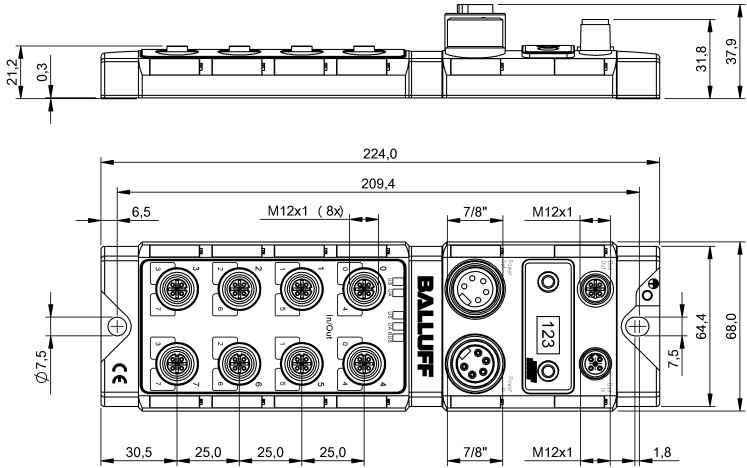


BNI PBS-104-101-Z001  
BNI PBS-202-101-Z001  
BNI PBS-206-101-Z001  
BNI PBS-302-101-Z001

Profibus IO Modules  
User's Guide





## Contents

<b>1</b>	<b>Notes for the user</b>	<b>3</b>
1.1	Structure of the manual	3
1.2	Typographical conventions	3
	Enumerations	3
	Actions	3
	Syntax	3
	Cross-references	3
1.3	Symbols	3
1.4	Abbreviations	3
1.5	Deviating views	3
<b>2</b>	<b>Safety</b>	<b>4</b>
2.1	Intendend use	4
2.2	Installation and Startup	4
2.3	General Safety Notes	4
2.4	Resistance to Aggressive Substances	4
	Dangerous Voltage	4
<b>3</b>	<b>First Steps</b>	<b>5</b>
3.1	Connection overview - BNI PBS-xxx-101	5
<b>4</b>	<b>Basic knowledge</b>	<b>6</b>
4.1	Product description	6
4.2	Profibus	6
4.3	Replacing modules	6
<b>5</b>	<b>Technical data</b>	<b>7</b>
5.1	Dimensions	7
5.2	Mechanical data	7
5.3	Electrical data	7
5.4	Operating conditions	7
<b>6</b>	<b>Installation</b>	<b>8</b>
6.1	Mechanical connection	8
6.2	Electrical connection	8
	Function ground	8
	Supply voltage	9
6.3	Bus connection	10
6.4	Ports	10
	I/O ports	10
6.5	Replacing BNI PBS modules	10
<b>7</b>	<b>Startup</b>	<b>11</b>
7.1	Profibus address	11
	Addressing	11
	Menu structure	11
	Address setting	11
7.2	Configuration	11
	GSD file	12
	Header module	12
	Structure of the header module	12
	Header byte coding	12
	Data modules	12
	Data module coding	12
	Process data coding	13
7.3	Parameter configuration	14
	Parameter setting of the standard I/O ports	14
7.4	Parameter configuration	15
	Norm-specific parameters	15
	Station status	15

WD_Fact_1 and WD_Fact_2	15
MinTSDR	16
Ident_Number_High	16
Ident_Number_Low	16
Group_Ident	16
User parameters	17
BNI PBS-104-...	17
BNI PBS-202-...	17
BNI PBS-206-...	17
BNI PBS-302-...	18
Coding the user parameters	18
7.5 Integration in project planning software	21
Installing the GSD file	21
Prerequisite	22
Integrating the module	22
Header module	23
Adding	23
Specifying the properties	23
Configuring inputs or outputs	24
Configuring the slots	24
<b>8 Diagnostics</b>	<b>25</b>
8.1 Function Indicators	25
LED indicators	25
Module LEDs	25
I/O port LEDs	25
Diagnostics input	25
8.2 Diagnostics telegram	26
8.3 Norm diagnostics	26
Norm diagnostics coding	26
Status 1	26
Status 2	27
Status 3	27
Address	27
Ident_Number_High_Byte	27
Ident_Number_Low_Byte	27
8.4 Device-specific diagnostics	28
ID-specific diagnostics	28
Channel-specific diagnostics	28
Possible channel-specific diagnostics	29
<b>9 Appendix</b>	<b>31</b>
9.1 Scope of delivery	31
9.2 Order code	31
9.3 Ordering information	31
9.4 ASCII table	32

## 1 Notes for the user

- 1.1 Structure of the manual** The guide is organized so that the chapters build on each other:  
Chapter 2: Basic safety information.  
.....
- 1.2 Typographical conventions** The following typographical conventions are used in this guide
- Enumerations** Enumerations are shown in list form with bullet points
- Entry 1
  - Entry 2
- Actions** Action instructions are indicated by a preceding triangle. The result of an action is indicated by an arrow.
- Action instruction 1,
  - Action result.
  - Action instruction 2.
- Syntax**
- Numbers:**
- Decimal numbers are shown without additional indicators (e.g. 123),
  - Hexadecimal numbers are shown with the additional indicator hex (e.g. 00hex).
- Menu commands:**  
Menu commands are separated by a vertical line. "Tools | Install new GSD..." refers to the menu command "Install new GSD..." from the "Tools" menu.
- Buttons:**  
Buttons are shown in brackets, e.g. [Install].
- Cross-references** Cross-references indicate where additional information on the topic can be found.
- 1.3 Symbols**
- 
-  **Note**  
This symbol indicates general notes.
- 
-  **Attention!**  
This symbol indicates a safety instruction that must be followed without exception.
- 
- 1.4 Abbreviations**
- |             |                                  |
|-------------|----------------------------------|
| BCD         | Binary coded switch              |
| BNI         | Balluff Network Interface        |
| EMC         | Electromagnetic Compatibility    |
| FE          | Function ground                  |
| GSD file    | Generic Station Description      |
| I-port      | Digital input port               |
| LSB         | Least Significant Bit            |
| MSB         | Most Significant Bit             |
| O-port      | Digital output port              |
| PELV        | Protective Extra Low Voltage     |
| PLC         | Programmable Logic Controller    |
| Profibus-DP | Profibus Decentralized Periphery |
| SELV        | Safety Extra Low Voltage         |
- 1.5 Deviating views** Product views and illustrations in this guide may differ from the actual product. They are intended only as illustrative material.

## 2 Safety

### 2.1 Intendend use

The BNI PBS-... serves as a decentralized input and output module for connecting to a Profibus-DP network. The module may be used only for this purpose in an industrial environment corresponding to Class A of the EMC Law.

### 2.2 Installation and Startup



#### Attention!

Installation and startup are to be performed by trained technical personnel only. Skilled specialists are people who are familiar with the work such as installation and the operation of the product and have the necessary qualifications for these tasks. Any damage resulting from unauthorized tampering or improper use shall void warranty and liability claims against the manufacturer. The operator is responsible for ensuring that the valid safety and accident prevention regulations are observed in specific individual cases.

### 2.3 General Safety Notes

Commissioning and inspection

Before commissioning, carefully read the User's Guide.

The system must not be used in applications in which the safety of persons depends on the function of the device.

#### Intended use

Warranty and liability claims against the manufacturer shall be rendered void by damage from:

- Unauthorized tampering
- Improper use
- Use, installation or handling contrary to the instructions provided in this User's Guide.

#### Obligations of the owner/operator!

The device is a piece of equipment in accordance with EMC Class A. This device can produce RF noise. The owner/operator must take appropriate precautionary measures against this for its use. The device may be used only with a power supply approved for this. Only approved cables may be connected.

#### Malfunctions

In the event of defects and device malfunctions that cannot be rectified, the device must be taken out of operation and protected against unauthorized use.

Approved use is ensured only when the housing is fully installed.

### 2.4 Resistance to Aggressive Substances



#### Attention!

The BNI modules always have good chemical and oil resistance. When used in aggressive media (such as chemicals, oils, lubricants and coolants, each in a high concentration (i.e. too little water content)), the material must first be checked for resistance in the particular application. No defect claims may be asserted in the event of a failure or damage to the BNI modules caused by such aggressive media.

### Dangerous Voltage



#### Attention!

Before working on the device, switch off its power supply.

