaft encoder whose signals (A/B) are wired to the encoder counter in the **PA-CONTROL EP** is in the step motor.

The command provides the current difference between the counter of the step motor and the encoder in steps (microsteps, 3200 steps / revolution).

The axes are selected in the command parameter:

1 = axis 1
2 = axis 2
.....
7 = Axis 7

Example of application: Get current towfault of axis 3

Master send data:

	Profibus/Interbus		RS232
Command code:	**1915**$_{hex}$	#	**1915**$_{dec}$
Command para.:	**0003**$_{hex}$	#	**3**$_{dec}$
Command date:	**0000**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4120 0000 $_{hex}$ # **10.00**$_{dec}$

Result: Axis 2 has a current towfault of 10.0 AE.

cmd_get_temperature

5.2.4.27 cmd_get_temperature

Command code:	**1920**$_{hex}$	**1920**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	--	
Acknowledgement date:	**0000**$_{hex}$ **- FFFF**$_{hex}$	

Description: This command is only used in **PA-CONTROL EP.**

A temperature sensor is mounted on the **PA-CONTROL EP's** cooler; its measuring results can be queried with this command.

The axes are selected in the command parameter:

1 = axis 1
2 = axis 2
...
7 = Axis 7

Example of application: Get current cooler temperature of axis 3

Master send data:

	Profibus/Interbus		RS232
Command code:	**1920**$_{hex}$	#	**1920**$_{dec}$
Command para.:	**0003**$_{hex}$	#	**3**$_{dec}$
Command date:	**0000**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4220 0000 $_{hex}$ # **40.03**$_{dec}$

Result: The cooler of axis 3 has a temperature of 40.03°C.

cmd_get_extended_ status_axis_

5.2.4.28 cmd_get_extended_ status_axis

Command code:	**1921**$_{hex}$	**1921**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	--	
Acknowledgement date:	**32 bit integer**	
Description:	This command can be used to query the extended status of an axis. The acknowledgement date also includes the axis status, information on the limit switches and readiness. The axes are selected in the command parameter: 1 = axis 1 2 = axis 2 ... 9 = Axis 9	

The acknowledgement date is a 32 bit integer whose individual bits are interpreted as follows:

Profibus/Interbus Byte	Acknowledgement date possible statuses	Meaning
0	**Bit** 31 30 29 28 27 26 25 24 0 0 0 0 0 0 0 **0** 0 0 0 0 0 0 0 **1**	Status readiness: Power pack not ready Power pack ready
1	**Bit** 23 22 21 20 19 18 17 16 0 0 0 0 0 0 0 **0** 0 0 0 0 0 0 0 **1**	Status of positive limit switches: activated not activated
2	**Bit** 15 14 13 12 11 10 9 8 0 0 0 0 0 0 0 **0** 0 0 0 0 0 0 0 **1**	Status of negative limit switches: activated not activated
3	**Bit** 7 6 5 4 3 2 1 0 0 0 0 0 0 0 0 **0** 0 0 0 0 0 0 0 **1** 0 0 0 0 0 0 **1** 0 0 0 0 0 0 **1** 0 0 0 0 0 0 **1** 0 0 0	Statuses of the axes: Axis standing, in position Axis moves Axis still, was stopped Axis still and with malfunction Axis in measuring mode

Example of application: Get extended status of axis 8

Master send data:

	Profibus/Interbus		RS232
Command code:	**1921**$_{hex}$	#	**1921**$_{dec}$
Command para.:	**0008**$_{hex}$	#	**8**$_{dec}$
Command date:	**0**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

0100 0104 $_{hex}$ # **16777476**$_{dec}$

Result: The extended status of axis 8 indicates:

- The power pack of the axis is ready,
- The positive limit switch has been reached,
- The negative limit switch has not been reached,
- Axis 8 is still and with malfunction

cmd_send_system_flag

5.2.4.29 cmd_send_system_flag

Command code:	**1934**$_{hex}$
Command parameter:	Number of required system flag
Command date:	--
Acknowledgment date:	Status of system flag
Description:	This command is used to query the status of a system flag of the PA-CONTROL by the Profibus master.

cmd_send_system_n_reg

5.2.4.30 cmd_send_system_n_reg

Command code:	**1935**$_{hex}$
Command parameter:	Number of required system N register
Command date:	--
Acknowledgment date:	Contents of system N register

Description:
This command is used to query the contents of a system N register of the PA-CONTROL by the Profibus master.

cmd_send_system_r_reg

5.2.4.31 cmd_send_system_r_reg

Command code:	**1937**$_{hex}$
Command parameter:	Number of required system R register
Command date:	--
Acknowledgment date:	Contents of system R register

Description:
This command is used to query the contents of a system R register of the PA-CONTROL by the Profibus master.

5.2.5 PA-CONTROL – automatic - commands

cmd_abort_auto

5.2.5.1 cmd_abort_auto

Command code:	**0A41**$_{hex}$	**0A41**
Command parameter:	--	
Command date:	--	
Acknowledgement date:	--	

Description: The **PA-CONTROL** is in automatic operation and is being stopped. Positioning is being stopped and the current position taken over. The program is interrupted. The **PA-CONTROL** changes to home position.

Example of application: Exit automatic mode

Master send data:

	Profibus/Interbus		RS232
Command code:	**0A41**$_{hex}$	#	**0A41**
Command para.:	**0**$_{hex}$	#	**0**$_{dec}$
Command date:	**0**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL Acknowledgement data for error-free command execution: . The values entered in the acknowledgement date have no meaning.

