SHPIPCBPB
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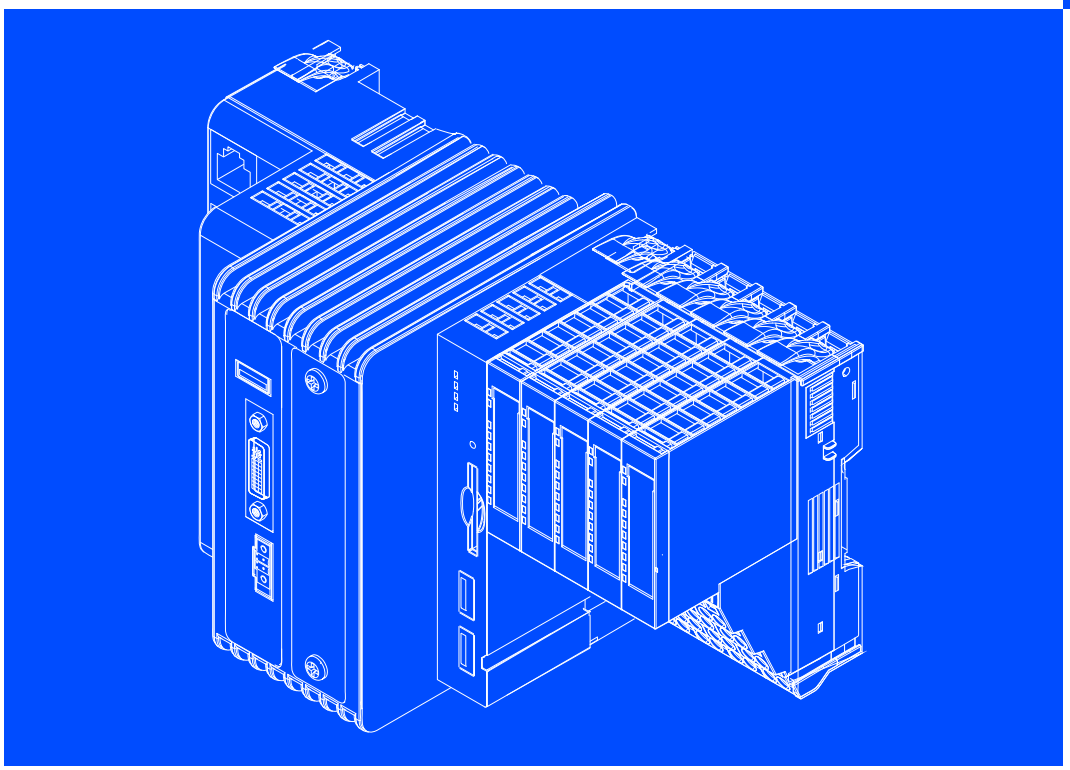
L-force Controls

Software Manual

Industrial PC



L-force Controller 3241C - Backplane Bus

Programming Interface I/O-System 1000

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Contents

1 Introduction

This manual describes the programming interface for the on board I/O system 1000. The L-force Controller 3241 and the I/O compound modules are connected via a backplane bus. By means of an interface DLL (BpbDrvApi.dll), the connection of the individual application to the backplane bus device driver (BpbDrvXp.sys) and the I/O system is enabled.

Up to 64 I/O compound modules can be connected to the 3241 controller. Digital input/output modules, analog modules, and counter modules are provided as I/O compound modules. Further information can be found in the manual of the I/O system 1000.

2 Architecture

In the following illustration the architecture of the backplane bus to the application is shown in a detailed manner.