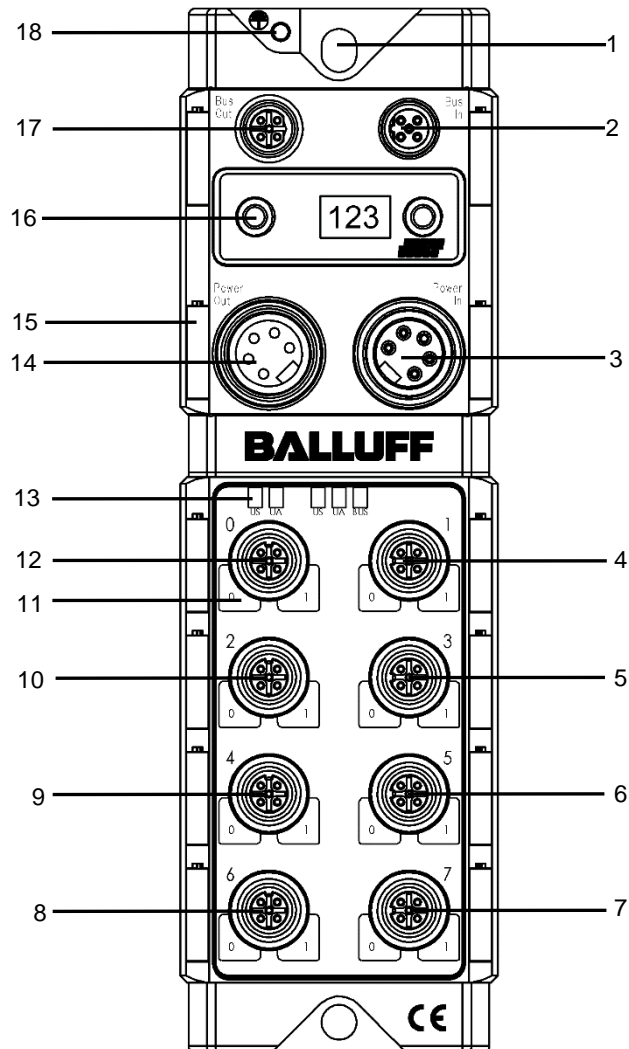


#### Note

In the interest of continuous improvement of the product, Balluff GmbH reserves the right to change the technical data of the product and the content of these instructions at any time without notice.

### 3 First Steps

#### 3.1 Connection overview - BNI PBS-xxx-101



- |   |                         |    |                          |
|---|-------------------------|----|--------------------------|
| 1 | Mounting hole           | 10 | Port 2                   |
| 2 | Profibus input          | 11 | Port LEDs                |
| 3 | Supply voltage POWER IN | 12 | Port 0                   |
| 4 | Port 1                  | 13 | Module LEDs              |
| 5 | Port 3                  | 14 | Supply voltage POWER OUT |
| 6 | Port 5                  | 15 | Part label               |
| 7 | Port 7                  | 16 | Display with buttons     |
| 8 | Port 6                  | 17 | Profibus output          |
| 9 | Port 4                  | 18 | Ground                   |

## 4 Basic knowledge

### 4.1 Product description

Balluff Network Interface BNI PBS-...:  
Used for connecting sensors/actuators to a Profibus-DP network.  
Sensors/actuators can be connected through eight standard I/O ports.  
Connection to Profibus using 2 × M12x1 round connectors.  
Electrical power 24 V DC using 7/8" round connector.

Connection options:

- BNI PBS-104-...**: 16 standard inputs
- BNI PBS-202-...**: 8 standard outputs
- BNI PBS-206-...**: 16 standard outputs
- BNI PBS-302-...**: max. 16 standard inputs/outputs, freely configurable

The main areas of application are:

- In the industrial sector as an interface between sensors/actuators and a Profibus.

### 4.2 Profibus

Open bus system for process and field communication in cell networks with a low number of stations as well as for data communication per IEC 61158/EN 50170. Automation devices such as PLCs, PCs, control and monitoring devices, sensors or actuators can communicate over this bus system.

Variants:

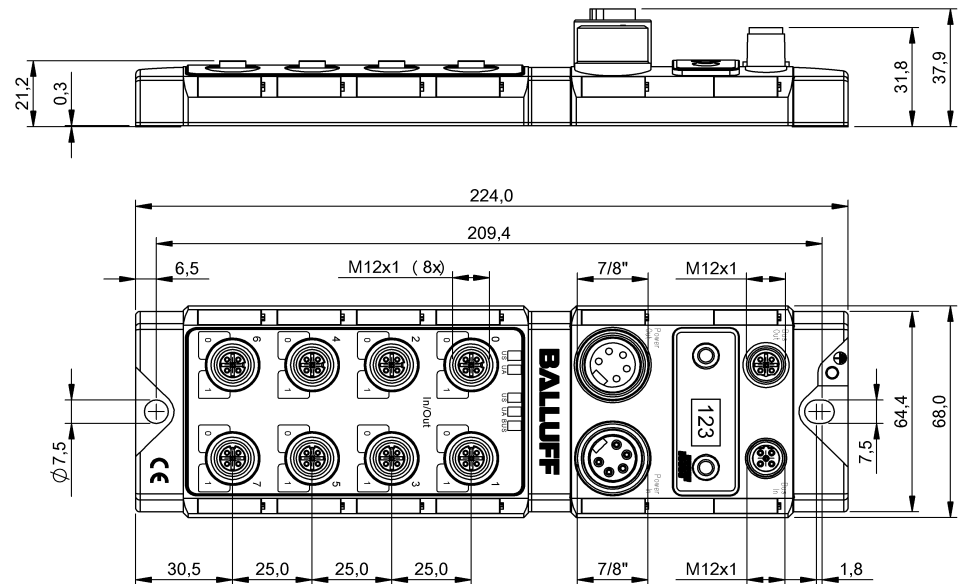
- Profibus DP for fast, cyclical data exchange with field devices,
- Profibus PA for applications in process automation in the intrinsically safe area,
- Profibus FMS for data communication between automation devices and field devices.

### 4.3 Replacing modules

The BNI PBS-... modules are upward compatible. A defective module can be replaced with a module which has a greater or at least the same functionality.

## 5 Technical data

### 5.1 Dimensions



### 5.2 Mechanical data

Housing material	Die-case zinc, matte nickel plated
Fieldbus	Profibus: M12, B-coded (male and female)
Supply voltage	5-pin, 7/8" (male and female)
I/O ports	M12, A-coded (8x female)
Enclosure rating	IP67 (only when plugged-in and screwed-in)
Weight	approx. 735 g

### 5.3 Electrical data

Operating voltage	18 ... 30 V DC
Ripple	< 1 %
Current draw without load	≤ 200 mA

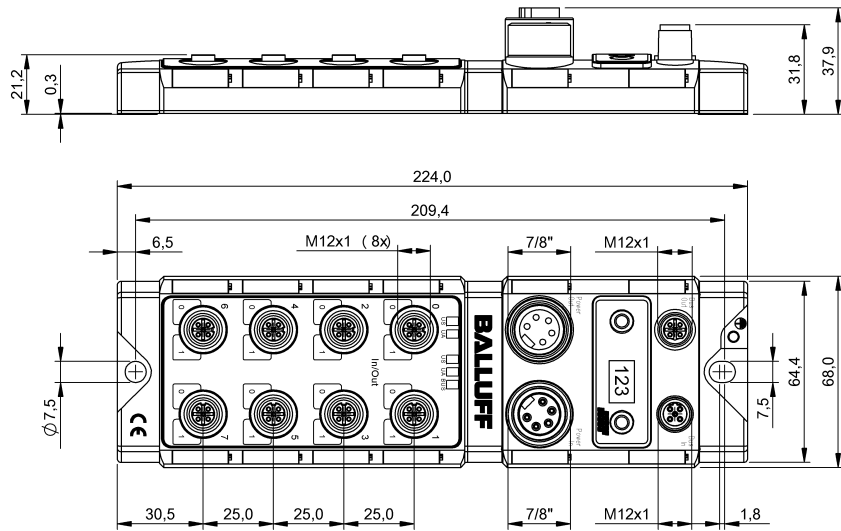
### 5.4 Operating conditions

Operating temperature	-5 C ... 70°C
Storage temperature	-25 C ... 70°C



## 6 Installation

### 6.1 Mechanical connection



The BNI PBS-... module can be connected directly to a mounting wall or to a machine. Be sure that the mounting base is flat to prevent any mechanical stress on the device housing.

Two M6 screws and two washers are required for mounting. The tightening torque is 9 Nm.

#### Installation:

- Attach module using two M6 screws and two washers.
- Keep a distance of at least 3 mm between two modules.

The BNI PBS-... is attached using two max. M6 screws and two washers.

#### Note



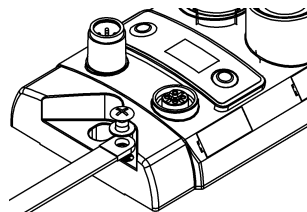
Recommended hole dimension:  $210.5 \pm 0.2$  mm (when using M6 screws!). All IP67 Profibus/Profinet splitter boxes can be mounted when this hole diameter is used.

### 6.2 Electrical connection

The ground connection for the BNI PBS-... modules is located at upper left next to the mounting hole.

Ground straps are preferred for the ground connection. Alternately a fine-strand PE wire with large cross-section may be used.

#### Function ground



#### Note

The FE connection from the housing to the machine must be low-impedance and kept as short as possible.

**Supply voltage**

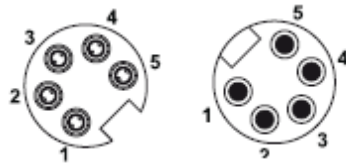
Profibus modules require a DC voltage of 24 V DC (SELF/PELF) for power. The power can be provided by regulated and unregulated power supplies. Regulated power supplies allow the output voltage to be increased above the nominal voltage to compensate for line losses.



**Attention!**

The use of a Profibus hybrid cable is not permitted.

**Power IN (7/8", 5-pin, male) Power OUT (7/8", 5-pin, female)**



Pin	Function	
1	Ground	0 V
2		
3	Function ground	FE
4	Module and sensor supply	+24V
5	Actuator supply	+24V

- 24 V DC.
- Use different power sources for the sensor/bus and for the actuator if possible to minimize noise susceptibility.
- Total current < 9 A. The total current of all modules may not exceed 9 A even when daisy chaining the actuator supply.



**Note**

Module and connected sensors are powered by the "module and sensor supply", while the "actuator supply" powers all outputs.



