Modicon TSX Quantum

PROFIBUS-DP under Concept

User Manual

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11/00

Schneider Electric

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Info

⚠ **Caution**
Controller applications which underlie stringent safety requirements must conform with relevant regulations.
For security reasons and to ensure the retention of documented systems data, component repairs should only be carried out by the manufacturer.

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Employed Symbols

Note
This symbol serves to highlight important facts.

Caution
This symbol points out frequently occurring sources of error.

Warning
This symbol alerts the user to principal sources of danger which can cause significant injury and financial damages, or other serious consequences.

Expert
This symbol will be used whenever far–reaching information is offered, exclusively intended for experts (those individuals possessing specialized training). Disregarding this information has no influence on the intelligibility of this publication, and will not reduce the usage spectrum of the product.

Tip
This symbol points out explanations of invaluable Tips & Tricks regarding product usage.

Example This symbol highlights application examples.

▶ **Proceed as follows:**
This symbol marks the start of an instruction sequence whose execution is required to achieve a particular product function.

This symbol indicates manuals or other sources which elaborate on the addressed topic in more detail.

Employed Terminology and Abbreviations

The notation applied to numerical values conforms to international practice, as well as a SI (Système International d' Unités) sanctioned representation. This notational format requires a space between hundreds and thousands, and the use of the decimal point (for example: 12 345.67).

ASIC Application Specific Integrated Circuit

AWP PLC User program

BP Back plane

CRP 811 PROFIBUS DP module for TSX Quantum

DP Distributed peripherals

GSD, DDB Device Data Base (PROFIBUS DP)

ISO International Standardization Organization

MB+ Modbus Plus network under Quantum

PLC, SPS Programmable Logic Controller

PUTE Programming Unit and Test Environment (PC)

TIO Terminal I/O

Supplemental Documentation

Title	Type
PROFIBUS User Organization Installation Guidelines PROFIBUS Nutzerorganisation e.V. Haid– und Neu–Straße 7 D–76131 Karlsruhe, Germany	Order No.: 2.111
Modicon TSX Momentum, I/O Units, User Manual	870 USE 002 02
Modicon TSX Momentum, PROFIBUS DP Communications Adapter, User Manual	870 USE 004 02
Field Bus Specification, Part 2	EN 50170 Field Bus, Part 2
Implementation Guidelines	DIN 19429 Parts 1 and 3

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Validity Reference

The version relationships between ConCept and the required software and firmware is listed in the following table:

Table 1 Version dependencies

Required CPU Exec		**ConCept >= V 2.2**
PLC	**Module**	**FW/SW**
Exec	CPU x13	>= V 2.20 (Q186V220.bin)
	CPU 424	>= V 2.18 (Q486V218.bin)
	CPU 434 CPU 534	>= V 1.05 (Q58V105b.bin)
PROFIBUS configuration		**ConCept V 2.2**
Order Ident.	**Module**	**FW/SW**
140 CRP 811 00	CRP 811	>= V 4.10D
	NHP811	>= V 5.02I
TLX L FBCM (Hilscher SyCon–PB/GS)	Config. tool	>= V 2.6.0.0
	DDB files	>= V 3.00

Note
Any updates to newer releases must be performed for all components.

General Information

1

The following topics will be presented in this chapter:

- Introduction to the ISO OSI Reference Model, Section 1.1.
- General Information about PROFIBUS DP, Section 1.2.
- CRP 811 – Master (Class 1) Functionality and Performance Data, Section 1.3.

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1.1 Introduction to the ISO OSI Reference Model

The following topics will be presented:

- Application Note, Section 1.1.1.
- Open Communication, Section 1.1.2.
- The ISO OSI Reference Model, Section 1.1.3.
- The Seven Layers in a Telephone Conversation (an Example), Section 1.1.4.

1.1.1 Application Note

The PROFIBUS is a proven fieldbus for communication in accordance with EN 501 70 (DIN 19245), between PCs, PLCs, control and observation units, sensors, and actuators. It is:

- Open
- Vendor–independent
- Proven
- Certified
- Future–oriented

In order to aid your general understanding, here are some key communication Concepts relevant to PROFIBUS.

1.1.2 Open Communication

Open communication (OSI = Open System Interconnection) refers to data exchange between stations by different manufacturers via a data network using standardized protocols.
In 1984 the ISO (International Standardization Organization) passed the international standard ISO 7498 as a basis for open communication, also known as the ISO OSI reference model.

1.1.3 The ISO OSI Reference Model

Hereafter follows a tabular summary of the model.

Layer	Layer	Function
7 Application, Processing	7 Application	Provides useful communication services for the user.
6 Presentation	6 Presentation	Determines the meaning of data exchanged between user programs in different stations.
5 Session, Communication Control	5 Session	Provides the tools required for opening, carrying out, and ending a communication session. Communication between layers is synchronized using these tools.
4 Transport	4 Transport	Defines secure data transport, also for larger amounts of data, via several transmission paths (buses) and stations.
3 Network	3 Network	Defines the transfer details of messages via several transmission paths (buses) and stations.
2 Data Link	2 Data Link	Defines the bus access control functions, data security implementation, processing of transmission protocols and message blocks.
1 Physical	1 Physical	Chooses the transmission medium and the physical bus interface.

Significance of the 7 Layers
As the table indicates, the reference model is made up of 7 layers. Each layer carries out a defined range of functions that will be described below. For each layer there are also a variety of national and international standards. Protocols are carried out between communication partners in the same layer. Communication between two devices only functions when both devices have the same standards (and thus, the same protocols) implemented on all existing layers. Some of these layers can be left empty.

What is a Communications Profile
The sum of protocols used by the reference model is also referred to as the communications profile. In order to exchange data via a common data network, devices must have the same communications profile, e.g. MAP, PROFIBUS, or MMSE.

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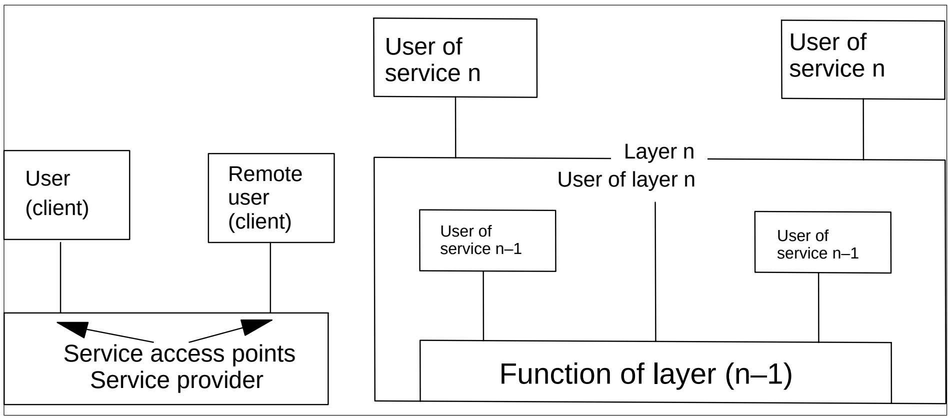
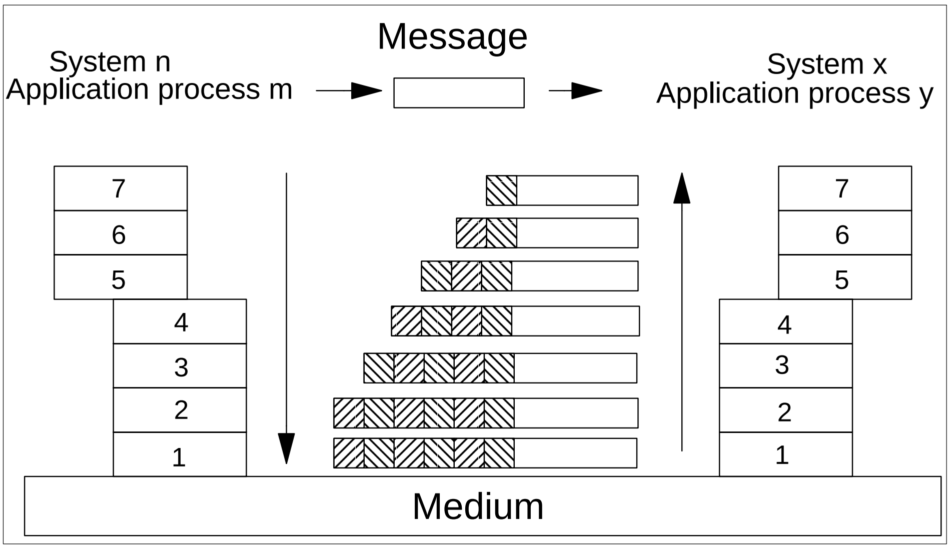
Services between the Layers
Each layer provides services for the layer above at what is called the service access point (SAP) (Figure 1, left). Each service access point has an address in the reference model. The layer currently under observation in the reference model then becomes the user in relation to the layer below it (Figure 1, right). The advantage of the layer model is that the user only needs to master the functionality of the layer it deals with directly; the other layers remain hidden.

Figure 1 Service model (left), recursive application of the service model (right)



Significance of the Layers
Only layers 1 and 2 are required if, for example, data are only to be transferred over a point–to–point connection. The higher–level layers provide more comfort for more complex configurations. A setup that goes up to layer 7 frees the user (programmer) completely from all technical aspects of the communication, and he can use his application in a familiar environment. At the sending device, the data flows from top to bottom through the layers, and at the receiving device from bottom to top. In each layer other than layer 1, the sending end adds protocol information that is then used in the corresponding layer on the receiving end (Figure 2).

Figure 2 information flow within the reference model



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1.1.4 The Seven Layers in a Telephone Conversation (an Example)

Since the description of the OSI reference model is very abstract, we will try to explain what happens using a telephone conversation as our example.

The reference model demonstrated by a telephone conversation		
Layer	**Function**	**Example**
7 Application	Communications request from the application	Boss asks secretary to communicate data by telephone from Frankfurt to Tokyo
6 Presentation	Arbitrate transfer syntax	English Language
5 Session	Dialog management	If the connection is lost for whatever reason, a new connection is established; where necessary, the session is spread out over several phone conversations; synchronization
4 Transport	Segmentation, repeti–tion, acknowledgement, flow control	Adapt information flow to allow for breathing; confirm whether understood; adjust speaking speed
3 Network	Routing	Dialing protocol of the long–distance exchanges
2 Data Link	Message block composition error check Media access	Compose sentences, if necessary spell out words (redundancy to prevent errors); who may speak? Special rules e.g. for conference calls
1 Physical	Bit transmission; coupling to medium	Sound transmission; conversion from sound waves to electrical signals

1.2 General Information about PROFIBUS DP

This section presents:

- Basic Characteristics, Section 1.2.1.
- PROFIBUS DP Layers, Section 1.2.2.
- System Configurations and Device Types, Section 1.2.3.
- System Behavior, Section 1.2.4.
- Data Transmission between the DP Master (Class 1) and DP Slaves, Section 1.2.5.
- Sync und Freeze Mode (not supported by the CRP 811), Section 1.2.6.
- Data Transmission between the DP Master and Configuration Devices, Section 1.2.7.
- Master and Slave Time Monitoring, Section 1.2.8.
- Device Data Base (DDB/GSD) permits Open Configuration, Section 1.2.9.

1.2.1 Basic Characteristics

Why PROFIBUS DP?
PROFIBUS DP (Distributed Process Periphery) is a speed–optimized PROFIBUS variant using the proven qualities of PROFIBUS transmission technology and bus access protocols, but supplemented with specific functions to meet the stringent demands posed by remote process peripherals.

The success of a bus system depends on more than on high data throughput rates. It must also be easy to install and service, provide good diagnostic capabilities, and an error–free, proven transfer technology, in order to satisfy the user's requirements. PROFIBUS DP combines these characteristics in an optimized manner.

Basic Application Characteristics

- PROFIBUS DP has been designed to carry out high–speed data exchange on the sensor/actuator level.
- Here, central controllers (e.g., PLCs) communicate with their distributed input and output devices via a high–speed serial link.
- Most of the data communication with these distributed devices is done in a cyclic manner.
- The central controller (master) reads the input information from the slaves and writes the output information to the slave devices.
- This process requires the bus cycle time to be shorter than the central controller's program cycle time, which in many applications is approximately 10 ms.