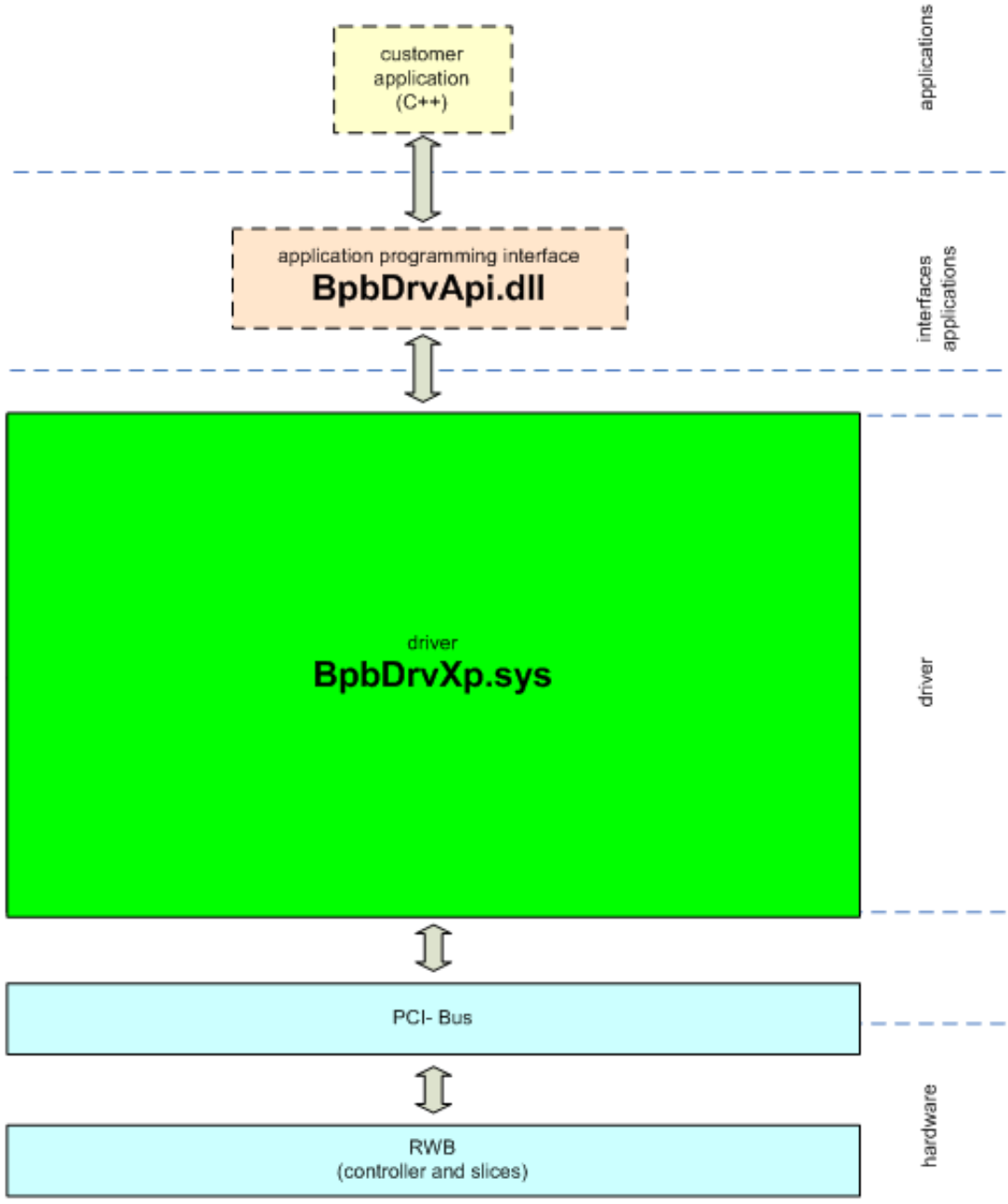


Abb. 1 ***Structure of the backplane bus driver***

3 API functions

The programming interface is based on the backplane bus device driver and provides an interface for the transmission/reception of process data (PDOs) and configuration data (SDOs).

By means of this interface, a cyclic thread is created, copying the process data from/to the I/O modules. The grouping for the customer application interface is simplified, so that there only is one group. During transmission this group contains all output data, and during reception it contains all input data.

3.1 Functions of the interface DLL

The following functions are provided:

Function	Description
BpbApiOpen	Log on application on application interface
BpbApiClose	Log off application on application interface
BpbApiGetVersion	Returns the version
BpbApiGetStates	Read out status of the backplane bus (BPB)
BpbApiResetBpb	Carries out a reset on the BPB controller
BpbApiGetError	Read last error message of the BPB
BpbApiResetError	Resets the error memory in the BPB controller
BpbApiReadSdo	Reading out the input buffer
BpbApiWriteSdo	Writing to the output buffer
BpbApiSetOperational	Starts free-running BPB operation
BpbApiReadPdo	Imports the process image
BpbApiWritePdo	Writes the process image

In the following the functions listed above are specified.

3.2 Basic functions

The basic functions serve to the connection establishment or connection termination:

3.2.1 Function: BpbOpen

Register to the hardware of the controller. The return value is a handle for identification. This handle must be transferred as the first parameter for all further functions.

Parameters

[in] LPTSTR	szAppName	Name of the application to be registered
[out] PHANDLE	hOpen	Pointer to open context (handle) for identification

Return values

S_OK	Successful
E_LOADED	Incomplete (driver not loaded)

3.2.2 Function: BpbClose

Disconnection of the backplane bus connection to the 3241 controller.

Parameter

[in] HANDLE	hOpen	Pointer to open context (handle) for identification

Return values

S_OK	Successful
E_HANDLE	Error during connection termination (handle is invalid)

3.3 Diagnostics, service functions and network management

3.3.1 Diagnostics functions

The diagnostics function provide some return information on the version, available errors, and states of the backplane buses.

BpbGetVersion function

The BpbGetVersion function supplies the version of the backplane bus driver.

Parameter

[in] HANDLE	hOpen	Pointer to open context (handle) for identification
[out] PSTRING	pszVersion	Version of the backplane bus driver

Return values

S_OK	Successful
E_HANDLE	Incorrect (handle is invalid)

BpbGetError function

In the status register an error status is signalised. It contains a byte error code. The BpbGetError function reads out this error code from the status register of the backplane bus.

Parameter

[in] HANDLE	hOpen	Pointer to open context (handle) for identification
[out] PUCHAR	pbError	Error code

Return values

S_OK	Successful
E_HANDLE	Incorrect (handle is invalid)

A description of the error code can be found in the chapter "Error code“.

BpbGetStates function

Parameter

[in] HANDLE	hOpen	Pointer to open context (handle) for identification
[out] PBPBSTATES	pBpbStates	Pointer to the states structure

Return values

S_OK	Successful
E_HANDLE	Incorrect (handle is invalid)

The states are returned in the BpbStates structure. In the following the organisation of this structure is shown.

BpbState structure

Structure of the status register:

UCHAR	hRaw	Raw value of the status information
Name	hName	Status information of the controller and the groups

Structure of the name

Structure of the name:

Bit 0 .. bit 1	Controller	Status of the controller
Bit 2 .. bit 3	Group1	Status of group 1
Bit 4 .. bit 5	Group2	Status of group 2
Bit 6 .. bit 7	Group3	Status of group 3

The byte is divided according to the status byte of the 3241 controller status register and the I/O modules configured.

Return values of the controller

1	BPB_ CONTROLLER_STATE_INIT
2	BPB_ CONTROLLER_STATE_PREOP
3	BPB_ CONTROLLER_STATE_OP

Return values of the group

0	BPB_GROUP_STATE_UNAVAILABLE
1	BPB_GROUP_STATE_INIT
2	BPB_GROUP_STATE_RUNNING
3	BPB_GROUP_STATE_ERROR

Please note: Under XP the grouping for the programming interface is simplified, so that there only is one group. During transmission this group contains all output data, and during reception it contains all input data.