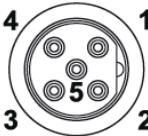
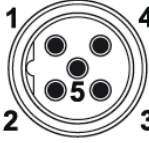
**Note**

The sensor supply and actuator supply should be powered from different electricity sources wherever possible.

6 Installation

6.3 Bus connection

The bus connection is made using the Profibus IN and Profibus OUT M12 sockets. The address is set on the address switch.

Profibus OUT (M12, B-coded, female)	Profibus IN (M12, B-coded, male)	PIN	Function
		1	VP(+5V)
		2	RxD/TxD-N, A line (green)
		3	DGND
		4	RxD/TxD-P, B line (red)
		5	n.c.
		Thread	Shield/FE

**Connection information**

- i** > Connect protective ground to FE
- > Connect the incoming Profibus line to Profibus IN
- > Connect the secondary Profibus line to Profibus OUT and connect to downstream device or use terminating resistor.

**i Note** Each Profibus segment must be terminated with a bus terminator. The terminating resistor requires no external voltage. Unused sockets must be fitted with cover caps to ensure IP 67 enclosure rating.


**⚠ Attention!** Pin 1 on the male connector (VP) is only required for the terminating resistors and is coupled via the Profibus. Any voltages connected directly to the pin may damage the module.

6.4 Ports

Eight I/O ports are provided for connecting actuators and sensors. The sensor supply is protected against short circuits and overload by a self-resetting PTC. When an overload or short circuit occurs at the output, the affected output is turned off. The output remains turned off after the fault is eliminated. The affected output must be turned off from the controller to clear the short circuit memory.

I/O ports

**Standard I/O port M12, A-coded, female**

	PIN	Function
	1	+ 24 V, max. 200mA
	2	Input / output max. 2A / diagnostics input
	3	0 V / GND
	4	Input / output max. 2A
	5	FE

**i Note** For the digital sensor inputs, the input guideline specified in EN 61131-2, Type 2 applies.

6.5 Replacing BNI PBS modules

- Turn off power to the Profibus module,
- remove the mounting screws,
- replace the unit.

**7.1 Profibus address** The Profibus address is set directly on the BNI PBS-... using two buttons on the display. Permissible address range 0...125.

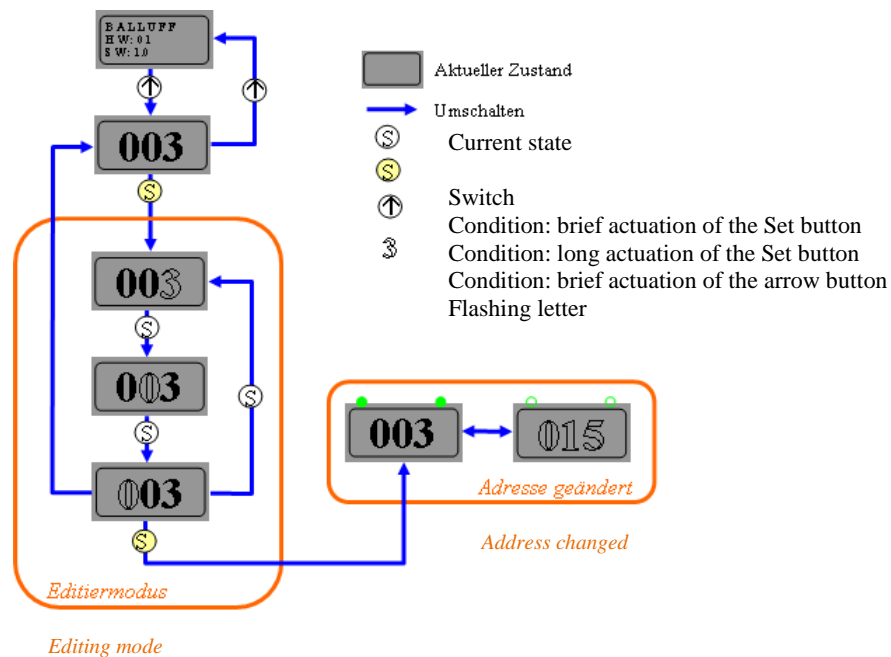
**Addressing**



Each Profibus node must have a unique address assigned to it. The address is loaded once from the hard disk after the power is turned on. Any change to the address is saved immediately but does not become effective until power is reset on the module.

**Menu structure**

The display on the BNI PBS-xxx-101-Z001 has the following menu structure. You can navigate between the different menu items using the buttons.



**Address setting**

The bus address is set on the display. Editing mode is activated if the "S" button is pressed for longer than 3s. A flashing status value indicates that editing mode is active. In this case, pressing the "↑" button increases the value by one. When the required value is reached, the next status value can be selected by pressing the "S" button again. The value is changed by pressing the "↑" button.

Pressing the "S" button in editing mode for more than approx. 10s saves the address currently selected. Although this address is saved, it is not yet active. The display LEDs and address flash to indicate that this status is active. The new address is only adopted after the power is reset.

If no buttons are pressed in editing mode within 10 seconds, the module exits editing mode without saving the address.

The display buttons can be locked by the PLC. A key symbol on the display indicates that this status is active.

**7.2 Configuration**

When project planning Profibus devices, a device is mapped as a modular system which consists of a header module and multiple data modules.

7 Startup

**GSD file** The device data required for project planning are stored in GSD files (Generic Station Description). The GSD files are available in 2 languages for downloading over the Internet (www.balluff.com).

**Header module** First the header module is inserted into the configuration. The header module is coded according to the special identification format. Header modules with this coding are only used for identification and configuration and have a data width of 0 bytes.

**Structure of the header module**

**Coding of the header module**

Header module	Description	Coding
BNI PBS-104-101-Z001	BNI DI16	01hex 52hex
BNI PBS-202-101-Z001	BNI DO8	
BNI PBS-206-101-Z001	BNI DO16	
BNI PBS-302-101-Z001	BNI DI16DO16	

**Header byte coding**

**First byte of the header module (header byte)**

Determining the inputs and/or outputs of the module

Bit layout of header byte							
7	6	5	4	3	2	1	0
		0	0	Number of manufacturer-specific bytes: (0: none, 1...14: number of bytes, 15: 16 bytes or words) Header special format			
0	0	Determining inputs/outputs of the module: Empty					
0	1	Ports are inputs, 1 length-byte for input data					
1	0	Ports are outputs, 1 length-byte for output data					
1	1	Ports may be inputs or outputs, each 1 length-byte for output and input data					

**Data modules** Data modules are strung on to the header module in any sequence. Each data module contains 1 byte of process data.

**Data module coding**

**Input modules**

Data module	Bit assignment	Coding
Input/Read back Pin 4	①	41hex 00hex 01hex
Input/Diagnostic/Read back Pin 2	②	41hex 00hex 02hex
Station diagnostic	③	41hex 00hex 03hex
Periphery error on port	④	41hex 00hex 04hex
Sensor supply short circuit	④	41hex 00hex 05hex
Actuator shutdown Pin 4	①	41hex 00hex 06hex
Actuator shutdown Pin 2	②	41hex 00hex 07hex
Actuator warning Pin 4	①	41hex 00hex 08hex
Actuator warning Pin 2	②	41hex 00hex 09hex

**Output modules**

Data module	Bit assignment	Coding
Outputs Pin 4	①	81hex 00hex 0Ahex
Outputs Pin 2	②	81hex 00hex 0Bhex
Restart Pin 4	①	81hex 00hex 0Chex
Restart Pin 2	②	81hex 00hex 0Dhex
Display Control	⑤	81hex 00hex 0Ehex



**Note**

Project planning software offers mostly graphical assistance in configuration; the configuration string is automatically created.

Process data coding

①

Bit							
7	6	5	4	3	2	1	0
Port 7, Channel 14	Port 6, Channel 12	Port 5, Channel 10	Port 4, Channel 8	Port 3, Channel 6	Port 2, Channel 4	Port 1, Channel 2	Port 0, Channel 0

②

Bit							
7	6	5	4	3	2	1	0
Port 7, Channel 15	Port 6, Channel 13	Port 5, Channel 11	Port 4, Channel 9	Port 3, Channel 7	Port 2, Channel 5	Port 1, Channel 3	Port 0, Channel 1

③

Bit							
7	6	5	4	3	2	1	0
-	Actuator warning	Actuator short circ.	Sensor short circ.	External error	None UA	Undervolt. UA	Undervolt. US

④

Bit							
7	6	5	4	3	2	1	0
Port 7, Ch.	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0

⑤

Bit							
7	6	5	4	3	2	1	0
-	-	-	-	-	-	Green LED on	Red LED on

7 Startup

7.3 Parameter configuration

The BNI PBS modules differ in how their I/O ports are configured:

Module	Port	Pin	Channel	Function
BNI PBS-104-	0...7	4	00, 02, 04, 06, 08, 10, 12, 14	Input with N.O. function or input with N.C. function
	0...7	2	01, 03, 05, 07, 09, 11, 13, 15	Input with N.O. function or input with N.C. function or diagnostics input (N.C. function)
BNI PBS-202-	0...7	4	00, 02, 04, 06, 08, 10, 12, 14	Output
BNI PBS-206-	0...7	4	00, 02, 04, 06, 08, 10, 12, 14	Output
	0...7	2	01, 03, 05, 07, 09, 11, 13, 15	Output
BNI PBS-302-	0...7	4	00, 02, 04, 06, 08, 10, 12, 14	Input with N.O. function or input with N.C. function Output
	0...7	2	01, 03, 05, 07, 09, 11, 13, 15	Input with N.O. function or input with N.C. function or diagnostics input (N.C. function) Output

Some parameters have four selection options. These parameters are represented by two bits each (values 0dec to 3dec).