Acknowledgement date:

XXXX $_{hex}$ # **X**$_{dec}$

Result: The automatic mode was successfully finished.

The **PA-CONTROL** is in home position. The home position can be checked with the analysis of the bits for the operating status of Profibus-DP and Interbus-S (see ch. 2.3.1 and 4.3.1, use of data words). The current operating status of the PA-CONTROL is checked via the data field “STATUS” in the acknowledgement data for communication via the RS 232 port.

5.2.6 PA-CONTROL –online - commands

cmd_abort_online

5.2.6.1 cmd_abort_online

Command code:	**0A81**$_{hex}$	**0A81**
Command parameter:	--	
Command date:	--	
Acknowledgement date:	--	
Description:	The **PA-CONTROL** is in ONLINE mode. Positioning is stopped and the current position taken over; online mode is interrupted. The **PA-CONTROL** switches to home position.	

Example of application: Stop online mode

Master send data:

	Profibus/Interbus		RS232
Command code:	**0A81**$_{hex}$	#	**0A81**
Command para.:	**0**$_{hex}$	#	**0**$_{dec}$
Command date:	**0**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL

Acknowledgement data for error-free command execution: . The values entered in the acknowledgement date have no meaning.

Acknowledgement date:

XXXX $_{hex}$	#	**X**$_{dec}$

Result: The online mode was successfully interrupted.

The **PA-CONTROL** is in home position. The home position can be checked with the analysis of the bits for the operating status of Profibus-DP and Interbus-S (see ch. 2.3.1 and 4.3.1, use of data words). The current operating status of the PA-CONTROL is checked via the data field “STATUS” in the acknowledgement data for communication via the RS 232 port.

cmd_put_no_reference

5.2.6.2 cmd_put_no_reference

Command code:	**0A83**$_{hex}$	**0A83**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	--	
Acknowledgement date:	--	

Description:

The prerequisite for positioning the axis is the release to traverse. There are two ways to do so: reference drive or the use of the command with the code "**0A83**". During reference drive, the position counter is set to zero when the flag is set. The use of the command "cmd_put_no_referenc" does not change the position values of the axis. It is thus comparable to the command G25.A0, the difference being that it processes each axis separately (also see the command description PA-CONTROL).

Application: This command should therefore be used very carefully. Generally, reference drive is done each time the facility is restated, for instance when it is switched on. This is the only way to ensure that the axes truly traverse as defined when the program is running.

In certain situations, for instance for manual traverse of an axis to check or measure a path, it may be best to do without this reference drive. This command only issues the release; no motion ensues.

If an axis not defined in the parameters is set off, an error message is output.

Example of application: Set the reference flag for axis 2

Master send data:

	Profibus/Interbus		RS232
Command code:	**0A83**$_{hex}$	#	**0A83**
Command para.:	**0002**$_{hex}$	#	**2**$_{dec}$
Command date:	**0**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL

Acknowledgement data for error-free command execution: . The values entered in the acknowledgement date have no meaning.

Acknowledgement date:

XXXX XXXX $_{hex}$ # **X**$_{dec}$

Result: The release to traverse has been issued.

cmd_put_start_reference

5.2.6.3 cmd_put_start_reference

Command code:	**0A84**$_{hex}$	**0A84**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	--	
Acknowledgement date:	--	

Description:

The prerequisite for positioning the axis is the release to traverse. There are two ways to do so: reference drive or the use of the command with the code "**0A83**". During reference drive, command code "**0A84**", the position counter is set to zero when the flag is set.

The command "cmd_put_start_reference" carries out reference drive for one axis. Once the command has been executed, the reference flag is set. It is comparable to the command G25.Ai.

If an axis not defined in the parameters is started, an error message is output.

Example of application: Execute reference drive for axis 4

Master send data:

	Profibus/Interbus		RS232
Command code:	**0A84**$_{hex}$	#	**0A84**
Command para.:	**0004**$_{hex}$	#	**4**$_{dec}$
Command date:	**0**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL

Acknowledgement data for error-free command execution: . The values entered in the acknowledgement date have no meaning.

Acknowledgement date:

XXXX XXXX $_{hex}$ # **X**$_{dec}$

Result: Reference drive of axis 4 was executed, and the reference flag was set.

cmd_set_position_null

5.2.6.4 cmd_set_position_null

Command code:	**0A85**$_{hex}$	**0A85**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	--	
Acknowledgement date:	--	

Description:

The command sets the current position of an axis to zero and is then comparable to the command G26.

Important:

The software end switches defined in the parameter level by the range will be overtaken without modification. Repeating this command enables the endless positioning in one direction because a counter overflow or exceed limit is not possible.

If an axis not defined in the parameters is set off, an error message is output.

Example of application: Set current position of axis 2 to zero “0.000” , (corresponds to G26.A1)

Master send data:

	Profibus/Interbus		RS232
Command code:	**0A85**$_{hex}$	#	**0A85**
Command para.:	**0002**$_{hex}$	#	**2**$_{dec}$
Command date:	**0**$_{hex}$	#	**0**$_{dec}$

PA-CONTROL

Acknowledgement data for error-free command execution: . The values entered in the acknowledgement date have no meaning.

Acknowledgement date:

XXXX XXXX $_{hex}$ # **X**$_{dec}$

Result: The current position of axis 2 is set to zero.

cmd_set_position

5.2.6.5 cmd_set_position

Command code:	**0A86**$_{hex}$	**0A86**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	**32-bit float**	
Acknowledgement date:	**32-bit float**	

Description:

The command sets the current position to scale, i.e. this command corresponds to the G29 command, e.g. G29.A1.100. Software switches will be changed accordingly. This command allow a zero point that corresponds to the drawing zero point to be defined.