3.3.2 Service functions

The two functions BpbResetBpb and BpbResetError serve to carry out troubleshooting.

BpbResetBpb function

The service function BpbResetBpb carries out a reset of the backplane bus and restarts the backplane bus controller.

Note:

After a reset, BpbSetOperational should be called to start cyclic communication.

Parameter

[in] HANDLE	hOpen	Pointer to open context (handle) for identification

Return values

S_OK	Successful
E_HANDLE	Incorrect (handle is invalid)

BpbResetError function

The service function BpbResetError deletes the fault memory in the status register.

Parameter

[in] HANDLE	hOpen	Pointer to open context (handle) for identification

Return values

S_OK	Successful
E_HANDLE	Incorrect (handle is invalid)

3.3.3 Network management

By means of the BpbSetOperational network management function, the status of the backplane bus can be changed over from Operational to PreOperational.

BpbSetOperational function

The BpbSetOperational function implicitly executes the BpbReset function.

Parameter

[in] HANDLE	hOpen	Pointer to open context (handle) for identification
[in] ULONG	ulCycleTime	Cycle time for internal BPB cycle [µs]
[in] BOOLEAN	bOperational	Operational = TRUE or PreOperational = FALSE

Return values

S_OK	Successful
E_HANDLE	Incorrect (handle is invalid)

3.4 Communication

In this chapter the transmission/reception of process data (PDOs) and configuration data (SDOs) is described.

3.4.1 SDO communication

Configuration data (SDOs)

During writing the configuration data the SDOs are stored directly in an output buffer of the driver. Access is basically initiated by the IPC. The BPB controller then responds accordingly. If the SDOs can be written to the corresponding FIFO of the backplane bus, they are transmitted. A definite job number is assigned to each SDO by the driver, in order to be able to assign responses to the response FIFO and store them in the corresponding input buffer of the application.

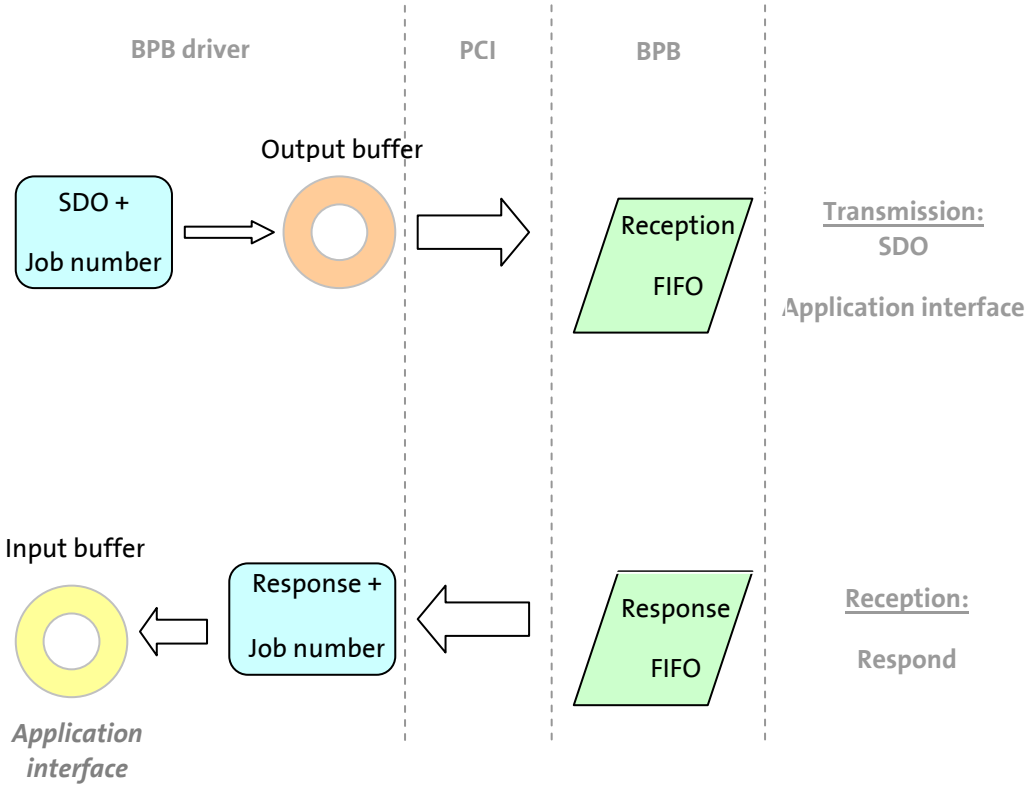


Abb. 2 FIFOs, buffers, and job numbers

A configuration parameter of an I/O module is treated as an SDO in the IPC and is transferred to the BPB controller via the FIFOs in the form of a structure, which contains the data in a format suitable for DS 401. Access of the IPC to the BPB controller is effected in 2 possible ways:

	IPC		BPB controller
Writing:	Write request	⇨	Status message
Reading:	Read request	⇨	Response

3.4.2 SDO functions

BpbReadSdo function

Parameter

[in] HANDLE	hOpen	Pointer to open context (handle) for identification
[out] PUCHAR	pReadBuffer	SDO memory area
[in] WORD	usBufferSize	Size of the memory area
[out] PWORD	pusActualSdoSize	Size of the memory area assigned

Return values

S_OK	Successful
E_HANDLE	Incorrect (handle is invalid)
E_MEMORY	Incorrect (BPB message memory area overflown)