**Note**

Coding of the function of pin 2 and pin 4 is not identical.

Parameter setting of the standard I/O ports

Pin 4 functions:

Decimal	Bit 1	Bit 0	Function
0	0	0	Input – N.O. function (for BNI PBS-202/206... reserved)
1	0	1	Input – N.C. function (for BNI PBS-202/206...reserved)
2	1	0	Output (for BNI PBS-104-101... reserved)
3	1	1	Reserved

Functions Pin 2: (only for BNI PBS-104... and BNI PBS-302...)

Decimal	Bit 1	Bit 0	Function
0	0	0	Input – N.O. function (for BNI PBS-202/206 reserved)
1	0	1	Input – N.C. function (for BNI PBS-202/206 reserved)
2	1	0	Diagnostics input (N.C.)
3	1	1	Output (for BNI PBS-104-101 reserved.)

Safe state:

The "safe state" function can only be configured for standard outputs. (not possible for BNI PBS-104-...)

Decimal	Bit 1	Bit 0	Function
0	0	0	"0" output is switched off (0V)
1	0	1	"1" output is switched on (+24V)
2	1	0	Last state – the last state of the output is preserved
3	1	1	Reserved

**7.4 Parameter configuration**

For the BNI PBS modules the parameter telegram is 19 bytes long. The first 7 bytes are defined by Profibus standard EN 50170. The following 12 bytes are user parameters.

**Norm-specific parameters**

Structure of the norm-specific parameters (bytes 0 to 6, see below for coding):

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Station status							
1	WD_Fact_1							
2	WD_Fact_2							
3	MinTSDR							
4	Ident_Number_High							
5	Ident_Number_High							
6	Group_Ident							



**Note**

When coding the parameters: 1 = activated, 0 = deactivated.

**Station status**

Byte 0, station status

Bit	Parameter	Meaning
0 ... 2	-	Reserved
3	WD_On	Activate/deactivate watchdog (access monitoring in the slave)
4	Freeze_req	Operate DP slave in Freeze mode
5	Sync_req	Operate DP slave in Sync mode
6	Unlock_req	(see below for coding)
7	Lock_req	

Coding of Lock and Unlock:

Lock	Unlock	Meaning
0	0	minTSDR and slave-specific parameters may be overwritten
0	1	Enable DP slave for other masters
1	0	DP slave blocked for other masters, all parameters are copied
1	1	DP slave released for other masters (Unlock has priority over Lock)

**WD\_Fact\_1 and WD\_Fact\_2**

Bytes 1 and 2, Watchdog factor 1 and 2:

Time until access monitoring in DP slave expires. After a failure of the DP master, the outputs assume the safe state after this time expires.

Timeout (TWD) = 10 ms x WD\_Fact\_1 x WD\_Fact\_2.

Times from 10 ms to 650 s can be set.

**WD\_Fact\_1**

Byte 1							
7	6	5	4	3	2	1	0
0 ... 255 (0x00 ... 0xFF)							

**WD\_Fact\_2**

Byte 2							
7	6	5	4	3	2	1	0
0 ... 255 (0x00 ... 0xFF)							



7 Startup

**MinTSDR**

**MinTSDR:** Minimum time before sending a slave reply (in Tbits).  
The standard prescribes a minimum value of 11 Tbits. The value must be less than MaxTSDR.

Byte 1							
7	6	5	4	3	2	1	0
0, 11 ... 255 (0x00, 0x0B ... 0xFF)							

**Ident\_Number\_High**

**Ident\_Number\_High:** Identification number high-byte

Byte 1							
7	6	5	4	3	2	1	0
0 ... 255 (0x00 ... 0xFF)							

**Ident\_Number\_Low**

**Ident\_Number\_Low:** Identification number low-byte

Byte 1							
7	6	5	4	3	2	1	0
0 ... 255 (0x00 ... 0xFF)							

**Group\_Ident**

**Group\_Ident:** Group number of the BNI PBS-Module.  
Each bit represents a group. Is only applied if Lock\_Req is activated.

Byte 1							
7	6	5	4	3	2	1	0
Group 8	Group 7	Group 6	Group 5	Group 4	Group 3	Group 2	Group 1

**User parameters** The BNI PBS modules differ in how the functions are set for the ports. The user parameters have the same structure for all modules. Parameters which are not supported by a module are indicated as reserved. Reserved parameters must be written with the value 0. Bytes 7 to 9 of the user parameters are reserved and can be ignored. The required settings are made using the user parameters beginning with byte 10.

Bytes in telegram	Meaning
0 to 6	Norm-specific parameters (see above)
7	Reserved
8	Reserved
9	Reserved
10	Global settings
11	Function Port 0...3 Pin 4 (Channel 00, 02, 04, 06)
12	Function Port 4...7 Pin 4 (Channel 08, 10, 12, 14)
13	Function Port 0...3 Pin 2 (Channel 01, 03, 05, 07)
14	Function Port 4...7 Pin 2 (Channel 09, 11, 13, 15)
15	Reserved
16	Reserved
17	Reserved
18	Reserved

Bytes in telegram	Meaning
0 to 6	Norm-specific parameters (see above)
7	Reserved
8	Reserved
9	Reserved
10	Global settings
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Safe State Port 0...3 Pin 4 (Channel 00, 02, 04, 06)
16	Safe State Port 4...7 Pin 4 (Channel 08, 10, 12, 14)
17	Reserved
18	Reserved

Bytes in telegram	Meaning
0 to 6	Norm-specific parameters (see above)
7	Reserved
8	Reserved
9	Reserved
10	Global settings
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Safe State Port 0...3 Pin 4 (Channel 00, 02, 04, 06)
16	Safe State Port 4...7 Pin 4 (Channel 08, 10, 12, 14)
17	Safe State Port 0...3 Pin 2 (Channel 01, 03, 05, 07)
18	Safe State Port 4...7 Pin 2 (Channel 09, 11, 13, 15)

7 Startup

BNI PBS-302-...

Bytes in telegram	Meaning
0 to 6	Norm-specific parameters (see above)
7	Reserved
8	Reserved
9	Reserved
10	Global settings
11	Function Port 0...3 Pin 4 (Channel 00, 02, 04, 06)
12	Function Port 4...7 Pin 4 (Channel 08, 10, 12, 14)
13	Function Port 0...3 Pin 2 (Channel 01, 03, 05, 07)
14	Function Port 4...7 Pin 2 (Channel 09, 11, 13, 15)
15	Safe State Port 0...3 Pin 4 (Channel 00, 02, 04, 06)
16	Safe State Port 4...7 Pin 4 (Channel 08, 10, 12, 14)
17	Safe State Port 0...3 Pin 2 (Channel 01, 03, 05, 07)
18	Safe State Port 4...7 Pin 2 (Channel 09, 11, 13, 15)

Coding the user parameters

Global settings

Byte 10	
Bit	Meaning
0	Enable/block diagnostics messages
1	Enable/block channel-specific diagnostics
2	Enable/block diagnostics for undervoltage of sensor/bus supply
3	Enable/block diagnostics for undervoltage of actuators*
4	Enable/block diagnostics for Us short circuit at outputs**
5	Enable/block editing of the address
6	Reserved
7	Reserved

\* for BNI-PBS-104-... reserved

\*\* only for BNI PBS-302-...



**Note**

When coding the settings: 1 = enabled, 0 = blocked.

Function Port 0...3 (Channel 00, 02, 04, 06)

Byte 11	
Bit	Meaning
0	Function Port 0, Pin 4 (Channel 00)
1	
2	Function Port 1, Pin 4 (Channel 02)
3	
4	Function Port 2, Pin 4 (Channel 04)
5	
6	Function Port 3, Pin 4 (Channel 06)
7	

**Function Port 4...7 (Channel 08, 10, 12, 14)**

Byte 12	
Bit	Meaning
0	Function Port 4, Pin 4 (Channel 08)
1	
2	Function Port 5, Pin 4 (Channel 10)
3	
4	Function Port 6, Pin 4 (Channel 12)
5	
6	Function Port 7, Pin 4 (Channel 14)
7	

**Function Port 0...3 (Channel 01, 03, 05, 07)**

Byte 13	
Bit	Meaning
0	Function Port 0, Pin 2 (Channel 01)
1	
2	Function Port 1, Pin 2 (Channel 03)
3	
4	Function Port 2, Pin 2 (Channel 05)
5	
6	Function Port 3, Pin 2 (Channel 07)
7	

**Function Port 4...7 (Channel 09, 11, 13, 15)**

Byte 14	
Bit	Meaning
0	Function Port 4, Pin 2 (Channel 09)
1	
2	Function Port 5, Pin 2 (Channel 11)
3	
4	Function Port 6, Pin 2 (Channel 12)
5	
6	Function Port 7, Pin 2 (Channel 15)
7	

**Note**

For BNI PBS-202/206-...bytes 11 to 14 are reserved

**Safe State Port 0...3 (Channel 00, 02, 04, 06)**

Byte 15	
Bit	Meaning
0	Safe State Port 0, Pin 4 (Channel 00)
1	
2	Safe State Port 1, Pin 4 (Channel 02)
3	
4	Safe State Port 2, Pin 4 (Channel 04)
5	
6	Safe State Port 3, Pin 4 (Channel 06)
7	

7 Startup

**Safe State Port 4...7 (Channel 08, 10, 12, 14)**

Byte 16	
Bit	Meaning
0	Safe State Port 4, Pin 4 (Channel 08)
1	
2	Safe State Port 5, Pin 4 (Channel 10)
3	
4	Safe State Port 6, Pin 4 (Channel 12)
5	
6	Safe State Port 7, Pin 4 (Channel 14)
7	

**Safe State Port 0...3 (Channel 01, 03, 05, 07)**

Byte 17	
Bit	Meaning
0	Safe State Port 0, Pin 2 (Channel 01)
1	
2	Safe State Port 1, Pin 2 (Channel 03)
3	
4	Safe State Port 2, Pin 2 (Channel 05)
5	
6	Safe State Port 3, Pin 2 (Channel 07)
7	

**Safe State Port 4...7 (Channel 09, 11, 13, 15)**

Byte 18	
Bit	Meaning
0	Safe State Port 4, Pin 2 (Channel 09)
1	
2	Safe State Port 5, Pin 2 (Channel 11)
3	
4	Safe State Port 6, Pin 2 (Channel 12)
5	
6	Safe State Port 7, Pin 2 (Channel 15)
7	



**Note**

Bytes 15 to 18 are reserved for the BNI PBS-104-...  
 Bytes 13 to 14 and 17 to 18 are reserved for the BNI PBS-202-...