If an axis non-defined in the parameters is denoted, an error message is acknowledged.

The transmission data for Profibus-DP and Interbus-S contain the new value of the position counter in the IEEE format. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”.

The acknowledgement date corresponds to the value of the command date when the command has been successfully executed.

Example of application:

Set the current position of axis 2 to 200.00 (corresponds to the command G29.A2.200.00)

Master send data:

	Profibus/Interbus		RS232
Command code:	**0A86**$_{hex}$	#	**0A86**
Command para.:	**0000 0002**$_{hex}$	#	**2**$_{dec}$
Command date:	**4348 0000**$_{hex}$	#	**200.00**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4348 0000 $_{hex}$	#	**200.00**$_{dec}$

Result:

For axis 2, the command was not executed correctly. The position counter is set to 200.00.

cmd_pos_axis_absolut

5.2.6.6 cmd_pos_axis_relativ

Command code:	**0A87**$_{hex}$	**0A87**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	**32-bit float**	
Acknowledgement date:	**32-bit float**	

Description:

The command traverses an axis directly to the absolute position also transferred with the command, corresponding to the traverse command, e.g. A1:=100.

If an axis non-defined in the parameter is denoted, an error message is output.

The transmission data for Profibus-DP and Interbus-S contain the new value of the position counter in the IEEE format. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”. The axis number continues to be transmitted in the command parameter.

The acknowledgement date corresponds to the value of the current position when the command has been successfully executed, i.e. the start position. After the start, the value of the position counter, which constantly changes during traverse, is made available via the Profibus-DP and Interbus-S. Only when the traverse is over is the complete execution of the command reported when the “end of processing flag” is set.

Important: In programming, this situation must be taken account of. If other commands have to follow before the “end of processing flag” is transmitted, use the command “**0A94**”.

The desired updating of the position counter within the acknowledgement data has to be done by transmitting the “poll command” (“EOT” = 04) during transmission of the data via the RS232 port (see the example in chapter 3.4.3).

This command is the only one that may be transmitted before the end of processing has been set. If other commands have to follow before the “end of processing flag” is transmitted, use the command “**0A94**” here, too.

Example of application: Axis 2 is to be moved directly, absolutely to 200.000. (corresponds to A1:=200.0)

Master send data:	Profibus/Interbus		RS232
Command code:	**0A87**$_{hex}$	#	**0A87**
Command para.:	**0000 0002**$_{hex}$	#	**2**$_{dec}$
Command date:	**4348 0000**	#	**200.0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4320 0000 $_{hex}$	#	**10.0**$_{dec}$

Result: For axis 2, the command was not executed correctly. The position counter is at 10.0 as this was the position started from.

cmd_pos_axis_relativ

5.2.6.7 cmd_pos_axis_relativ

Command code:	**0A89**$_{hex}$	**0A89**$_{hex}$
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	**32-bit float**	
Acknowledgement date:	**32-bit float**	

Description:

The command directly traverses an axis by a relative value (chain measuring system).

If an axis non-defined in the parameter is denoted, an error message is output.

The transmission data for Profibus-DP and Interbus-S contain the new value of the position counter in the IEEE format. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”. The axis number continues to be transmitted in the command parameter.

The acknowledgement date corresponds to the value of the current position when the command has been successfully executed, i.e. the start position. After the start, the value of the position counter, which constantly changes during traverse, is made available via the Profibus-DP and Interbus-S. Only when the traverse is over is the complete execution of the command reported when the “end of processing flag” is set.

Important: In programming, this situation must be taken account of. If other commands have to follow before the “end of processing flag” is transmitted, use the command “**0A95**”.

The desired updating of the position counter within the acknowledgement data has to be done by transmitting the “poll command” (“EOT” = 04) during transmission of the data via the RS232 port (see the example in chapter 3.4.3).

This command is the only one that may be transmitted before the end of processing has been set. If other commands have to follow before the “end of processing flag” is transmitted, use the command “**0A95**” here, too.

Example of application: Axis 3 is to be moved relatively by 10.000.

Master send data:

	Profibus/Interbus		RS232
Command code:	**0A89**$_{hex}$	#	**0A89**
Command para.:	**0000 0003**$_{hex}$	#	**3**$_{dec}$
Command date:	**4120 0000**$_{hex}$	#	**10.0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4348 0000	#	**200.0**$_{dec}$

Result: For axis 3, the command was not executed correctly. The position counter is at 200.0 as this was the position started from.

cmd_set_speed_axis

5.2.6.8 cmd_set_speed_axis

Command code:	**0A8D**$_{hex}$	**0A8D**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	**32-bit float**	
Acknowledgement date:	**32-bit float**	

Description:

With this command, the traverse speed of an axis can be reset in online mode. The speed can be changed before the traverse command starts, but also during traverse with the **PA-CONTROL EP**.

If an axis non-defined in the parameter is denoted, an error message is output.

The transmission data for Profibus-DP and Interbus-S contain the new value of the traverse speed in the IEEE format. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”. The axis number continues to be transmitted.

The acknowledgement date contains the value of the command date.

The traverse speed can only be changed within the limits for min. and max. saved in the parameters. The change made is valid until the next change in online mode. When the online mode is exited, the values saved in the control are principally reset.