BpbWriteSdo function

Parameter

[in] HANDLE	hOpen	Pointer to open context (handle) for identification
[in] PUCHAR	pWriteBuffer	SDO memory area
[in] USHORT	usBufferSize	Size of the memory area
[in] USHORT	usSdoCount	Number of SDOs
[out] PUSHORT	pusSdoWritten	Number of SDOs written

Return values

S_OK	Successful
E_HANDLE	Incorrect (handle is invalid)
E_FIFO	Incorrect (output buffer has overflown)

3.4.3 SDO indexes

The following table provides a summary of possible telegrams:

	Designation	Index	Subindex	Description
DS301	Hardware/firmware version	1009_h	80_d	String[14] for config. file version of the BPB controller
Indexes 0-1FFF			81_d	String[14] for ID of the BPB master
	Software version	$100A_h$	80_d	String[14] for version of Nios SW (build#.major.minor.micro)
			81_d	String[14] for the master version of the BPB master
	Module identification	1027_h	0_d	Number of disks
			n	Identification according to disk (1-64)
Manufacturer-specific	Module type designation	2028_h	$1_d - 40_d$	Returns string[10] with the type designation of terminal n.
DS401	See documentation for I/O system 1000			
Module parameter for....				

In the following the identification of the modules is described:

Module	Value
DI_2X	0x001
DI_4X	0x003
DI_8X	0x005
DI_4X_3WIRE	0x006
DI_2X_NPN	0x002
DI_4X_NPN	0x004
DI_8X_NPN	0x007
DO_2X	0x101
DO_4X	0x104
DO_8X	0x106
DO_2X_2A	0x102
DO_2X_NPN	0x103
DO_4X_NPN	0x105
DO_8X_NPN	0x107
AI_2X_U	0x401
AI_4X_U	0x404
AI_2X_I	0x402
AI_4X_I	0x405
AO_2X_U	0x501
AO_4X_U	0x503
AO_2X_I	0x502
AO_4X_I	0x504
AI_2X_TC	0x403
AI_4X_R	0x406
CNT_1X_24V	0x991
CNT_1X_5V	0x992
CNT_2X_24V	0x993
CNT_2X_24VEC	0x994
SSI_1X	0x995

3.4.4 SDO block structure

SDO memory area header	1. DWORD	BpbSdoBlockHeader
Status register	2. DWORD	
SDOs	3. DWORD ... n. DWORD	(binary data, according to SDO package formats)

The structure of the SDO memory area results from the different SDO package formats. The following package formats are defined there:

Write request (BpbSdoHeader, BpbWrite) ⇨ status message (BpbSdoHeader)

Read request (BpbSdoHeader) ⇨ response (BpbSdoHeader, BpbRead)

Each SDO (FIFO telegram) starts with a header, which is identical for the IPC and the BPB controller:

Header

Structural element	Type	Bits	Description	FIFO
Index	WORD	16-31	Index of the parameter	1 DWORD
Subindex	BYTE	8-15	Subindex of the parameter	
Control	BYTE	0-7	Bit 7 = 0 (read) / 1 (write) Bit 0-6 = job number	

Via the index and subindex, the BPB controller basically decodes the action to be executed and, if required, generates a suitable command for the BPB master, which the backplane bus master in turn transmits to the I/O module/s. Since a telegram on the BPB must only contain a maximum of 64 bytes of user data, a data volume greater than that, if necessary, has to be fragmented into several individual telegrams by the IPC. After processing, the BPB controller sends a status message on the response FIFO to the IPC. The response contains the job number and one byte regarding the success of the action.

In the following the SDOs for writing/reading and the corresponding status message/response are shown:

Write request

Structural element	Type	Bits	Description	FIFO
Header				1 DWORD
Value	BYTE	24-31	0. WORD	1 DWORD
Value	BYTE	16-23		
Number of values	BYTE	8-15	Number of bytes (max. 64)	
Reserved	BYTE	0-7		
Values	WORD		2. WORD	1 DWORD
	WORD		1. WORD	
	WORD		4. WORD	1 DWORD
	WORD		3. WORD	
	WORD		6. WORD	1 DWORD
	WORD		5. WORD	

For the sequence of the values, in the 2. and all following DWORD ascending byte addresses are selected, respectively.

Status message (identical to the response to a read request)

Structural element	Type	Bits	Description	FIFO
Header				1 DWORD
Reserved	BYTE	24-31		1 DWORD
Reserved	BYTE	16-23		
Number of values	BYTE	8-15	Number of bytes (max. 64)	
Status	BYTE	0-7	Status information (0 = OK)	

Read request

Structural element	Type	Bits	Description	FIFO
Header				1 DWORD

Response

Structural element	Type	Bits	Description	FIFO
Header				1 DWORD
Value	BYTE	24-31	2. value	1 DWORD
Value	BYTE	16-23	1. value	
Number of values	BYTE	8-15	Number of bytes (max. 64)	
Status	BYTE	0-7	Status information (0 = OK)	
Values	ARRAY		Other values to be transmitted	n DWORDs

Notes:

All SDOs are to be stored in a DWORD-aligned manner.

Job is completed automatically by the driver.

3.4.5 Memory requirements for SDO

For SDO there are also two directions:

- L-force Controller transmits control data/commands to the backplane bus controller
- Backplane bus controller transmits control data/status information to the L-force Controller

For both directions FIFOs are used as mailbox. The size of the FIFOs is 128 bytes in each case.

3.4.6 PDO communication

Process data (PDO)

In order to read process data from the backplane bus, the BpbReadPdo function is used, reading the process input image. The process output image can be written to the backplane bus by means of the BpbWritePdo function. The reading/writing of PDOs is only possible in the Operational state.