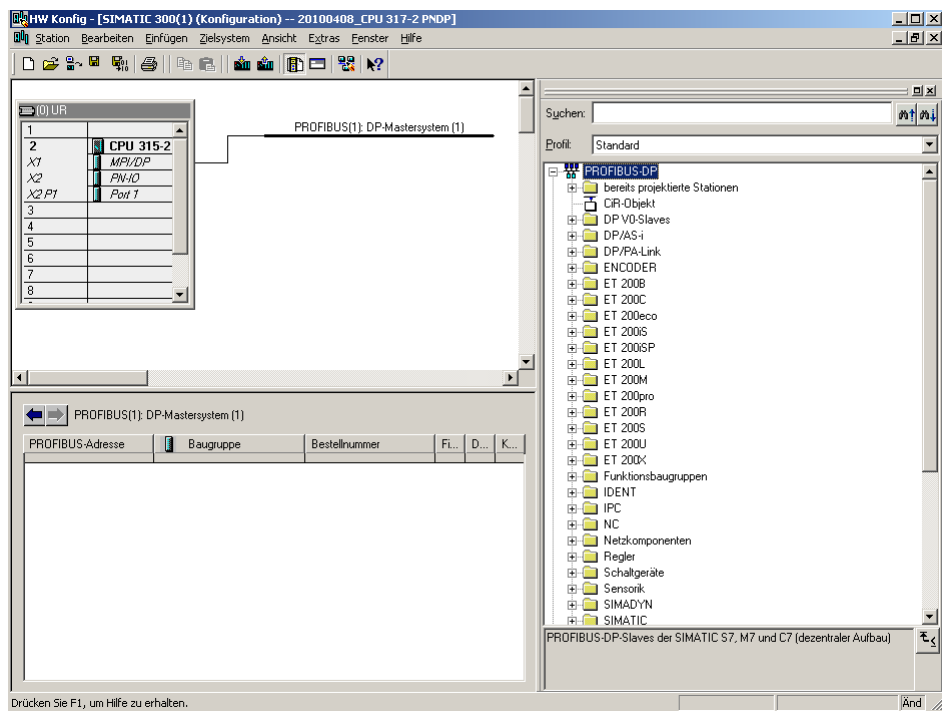
### 7.5 Integration in project planning software

#### Installing the GSD file

The example shows the connection of the BNI PBS modules to a Siemens S7 controller with "SIMATIC Manager". The exact procedure depends on the project planning software used

To perform project planning on the PC, the GSD file for the module must be installed:

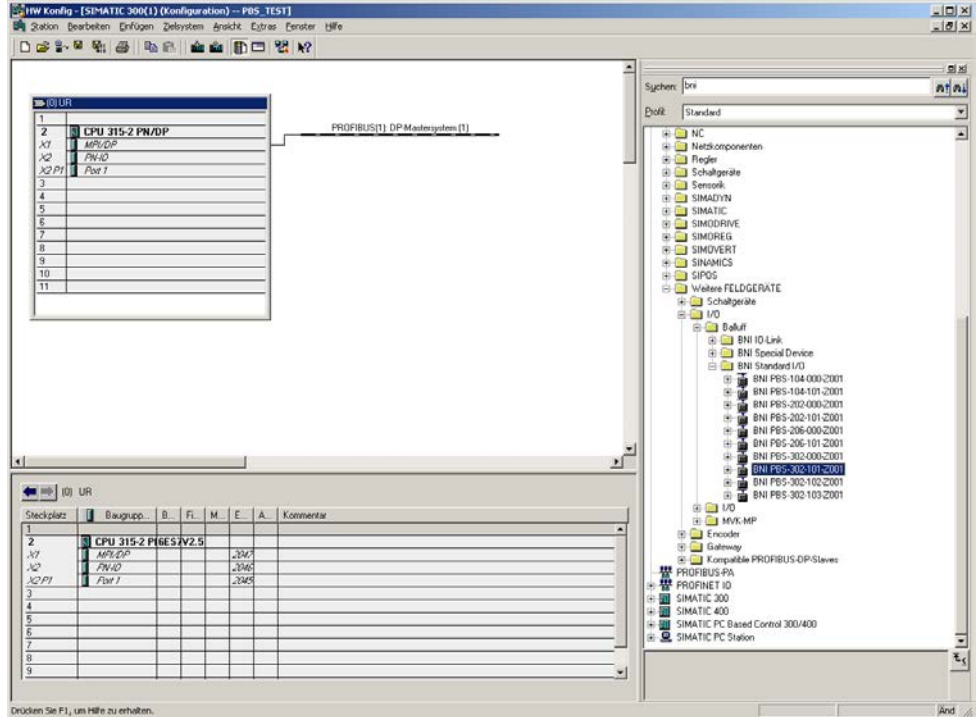
- Open a new project.
- Open hardware configurator.
- Select menu command "Tools | Install new GSD...".
- The window "Install new GSD" opens.
- Select directory and GSD file.
- The [Install] button only becomes active if a GSD file is selected.
- Click on [Install].
- The GSD file is installed.
- When the process is finished, a message appears.
- Confirm the message and close the window.
- Select the menu command "Tools | Update catalog".
- The modules are displayed in the project tree.



## 7 Startup

### Prerequisite

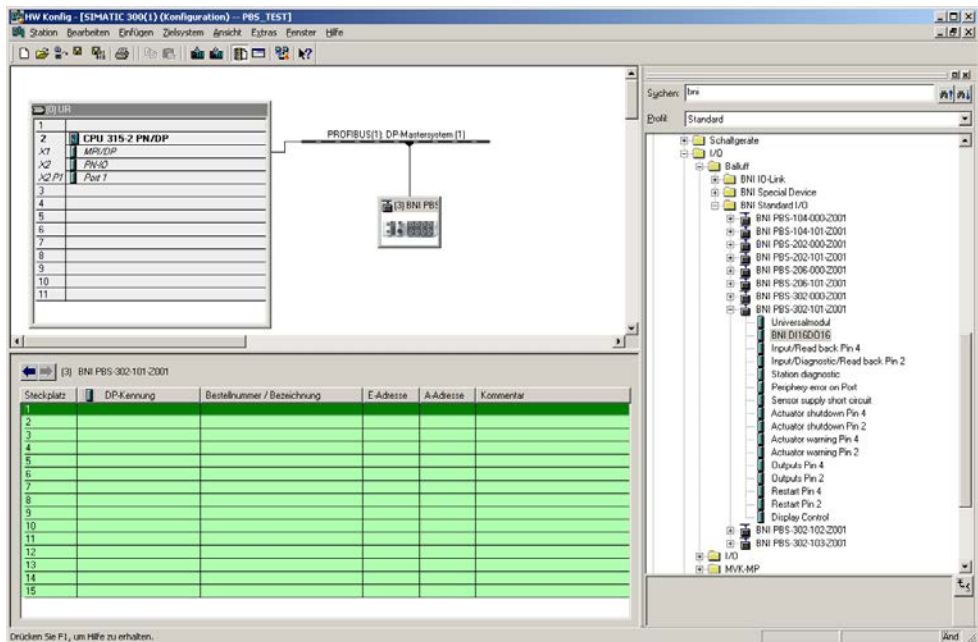
To integrate the Profibus slave, a functioning configuration of the PLC and of DP interface is necessary.



### Integrating the module

The modules are located in the hardware catalog under "Other field devices". The module is added as a DP slave.