Example of application: Set the traverse speed of axis 3 to 20480 AE/s

Master send data:

	Profibus/Interbus		RS232
Command code:	**0A8D**$_{hex}$	#	**0A8D**
Command para.:	**0000 0003**$_{hex}$	#	**3**$_{dec}$
Command date:	**47A8 0000** $_{hex}$	#	**20480.0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

47A8 0000 $_{hex}$	#	**20480.0**$_{dec}$

Result: For axis 3, the command was not executed correctly. The traverse speed was changed to 20480.0 AE/s.

cmd_set_acceleration_axis

5.2.6.9 cmd_set_acceleration_axis

Command code:	**0A8E**$_{hex}$	**0A8E**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	**32-bit float**	
Acknowledgement date:	**32-bit float**	

Description:

With this command, the acceleration of an axis can be reset in online mode. The change in acceleration must be made before the traverse command starts.

If an axis non-defined in the parameter is denoted, an error message is output.

The transmission data for Profibus-DP and Interbus-S contain the new value of the traverse speed in the IEEE format. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”. The axis number continues to be transmitted.

The acknowledgement date contains the value of the command date.

The acceleration can only be changed within the limits for min. and max. saved in the parameters. The change made is valid until the next change in online mode. When the online mode is exited, the values saved in the control are principally reset.

Example of application: Set the acceleration of axis 3 to 10

Master send data:

	Profibus/Interbus		RS232
Command code:	**0A8DE**$_{ex}$	#	**0A8E**
Command para.:	**0000 0003**$_{hex}$	#	**3**$_{dec}$
Command date:	**4120 0000**$_{hex}$	#	**10.0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4120 0000$_{hex}$	#	**10.0**$_{dec}$

Result: For axis 3, the command was not executed correctly. The acceleration was set to 10 AE/s^2.

cmd_start_manuell_axis_absolut

5.2.6.10 cmd_start_manuell_axis_absolut

Command code:	**0A90**$_{hex}$	**0A90**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	**32-bit float**	
Acknowledgement date:	**32 bit float** (current absolute position)	

Description:

the command moves the axis to the absolute position transmitted. The command is immediately acknowledged with the end of processing.

If an axis non-defined in the parameter is denoted, an error message is output.

The transmission data for Profibus-DP and Interbus-S contain the new value of the position counter in the IEEE format. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”. The axis number continues to be transmitted in the command parameter.

The acknowledgement date corresponds to the value of the current position when the command has been successfully executed, i.e. the start position.

The motion of the axis must be kept going with the transmission of the command “cmd_in_online_control_move_axis”. The repetition time for this command must be less than one second. If this command is not issued, the respective axis stays still.

Example of application: Axis 3 is to be moved directly, absolutely to 200.000.

Master send data:	Profibus/Interbus		RS232
Command code:	**0A90**$_{hex}$	#	**0A90**
Command para.:	**0000 0003**$_{hex}$	#	**3**$_{dec}$
Command date:	**4348 0000**	#	**200.0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4120 0000 $_{hex}$ # **10.0**$_{dec}$

Result: For axis 3, the command was not executed correctly. The position counter is at 10.0 as this was the position started from.

cmd_start_manuell_axis_relativ

5.2.6.11 cmd_start_manuell_axis_relativ

Command code:	**0A91**$_{hex}$	**0A91**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	**32-bit float**	
Acknowledgement date:	**32 bit float** (current absolute position)	

Description:

the command moves the axis by the position transmitted. The command is immediately acknowledged with the end of processing.

If an axis non-defined in the parameter is denoted, an error message is output.

The transmission data for Profibus-DP and Interbus-S contain the change value of the position counter in the IEEE format. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”. The axis number continues to be transmitted in the command parameter.

The acknowledgement date corresponds to the value of the current position when the command has been successfully executed, i.e. the start position.

The motion of the axis must be kept going with the transmission of the command “cmd_in_online_control_move_axis”. The repetition time for this command must be less than one second. If this command is not issued, the respective axis stays still.

Example of application:

Axis 2 is to be moved relatively by 200,000. (A2:=200.0 in incremental dimension)

Master send data:

	Profibus/Interbus		RS232
Command code:	**0A91**$_{hex}$	#	**0A91**
Command para.:	**0002**$_{hex}$	#	**2**$_{dec}$
Command date:	**4348 0000**	#	**200.0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

44 20 20 00 $_{hex}$ # **640.0** $_{dec}$

Result:

For axis 2, the command was not executed correctly. The position counter is at 640.0 as this was the position started from.

cmd_control_move_axis

5.2.6.12 cmd_control_move_axis

Command code:	**0A92**$_{hex}$	**0A92**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	-	
Acknowledgement date:	Current absolute position, **32-bit float**	
Description:	The command is a necessary complement to the “0A90” and “0A91” commands for manual online axis traverse previously described. It must be repeated cyclically in intervals less than one second until the desired traverse route is reached, thus allowing the axis to continue traversing. The command is immediately acknowledged with the end of processing. If an axis non-defined in the parameter is denoted, an error message is output.	

Example of application: Axis 4 was started for teaching with the command “cmd_ in_online_start_manuell_axis_absolut”. Motion is to be continued.