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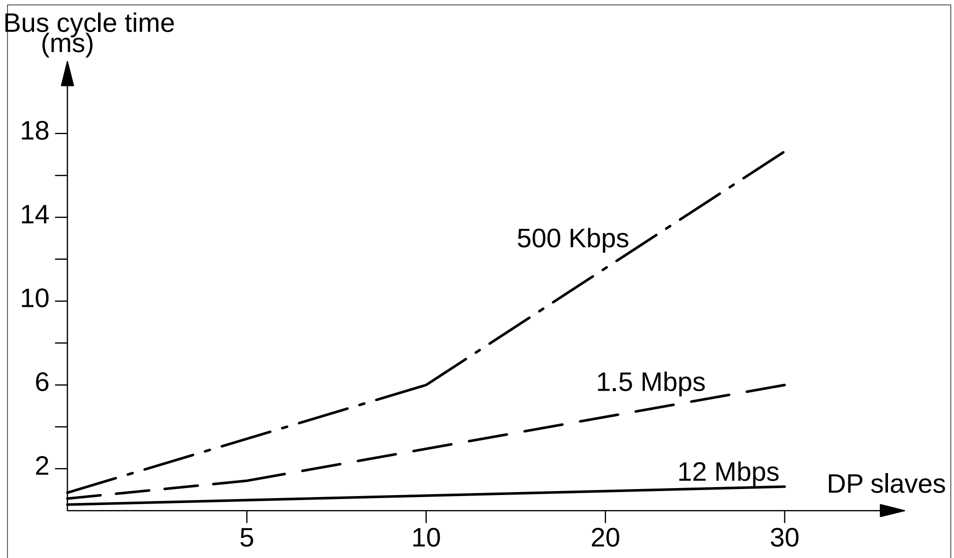
Transfer Speed
The transfer of 2 bytes input and 2 bytes output data per slave for 32 PROFIBUS DP nodes requires roughly 6 ms at 1.5 Mbps, and 2 ms at 12 Mbps. This fully satisfies the system response time requirement. Figure 3 displays PROFIBUS DP’s transmission time relative to the number of slaves and the utilized transfer speed.

Data Throughput
DP’s high rate of data throughput can be traced to the fact that input and output data are transferred in a message cycle using layer 2’s Send and Receive Data service (SRD service). In addition, minimum requirements have been defined for protocol implementation efficiency, and transmission speed can be increased up to 12 Mbps.

Figure 3 Bus cycle times for a mono–master PROFIBUS DP system



Test conditions:
Each slave has 2 bytes of input data and 2 bytes of output data.
The minimum slave interval time amounts to 200 µs, Tsdi = 37 bit times, and Tsdr = 11 bit times.

Diagnostic Functions
PROFIBUS DP's extensive diagnostic functions permit rapid error localization. Diagnostic messages are transmitted over the bus and collected at the master. These messages are divided into three levels:

- Station–related diagnostics
  These messages concern the general operational status of the whole device, e.g. undervoltage or excessive temperature.
- Module–related diagnostics
  These messages indicate that a fault is present within a specific I/O range, e.g. the 8–bit output module of a device.
- Channel–related diagnostics
  These messages indicate faults for an individual input/output point (channel), e.g. short circuit on output 7.

Handling and Installation (also refer to the PUO guidelines)
The RS–485 transmission technology can be simply handled. Installation of the twisted pair cable and PROFIBUS nodes must be carried out in accordance with the PUO guideline 2.111. The bus structure permits addition and removal of stations or step–by–step commissioning of the system without influencing the other stations. Later expansions have no effect on stations which are already in operation.

1.2.2 PROFIBUS DP Layers

PROFIBUS DP Features
- PROFIBUS DP only uses the functions in layers 1 and 2 of the OSI reference model.
- Layers 3 through 7 are not defined.
- Layer 7 (application layer) is not used in order to achieve the required speed.
- The Direct Data Link Mapper (DDLM) provides the user interface with comfortable access to layer 2.
- The user interface defines application functions for the user, and system and device behaviors for the various PROFIBUS DP device types.

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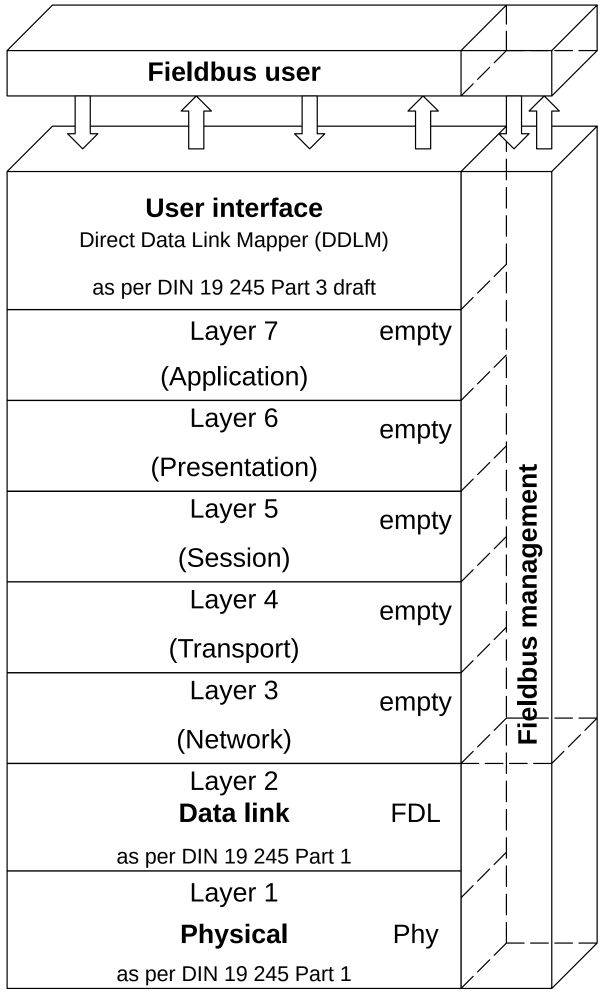
Figure 4 PROFIBUS DP layers



1.2.3 System Configurations and Device Types

Main Features

- PROFIBUS DP can be used with mono– or multi–master systems. This provides a high degree of flexibility during system configuration.
- Up to 125 devices (master or slaves) can be connected to a single bus.
- Details held in the system configuration are the number of stations, assignments of station address vs. I/O addresses, I/O data format, diagnostic message format, and the bus parameters used such as bus address and transmission rate.

☞ **Note**
The CRP 811 PROFIBUS master is only supported in the primary subrack. CRP operation in RIO (remote I/O) or DIO (distributed I/O) is thus not possible.

DP Device Classes

Every PROFIBUS DP system consists of a variety of device types. There are three types of devices, each used for different tasks:

- **Class 1 DP Master (DPM1)**
  This is a central bus controller exchanging information with remote stations (DP slaves) within a specified message cycle.Typical devices include programmable controllers (PLCs), numeric controllers (CNC), or robotic controllers (RC).
- **Class 2 DP Master** (Third Party)
  Devices of this type include programming, configuration, and diagnostic devices. They can optionally be used during commissioning to create the DP system configuration.
- **DP Slave**
  A DP slave is itself an I/O peripheral device (sensor/actuator) to collect input information and/or send output information to the attached peripherals. It is also possible to have devices which only handle either input or output information. Typical DP slave devices include discrete I/Os for 24/230 V, analog inputs, analog outputs, counters, etc.

The input and output information complement is device dependent, with a maximum of 244 bytes of input and 244 bytes of output information permitted. For reasons of expense and implementation, many of the devices available today work with a maximum user data length of 32 bytes.

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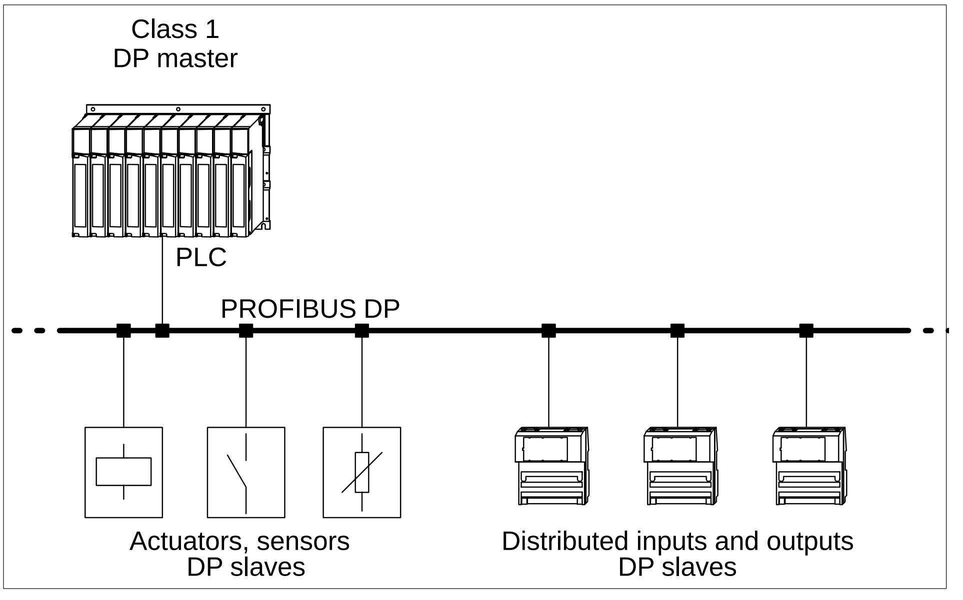
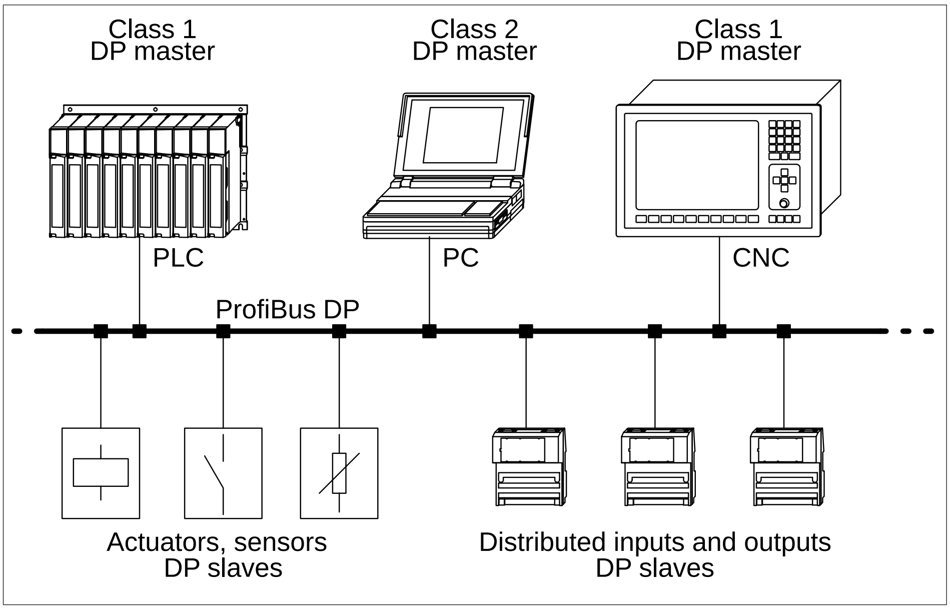
System Configurations
Only one master is active on the bus in **mono–master systems** during the bus system operating phase. Figure 5 shows the system configuration of a mono–master system. The programmable controller (PLC) is the central control component. The distributed DP slaves are linked via the transfer medium to the programmable controller.
This system configuration achieves the shortest bus cycle time.

Figure 5 PROFIBUS DP mono–master system



Several masters are connected to one bus in **multi–master configurations**. They either form independent subsystems, each consisting of a single DPM1 with privately assigned slaves, or additional configuration and diagnostic devices (see Figure 6).
DP slave input and output images can be read by all DP masters. (The class 1 DP master CRP 811 only allows slaves to be assigned to, and read from, a single master).
Outputs may only be written by a single DP master (the DPM1 assigned during configuration).
Multi–master systems achieve an intermediate bus cycle time.

Figure 6 PROFIBUS DP multi–master system



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1.2.4 Standardized System Behavior

PROFIBUS DP system behavior has been standardized in order to ensure device exchangeability. System behavior is determined primarily by the operating status of the DPM1. The DPM1 can be controlled either locally or via the bus by the configuration device. There are three main states:

Stop
No data transmission occurs between the DPM1 and the DP slaves in this state.

Clear
The DPM1 reads DP slave input information, while holding the outputs in a secure state.

Operate
The DPM1 is in the data transmission phase:

- In a cyclic data communication inputs of the DP slaves are read, and output information is then transferred to the DP slaves.
- The DPM1 sends its local status cyclically to all of its assigned slaves with a multicast command in configurable time intervals.
- The system reaction to an error during the data transmission phase of the DPM1, e.g. a DP slave failure, is determined by the **”auto–clear”** configuration parameter.