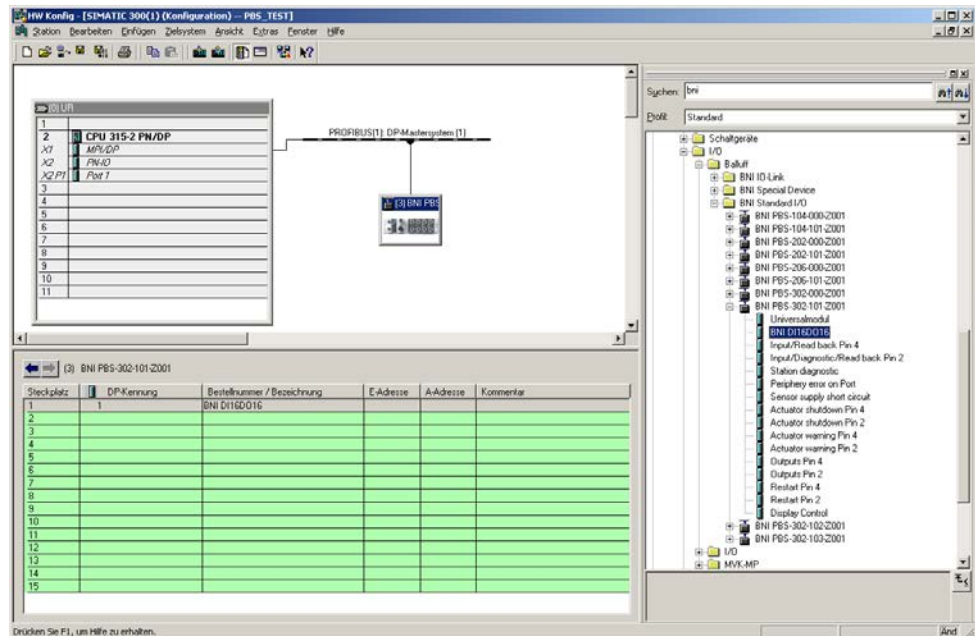
- Select the Profibus rail.
- Double-clicking adds the module as a DP slave.



## 7 Startup

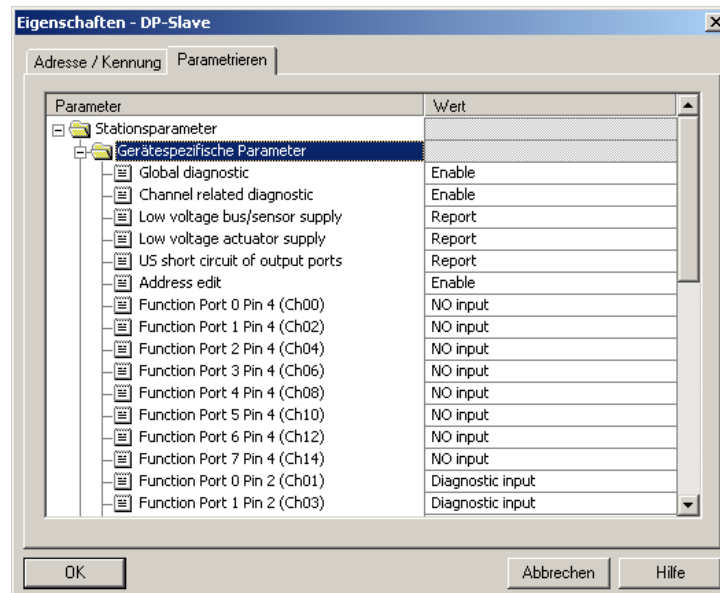
### Header module Adding

- Add a header module by double-clicking in the hardware catalog.



### Specifying the properties

- Double-click the module in slot 1 (header module)
- The "Properties – DP Slave" window opens.
- The switching contacts can be configured under Parameterize.

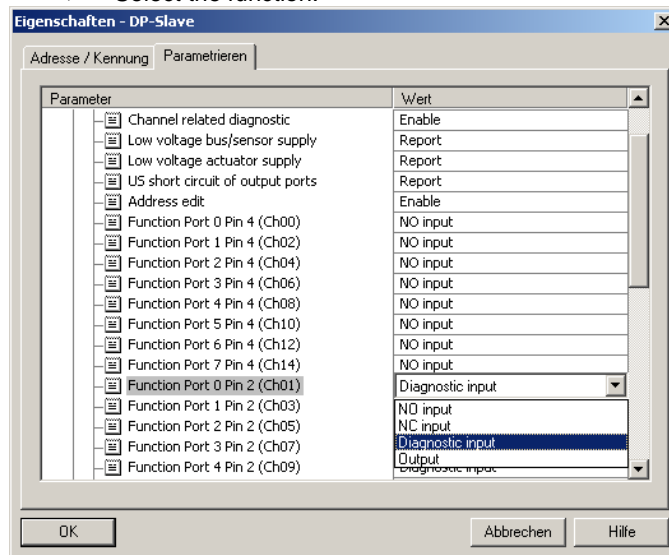




## 7 Startup

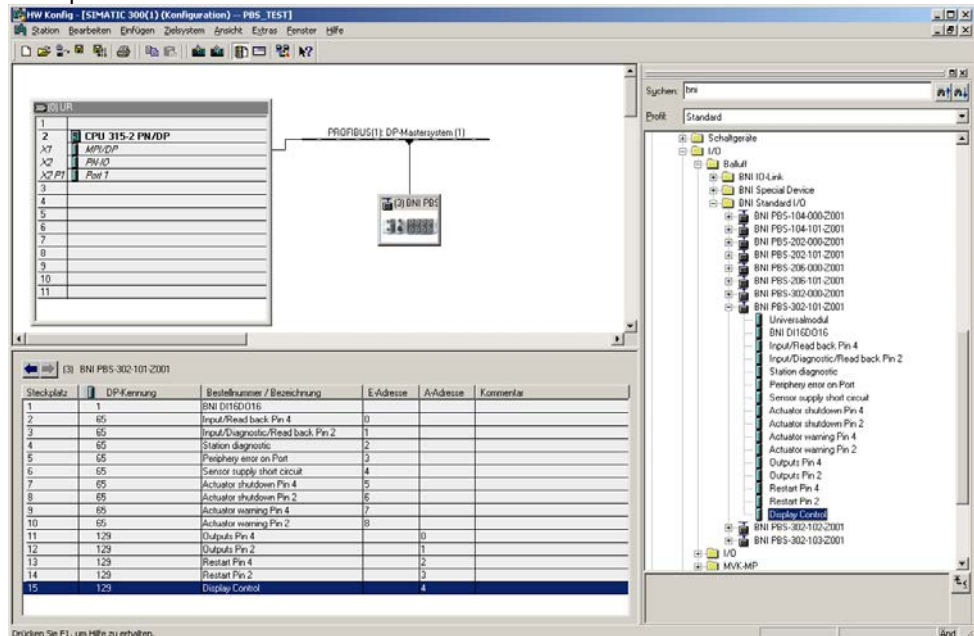
### Configuring inputs or outputs

- Under "Parameter" select port and pin.
- In the list field click on "Value".
- The possible functions for the selected port and pin are displayed.
- Select the function.



### Configuring the slots

Additional data modules can be selected and configured from the hardware catalog. Example:



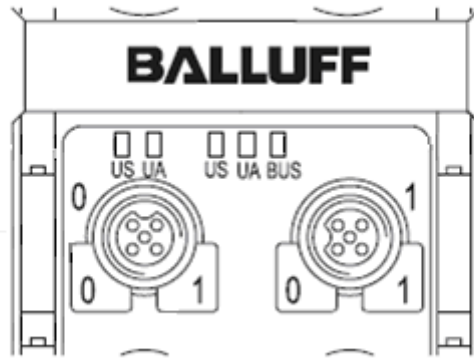
### Note

If the Restart Pin x modules are not selected, the outputs are automatically restarted in the event of a short circuit

8.1 Function Indicators

The status of the supply voltages is indicated by status LEDs 1 to 5.

LED indicators



Module LEDs

LED	Display	Function
US	Green, illuminated and stays on	US "sensors" power supply on
UA	Green, static	UA "actuators" power supply on
US	Red, static	US "sensors" power supply undervoltage
UA	Red, static	UA "actuators" power supply undervoltage
BUS	Green, static	BUS, data transmission with master active
	Green, flashing	BUS, data transmission with master inactive

I/O port LEDs

Channel-specific diagnostics are indicated by the port LEDs. Each M12 port (I/O interface) is assigned two 2-color LEDs which indicate the configuration or operating states.

LED "0" - PIN 4, LED "1" - PIN 2

Display	Function		
	Output	Input	Diagnostics input
Off	Signal = 0	Signal = 0	Diagnostics 0
Yellow	Signal = 1	Signal = 1	
Red, constant on	I Output > I <sub>max</sub>	SS*	Diagnostics = 1 or SC
Red, flashing	SS*	-	-

\* **SS= Short circuit on PIN 1. In this case both LEDs are red.**

Diagnostics input

Pin 2 of the I/O port can be configured as a diagnostics channel. It behaves like an inverted input. The 0 V signal is interpreted as logical 1, the corresponding port LED comes on red and a diagnostics message is sent over DP-Diagnostics. The optical indicator on the corresponding I/O port allows defective sensors/actuators to be more easily and quickly localized.

8 Diagnostics

8.2 Diagnostics telegram

The diagnostics telegram comprises various blocks. The first 6 bytes are defined by the Profibus standard EN 50170. The following 4 bytes are device-specific and ID-specific diagnostics information (2 bytes each). For each channel-specific diagnostic, 3 bytes of diagnostics information are added (min. 6 and max. 244 bytes).

8.3 Norm diagnostics

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Status 1							
1	Status 2							
2	Status 3							
3	Master address							
4	Indent_Number_High_Byte: 0Bhex							
5	Indent_Number_Low_Byte: 1Ahex							



**Note**

The following applies for the coding of norm-specific diagnostics:  
1 = activated, 0 = deactivated

Norm diagnostics coding

In the following, the coding of bytes 0 to 3 of the norm diagnostics is described. Byte 4 and byte 5 (identification number) are fixed.