Master send data:

	Profibus/Interbus		RS232
Command code:	**0A92**$_{hex}$	#	**0A92**
Command para.:	**0004**$_{hex}$	#	**4**$_{dec}$
Command date:	**0** $_{hex}$	#	**0.0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4420 2000 $_{hex}$ # **640.50**$_{dec}$

Result: For axis 4, the command was not executed correctly. The position counter is at 640.50 AE at the time our command is transmitted.

cmd_abort_move_axis

5.2.6.13 cmd_abort_move_axis

Command code:	**0A93**$_{hex}$	**0A93**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	-	
Acknowledgement date:	Current absolute position, **32-bit float**	
Description:	The axis is being stopped. If the axis stands still, the current position is taken over, and the traverse command interrupted with “STOP” is accepted as finished. The command is only acknowledged with the end of processing when the axis stands still. The time between the transmission of the command and the end of processing depends on the speed and the ramp until standstill of the axis. If an axis non-defined in the parameter is denoted, an error message is output. The acknowledgement date corresponds to the value of the current position when the command has been successfully executed, i.e. the stop position. The data are transmitted in IEEE format for Profibus-DP and Interbus-S. The transmission of the value via port RS232 is done in the ASCII format with the set bit for data type “float”.	

Example of application: Axis 4 is to be stopped

Master send data:

	Profibus/Interbus		RS232
Command code:	**0A93**$_{hex}$	#	**0A93**
Command para.:	**0004**$_{hex}$	#	**4**$_{dec}$
Command date:	**0** $_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

47A8 0000 $_{hex}$ # **20480.0**$_{dec}$

Result: For axis 4, the command was not executed correctly. The position counter is at 20480.0 as this was the position stopped at.

cmd_start_axis_absolut

5.2.6.14 cmd_start_axis_absolut

Command code:	**0A94**$_{hex}$	**0A94**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	**32-bit float**	
Acknowledgement date:	**32-bit float**	

Description:

The command “cmd_start_axis_absolut” starts motion, immediately sets the “end of processing flag”, and outputs the start position of the started traverse in the acknowledgement date. The independent position update is suppressed.

This command makes it possible to follow up with other command directly after a traverse command, e.g. for querying inputs or setting outputs (see the command “cmd_pos_axis_absolut”, command code 0A87.

With the command “cmd_get_status_axis”, command code **1910**, the status of the axis can be queried at any later time, thus checking whether the command has been properly executed.

Example of application: Axis 3 is to be moved directly, absolutely to 200.000. (A1:=200.0)

Master send data:

	Profibus/Interbus		RS232
Command code:	**0A94**$_{hex}$	#	**0A94**
Command para.:	**0000 0003**$_{hex}$	#	**3**$_{dec}$
Command date:	**4348 0000**	#	**200.0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4320 0000 $_{hex}$	#	**10.0**$_{dec}$

Result: For axis 3, the command was not executed correctly. The position counter is at 10.0 as this was the position started from.

cmd_start_axis_relativ

5.2.6.15 cmd_start_axis_relativ

Command code:	**0A95**$_{hex}$	**0A95**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	**32-bit float**	
Acknowledgement date:	**32-bit float**	

Description:

The command “cmd_start_axis_absolut” starts motion, immediately sets the “end of processing flag”, and outputs the start position of the started traverse in the acknowledgement date. The independent position update is suppressed.

This command makes it possible to follow up with other command directly after a traverse command, e.g. for querying inputs or setting outputs (see the command “cmd_pos_axis_ relativ”, command code 0A89.

With the command “cmd_get_status_axis”, command code **1910**, the status of the axis can be queried at any later time, thus checking whether the command has been properly executed.

Example of application: Axis 4 is to be moved relatively by 10.000.

Master send data:

	Profibus/Interbus		RS232
Command code:	**0A89**$_{hex}$	#	**0A89**
Command para.:	**0000 0004**$_{hex}$	#	**4**$_{dec}$
Command date:	**4120 0000**$_{hex}$	#	**10.0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

4348 0000	#	**200.0**$_{dec}$

Result: For axis 4, the command was not executed correctly. The position counter is at 200.0 as this was the position started from.

cmd_put_axis_reference_on_position

5.2.6.16 cmd_put_axis_reference_on_position

Command code:	**0A96hex**
Command parameter:	**0001**$_{hex}$ **- max**. number of axes
Command date:	Reference offset / absolute position, **32-bit float**
Acknowledgement date	Current absolute position **32-bit float**
Description:	The axis performs a reference run to the “current position” and uses the command date “Reference offset” as actual position specified, If an axis not defined in the parameter is an error message is output.
Example of application:	Axis 4 must be referenced at the current position. 0 should be set as position.

Master send data:	Profibus/Interbus	RS232
Command code:	**0A96**$_{hex}$	# **0A96**
Command parameter:	**0004**$_{hex}$	# **0004**$_{dec}$
Command date:	**0000**$_{hex}$	# **0.0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:	**0000 0000**$_{hex}$ # **0.0**$_{dec}$
Result:	For axis 4, the command was executed correctly. The position counter is 0.0.

cmd_on_axis

5.2.6.17 cmd_on_axis

Command code:	**0A97hex**
Command parameter:	**0001_{hex} - max**. number of axes
Command date: --	
Acknowledgement date:	-
Description:	The axis is switched on. If an axis not defined in the parameter is specified, an error message is output.

cmd_off_axis

5.2.6.18 cmd_off_axis

Command code:	**0A98hex**
Command parameter:	**0001**$_{hex}$ **- max**. number of axes
Command date: --	
Acknowledgement date:	-
Description:	The axis is switched off. If an axis not defined in the parameter is specified, an error message is output.

cmd_stop_axis_multi_cmd

5.2.6.19 cmd_stop_axis_multi_cmd

Command code:	**0A9A**$_{hex}$
Command parameter:	**0001**$_{hex}$ **-** max. number of axes
Command date:	--
Acknowledgement date	Current absolute position **32-bit float**
Description:	The axis is stopped. If the axis stops, the current position is used and the traverse command aborted with “STOP” is considered to be terminated. The command is immediately acknowledged with end of processing. The time between the transmission of the command and the standstill of the axis depends on the speed and the axis ramp. Whether the axis is at a standstill must then be queried later via the axis status (see commands). If an axis not defined in the parameters is specified, an error message is output.
Example of application:	Axis 4 is to be stopped.