⚠ **Caution**
CRP 811 only supports ”auto–clear” = false

Auto–Clear = True (not supported by the CRP 811)
If this parameter is set to ”true”, the DPM1 switches outputs of all assigned DP slaves to a secure state as soon as a DP slave is no longer ready for user data transmission. The DPM1 then switches to the Clear state.

Auto–Clear = False
When ”false”, the DPM1 remains in the Operate state even when an error occurs, allowing the user to specify the system reaction.

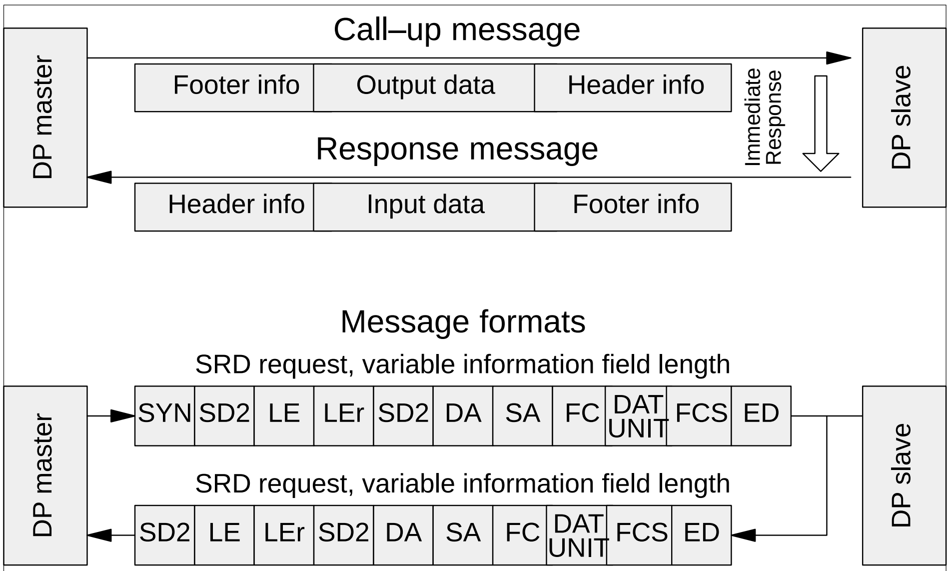
1.2.5 Data Transmission between the DP Master (Class 1) and DP Slaves

Data Transmission Handling
Data transmission between the DPM1 and the slaves assigned to it is executed automatically by the DPM1 in a defined, recurring order. During configuration of the bus system, the user specifies the assignments of the DP slaves to the DPM1. Which DP slaves are to be included in or excluded from cyclic user data transmission is also defined during configuration.

Data Transmission Principles and Security

Data transmission between the DPM1 and the slaves is divided into three phases: parameterization, configuration, and data transfer.
Before a DP slave is included in the actual data transfer phase, the DPM1 examines the planned configuration for correspondence with the real device configuration in the parameterization and configuration phases.
This examination requires that the device type, format, length information, and number of inputs and outputs all correspond.
These tests provide the user with reliable protection against parameterization errors. In addition to the user data transfer executed automatically by the DPM1, the user can request that new parameterization data be sent to the slaves.

Figure 7 User data transmission principles



DA	Destination Address, 22–bit
DAT UNIT	Data field, max. 246 bytes
ED	End Delimiter, 11–bit
FC	Frame Control
FCS	Frame Check Sequence, 11–bit
LE	Length, 11–bit
LEr	Length, repeated, 11–bit
SA	Source Address
SD	Start Delimiter
SYN	Synchronization byte

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1.2.6 Sync and Freeze Mode (not supported by the CRP 811)

Event–Controlled Slave Synchronization
In addition to the station–related user data transfer executed automatically by the DPM1, the DP master can simultaneously send control commands to a single slave, a group of slaves, or all slaves. These control commands are transmitted as multicast functions, and can be issued to set the sync and freeze operating modes, permitting event–controlled DP slave synchronization.

Sync Mode
DP slaves initiate **sync mode** when they receive a sync control command from their assigned DP master. In this operating mode the outputs of all addressed slaves are held at their current state. Any output data gained during subsequent user data transmissions is stored by the slaves, while leaving the states of the targeted outputs unchanged. When the next sync control command from the master is received, stored output data is finally sent to the outputs. The user can terminate the sync operating mode through the unsync control command.

Freeze Mode
Similarly, a freeze control command causes the addressed DP slaves to assume **freeze mode**. In this operating mode input states are held at their current values. Input data for the involved devices are not updated until the DP master sends the next freeze command.
The freeze operating mode is terminated through the unfreeze control command.

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1.2.7 Data Transmission between the DP Master and Configuration Devices

Master – Master
In addition to master–slave functions, master–master communication functions are also available under PROFIBUS DP. These enable configuration and diagnostic devices (DPM2) to initiate the following functions as shown in the table below via bus.

Supported Master–Master Functions			
Function	**Action**	**DPM1**	**DPM2**
Get_Master_Diag	Reads DPM1 diagnostic data or the diagnostic summary of the DP slaves.	M	O
Download/Upload Group (Start_Seq, Download/ Upload, End_Seq)	Downloads or uploads all configuration data of a DPM1 and its associated DP slaves.	O	O
Act_Para_Brct	Activates bus parameters simultaneously for all addressed DPM1 devices.	O	O
Act_Param	Activates parameters or operating state change of the addressed DPM1 device.	O	O

M = mandatory

O = optional; not supported by the CRP 811.

Explanation of the above table
In addition to the upload/download functions, master–master functions permit dynamic enabling/disabling of user data transfer between the individual DP slaves and DPM1, whose operating state can also be changed.

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1.2.8 Master and Slave Time Monitoring

General Information
For security reasons, distributed systems must be equipped with effective protective functions against transmission equipment failures or parameterization errors. PROFIBUS DP uses monitoring mechanisms for both master and slaves. The type of mechanism employed is time monitoring. The monitoring interval is specified during configuration of the DP system.

At the DP master
The DPM1 monitors slave data transmissions with the Data_Control_Timer. A separate control timer is used for each slave. The time monitor reacts if no correct user data transfer occurs within the monitoring interval. The user is informed when this happens. If the automatic error reaction (Auto_Clear = ”true”) has been enabled, the DPM1 leaves the Operate state, switches outputs of the assigned DP slaves to secure states, and then changes to its Clear operating state.

At the DP slave
DP slaves make use of response monitoring to detect master or transmission line failures. If no data transmission with the assigned master takes place within the monitoring interval, the slave switches its own outputs to secure states.

Access Protection for Multi–Master Operation
Slave inputs and outputs require access protection in multi–master systems to ensure that only the authorized master has direct access. For all other DP masters, the slaves offer an image of the inputs and outputs which can be read by any master, even without access rights.

1.2.9 Device Data Base (DDB/GSD) permits Open Configuration

Device Characteristics
The features of PROFIBUS DP devices are documented by the vendor in device data sheets and device data base files made available to the user. Structure, content, and coding of these device data base files (DDB/GSD) is standardized. This makes it easy to integrate a wide range of DP slaves with configuration devices from different vendors. The PROFIBUS User Organization (PUO) archives the information from all vendors and will gladly provide further information concerning the DDB/GSD files.

Device Identification
Every DP slave and DPM1 must have a type–specific ident number. The DP master requires this number in order to identify the types of devices connected without creating significant protocol overhead. The master compares the ident numbers of the devices connected with the ident numbers specified by the DPM2 in the configuration data. Transfer of user data cannot begin until the correct device types with the correct station addresses have been connected on the bus. This provides a high degree of security against configuration errors.

☞ **Note**
Manufacturers must apply to the PUO for ident numbers for each unique DP slave and DPM1 type.The PUO handles the administration of the ident numbers as well as the device data base files. For further information, please contact your PUO regional office.

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1.3 CRP 811 – Master (Class 1) Functionality and Performance Data

The topics presented in this section are:

- Read DP Slave Diagnostic Data and Store in State RAM, Section 1.3.1.
- Data Transmission, Section 1.3.2.
- Control Commands, Section 1.3.3.
- CRP 811 Failure Behavior, Section 1.3.4.
- Diagrams of Processing and Delay Times on the Bus, Section 1.3.5.
- I/O Performance Figures, Section 1.3.6.

1.3.1 Read DP Slave Diagnostic Data and Store in State RAM

Triggering Criteria
The CRP 811 reads diagnostic data automatically from the slaves. The Quantum PLC may be in either STOP or RUN mode. This procedure takes place:

- After CRP 811 power–up
- After CRP 811 hot swap
- After CRP 811 reset from the RS–232C
- In the warm–up and initialization phases of the slaves
- When the slave has new diagnostic data

State RAM Addresses
Per slave configuration of state RAM diagnostic data:

- Mapping in 3xxxx range => register inputs
- n x INT8 configurable through Concept configuration
- n = 6 : default standard diagnostic value adhering to the standard
- n = 6 : minimum number of diagnostic data
- n = 244 : max. number of diagnostic data per slave

☞ **Note**
The maximum diagnostic data complement and specification can be be gathered from the user manual of the respective DP slave vendor.

Table 2 Specifications valid for Schneider Automation DP slaves:

DP slave type	Max. diagn. bytes	Documentation no.
CLASSIC TIOS	13	
MOMENTUM	19	Refer to documentation
DEA 203	22	

CRP 811 Diagnostic Data Storage Configuration (Buffer Resources)

Diagnostic buffers	Default 100, max. 400
Bytes per buffer	Default 32, slave specifies max. diagnostic data byte length (refer to Table 2).

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1.3.2 Data Transmission

Parameter Data Transfer to DP Slave

- Parameter data are automatically sent to the slaves in the warm–up and initialization phases, i.e. not when user data is being transferred.
- Bus–wide parameter data are specified by the DP configuration tool and the DP slave device data base files.
- Vendor DP slave–specific parameter data (user parameter data) are specified through the DP configuration tool and the DP slave device data base files. Refer to the slave vendor’s user manual for user parameter data number and significance.

Configuration Data Transfer to DP Slave

- Configuration data are automatically sent to the slaves in the warm–up and initialization phases, i.e. not when user data is being transferred.
- Configuration data are specified by the DP configuration tool and the DP slave device data base files.

Cyclic I/O Data Transfer from State RAM

The permitted input and output mappings are presented below.

References	Concept selection
Outputs with 0xxxx references	Boolean (see note 1)
Outputs with 4xxxx references	Boolean (see note 2)
	Int8, Int16, Int32 (see note 2)
	RAW, String
Inputs n with 1xxxx references	Boolean (see note 1)
Inputs n with 3xxxx references	Boolean
	Int8, Int16, Int32 (see note 2)
	RAW, String (see note 2)

Note
1: Mapping for 0x/1x references may also be made to byte boundaries.
2: No restrictions apply to transitions and forces with 0.xxx / 1.xxx references.

General principles: Max. slave and I/O data complement on a single bus master
Two transfer paths must to be taken into account for data transfers between the PROFIBUS slaves and the state RAM on the CPU:

- The path from the bus to CRP memory (bus transfer)
- The path from the CRP to the CPU's state RAM (back plane transfer)

Restrictions apply to both transfer paths, which in their sum are presented in the following table.

The CPU is chosen based upon the required number of I/O points. The following principles are to be taken into account when interpreting the following table:

Principles

1	Input and output data transfer is accomplished through **separate** buffers.
2	A complete bus scan (inputs + outputs) may make use of a **max. of 16 buffers**.
3	An I/O buffer size of 128 bytes can be assumed for the CPU x13 (1). Modular slaves have a buffer transfer size of max. 244 bytes.
4	An I/O buffer size of 128 bytes can be assumed for CPU group (2). Modular slaves have a buffer transfer size of max. 244 bytes.
5	Should e.g. **module input data** exceed the buffer block limit of 128 resp. 1024 bytes, the remaining module data will be conveyed in the next buffer block.
6	The mapping of input resp. output data within the buffer block for individual slave modules follows the slave addresses in **ascending** order.