Status 1

Byte 0, status 1

Bit	Meaning
0	Station_non_existent The DP slave always sets the bit to 0. The DP master sets it to 1 if the DP slave cannot be reached.
1	Station_not_ready The DP slave sets the bit to 1 if it is not yet ready for data exchange.
2	Cfg_Fault The DP slave sets the bit to 1 if the configuration data last received from the master do not agree with those which the DP slave determined.
3	Ext_diag If the bit is set to 1, there is a diagnostics entry in the slave-specific diagnostics area (Ext_Diag_Data). A further diagnostic follows in the telegram.
4	Not supported The DP slave sets the bit to 1 if a function was requested which is not supported.
5	Invalid_Slave-Response The DP slave always sets the bit to 0. The DP master sets it to 1 if the DP slave sends an implausible response.
6	Prm_fault The DP slave sets the bit to 1 if the last parameter telegram was incorrect (e.g. incorrect length, incorrect identification number, invalid parameters).
7	Master_lock The DP slave always sets the bit to 0. The DP master sets it to 1 if the DP slave was parameterized by a different master (Lock from another master, here: address in byte 3 not equal to FFhex and not equal to its own address).

**Status 2****Byte 1, status 2**

Bit	Meaning
0	Prm_req The DP slave always sets the bit to 1 if it needs to be reconfigured and parameterized. The bit remains set until parameterization has been performed.
1	Stat_Diag (static diagnostic) The slave sets the bit to 1 if, for example, it can't + send valid data. In this case the DP master retrieves diagnostic data until the bit is reset to 0.
2	Fixed at 1
3	WD_On Monitoring activated/deactivated (Watchdog on).
4	Freeze_Mode The slave sets the bit to 1 if it has received the Freeze command.
5	Sync_Mode The slave sets the bit to 1 if it has received the Sync command.
6	Not_Present The DP slave always sets the bit to 0. The DP master sets it to 1 for the DP slaves that are not included in the master parameter set.
7	Deactivated The DP slave always sets the bit to 0. The DP master sets it to 1 if the DP slave is removed from the master parameter set.

**Status 3****Byte 2, status 3**

Bit	Meaning
0 ... 6	Reserved
7	Ext_Diag_Overflow If this bit is set, there is more diagnostics information than indicated in Ext_Diag_Data. For example, the DP slave sets the bit to 1 if there is more channel-specific diagnostics information than the DP slave can enter in its send buffer. A DP master sets the bit to 1 if the DP slave sends more diagnostics information than the master can hold in its diagnostics buffer.

**Address****Byte 3, address of the master:**

Bit	Meaning
0 ... 7	Master_Add After parameterizing, the address of the DP master which has parameterized the DP slave is entered. If the DP slave has not been parameterized by a master, it sets address FFhex.

**Ident\_Number\_High\_Byte****Byte 4, Ident High**

Bit	Meaning
0 ... 7	BNI PBS-...-101-...: 0Dhex

**Ident\_Number\_Low\_Byte****Byte 5, Ident Low**

Bit	Meaning
0 ... 7	BNI PBS-104-101-...: 92hex BNI PBS-202-101-...: 91hex BNI PBS-206-101-...: 90hex BNI PBS-302-101-...: 8Fhex

8 Diagnostics

8.4 Device-specific diagnostics

Bytes 6 and 7 in the diagnostics telegram, device-specific diagnostics:

	Byte	Bit							
		7	6	5	4	3	2	1	0
Header	6	0	0	Device-specific header byte: Number of bytes in the device-specific diagnostics (incl. header byte)					
Device block	7	-	Actuator warning	Actuator turn-off	Sensor short circuit	External error	None U <sub>A</sub>	U <sub>A</sub>	U <sub>S</sub>

U<sub>A</sub>: Undervoltage, actuator supply; U<sub>S</sub>: Undervoltage, sensor and bus supply



**Note**

The following applies for the coding of device-specific diagnostics:  
1 = activated, 0 = deactivated

ID-specific diagnostics

Bytes 8 and 9 in diagnostics telegram, ID-specific diagnostics

	Byte	Bit							
		7	6	5	4	3	2	1	0
Header	8	0	0	ID-specific header byte: Number of bytes in the ID-specific diagnostic (incl. header byte)					
Module-specific diagnostics	9	Ident number of the module							

Channel-specific diagnostics

Bytes 10 to 12 in diagnostics telegram, channel-specific diagnostics

For each channel-specific diagnosis, three bytes of diagnostics information are added with the following coding.

Byte	Bit							
	7	6	5	4	3	2	1	0
10	1	0	Ident number					
11	0	0	Channel number (from port/pin)					
	0	1	Reserved					
	1	0	Input					
	1	1	Output					
12	0	0	Input and output					
	Error type:							
	01hex: Short circuit, sensor supply							
	02hex: Undervoltage							
	17hex: Actuator warning							
	18hex: Actuator turn-off							
	1Ahex: External error							
	0	0	0	Reserved				
0	0	1	Bit					
0	1	0	2 bit					
0	1	1	4 bit					
1	0	0	Byte					
1	0	1	Word					
1	1	0	2 words					
1	1	1	Reserved					

Possible  
channel-specific  
diagnostics

Sensor supply short circuit (pin configured as input):

Port	Pin	Channel	1st byte	2nd byte	3rd byte
0	4	0	80 <sub>hex</sub>	40 <sub>hex</sub>	21 <sub>hex</sub>
	2	1	80 <sub>hex</sub>	41 <sub>hex</sub>	21 <sub>hex</sub>
1	4	2	80 <sub>hex</sub>	42 <sub>hex</sub>	21 <sub>hex</sub>
	2	3	80 <sub>hex</sub>	43 <sub>hex</sub>	21 <sub>hex</sub>
2	4	4	80 <sub>hex</sub>	44 <sub>hex</sub>	21 <sub>hex</sub>
	2	5	80 <sub>hex</sub>	45 <sub>hex</sub>	21 <sub>hex</sub>
3	4	6	80 <sub>hex</sub>	46 <sub>hex</sub>	21 <sub>hex</sub>
	2	7	80 <sub>hex</sub>	47 <sub>hex</sub>	21 <sub>hex</sub>
4	4	8	80 <sub>hex</sub>	48 <sub>hex</sub>	21 <sub>hex</sub>
	2	9	80 <sub>hex</sub>	49 <sub>hex</sub>	21 <sub>hex</sub>
5	4	10	80 <sub>hex</sub>	4A <sub>hex</sub>	21 <sub>hex</sub>
	2	11	80 <sub>hex</sub>	4B <sub>hex</sub>	21 <sub>hex</sub>
6	4	12	80 <sub>hex</sub>	4C <sub>hex</sub>	21 <sub>hex</sub>
	2	13	80 <sub>hex</sub>	4D <sub>hex</sub>	21 <sub>hex</sub>
7	4	14	80 <sub>hex</sub>	4E <sub>hex</sub>	21 <sub>hex</sub>
	2	15	80 <sub>hex</sub>	4F <sub>hex</sub>	21 <sub>hex</sub>

Sensor supply short circuit (pin configured as output, only for BNI PBS-302-...):

Port	Pin	Channel	1st byte	2nd byte	3rd byte
0	4	0	80 <sub>hex</sub>	80 <sub>hex</sub>	21 <sub>hex</sub>
	2	1	80 <sub>hex</sub>	81 <sub>hex</sub>	21 <sub>hex</sub>
1	4	2	80 <sub>hex</sub>	82 <sub>hex</sub>	21 <sub>hex</sub>
	2	3	80 <sub>hex</sub>	83 <sub>hex</sub>	21 <sub>hex</sub>
2	4	4	80 <sub>hex</sub>	84 <sub>hex</sub>	21 <sub>hex</sub>
	2	5	80 <sub>hex</sub>	85 <sub>hex</sub>	21 <sub>hex</sub>
3	4	6	80 <sub>hex</sub>	86 <sub>hex</sub>	21 <sub>hex</sub>
	2	7	80 <sub>hex</sub>	87 <sub>hex</sub>	21 <sub>hex</sub>
4	4	8	80 <sub>hex</sub>	88 <sub>hex</sub>	21 <sub>hex</sub>
	2	9	80 <sub>hex</sub>	89 <sub>hex</sub>	21 <sub>hex</sub>
5	4	10	80 <sub>hex</sub>	8A <sub>hex</sub>	21 <sub>hex</sub>
	2	11	80 <sub>hex</sub>	8B <sub>hex</sub>	21 <sub>hex</sub>
6	4	12	80 <sub>hex</sub>	8C <sub>hex</sub>	21 <sub>hex</sub>
	2	13	80 <sub>hex</sub>	8D <sub>hex</sub>	21 <sub>hex</sub>
7	4	14	80 <sub>hex</sub>	8E <sub>hex</sub>	21 <sub>hex</sub>
	2	15	80 <sub>hex</sub>	8F <sub>hex</sub>	21 <sub>hex</sub>

Actuator warning (pin configured as output, except for BNI PBS-104-...):

Port	Pin	Channel	1st byte	2nd byte	3rd byte
0	4	0	80 <sub>hex</sub>	80 <sub>hex</sub>	37 <sub>hex</sub>
	2	1	80 <sub>hex</sub>	81 <sub>hex</sub>	37 <sub>hex</sub>
1	4	2	80 <sub>hex</sub>	82 <sub>hex</sub>	37 <sub>hex</sub>
	2	3	80 <sub>hex</sub>	83 <sub>hex</sub>	37 <sub>hex</sub>
2	4	4	80 <sub>hex</sub>	84 <sub>hex</sub>	37 <sub>hex</sub>
	2	5	80 <sub>hex</sub>	85 <sub>hex</sub>	37 <sub>hex</sub>
3	4	6	80 <sub>hex</sub>	86 <sub>hex</sub>	37 <sub>hex</sub>
	2	7	80 <sub>hex</sub>	87 <sub>hex</sub>	37 <sub>hex</sub>
4	4	8	80 <sub>hex</sub>	88 <sub>hex</sub>	37 <sub>hex</sub>
	2	9	80 <sub>hex</sub>	89 <sub>hex</sub>	37 <sub>hex</sub>
5	4	10	80 <sub>hex</sub>	8A <sub>hex</sub>	37 <sub>hex</sub>
	2	11	80 <sub>hex</sub>	8B <sub>hex</sub>	37 <sub>hex</sub>
6	4	12	80 <sub>hex</sub>	8C <sub>hex</sub>	37 <sub>hex</sub>
	2	13	80 <sub>hex</sub>	8D <sub>hex</sub>	37 <sub>hex</sub>
7	4	14	80 <sub>hex</sub>	8E <sub>hex</sub>	37 <sub>hex</sub>
	2	15	80 <sub>hex</sub>	8F <sub>hex</sub>	37 <sub>hex</sub>

8 Diagnostics

Actuator turn-off (pin configured as output, except for BNI PBS-104-...)