Reading/writing the PDOs of a group is only transmitted from/to the BPB controller if the group status is "RUNNING“. During the "INIT“ group status, the values are read as 0 (directly in the driver, not from the BPB controller).

By the BpdReadPdo and BpbWritePdo functions, a PDO block including a header (contains the size of the PDOs and the status register) is provided or expected. In the case of the writing access, the contents of the status register are ignored.

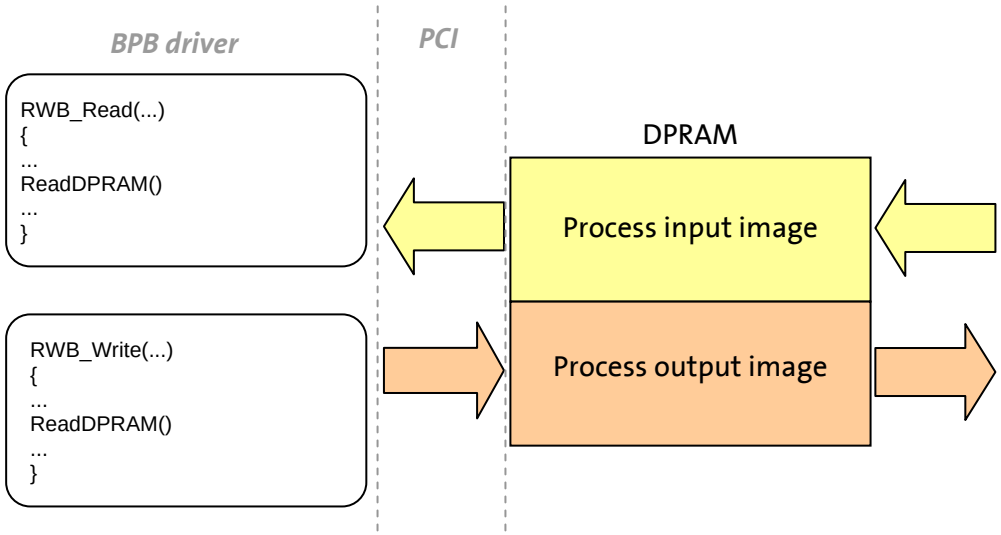


Abb. 3 Reading/writing the process image

3.4.7 PDO functions

BpbReadPdo function

Parameter

[in] HANDLE	hOpen	Pointer to open context (handle) for identification
[out] PUCHAR	pReadBuffer	PDO memory area
[in] WORD	usBufferSize	Size of the memory area
[out] PWORD	pusActualPdoSize	Size of the memory area assigned

Return values

S_OK	Successful
E_HANDLE	Incorrect (handle is invalid)
E_MEMORY	Incorrect (BPB message memory area overflown)

BpbWritePDO function

Parameter

[in] HANDLE	hOpen	Pointer to open context (handle) for identification
[in] PUCHAR	pWriteBuffer	PDO memory area
[in] USHORT	usBufferSize	Size of the memory area
[out] PUSHORT	pusSdoWritten	Number of PDOs written

Return values

S_OK	Successful
E_HANDLE	Incorrect (handle is invalid)

PDO block structure

The structure of the process data results from the group configuration of the I/O modules.

Size of the PDO memory area	1. DWORD	BpbPdoBlockHeader
Status register	2. DWORD	
SDOs	3. DWORD ... n. DWORD	(binary data, according to process image)

After a read or write access the status register contains the current status of the BPB and does not serve to change the status of the BPB.

3.4.8 Memory requirements for process data

The memory requirements for process data can be calculated via the currently available modules:

Terminal	Process image	Configurable	Bytes @64 nodes
DI,DO 2x	2 bits Always 1byte per terminal is transmitted		64
DI,DO 4x	4 bits (1byte)		64
DI,DO 8x	8 bits (1byte)		64
AI,AO 2x12bits	4 bytes (2x16bits)	✓	256
AI,AO 4x12bits	8 bytes (4x16bits)	✓	512

Reading and writing are different with the regard to the maximum amount of data. During reading, according to the table there is a maximum of 1280 bytes; during writing a maximum of 512 bytes.

3.4.9 Example constellation

The example constellation of a randomly selected combination of I/O compound modules is used as an illustration. After the address location has been carried out, the following results:

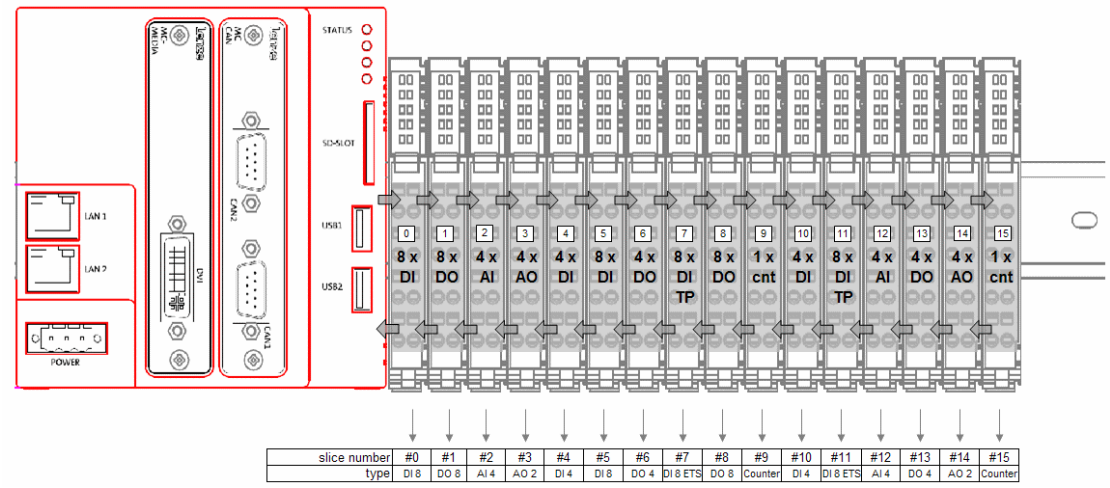
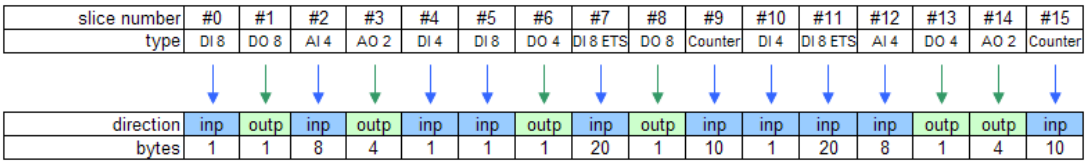