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Compact and modular I/O byte lengths for various CPU types

	Max. I/O bytes per node address:			**Max. no. slaves + master**	**Max. no. slaves:** (Example: For a module with **max.** I/O data) (3)	
Node type	**Slave:** –**Compact** or –modular with max. **1x** I/O module.	**Slave:** –**modular** with **more** than 1x I/O module.	**Master: CRP 811**	Module with **minimum** I/O data	**–Compact** or –modular with max. **1x** I/O module.	**–modular** with **more** than 1x I/O module.
CPU x13 (1)	128 I–bytes +128 O–bytes	244 I–bytes +244 O–bytes	1024 I–bytes +1024 O–bytes	124	16 slaves with 64 I–bytes +64 O–bytes	8 slaves with 122 I–bytes +122 O–bytes
CPU 424 (2) CPU 434 (2) CPU 534 (2)	244 I–bytes +244 O–bytes	244 I–bytes +244 O–bytes	7808 I–bytes +7808 O–bytes	124	32 slaves with 244 I–bytes +244 O–bytes	32 slaves with 244 I–bytes +244 O–bytes
(3) If one halves the byte sizes per slave for the example above, the no. of possible slaves doubles. If the In byte size in the example above (64 In bytes) is increased to 65 for this module type, then the total modules of this type which can be configured on a bus drops to 10.						

Example of an I/O scan of Compact slaves with the small CPU (1)
The following example should demonstrate the principal relationships.

Figure 8 How many Compact slave nodes (w/32 In and 16 Out) fit on this bus?

Input byte extent:

Slaves 1–4, 32 I each—>	**Buffer 1**	**128 bytes**
Slaves 5–8, 32 I each—>	**Buffer 2**	**128 bytes**
Slaves 9–12, 32 I each—>	**Buffer 3**	**128 bytes**
Slaves 13–16, 32 I each—>	**Buffer 4**	**128 bytes**
Slaves 17–20, 32 I each—>	**Buffer 5**	**128 bytes**
Slaves 21–24, 32 I each—>	**Buffer 6**	**128 bytes**
Slaves 25–28, 32 I each—>	**Buffer 7**	**128 bytes**
Slaves 29–32, 32 I each—>	**Buffer 8**	**128 bytes**
Slaves 33–36, 32 I each—>	**Buffer 9**	**128 bytes**
Slaves 37–40, 32 I each—>	**Buffer 10**	**128 bytes**

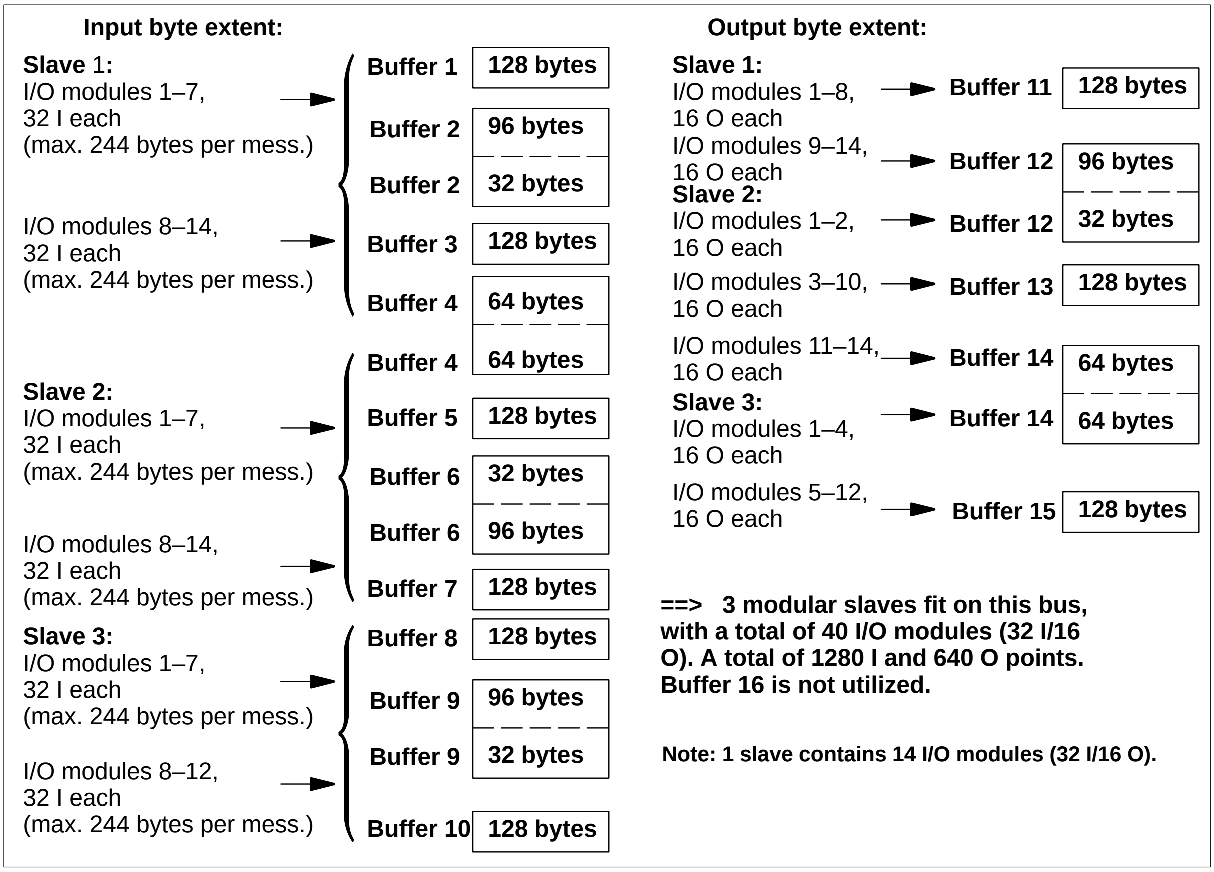
Output byte extent:

Slaves 1–8, 16 O each—>	**Buffer 11**	**128 bytes**
Slaves 9–16, 16 O each—>	**Buffer 12**	**128 bytes**
Slaves 17–24, 16 O each—>	**Buffer 13**	**128 bytes**
Slaves 25–32, 16 O each—>	**Buffer 14**	**128 bytes**
Slaves 33–40, 16 o each—>	**Buffer 15**	**128 bytes**

==> 40 slaves fit on this bus, each with 32 I/16 O. Buffer 16 is not utilized.

Example of a scan of slaves with modular I/O for the small CPU (1)
The following example should demonstrate the principal relationships.

Figure 9 How many modular I/O slave nodes (w/32 I and 16 O) fit on this bus?



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Example of an I/O scan of Compact slaves with the large CPU (2)
The following example should demonstrate the principal relationships.

Figure 10 How many Compact slave nodes (w/32 I and 16 O) fit on this bus?

Input byte extent:

Slaves 1–8, 32 I each	→ **Buffer 1**	**1024 bytes**
Slaves 9–16, 32 I each	→ **Buffer 2**	**1024 bytes**
Slaves 17–24, 32 I each	→ **Buffer 3**	**1024 bytes**
Slaves 25–32, 32 I each	→ **Buffer 4**	**1024 bytes**
Slaves 33–40, 32 I each	→ **Buffer 5**	**1024 bytes**
Slaves 41–48, 32 I each	→ **Buffer 6**	**1024 bytes**
Slaves 49–56, 32 I each	→ **Buffer 7**	**1024 bytes**
Slaves 57–64, 32 I each	→ **Buffer 8**	**1024 bytes**
Slaves 65–72, 32 I each	→ **Buffer 9**	**1024 bytes**
Slaves 73–80, 32 I each	→ **Buffer 10**	**1024 bytes**

Output byte extent:

Slaves 1–16, 16 A each	→ **Buffer 11**	**1024 bytes**
Slaves 17–32, 16 A each	→ **Buffer 12**	**1024 bytes**
Slaves 33–48, 16 A each	→ **Buffer 13**	**1024 bytes**
Slaves 49–64, 16 A each	→ **Buffer 14**	**1024 bytes**
Slaves 65–80, 16 A each	→ **Buffer 15**	**1024 bytes**

==> 80 slaves fit on this bus,
each with 32 I/16 O. A total of 2560 I and
1280 O points. Buffer 16 is not utilized.

Example of a scan of slaves with modular I/O for the large CPU (2)
The following example should demonstrate the principal relationships.

☞ **Note**
23 modular slaves are configured on this bus, each with 14x (32 I/16 O) modules. A total of 10240 I and 5120 O points. Buffer 16 is not utilized.

Figure 11 How many modular I/O slave nodes (w/32 I and 16 O) fit on this bus?

Input byte extent:

Slaves / I/O modules	Buffer	1024 bytes
Slave 1: I/O modules 1–14, 32 I each **Slave 2:** I/O modules 1–14, 32 I each **Slave 3:** I/O modules 1–4, 32 I each	**Buffer 1**	448 bytes 448 bytes 128 bytes
I/O modules 5–14, 32 I each **Slave** 4**:** I/O modules 1–14, 32 I each **Slave 5**: I/O modules 1–8, 32 I each	**Buffer 2**	320 bytes 448 bytes 256 bytes
I/O modules 9–14, 32 I each **Slave 6**: I/O modules 1–14, 32 I each **Slave 7**: I/O modules 1–12, 32 I each	**Buffer 3**	192 bytes 448 bytes 384 bytes
I/O modules 13–14, 32 I each **Slave 8**: I/O modules 1–14, 32 I each **Slave 9**: I/O modules 1–14, 32 I each **Slave 10:** I/O modules 1–2, 32 I each	**Buffer 4**	64 bytes 448 bytes 448 bytes 64 bytes
I/O modules 3–14, 32 I each **Slave 11**: I/O modules 1–14, 32 I each **Slave 12**: I/O modules 1–6, 32 I each	**Buffer 5**	384 bytes 448 bytes 192 bytes
I/O modules 7–14, 32 I each **Slave 13**: I/O modules 1–14, 32 I each **Slave 14**: I/O modules 1–10, 32 I each	**Buffer 6**	256 bytes 448 bytes 320 bytes
I/O modules 11–14, 32 I each **Slave 15**: I/O modules 1–14, 32 I each **Slave 16**: I/O modules 1–14, 32 I each	**Buffer 7**	128 bytes 448 bytes 448 bytes

through buffer 10: 7 further slaves.

Output byte extent:

Slaves / I/O modules	Buffer	1024 bytes
Slave 1: I/O modules 1–14, 16 O each **Slave 2:** I/O modules 1–14, 16 O each **Slave 3:** I/O modules 1–14, 16 O each **Slave 4:** I/O modules 1–14, 16 O each **Slave 5:** I/O modules 1–8, 16 O each	**Buffer 11**	4 x 224 bytes +128 bytes
I/O modules 9–14, 16 O each **Slave 6:** I/O modules 1–14, 16 O each **Slave 7:** I/O modules 1–14, 16 O each **Slave 8:** I/O modules 1–14, 16 O each **Slave 9:** I/O modules 1–14, 16 O each **Slave 10:** I/O modules 1–2, 16 O each	**Buffer 12**	96 bytes + 4x 224 bytes + 32 bytes
I/O modules 3–14, 16 O each **Slave 11:** I/O modules 1–14, 16 O each **Slave 12:** I/O modules 1–14, 16 O each **Slave 13:** I/O modules 1–14, 16 O each **Slave 14:** I/O modules 1–10, 16 O each	**Buffer 13**	192 bytes + 3x 224 bytes + 160 bytes
I/O modules 11–14, 16 O each **Slave 15:** I/O modules 1–14, 16 O each **Slave 16:** I/O modules 1–14, 16 O each **Slave 17:** I/O modules 1–14, 16 O each **Slave 18:** I/O modules 1–14, 16 O each **Slave 19:** I/O modules 1–4, 16 O each	**Buffer 14**	64 bytes + 4x 224 bytes + 64 bytes
I/O modules 5–14 16 O each **Slave 20:** I/O modules 1–14, 16 O each **Slave 21:** I/O modules 1–14, 16 O each **Slave 22:** I/O modules 1–14, 16 O each **Slave 23:** I/O modules 1–12, 16 O each	**Buffer 15**	160 bytes + 3x 224 bytes + 192 bytes

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1.3.3 Control Commands

The following control commands for DP slaves are **not** supported

Sync	Send outputs and hold
Unsync	Enable outputs
Freeze	Read inputs and hold
Unfreeze	Enable inputs
Clear	All outputs are set to ”0”

Auto–Clear
This command specifies output behavior upon failure of a DP slave.

Auto–Clear = TRUE Is **not** supported	If failure occurs at one DP slave, the outputs of all other slaves are set to ”0”.
Auto–Clear = FALSE Is supported	If failure occurs at one DP slave, the outputs of all other slaves retain their settings.

1.3.4 CRP 811 Failure Behavior

The effect of the various failures upon state RAM and the lifesign register can be gathered from the following table.