Port	Pin	Channel	1st byte	2nd byte	3rd byte
0	4	0	80 <sub>hex</sub>	80 <sub>hex</sub>	38 <sub>hex</sub>
	2	1	80 <sub>hex</sub>	81 <sub>hex</sub>	38 <sub>hex</sub>
1	4	2	80 <sub>hex</sub>	82 <sub>hex</sub>	38 <sub>hex</sub>
	2	3	80 <sub>hex</sub>	83 <sub>hex</sub>	38 <sub>hex</sub>
2	4	4	80 <sub>hex</sub>	84 <sub>hex</sub>	38 <sub>hex</sub>
	2	5	80 <sub>hex</sub>	85 <sub>hex</sub>	38 <sub>hex</sub>
3	4	6	80 <sub>hex</sub>	86 <sub>hex</sub>	38 <sub>hex</sub>
	2	7	80 <sub>hex</sub>	87 <sub>hex</sub>	38 <sub>hex</sub>
4	4	8	80 <sub>hex</sub>	88 <sub>hex</sub>	38 <sub>hex</sub>
	2	9	80 <sub>hex</sub>	89 <sub>hex</sub>	38 <sub>hex</sub>
5	4	10	80 <sub>hex</sub>	8A <sub>hex</sub>	38 <sub>hex</sub>
	2	11	80 <sub>hex</sub>	8B <sub>hex</sub>	38 <sub>hex</sub>
6	4	12	80 <sub>hex</sub>	8C <sub>hex</sub>	38 <sub>hex</sub>
	2	13	80 <sub>hex</sub>	8D <sub>hex</sub>	38 <sub>hex</sub>
7	4	14	80 <sub>hex</sub>	8E <sub>hex</sub>	38 <sub>hex</sub>
	2	15	80 <sub>hex</sub>	8F <sub>hex</sub>	38 <sub>hex</sub>

External error (pin configured as diagnostics input)

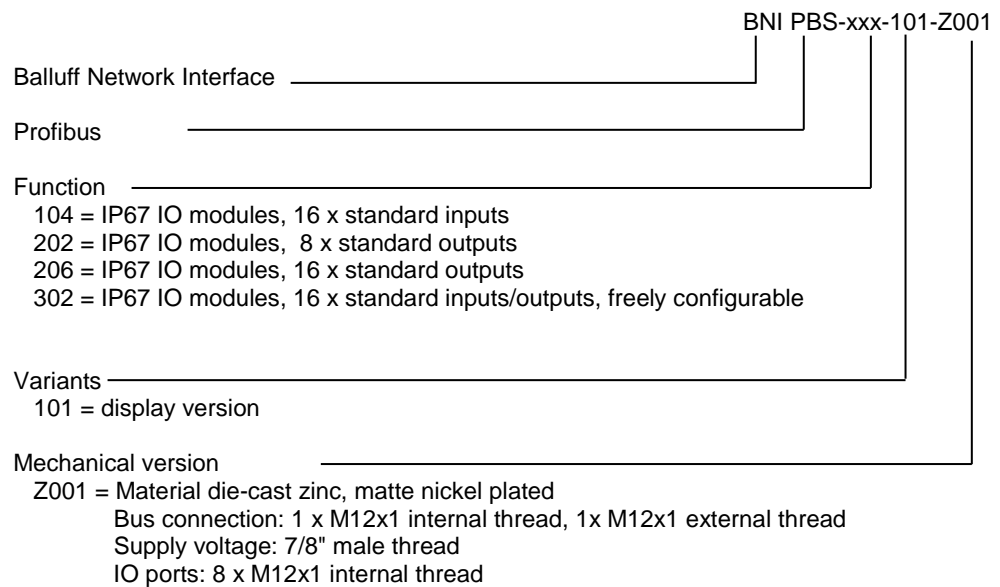
Port	Pin	Channel	1st byte	2nd byte	3rd byte
0	2	1	80 <sub>hex</sub>	41 <sub>hex</sub>	3A <sub>hex</sub>
1	2	3	80 <sub>hex</sub>	43 <sub>hex</sub>	3A <sub>hex</sub>
2	2	5	80 <sub>hex</sub>	45 <sub>hex</sub>	3A <sub>hex</sub>
3	2	7	80 <sub>hex</sub>	47 <sub>hex</sub>	3A <sub>hex</sub>
4	2	9	80 <sub>hex</sub>	49 <sub>hex</sub>	3A <sub>hex</sub>
5	2	11	80 <sub>hex</sub>	4B <sub>hex</sub>	3A <sub>hex</sub>
6	2	13	80 <sub>hex</sub>	4D <sub>hex</sub>	3A <sub>hex</sub>
7	2	15	80 <sub>hex</sub>	4F <sub>hex</sub>	3A <sub>hex</sub>

## 9 Appendix

**9.1 Scope of delivery** The BNI EIP consists of the following components:

- IO block
- 4 blind plugs M12
- Ground strap
- Screw M4x6
- 20 labels

**9.2 Order code**



**9.3 Ordering information**

Type designation code	Order code
BNI PBS-104-101-Z001	BNI005C
BNI PBS-202-101-Z001	BNI0057
BNI PBS-206-101-Z001	BNI0069
BNI PBS-302-101-Z001	BNI0047



9 Appendix

9.4 ASCII table

Decimal	Hex	Control code	ASCII	Decimal	Hex	ASCII	Decimal	Hex	ASCII
0	00	Ctrl @	NUL	43	2B	+	86	56	V
1	01	Ctrl A	SOH	44	2C	,	87	57	W
2	02	Ctrl B	STX	45	2D	-	88	58	X
3	03	Ctrl C	ETX	46	2E	.	89	59	Y
4	04	Ctrl D	EOT	47	2F	/	90	5A	Z
5	05	Ctrl E	ENQ	48	30	0	91	5B	[
6	06	Ctrl F	ACK	49	31	1	92	5C	\
7	07	Ctrl G	BEL	50	32	2	93	5D	]
8	08	Ctrl H	BS	51	33	3	94	5E	^
9	09	Ctrl I	HT	52	34	4	95	5F	_
10	0A	Ctrl J	LF	53	35	5	96	60	`
11	0B	Ctrl K	VT	54	36	6	97	61	A
12	0C	Ctrl L	FF	55	37	7	98	62	B
13	0D	Ctrl M	CR	56	38	8	99	63	c
14	0E	Ctrl N	SO	57	39	9	100	64	d
15	0F	Ctrl O	SI	58	3A	:	101	65	e
16	10	Ctrl P	DLE	59	3B	;	102	66	f
17	11	Ctrl Q	DC1	60	3C	<	103	67	g
18	12	Ctrl R	DC2	61	3D	=	104	68	h
19	13	Ctrl S	DC3	62	3E	>	105	69	i
20	14	Ctrl T	DC4	63	3F	?	106	6A	j
21	15	Ctrl U	NAK	64	40	@	107	6B	k
22	16	Ctrl V	SYN	65	41	A	108	6C	L
23	17	Ctrl W	ETB	66	42	B	109	6D	m
24	18	Ctrl X	CAN	67	43	C	110	6E	n
25	19	Ctrl Y	EM	68	44	D	111	6F	o
26	1A	Ctrl Z	SUB	69	45	E	112	70	p
27	1B	Ctrl [	ESC	70	46	F	113	71	q
28	1C	Ctrl \	FS	71	47	G	114	72	r
29	1D	Ctrl ]	GS	72	48	H	115	73	s
30	1E	Ctrl ^	RS	73	49	I	116	74	t
31	1F	Ctrl _	US	74	4A	J	117	75	u
32	20		SP	75	4B	K	118	76	V
33	21		!	76	4C	L	119	77	W
34	22		„	77	4D	M	120	78	X
35	23		#	78	4E	N	121	79	Y
36	24		\$	79	4F	O	122	7A	Z
37	25		%	80	50	P	123	7B	{
38	26		&	81	51	Q	124	7C	
39	27		'	82	52	R	125	7D	}
40	28		(	83	53	S	126	7E	~
41	29		)	84	54	T	127	7F	DEL
42	2A		*	85	55	U			

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