Master send data:	Profibus/Interbus	RS232
Command code:	**0A96**$_{hex}$	# **0A96**
Command parameter:	**0004**$_{hex}$	# **0004**$_{dec}$
Command date:	**0000**$_{hex}$	# **0.0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:	**47A8 0000**$_{hex}$	# **0.0**$_{dec}$
Result:	For axis 4, the command was executed correctly. The position counter is at **20480.0**, as this is the position stopped at.	

cmd_set_measuring_mode

5.2.6.20 cmd_set_measuring_mode

Command code:	**0AA0**$_{hex}$	**0AA0**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	-	
Acknowledgement date:	-	

Description:

The measuring mode is activated with this command.

Before the command is executed, the PA-CONTROL must be in automatic or online mode with the axis to be triggered stands still.

For the **PA-CONTROL EP**, the following applies:
This command activates the current zeroing in the final stage, and the monitoring of the shaft encoder and the readiness of the power pack is deactivated. The brakes may also be switched on.

For the **PA-CONTROL**, the following applies:
The monitoring of the readiness of the power pack is deactivated.

On the one hand, work safety is provided when the final stage is switched off. The axis cannot be moved by the control as positioning commands are blocked. The axis can be manually moved for set-up work or to remedy malfunctions.

Important: The analysis of the shaft encoder remains activated. For the PA-CONTROL EP, the position of the axis can be taken over from the encoder position when the measuring mode is exited. When switching a vertical axis into the measuring mode, this axis may fall down when the brake (axis parameter) is not activated. Risk of collision !

Example of application: For axis 1, the measuring mode is to be activated.

Master send data:

	Profibus/Interbus		RS232
Command code:	**0AA0**$_{hex}$	#	**0AA0**
Command para.:	**0001**$_{hex}$	#	**1**$_{dec}$
Command date:	**0000** $_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

XXXX XXXXX$_{hex}$ # **XXXXX**$_{dec}$

The information in the acknowledgement date is not relevant.

cmd_reset_axis_measuring_mode

5.2.6.21 cmd_reset_axis_measuring_mode

Command code:	**0AA1**$_{hex}$	**0AA1**
Command parameter:	**0001**$_{hex}$ – **0010**$_{hex}$	**1**$_{dec}$ – **16**$_{dec}$
Command date:	-	
Acknowledgement date:		

Description:

The measuring mode is deactivated with this command.

In executing the command in the **PA-CONTROL EP,**

- the motor has current again,
- the brake is deactivated,
- the shaft encoder is (optionally) synchronized,
- the axis position is taken over from the encoder position (option),
- monitoring of shaft encoder and power supply is activated.

Important: When exiting the measuring mode and synchronization on the encoder, the axis is moved to the next impulse flank in the positive direction of rotation. If no impulse flank is registered, traverse is limited to a maximum of 4 full motor steps in the positive direction before being interrupted with error message E560.

In executing the command in the **PA-CONTROL,**
the monitoring of the readiness of the power pack is activated.

As a result, the axis can be moved again by the control.

If the addressed axis is not in measuring mode, the command is skipped or only acknowledged by the port. No actions are executed.

Example of application:

For axis 1, the measuring mode is to be deactivated.

Master send data:

	Profibus/Interbus		RS232
Command code:	**0AA1**$_{hex}$	#	**0AA1**
Command para.:	**0001**$_{hex}$	#	**1**$_{dec}$
Command date:	**0** $_{hex}$	#	**0**$_{dec}$

PA-CONTROL acknowledgement data for error-free completion of command:

Acknowledgement date:

XXXX XXXXX$_{hex}$ # **XXXXX**$_{dec}$

The information in the acknowledgement date is not relevant.

cmd_put_limit_switch_monitoring_on_off

5.2.6.22 cmd_put_limit_switch_monitoring_on_off

Command code:	**0AA2**$_{hex}$
Command parameter:	**Number of the axis (**0=all axes, 1= axis1..)
Command date:	**0** → Monitoring **OFF** **1** → Monitoring **ON**
Acknowledgement date:	-
	Description: This command is used to switch limit switch monitoring off and, at a later point in time, on again.
Application:	Rotational axes are an important application. It must be possible to pass over the limit switch of a rotational axis in normal operation without causing an error.

NOTE During transition to ONLINE mode, the limit switch monitoring is always switched on.

cmd_put_condition_move_axis

5.2.6.23 cmd_put_condition_move_axis

Command code:	**0AA3**$_{hex}$
Command parameter:	**Number of the axis (**0=all axes, 1= axis1..)
Command date:	**Byte 3** $\rightarrow$: Condition 0 = as long as element = 0, 1 = as long as element = 1 **Byte 4** $\rightarrow$: Element type 1 = input 2 = output 3 = flag **Byte 1/0** $\rightarrow$: Number of the element
Acknowledgement date:	-
	Description: This command is used to set a condition for an axis which is then considered during the next movement of this axis.
Application:	An application is the movement of an axis with the condition that a certain input, output or flag is set. Switching over the element terminates the movement.