Table 3 Effect of failure upon the lifesign register => 3xxxxx register

			3xxxxx lifesign register		
Sources of failure	**PROFIBUS DP slave outputs**	**Quantum 1xxxxx state RAM inputs**	**Bit 14**	**Bit 15**	**Bit 16**
All configured DP slaves are errorless	Variable	Variable	Flashing	Flashing	Flashing
A DP slave is no longer on the bus	Zero 1)	Zero	Flashing	0 or 1	Flashing
A DP slave is powered–down	X	Zero	Flashing	0 or 1	Flashing
A DP slave has failed	Zero 1)	Zero	Flashing	0 or 1	Flashing
All DP slaves are powered–down	X	Zero	0 or 1	0 or 1	Flashing
DP slaves are no longer on the CRP 811 bus	Zero 1)	Zero	0 or 1	0 or 1	Flashing
CRP 811 has lost connection to the back plane	Zero 1)	Remain set	0 or 1	0 or 1	0 or 1
CRP 811 firmware update activated over RS–232C	Zero	Zero	0 or 1	0 or 1	0 or 1
CRP 811 in reset via RS–232C after password entry	Zero 1)	Remain set	0 or 1	0 or 1	0 or 1
Quantum went from PLC start to PLC stop	Zero	Remain set	0 or 1	0 or 1	0 or 1
Quantum is powered–down	Zero 1)	X	X	X	X
Quantum CPU has lost connection to the back plane	Zero 1)	X	X	X	X
Quantum power supply CPS ... disconnected from back plane	Zero 1)	X	X	X	X

1) Actioned by the DP slave. Values marked by X become undefined if ”Watchdog Control” was configured.

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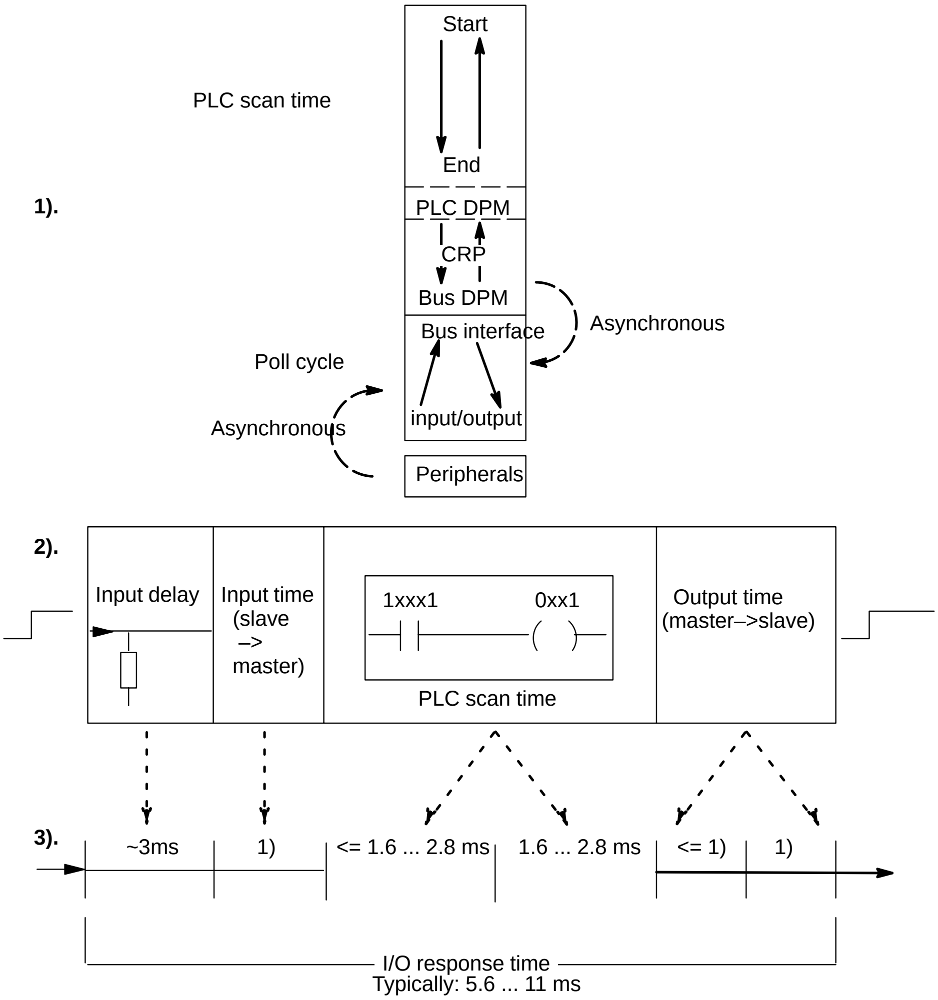
1.3.5 Diagrams of Processing and Delay Times on the Bus

In the sequence of 3 diagrams presented in the following illustration, the last focuses on components influencing the I/O response time over PROFIBUS DP.

Depending upon the I/O family type and an assumed program scan time, a typical I/O response time between 5.6 and 11 ms results.

Figure 12 I/O response time overview (worst case)



1) Slave interval: >= minimum slave interval; (dependent upon slave complement)

Minimum slave interval:
= 2 ms for Momentum/DEA 203
= 0.1 ms for TIO

1.3.6 I/O Performance Figures

Quantum PLC I/O response times for PROFIBUS DP **under Concept** with the Momentum, TIO, and Compact system families.

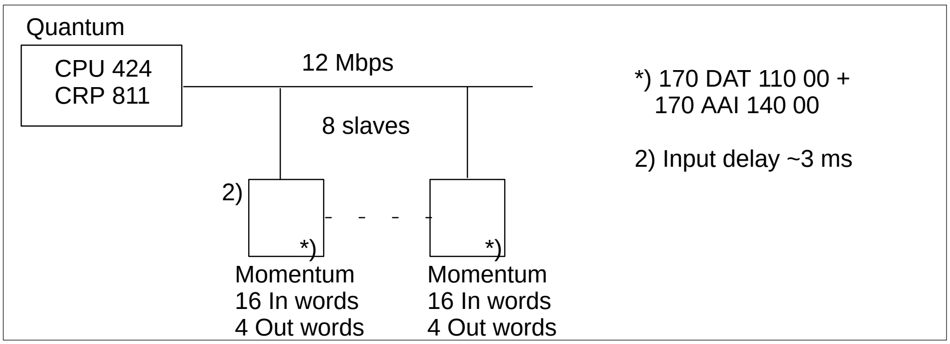
Momentum Slave Response Times
Typical I/O response times based upon connected I/O nodes can be gathered from the following table.

Table 4 MOMENTUM performance figures

DP slave complement	Total inputs	Words output	PLC cycle time	Typical I/O response time
–1)	–	–	0.54 ms	–
1	16	4	1.7 ms	8.4 ms
2	32	8	1.8 ms	8.5 ms
3	48	12	2.0 ms	8.6 ms
4	64	16	2.2 ms	9.1 ms
5	80	20	2.3 ms	10 ms
6	96	24	2.5 ms	10.5 ms
7	112	28	2.7 ms	10.6 ms
8	128	32	2.8 ms	11 ms
1) No CRP 811 installed				

Boundary Conditions
The assumed constraints can be gathered from the figure.

Figure 13 MOMENTUM configuration



Note
Bus addresses are meaningless (sequence, gaps)

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Classic TIO Response Times

Typical I/O response times based upon connected I/O nodes can be gathered from the following table.

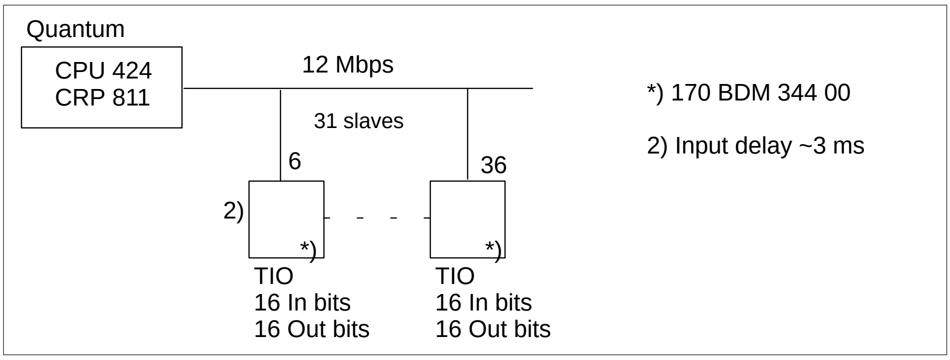
Table 5 TIO 170 BDM 344 00 performance figures

TIO DP slave complement	Total inputs	Words output	PLC cycle time	Typical I/O response time
–1)	–	–	0.54 ms	–
1	1	1	1.56 ms	5.6 ms
2	2	2	1.57 ms	5.7 ms
4	4	4	1.60 ms	5.8 ms
8	8	8	1.60 ms	6.8 ms
16	16	16	1.70 ms	8.0 ms
31	31	31	1.90 ms	11.0 ms
1) No CRP 811 installed				

Boundary Conditions

The assumed constraints can be gathered from the figure.

Figure 14 TIO configuration



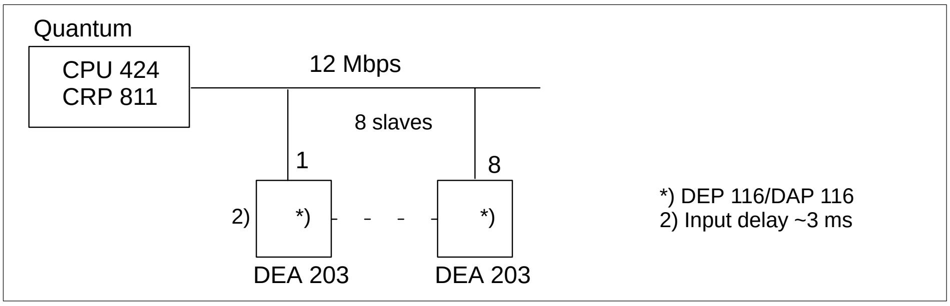
Compact Slave Response Times
Typical I/O response times based upon connected I/O nodes can be gathered from the following table.

Table 6 DEA 203 modular slave performance figures

DP slave complement	Total inputs	Words output	PLC cycle time	Typical I/O response time
–1)			0.58 ms	–
1	18		1.71 ms	6.0 ms
2	18	18	1.76 ms	6.6 ms
3	36	18	1.89 ms	7.5 ms
4	36	36	1.97 ms	7.7 ms
5	54	36	2.08 ms	7.9 ms
6	54	54	2.16 ms	8.3 ms
7	72	54	2.27 ms	8.7 ms
8	72	72	2.36 ms	9.8 ms
1) No CRP 811 installed				

Boundary Conditions
The assumed constraints can be gathered from the figure.

Figure 15 DEA 203 configuration



Note
Bus addresses are meaningless (sequence, gaps)

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PROFIBUS DP Overview

2

The topics presented in this chapter are:

- Product Overview, Section 2.1
- TIO and Compact Slave State RAM Assignment Tables, Section 2.2

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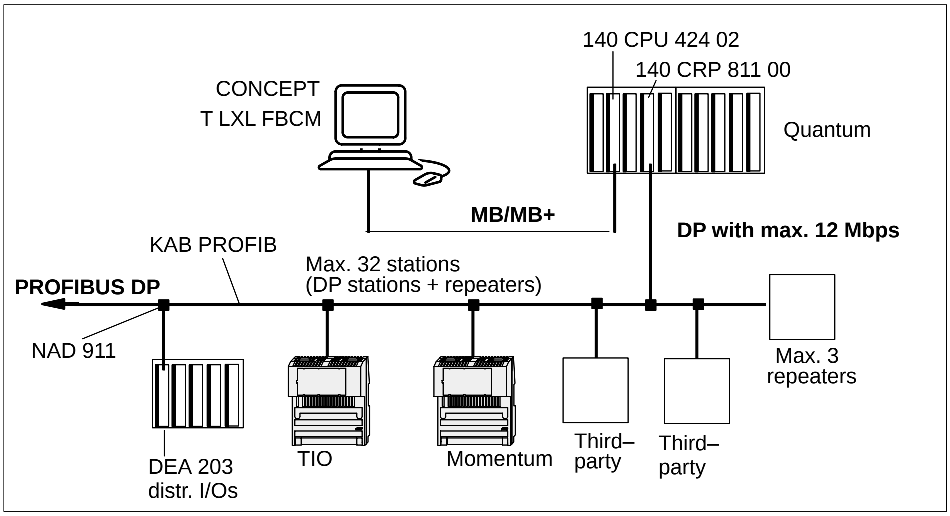
2.1 Product Overview

The topics presented in this section are:

- I/O Node Systems Overview, Section 2.1.1
- TSX Quantum PROFIBUS DP Components, Section 2.1.2.
- PROFIBUS DP Slave Component Assignments, Section 2.1.3.