Abb. 4 Example constellation

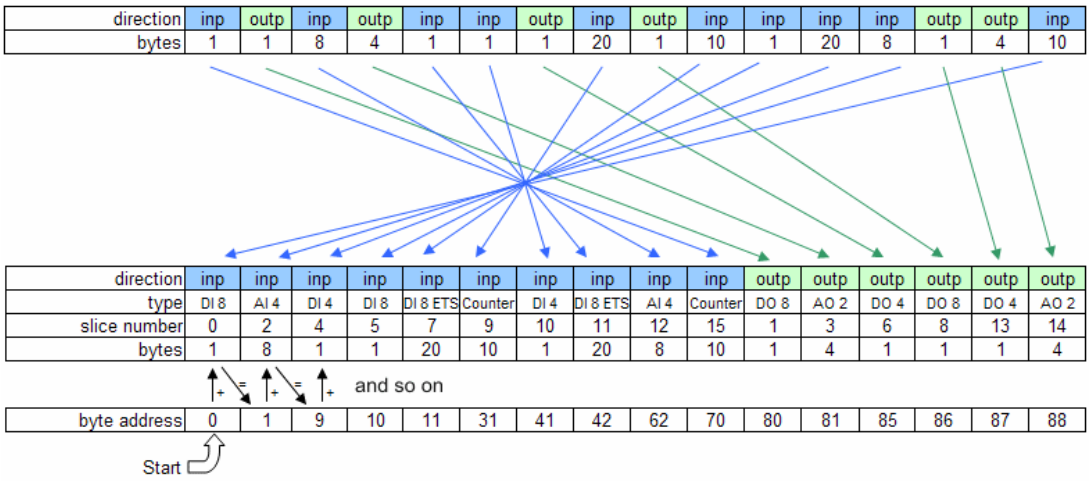
In the next step, the BPB controller classifies the I/O compound modules determined on the basis of their slice ID according to the categories "input“ or "output“. Depending on the slice ID, the required number of bytes in the PI is determined on the basis of a look-up table. (Inputs: blue, outputs: green)



slice number	#0	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15
type	DI 8	DO 8	AI 4	AO 2	DI 4	DI 8	DO 4	DI 8 ETS	DO 8	Counter	DI 4	DI 8 ETS	AI 4	DO 4	AO 2	Counter
direction	inp	outp	inp	outp	inp	inp	outp	inp	outp	inp	inp	inp	inp	outp	outp	inp
bytes	1	1	8	4	1	1	1	20	1	10	1	20	8	1	4	10

Abb. 5 Dividing the disks into inputs and outputs

With the information determined, the memory mapping can be calculated. For the case shown here the simplified assumption is that there only is 1 group for all inputs and outputs in each case.



direction	inp	outp	inp	outp	inp	inp	outp	inp	outp	inp	inp	inp	inp	outp	outp	inp
bytes	1	1	8	4	1	1	1	20	1	10	1	20	8	1	4	10

direction	inp	inp	inp	inp	inp	inp	inp	inp	inp	inp	outp	outp	outp	outp	outp	outp
type	DI 8	AI 4	DI 4	DI 8	DI 8 ETS	Counter	DI 4	DI 8 ETS	AI 4	Counter	DO 8	AO 2	DO 4	DO 8	DO 4	AO 2
slice number	0	2	4	5	7	9	10	11	12	15	1	3	6	8	13	14
bytes	1	8	1	1	20	10	1	20	8	10	1	4	1	1	1	4
byte address	0	1	9	10	11	31	41	42	62	70	80	81	85	86	87	88