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6. Technical Appendix

6.1 Explanation IEEE format

	Word 0																Word 1															
Hex	**Byte 0**				**Byte 1**				**Byte 2**				**Byte 3**				**Byte 4**				**Byte 5**				**Byte 6**				**Byte 7**			
Example	4				4				2				0				2				0				0				0			
Bit	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	V	Exponent								Mantissa																						
2nd Pot.		2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}	2^{-16}	2^{-17}	2^{-18}	2^{-19}	2^{-20}	2^{-21}	2^{-22}	2^{-23}
Value		128	64	32	16	8	4	2	1																							

Prefix “V”

0: Prefix is “+” (plus)
1: Prefix is “-” (minus)

CAUTION
DEFINITION
IEEE
FORMAT

Exponent “e”

$$e = \sum_{i=0}^{7} \text{Bit} * 2^i$$

Mantissa ”f”

$$f = \sum_{i=-1}^{-23} \text{Bit} * 2^i$$

Number

$$\text{Real number} = V(\pm)\ [\ \{1+f\} * 2^{\,e-127}\ ]$$

Examples:

40 16 00 00	corresponds to the real number	+	0,34375
41 20 00 00		+	10,00000
43 48 00 00	“	+	200,00000
44 20 20 00	“	+	640,00000
44 A8 00 00	“	+	20480,00000

6.2 System elements of the PA-CONTROL

The operating system of the PA-CONTROL has very much information concerning the axes or the CAN bus or other elements for the user.
This information can be called up via system flags (SM), system N registers (SN) or system R registers.
For a list of the system elements, see the PA-CONTROL Programming Manual.
List of commands for access:

- cmd_send_system_flag
- cmd_send_system_n_register
- cmd_send_system_r_register

Extract from the list of system elements
Flag :

Axis n is referenced	SM51 ... SM66
Axis n is in status ACTIVE	SM91 … SM106
Axis n is FAULT	SM231 …

N tab

System error number	SN10
Status of axis n	SN71 ... SN86

R register

Position of axis 1 when it was switched to the IDLE or SAFE state	SR51 ... SR66
Target position of axis n during the last traverse command	SR71 … SR86

6.3 Flag word assignment

Table: Flag word assignment part 1

Bit No.	FW1	FW2	FW3	FW4	FW5	FW6	FW7	FW8
15	M16	M32	M48	M64	M80	M96	M112	M128
14	M15	M31	M47	M63	M79	M95	M111	M127
...	...	...	...	...	...	...	...	...
1	M2	M18	M34	M50	M66	M82	M98	M114
0	M1	M17	M33	M49	M65	M81	M97	M113

Table: Flag word assignment part 2

Bit No.	FW9	FW10	FW11	FW12	FW13	FW14	FW15	FW16
15	M144	M160	M176	M192	M208	M224	M240	M256
14	M143	M159	M175	M191	M207	M223	M239	M255
...	...	...	...	...	...	...	...	...
1	M130	M146	M162	M178	M194	M210	M226	M242
0	M129	M145	M161	M177	M193	M209	M225	M241

Table: Flag word assignment part 3

Bit No.	FW17	FW18	FW19	FW20	FW21	FW22	FW23	FW24
15	M272	M288	M304	M320	M336	M252	M368	M384
14	M271	M287	M303	M319	M335	M251	M367	M383
...	...	...	...	...	...	...	...	...
1	M258	M274	M290	M306	M322	M338	M354	M370
0	M257	M273	M289	M305	M321	M337	M353	M369

Table: Flag word assignment part 4

Bit No.	FW25	FW26	FW27	FW28	FW29	FW30	FW31	FW32
15	M400	M416	M432	M448	M464	M480	M496	M512
14	M399	M415	M431	M447	M463	M479	M495	M511
...	...	...	...	...	...	...	...	...
1	M386	M402	M418	M434	M450	M466	M482	M498
0	M385	M401	M417	M433	M449	M465	M481	M497

6.4 Operating status of the PA-CONTROL

Table: Operating status of the PA-CONTROL:
The operating mode of the PA-CONTROL is represented in byte 5 of the IEF standard interface.

Operating status	
01	Home position
02	Manual operation via the PA-CONTROL front panel
03	Manual operation via the PA-CONTROL front panel and axis movement
…	
09	Home position with system error
10	AUTOMATIC started
11	AUTOMATIC
12	AUTOMATIC and STOP recognized
13	AUTOMATIC process STOP program
14	
15	AUTOMATIC and STOPPED
16	AUTOMATIC process START-AFTER-STOP program
17	AUTOMATIC malfunction recognized
18	AUTOMATIC process MALFUNCTION program
19	AUTOMATIC STOPPED with MALFUNCTION
20	Manual operation (movement of axes) via WINPAC
30	ONLINE started
31	ONLINE
32	ONLINE STOP recognized
35	ONLINE and STOPPED
37	ONLINE and MALFUNCTION recognized
39	ONLINE STOPPED with MALFUNCTION

For the list of the error numbers, see the PA-CONTROL Operating Instructions, ”Technical Appendix” Section.