2.1.1 I/O Node Systems Overview

This overview demonstrates the range of PROFIBUS DP capable I/O devices.



Supported I/O systems under Quantum with CONCEPT:

- Compact with the DEA 203 I/O coupler card for I/O module connection
- TIO with it’s I/O modules
- Momentum with the DNT 110 00 I/O communications adapter for I/O module connection

2.1.2 TSX Quantum PROFIBUS DP Components

A tabular summary of the basic DP system component groupings follows:

- CPUs
- PROFIBUS DP master module and configuration limits
- Accessories and spares

And now the 3 individual tables:

Table 7 CPUs

Features	Type
CPU 186 —> 8 k words logic memory	140 CPU 113 02
CPU 186 —> 16 k words logic memory	140 CPU 113 03
CPU 186 —> 32/48 k words logic memory	140 CPU 213 04
CPU 486 —> 64 k words logic memory	140 CPU 424 02
CPU 586 —> 64 k words logic memory	140 CPU 434 12
CPU 586 —> 64 k words logic memory	140 CPU 534 14
Quantum CPU ”Hot Standby” with PROFIBUS	No

Table 8 Master module and configuration limits

Item	Type/limit
PROFIBUS DP option module	140 CRP 811 00
PROFIBUS DP configuration package (Windows 95/98/NT)	TLX L FBCM (Hilscher SyCon–PB/GS)
No. CRP 811 with the 140 CPU 113 02	max. 2
No. CRP 811 with the 140 CPU 113 03	Max. 2
No. CRP 811 with the 140 CPU 213 04	Max. 2
No. CRP 811 with the 140 CPU 424 02	Max. 6
No. CRP 811 with the 140 CPU 434 12	Max. 6
No. CRP 811 with the 140 CPU 534 14	Max. 6
CRP 811 back plane slot	(Freely selectable)
CRP 811 is back plane ”hot swapable”	Yes

Breite: 185 mm
Höhe: 230 mm

Table 9 Accessories and spares

Item	Type
PROFIBUS connector	140 NAD 911 03 /04 /05
PROFIBUS cable	KAB PROFIB
	Belden 3079A (up to 12 Mbps)
RS–232C cable for CRP 811	YDL52 / 990 NAA 263 x0
Capacitive by–pass clamp	GND001
CRP 811 bus tap	490 NAE 911 00
PCMCIA card for CRP 811	467 NHP 811 00

2.1.3 PROFIBUS DP Slave Component Assignments

The slave components are based upon the 3 system families TIO, Momentum, and Compact (A120).

Slave Family Overview
A global overview of the individual elements sorted in master, slave, and network components is presented below.

Master under CONCEPT 2.2	**Slaves**			**Network components**
Hard–/software	TIO I/O	DEA 203 distributed I/O	Momentum I/O	
DP master h/w up to 12 Mbps: 140 CRP 811 00	Compact DP slaves up to 12 Mbps: See page 83	Modular DP slaves up to 12 Mbps: See page 83	Modular DP slaves with COM modules: See page 85	Bus connector up to 12 Mbps: 490 NAD 911 03 490 NAD 911 04 490 NAD 911 05 –KAB–PROFIB – GND001 –shield cable clamp, as per PUO (see page 72)
Software: –TLX L FBCM (Hilscher SyCon–PB/GS) (including DDB/GSD files)	–DDB/GSD files for slaves	–DDB/GSD files for slaves	–DDB/GSD files for slaves	

Note
DDB/GSD files are listed as user interface. DDB stands for device data base and forms the basis for standardized configuration.

Breite: 185 mm
Höhe: 230 mm

2.2 TIO and Compact Slave State RAM Assignment Tables

This section presents the state RAM assignments for the modules:

- BDO 354 – discrete output / 32–bit, 24 VDC, Section 2.2.1.
- BDI 354 – discrete input / 32–bit, 24 VDC, Section 2.2.2.
- BDM 344 – discrete inputs and outputs / 16–bit, 24 VDC, Section 2.2.3.
- DAP 204 – discrete output / 4–bit, 24 VDC, Section 2.2.4.
- DAP 216 – discrete output / 16–bit, 24 VDC, Section 2.2.5.
- DAP 220 – discrete inputs and outputs / 8–bit, 24 VDC, Section 2.2.6.
- DEP 216 – discrete input / 16–bit, 24 VDC, Section 2.2.7.

2.2.1 BDO 354 – Discrete Output / 32–Bit, 24 VDC

This section describes the relationship between the sequence of data in state RAM, and their assignment to the output terminals for the above named module. Each row of the table describes a single data type. For the BOOL data type, a distinction is made between the 0x and 4x references. Mappings are based upon the CRP 811 option board.

In/Out	State RAM Addr.	State RAM data MSB 1 8 17 24	LSB 9 16 25 32	Data type	CRP 811 I/O data	CRP 811 state RAM	Module 1 8 17 24	 9 16 25 32
Out	000001–16 000017–32	10000100 10100110	11000010 11100001	Bool	21 43 65 87	1–32 (*)	10000100 10100110	11000010 11100001
Out	400001 400002	10000100 10100110	11000010 11100001	Bool	21 43 65 87	1–2 (*)	10000100 10100110	11000010 11100001
Out	400001 400002 400003 400004	00000000 00000000 00000000 00000000	10000100 11000010 10100110 11100001	Uint8	84 C2 A6 E1	1–4 (*)	00100001 01100101	01000011 10000111
Out	400001 400002 400003 400004	00000000 00000000 00000000 00000000	10000100 11000010 10100110 11100001	Int8	84 C2 A6 E1	1–4 (*)	00100001 01100101	01000011 10000111
Out	400001 400002	10000100 10000100	11000010 11100001	Uint16	84 C2 A6 E1	1–2 (*)	00100001 01100101	01000011 10000111
Out	400001 400002	10000100 10100110	11000010 11100001	Int16	84 C2 A6 E1	1–2 (*)	00100001 01100101	01000011 10000111
Out	400001 400002	10000100 10100110	11000010 11100001	Uint32	84 C2 A6 E1	1–2 (*)	00100001 01100101	01000011 10000111

In/Out	State RAM Addr.	State RAM data MSB 1 8 17 24	 LSB 9 16 25 32	Data type	CRP 811 I/O data	CRP 811 state RAM	Module 1 8 17 24	 9 16 25 32
Out	400001 400002	10000100 10100110	11000010 11100001	Int32	84 C2 A6 E1	1–2 (*)	00100001 01100101	01000011 10000111
Out	400001 400002	10000100 10100110	11000010 11100001	Raw	C2 84 E1 A6	1–2 (*)	01000011 10000111	00100001 01100101
Out	400001 400002	10000100 10100110	11000010 11100001	String	84 C2 A6 E1	1–2 (*)	00100001 01100101	01000011 10000111
(*) These entries correspond to the state RAM addresses in column 2.								

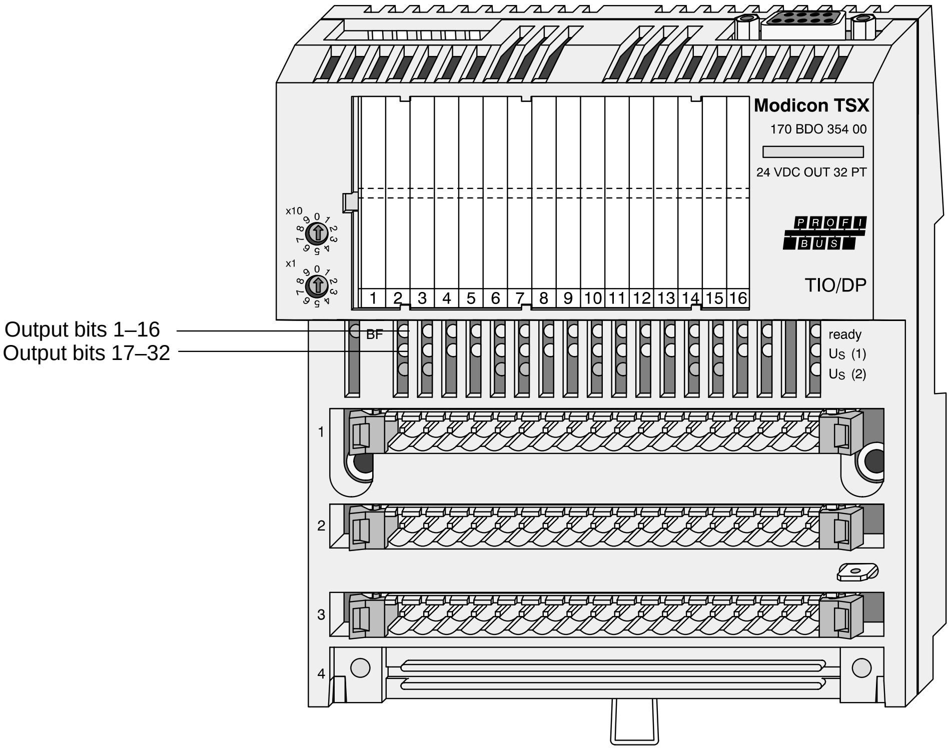


Figure 16 170 BDO 354 00

Breite: 185 mm
Höhe: 230 mm

2.2.2 BDI 354 – Discrete Input / 32–Bit, 24 VDC

This section describes the relationship between the sequence of data in state RAM, and their assignment to the input terminals for the above named module. Each row of the table describes a single data type. For the BOOL data type, a distinction is made between the 1x and 3x references. Mappings are based upon the CRP 811 option board.

In/Out	State RAM Addr.	State RAM data MSB 1–8 / 17–24	State RAM data LSB 9–16 / 25–32	Data type	CRP 811 I/O data	CRP 811 state RAM	Module 1–8 / 17–24	Module 9–16 / 25–32
In	100001–16 100017–32	10000100 10100110	11000010 11100001	Bool	21 43 65 87	1–32 (*)	10000100 10100110	11000010 11100001
In	300001 300002	10000100 10100110	11000010 11100001	Bool	21 43 65 87	1–2 (*)	10000100 10100110	11000010 11100001
In	300001 300002 300003 300004	00000000 00000000 00000000 00000000	00100001 01000011 01100101 10000111	Uint8	21 43 65 87	1–4 (*)	10000100 10100110	11000010 11100001
In	300001 300002 300003 300004	00000000 00000000 00000000 11111111	00100001 01000011 01100101 10000111	Int8	21 43 65 87	1–4 (*)	10000100 10100110	11000010 11100001
In	300001 300002 300003 300004	11111111 11111111 11111111 11111111	10100001 11000011 11100101 10000111	Int8	A1 C3 E5 87	1–4 (*)	10000101 10100111	11000011 11100001
In	300001 300002	00100001 01100101	01000011 10000111	Uint16	21 43 65 87	1–2 (*)	10000100 10100110	11000010 11100001
In	300001 300002	00100001 01100101	01000011 10000111	Int16	21 43 65 87	1–2 (*)	10000100 10100110	11000010 11100001
In	300001 300002	00100001 01100101	01000011 10000111	Uint32	21 43 65 87	1–2 (*)	10000100 10100110	11000010 11100001
In	300001 300002	00100001 01100101	01000011 10000111	Int32	21 43 65 87	1–2 (*)	10000100 10100110	11000010 11100001
In	300001 300002	01000011 10000111	00100001 01100101	Raw	21 43 65 87	1–2 (*)	10000100 10100110	11000010 11100001
In	300001 300002	00100001 01100101	01000011 10000111	String	21 43 65 87	1–2 (*)	10000100 10100110	11000010 11100001
(*) These entries correspond to the state RAM addresses in column 2.								