Abb. 6 Classification of the disks and calculation of the memory mapping

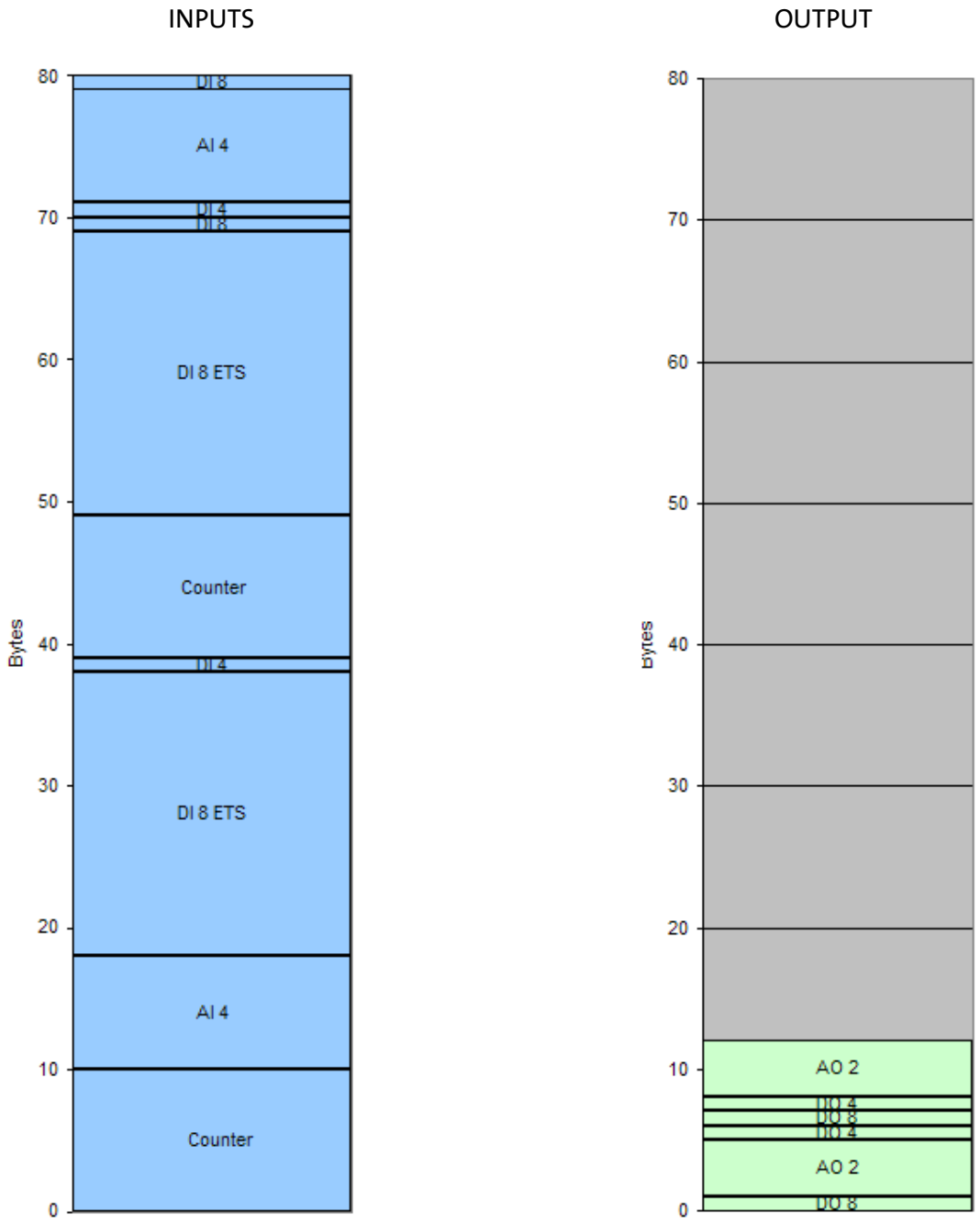


Abb. 7 Memory image of inputs and outputs in the address area

3.5 Status description of the backplane bus (state machine)

The switch-on procedure in the backplane bus is effected in several steps.

	Status	Transition	Description
1.	Init		Initialisation of the peripherals, automatic transition to the PreOperational state, and setting a status bit. No PDO & SDO communication
2.	PreOperational		SDO communication possible - Reception of configuration data for the individual terminals - Waiting for the "Start“ telegram, or repeated "Config“ L-force Controller -> BPB controller - Transmission of the terminal data to the IPC
3.	Operational		SDO & PDO communication possible

3.6 Error codes

The programming interface returns the following possible error codes. Errors are returned as a bit mask, i.e. several error codes can be linked with each other in each case.

Error list for the status register

(Error byte in the status register)

Error number		Category	Source	Description
Dec	Hex			
0	0	-	-	No error; ok
11	B	Warning	BPB controller	Synchronisation: DPRAM lock register
12	C	Warning	BPB controller	Result FIFO full
31	1F	Warning	BPB driver	Synchronisation: DPRAM lock register
32	20	Warning	BPB driver	Timeout: Reset
33	21	Warning	BPB driver	Timeout: ErrorReset
96	60	Error	BPB controller	Error during creation of group 1
97	61	Error	BPB controller	Error during creation of group 2
98	62	Error	BPB controller	Error during creation of group 3
99	63	Error	BPB controller	Groups ok, but cycle time not sufficient
100	64	Error	BPB controller	Error during processing the master queues

Error number		Category	Source	Description
Dec	Hex			
101	65	Error	BPB controller	Controller timeout during processing the master queues
102	66	Error	BPB controller	Error during the initialisation of the bus (error on one disk)
103	67	Error	BPB controller	Cycle time exceeded
104	68	Error	BPB controller	DPRAM semaphore timeout of group 1 (reading)
105	69	Error	BPB controller	DPRAM semaphore timeout of group 2 (reading)
106	6A	Error	BPB controller	DPRAM semaphore timeout of group 3 (reading)
107	6B	Error	BPB controller	DPRAM semaphore timeout of group 1 (writing)
108	6C	Error	BPB controller	DPRAM semaphore timeout of group 2 (writing)
109	6D	Error	BPB controller	DPRAM semaphore timeout of group 3 (writing)
116	74	Error	BPB driver	DPRAM semaphore timeout of group 1 (reading)
117	75	Error	BPB driver	DPRAM semaphore timeout of group 2 (reading)
118	76	Error	BPB driver	DPRAM semaphore timeout of group 3 (reading)
119	77	Error	BPB driver	DPRAM semaphore timeout of group 1 (writing)
120	78	Error	BPB driver	DPRAM semaphore timeout of group 2 (writing)
121	79	Error	BPB driver	DPRAM semaphore timeout of group 3 (writing)
181	B5	Fatal error	BPB controller	Synchronisation: DPRAM
182	B6	Fatal error	BPB controller	
200	C8	Fatal error	BPB controller	SDO timeout
201	C9	Fatal error	BPB driver	
220	DC	Fatal error	BPB driver	SDO communication error (=> inhibit of SDO communication)

A fatal error can only be eliminated by a reset of the BPB.