6.5 Command - error messages

Error number (hex)	Error number (dec)	Error message	Explanation
00	00	no error	
10	16	Sum of digits error	An error in the sum of digits was found in the transmission of the command via port RS232
11	17	Wrong sequence set-up	The sequence of the control symbols was incorrect in the transmission of the command via port RS232
12	18	Wrong sequence beginning	The sequence of the control symbols was incorrect in the transmission of the command via port RS232
13	19	unknown command	The transmitted command is not part of the valid command list
14	20	inadmissible command	This command may not be used in this situation.
15	21	command not executable	This command is not possible in this situation.
1A	26	EPROM programming defective	The errors in this command group,
1B	27	number of data bytes defective	$(1A – 1F)_{hex}$ / $(26 – 31)_{dec}$ can
1C	28	inadmissible data record	only occur in connection with
1D	29	sum of digits data record defective	an update of the operating
1D	30	delete EPROM defective	- system.
1F	31	inadmissible EPROM address	

Error number (hex)	Error number (dec)	Error message	Explanation
20	32	axis number unknown	The axis triggered by this command is not stored in the system parameters.
21	33	axis parameter unknown	The entry in the command parameter contains invalid information for an axis parameter.
22	34	system parameter unknown	The entry in the command parameter contains invalid information for a system parameter.
23	35	inadmissible input	The command contains an invalid entry for addressing an input
24	36	inadmissible output	The command contains an invalid entry for addressing an output
25	36	inadmissible flag	The command contains an invalid entry for addressing a flag
26	38	inadmissible N register	The command contains an invalid entry for addressing an N register.
27	39	inadmissible R register	The command contains an invalid entry for addressing an R register.
28	40	inadmissible task number	An inadmissible TASK was accessed during parallel processing.
29	41	value outside range	A value outside the values saved in the parameters was entered in the command date
2A	42	axis still moves	An axis already moving was started again
2B	43	no reference point	No reference flag was set for the axis
2C	44	External stop not defined	The definition of an input is necessary for the function “external stop” in the operating mode online. The input must have power.
2D	45	Inadmissible AD converter	The number of the AD converter is not known.
2D	46	Axis not ready	The axis is not ready

Error number		Error message	Explanation
(hex)	(dec)		
2F	7	Axis is no servoTEC axis	The function is not possible with this type of axis
30	48	No connection to servoTEC axis	For this axis, the requested command cannot be processed via the CANBus
31	49	Not all axes initialized	It was not possible to address an axis during initialization of the axes via the CANBus
31	49	Not all axes initialized	It was not possible to address an axis during initialization of the axes via the CANBus
32	50	Error during initialization	The initialization of the axis was aborted because of an error
33	51	Errors in axis parameters	An axis parameter of this axis is out of the permissible range
34	52	Not initiated (Not initialized)	Axis not initialized correctly
35	53	Access to SLAVE axis	Not all commands are allowed with a PA-CONTROL-MP as CANBus slave axis (A2 to A16) (program transfer, ...)
36	54	Axis path too long	With a servoTEC axis, the traverse distance is limited depending on the number of increments per motor revolution.
37	55	Axis not switched on	The axis is in “IDLE” or “SAFE” state
38	56	Axis displaced too much	The axis was displaced too much in the “IDLE” state (see axis parameter).
39	57	Profibus-DP address cannot be taken over	The address setting for the Profibus-DP is performed via the rotary switches
3A	58	Parameter inconsistent	WINPAC and PA-CONTROL use a different list of drive parameters with servoTEC S2 (error in WINPAC)
3B	59	Gantry-SLAVE axis cannot be traversed	This axis is a slave axis of a Gantry drive and therefore cannot be traversed
40	64	limit switch actuated	One of the two limit switches was reached, or a cable of a limit switch broke.
41	65	position outside range	The position given by the traverse command is outside the stored parameter values and cannot be reached.

Error number (hex)	Error number (dec)	Error message	Explanation
50	80	program already existing	The errors in this command group,
51	81	syntax error in program	$(50 – 53)_{hex}$ / $(80 – 83)_{dec}$ can
52	82	program not available	only occur in connection with
53	83	program names already exist	transmission of programs in the PA-CONTROL
60	96	Traverse speed too high	The errors of this command group ($60 – 6A)_{hex}$ occur when starting AUTOMATIC or ONLINE mode. There, the parameters are converted, and a check is done to see if the set values are feasible.
61	97	Traverse speed too low	
62	98	Reference speed too high	
63	99	Reference speed too low	
64	100	Manual speed too high	
65	101	Manual speed too low	
66	102	Creep speed too high	
67	103	Creep speed too low	
68	104	Initial speed too high	
69	105	Initial speed too low	
6A	106	Acceleration too high	
6B	107	Acceleration too low	
6C	108	Measuring mode option not admissible for this axis	This error can only occur in connection with the online commands **0AA0** and **0AA1**
6D	109	Number of axis traverse increments greater than 31 bits	This error is due to the same causes described for the errors (60-6B).
FA	250	Error during execution of host task	Error in communication between the PA-Control CPU and the AS-i bus master CPU
FB	251	no error in query by host	Error in communication between the PA-Control CPU and the AS-i bus master CPU
FC	252	The slave needed for the address change does not exist.	An AS-i slave should be set to an address.
FD	253	Only one slave has the address 0	In AUTOMATIC, no AS-i slave may be present with address 0.

Error number		Error message	Explanation
(hex)	(dec)		
FE	254	slave already exists	An AS-i slave is to be set to an address, but it is already occupied.
FF	255	Error in programming with address 0	An AS-i slave should be set to an address 0.
100	256	New address was not assigned	An AS-i slave should be set to an address.
101	257	New address could not be saved in EEPROM	An AS-i slave should be set to an address.
102	258	Unknown ASI address	An AS-i slave should be set to an address.
103	259	Command time-out	Error in communication between the PA-Control CPU and the AS-i bus master CPU
104	260	ASI power supply error	Error in ASI power pack.
105	261	ASI slave with address 0 is available	wrong programming, only master may have address 0
106	262	ASI configuration defective	

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