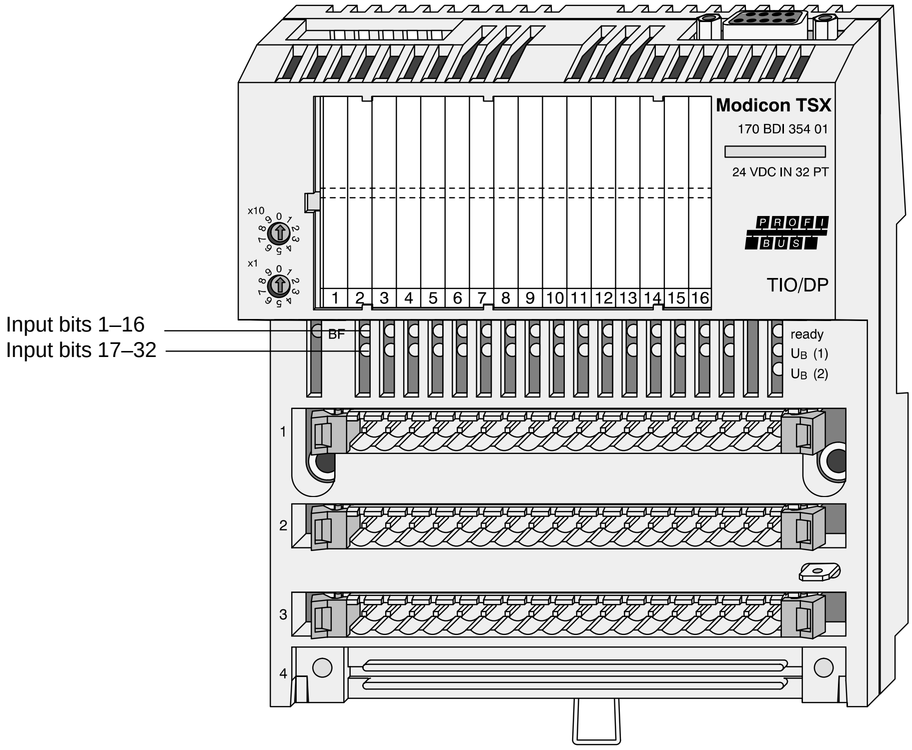


Figure 17 170 BDI 354 00

Breite: 185 mm
Höhe: 230 mm

2.2.3 BDM 344 – Discrete Input and Output / 16–Bit, 24 VDC

This section describes the relationship between the sequence of data in state RAM, and their assignment to the input and output terminals for the above named module. Each row of the table describes a single data type. For the BOOL data type, a distinction is made between the 1x and 3x, resp. 0x and 4x references for inputs and outputs. Mappings are based upon the CRP 811 option board.

In/ out	State RAM Addr.	State RAM data MSB 1 8	LSB 9 16	Data type	CRP 811 I/O data	CRP811 stat RAM	Module 1 8	9 16
Out	000001 –16	10000100	11000010	Bool	21 43	1–16 (*)	10000100	11000010
In	100001 –16	10000100	11000010	Bool	21 43	1–16 (*)	10000100	11000010
Out	400001	10000100	11000010	Bool	21 43	1 (*)	10000100	11000010
In	300001	10000100	11000010	Bool	21 43	1 (*)	10000100	11000010
Out	400001 400002	00000000 00000000	10000100 11000010	Uint8	84 C2	1–2 (*)	00100001	01000011
In	300001 300002	00000000 00000000	00100001 01000011	Uint8	21 43	1–2 (*)	10000100	11000010
Out	400001 400002	00000000 00000000	10000100 11000010	Int8	84 C2	1–2 (*)	00100001	01000011
In	300001 300002	00000000 00000000	00100001 01000011	Int8	21 43	1–2 (*)	10000100	11000010
In	300001 300002	111111111 111111111	10100001 11000011	Int8	A1 C3	1–2 (*)	10000101	11000011
Out	400001	10000100	11000010	Uint16	84 C2	1 (*)	00100001	01000011
In	300001	00100001	01000011	Uint16	21 43	1 (*)	10000100	11000010
Out	400001	10000100	11000010	Int16	84 C2	1 (*)	00100001	01000011
In	300001	00100001	01000011	Int16	21 43	1 (*)	10000100	11000010
Out	400001 400002	10000100 00000000	11000010 00000000	Uint32	84 C2 00 00	1–2 (*)	00100001	01000011 (**)
In	300001 300002	00100001 00000000	01000011 00000000	Uint32	21 43 00 00	1–2 (*)	10000100	11000010 (**)
Out	400001 400002	10000100 00000000	11000010 00000000	Int32	84 C2 00 00	1–2 (*)	00100001	01000011 (**)
In	300001 300002	00100001 00000000	01000011 00000000	Int32	21 43 00 00	1–2 (*)	10000100	11000010 (**)
Out	400001	10000100	11000010	Raw	C2 84	1 (*)	01000011	00100001
In	300001	01000011	00100001	Raw	21 43	1 (*)	10000100	11000010
Out	400001	10000100	11000010	String	84 C2	1 (*)	00100001	01000011
In	300001	00100001	01000011	String	21 43	1 (*)	10000100	11000010

(*) These entries correspond to the state RAM addresses in column 2.
(**) Prohibited, 2nd register is invalid.

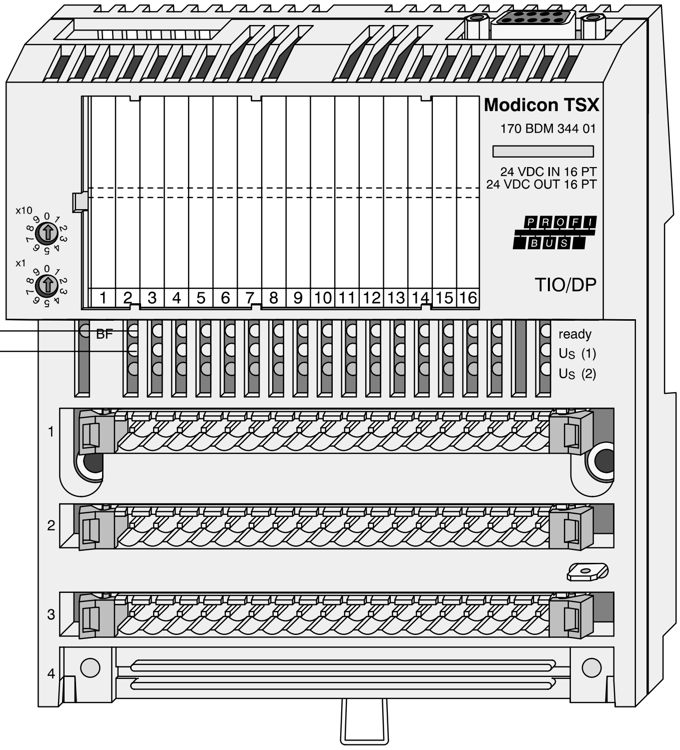


Figure 18 170 BDM 344 00

Breite: 185 mm
Höhe: 230 mm

2.2.4 DAP 204 – Discrete Output / 4–Bit, 24 VDC

This section describes the relationship between the sequence of data in state RAM, and their assignment to the output terminals for the above named module. Each row of the table describes a single data type. For the BOOL data type, a distinction is made between the 0x and 4x references. Mappings are based upon the CRP 811 option board.

In/ Out	**State RAM Addresses**	**State RAM data** **MSB** 1 8	 **LSB** 9 16	**Data type**	**CRP 811 I/O data**	**CRP 811 state RAM**	**Module** 1 4 Output
Out	000001 –16	10000100	00000000	Bool	21	1–4 (*)	1000
Out	400001	10000100	00000000	Bool	21	1 (*)	1000
Out	400001	00000000	11000010	Uint8	84	1 (*)	0010
Out	400001	00000000	11000010	Int8	84	1 (*)	0010
Out	400001	10000100	00000000	Uint16	84 00	1 (*)	0010 (**)
Out	400001	10000100	00000000	Int16	84 00	1 (*)	0010 (**)
Out	400001 400002	10000100 00000000	00000000 00000000	Uint32	84 00 00 00	1–2 (*)	0010 (**)
Out	400001 400002	10000100 00000000	00000000 00000000	Int32	84 00 00 00	1–2 (*)	0010 (**)
Out	400001	00000000	10000100	Raw	84	1 (*)	0010
Out	400001	10000100	00000000	String	84	1 (*)	0010
(*) These entries correspond to the state RAM addresses in column 2. (**) Only bits 1–8 valid in 1st register.							

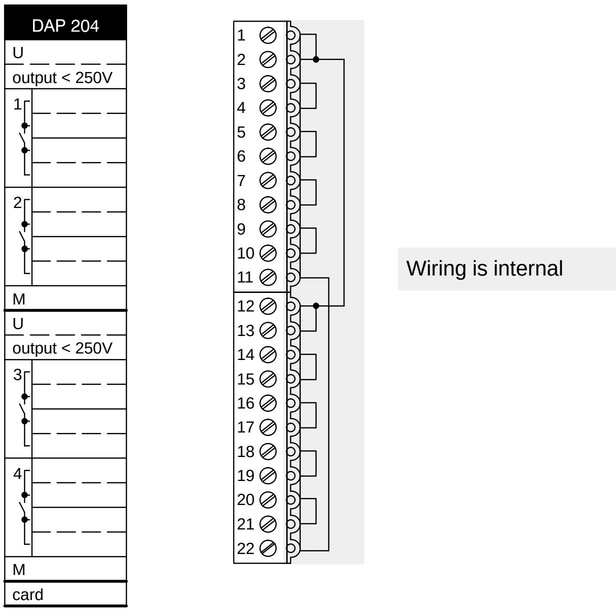


Figure 19 170 DAP 204 00

Breite: 185 mm
Höhe: 230 mm

2.2.5 DAP 216 – Discrete Output / 16–Bit, 24 VDC

This section describes the relationship between the sequence of data in state RAM, and their assignment to the output terminals for the above named module. Each row of the table describes a single data type. For the BOOL data type, a distinction is made between the 0x and 4x references. Mappings are based upon the CRP 811 option board.

In/Out	State RAM Addr.	State RAM data MSB 1 8	LSB 9 16	Data type	CRP 811 I/O data	CRP 811 state RAM	Module 1 8	9 16
Out	000001–16	10000100	11000010	Bool	43 21	1–16 (*)	10000100	11000010
Out	400001	10000100	11000010	Bool	43 21	1 (*)	10000100	11000010
Out	400001 400002	00000000 00000000	10000100 11000010	Uint8	84 C2	1–2 (*)	01000011	00100001
Out	400001 400002	00000000 00000000	10000100 11000010	Int8	84 C2	1–2 (*)	01000011	00100001
Out	400001	10000100	11000010	Uint16	84 C2	1 (*)	01000011	00100001
Out	400001	10000100	11000010	Int16	84 C2	1 (*)	01000011	00100001
Out	400001 400002	10000100 00000000	11000010 00000000	Uint32	84 C2 00 00	1–2 (*)	01000011	00100001 (**)
Out	400001 400002	10000100 00000000	11000010 00000000	Int32	84 C2 00 00	1–2 (*)	01000011	00100001 (**)
Out	400001	10000100	11000010	Raw	C2 84	1 (*)	00100001	01000011
Out	400001	10000100	11000010	String	84 C2	1 (*)	01000011	00100001
(*) These entries correspond to the state RAM addresses in column 2. (**) Prohibited, 2nd register is invalid.								

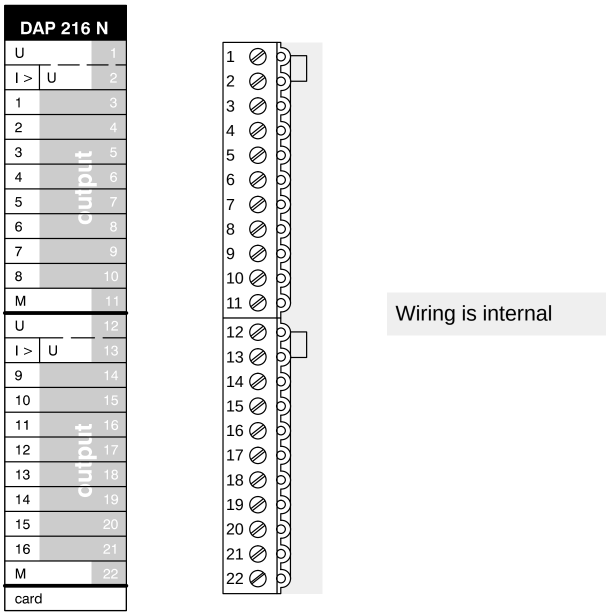


Figure 20 170 DAP 216 00

Breite: 185 mm
Höhe: 230 mm

2.2.6 DAP 220 – Discrete Input and Output / 8–Bit, 24 VDC

This section describes the relationship between the sequence of data in state RAM, and their assignment to the input and output terminals for the above named module. Each row of the table describes a single data type. For the BOOL data type, a distinction is made between the 1x and 3x, resp. 0x and 4x references for inputs and outputs. Mappings are based upon the CRP 811 option board.