The following SDO errors can occur:

Error list for the SDO status

(status byte in the second DWORD of the SDO response)

Error number		Description
Dec	Hex	
0	0	No error; OK
8	8	Telegram timeout
40	28	Subindex out of range
63	3F	Group number out of range
200	C8	SDO timeout FATAL Error
254	FE	Subindex not supported
255	FF	Index not supported
160	A0	Read Access on write-only parameter
161	A1	Write access on read-only parameter
170	AA	Wrong lenght of data

3.7 I/O module types and their data width

In this chapter a list of the available I/O modules is shown:

Disk	Description	Data width
Digital I/O		
EPM–S200	2 digital inputs	2 bits
EPM–S201	4 digital inputs	4 bits
EPM–S202	8 digital inputs	8 bits
EPM–S203	4 digital inputs 3–wire	8 bits
EPM–S204	2 digital inputs NPN	2 bits
EPM–S205	4 digital inputs NPN	4 bits
EPM–S206	8 digital inputs NPN	8 bits
EPM–S300	2 digital outputs 0.5 A	2 bits
EPM–S301	4 digital outputs 0.5 A	4 bits
EPM–S302	8 digital outputs 0.5 A	8 bits
EPM–S303	2 digital outputs 0.5 A NPN	2 bits
EPM–S304	4 digital outputs 0.5 A NPN	4 bits
EPM–S305	8 digital outputs 0.5 A NPN	8 bits
EPM–S306	2 digital outputs 2 A	2 bits
EPM–S309	4 digital outputs 2 A	4 bits
EPM–S308	2 relay outputs	
Analog I/O		
EPM–S400	2 analog inputs 0 ... 10 V DC	2 x 16 bits
EPM–S401	4 analog inputs 0 ... 10 V DC	4 x 16 bits
EPM–S402	2 analog inputs 0/4 ... 20 mA	2 x 16 bits
EPM–S403	4 analog inputs 0/4 ... 20 mA	4 x 16 bits
EPM–S500	2 analog outputs 0 ... 10 V DC	2 x 16 bits
EPM–S501	4 analog outputs 0 ... 10 V DC	4 x 16 bits
EPM–S502	2 analog outputs 0/4 ... 20 mA	2 x 16 bits
EPM–S503	4 analog outputs 0/4 ... 20 mA	4 x 16 bits
Temperature measurement		
EPM–S404	4(2) analog inputs resistor	4(2) x 16 bits
EPM–S405	2 analog inputs thermocouple	2 x 16 bits

Disk	Description	Data width
Counter		
EPM–S600	1 counter 32 bits, 24 V DC (reading, setting, comparing)	12 bytes input/10 bytes output
EPM–S601	2 counters 32 bits, 24 V DC (reading, setting)	12 bytes input/12 bytes output
EPM–S602	1 counter 32 bits, 5 V DC (reading, setting)	8 bytes input/10 bytes output
EPM–S603	2 counters 32 bits, 24 V DC (reading)	12 bytes input/4 bytes output
Encoder evaluation		
EPM–S604	SSI	6 bytes input

4 Software

List of the software required for the individual application:

4.1 Driver

Name	Description	Directory
BpbDrvXp.sys	Backplane bus driver for the backplane bus	..\Windows\System32\Drivers\
BpbDrvXp.inf	Backplane bus driver installation routine	..\Windows\Inf\
WdfCoInstaller01007.dll	KDMF Framework	..\Windows\System32\

The driver is preinstalled in the WES2009 for the 3241 controller

4.2 Programming interface

Name	Description	Directory
BpbDrvApi.dll	Programming interface for access to the backplane bus via the backplane bus driver	..\Windows\System32\

The programming interface is preinstalled in the WES2009 for the 3241 controller.

4.3 Include and library files

The following include and library files are to be integrated in the individual C++ application:

Include files

Name	Description
BpbDrv.h	Header file of the structures and definitions used
BpbDrvApi.h	Header file of the macro definitions of the functions provided by the backplane bus driver
BpbError.h	Header file of the error definitions

Library files

Name	Description
BpbDrvApi.lib	Library of the programming interface for access to the backplane bus via the backplane bus driver

Example application

Name	Description
BpbApiSample	C++ example application for connection to the I/O system 1000 using all functions provided

5 Definitions, acronyms, and abbreviations

The following abbreviations are relevant for understanding this document :

- IPC Industrial PC
- RWB Backplane bus
- SDO Service data object
- PDO Process data object
- DS401 CanOpen profile for “generic IO modules”
- DPRAM Dual Ported RAM
- DWORD 32-bit date
- WORD 16-bit date
- BYTE 8-bit date
- PCI Peripheral Component Interconnection
- DI Digital In
- DO Digital Out
- AI Analog In
- AO Analog Out
- API Application Programming Interface
- DLL Dynamic Link Library
- LIB Library
- SYS System driver
- BPB Backplane bus

Lenze Automation GmbH
Hans-Lenze-Str. 1
D-31855 Aerzen
Germany

+49 (0)51 54 / 82-0

+49 (0)51 54 / 82 - 28 00

Lenze@Lenze.de

www.Lenze.com

Service

Lenze Service GmbH
Breslauer Straße 3
D-32699 Extertal
Germany

00 80 00 / 24 4 68 77 (24 h helpline)

+49 (0)51 54 / 82-11 12

Service@Lenze.de

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