In/ out	State RAM Addres-ses	State RAM data MSB 1 8	LSB 9 16	Data type	CRP 811 I/O data	CRP 811 state RAM	Module 1 8 output	 1 8 input
Out	000001 –16	10000100	00000000	Bool	21	1–8 (*)	10000100	
In	100001 –16	10000100	00000000	Bool	21	1–8 (*)		10000100
Out	400001	10000100	00000000	Bool	21	1 (*)	10000100	
In	300001	10000100	00000000	Bool	21	1 (*)		10000100
Out	400001	00000000	10000100	Uint8	84	1 (*)	00100001	
In	300001	00000000	00100001	Uint8	21	1 (*)		10000100
Out	400001	00000000	10000100	Int8	84	1 (*)	00100001	
In	300001	00000000	00100001	Int8	21	1 (*)		10000100
In	300001	111111111	10100001	Int8	A1	1 (*)		10000101
Out	400001	10000100	00000000	Uint16	84 00	1 (*)	00100001 (**)	
In	300001	00100001	00000000	Uint16	21 00	1 (*)		10000100 (**)
Out	400001	10000100	00000000	Int16	84 00	1 (*)	00100001 (**)	
In	300001	00100001	00000000	Int16	21 00	1 (*)		10000100 (**)
Out	400001 400002	10000100 00000000	00000000 00000000	Uint32	84 00 00 00	1–2 (*)	00100001 (**)	
In	300001 300002	00100001 00000000	00000000 00000000	Uint32	21 00 00 00	1–2 (*)		10000100 (**)
Out	400001 400002	10000100 00000000	00000000 00000000	Int32	84 00 00 00	1–2 (*)	00100001 (**)	
In	300001 300002	00100001 00000000	00000000 00000000	Int32	21 00 00 00	1–2 (*)		10000100 (**)
Out	400001	10000100	10000100	Raw	84	1 (*)	01000011	
In	300001	01000011	00100001	Raw	21	1 (*)		10000100
Out	400001	10000100	00000000	String	84	1 (*)	00100001	
In	300001	00100001	00000000	String	21	1 (*)		10000100

(*) These entries correspond to the state RAM addresses in column 2.
(**) Only bits 1–8 valid in 1st register.

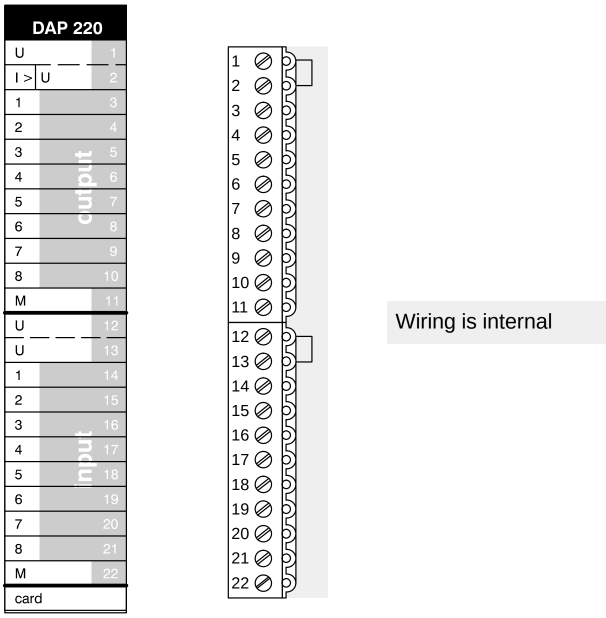


Figure 21 170 DAP 220 00

Breite: 185 mm
Höhe: 230 mm

2.2.7 DEP 216 – Discrete Input / 16–Bit, 24 VDC

This section describes the relationship between the sequence of data in state RAM, and their assignment to the input terminals for the above named module. Each row of the table describes a single data type. For the BOOL data type, a distinction is made between the 1x and 3x references. Mappings are based upon the CRP 811 option board.

In/Out	State RAM Addr.	State RAM data MSB 1 8	LSB 9 16	Data type	CRP 811 I/O data	CRP 811 state RAM	Module 1 8	9 16
In	100001 –16	10000100	11000010	Bool	43 21	1–16 (*)	10000100	11000010
In	300001	10000100	11000010	Bool	43 21	1 (*)	10000100	11000010
In	300001 300002	00000000 00000000	01000011 00100001	Uint8	43 21	1–2 (*)	10000100	11000010
In	300001 300002	00000000 00000000	01000011 00100001	Int8	43 21	1–2 (*)	10000100	11000010
In	300001 300002	11111111 11111111	11000011 10100001	Int8	C3 A1	1–2 (*)	10000101	11000011
In	300001	01000011	00100001	Uint16	43 21	1 (*)	10000100	11000010
In	300001	01000011	00100001	Int16	43 21	1 (*)	10000100	11000010
In	300001 300002	01000011 00000000	00100001 00000000	Uint32	43 21 00 00	1–2 (*)	10000100	11000010 (**)
In	300001 300002	01000011 00000000	00100001 00000000	Int32	43 21 00 00	1–2 (*)	10000100	11000010 (**)
In	300001	00100001	01000011	Raw	43 21	1 (*)	10000100	11000010
In	300001	01000011	00100001	String	43 21	1 (*)	10000100	11000010

(*) These entries correspond to the state RAM addresses in column 2.
(**) Prohibited, 2nd register is invalid.

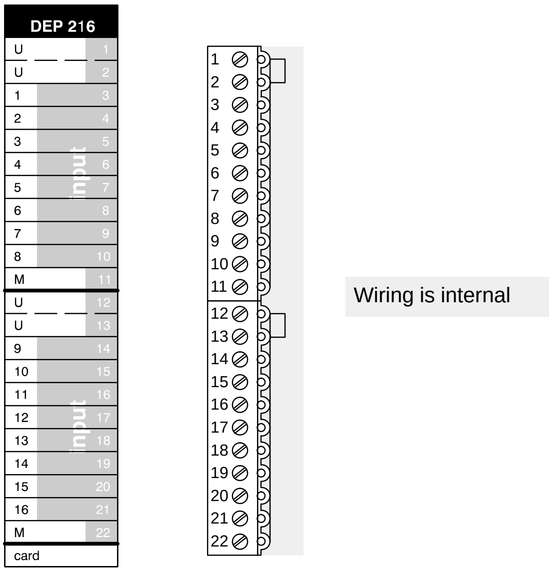


Figure 22 170 DEP 216 00

Breite: 185 mm
Höhe: 230 mm

Hardware Installation

3

The purpose of this chapter is to serve as a standardized basis for all future controller or infrastructure installations. The most important EMC noise–immunity measures targeted to provide trouble free operation are also presented.

The basis of all presented specifications are taken from the PROFIBUS User Organization (PUO) Installation Guidelines. They can be procurred under the order no. 2111 from the PROFIBUS Nutzerorganisation e.V., Haid– und Neu–Strasse 7, D–76131 Karlsruhe, Germany.

The individual sections presented are:

- General Information Regarding PROFIBUS DP Installation, Section 3.1.
- Installation Guidelines, Section 3.2.
- Cable and Connector Specifications, Section 3.3.
- Schneider Automation Products for PROFIBUS DP Installation with Quantum, Section 3.4.

Breite: 185 mm
Höhe: 230 mm

3.1 General Information Regarding PROFIBUS DP Installation

The topics presented in this section are:

- General Information , Section 3.1.1.
- Quantum–Specific PROFIBUS DP Specifications , Section 3.1.2.
- PROFIBUS DP Network Nodes , Section 3.1.3.
- Configuration Limits , Section 3.1.4.
- Segmentation Example of a PROFIBUS Installation with Repeaters , Section 3.1.5.
- PROFIBUS DP Cable and Bus Specifications , Section 3.1.6.

3.1.1 General Information

What is PROFIBUS DP?
PROFIBUS DP is a serial field bus. This bus represents an open network according to the EN 50170 standard, section 2. Only shielded, twisted pair cable may be used.

☞ **Note**
The details of the following specification must be strictly upheld. This refers in particular to the installation and the use of field devices. The technical directives provided by the individual manufacturers and vendors are also to be observed.

Guidelines
The specifications as set forth in the PROFIBUS User Organization (PUO) Installation Guidelines (order no. 2111) are always valid.

3.1.2 Quantum–Specific PROFIBUS DP Specifications

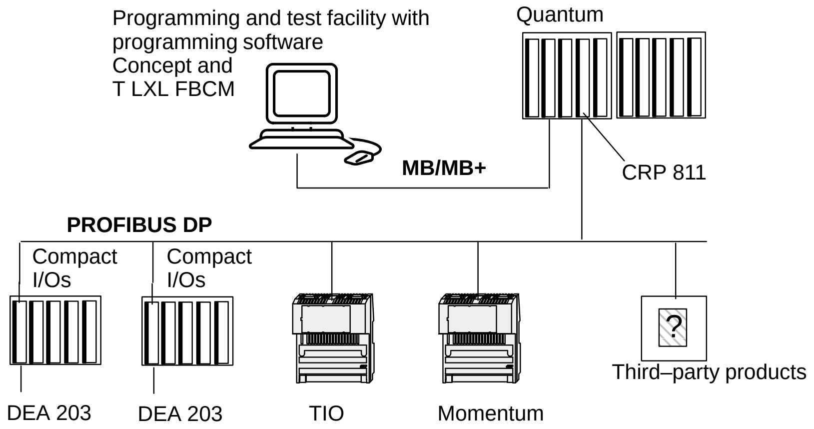
A tabular summary of the configuration details follows:

Bus master complement:	Only 1 bus master is permitted within a PROFIBUS DP network.
Number of field devices per segment:	Max. of 32 stations, including at most 1 active programming device
Specified bus transmission rate:	>= 9.6 Kbps/up to 12 Mbps
Total line length per segment:	As per Table 10 on page 62, Transmission rates
Number of segments	Max. of 4, with up to 3 repeaters

3.1.3 PROFIBUS DP Network Nodes

Network configuration example with possible I/O node systems.

Figure 23 PROFIBUS DP network example with Quantum, Compact, TIO's, and third–party products



Hardware components for connection to PROFIBUS DP

– Master for Quantum:
  140 CRP 811 00

–Slaves:
  for DEA 203 (AS–BDEA 203)
  with Compact peripherals
  TIO components
  Momentum components

Software components for connection to PROFIBUS DP

–Configuration tool: TLX L FBCM
–Concept >= V 2.2

3.1.4 Configuration Limits

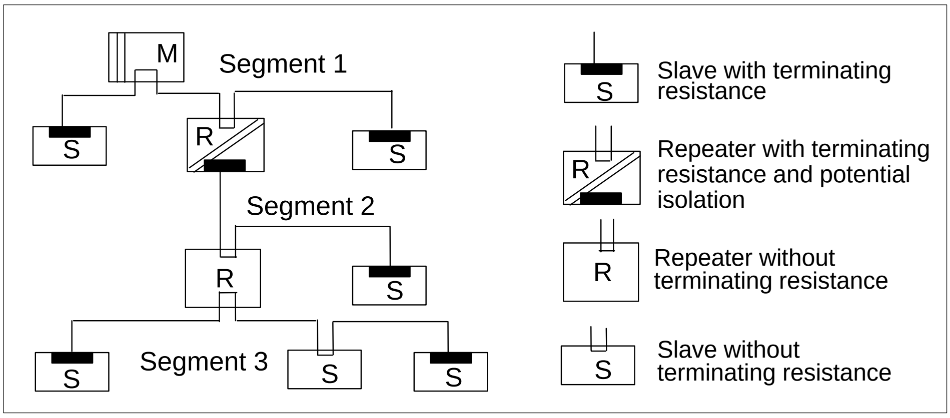
Refer to the module description, CRP 811 Technical Specifications , page NO TAG

Refer to CRP 811 – Master (Class 1) Functionality and Performance Data, Section 1.3 on page 24

Breite: 185 mm
Höhe: 230 mm

3.1.5 Segmentation Example of a PROFIBUS Installation with Repeaters

The following diagram illustrates the utilization of all network configuration elements.



Repeaters at segment start or end must be terminated. For additional information refer to page 78, PROFIBUS DP Repeaters.

3.1.6 PROFIBUS DP Cable and Bus Specifications

Transmission Specifications
A tabular summary of cable lengths with permitted transmission rate follows.

Table 10 Transmission rates

Bus length per segment	Transmission rates for type A cable up to 12 Mbps
Max. of 1.2 km	9.6 Kbps
Max. of 1.2 km	19.2 Kbps
Max. of 1.2 km	93.75 Kbps
Max. of 1.0 km	187.5 Kbps
Max. of 0.4 km	500 Kbps
Max. of 0.2 km	1.5 Mbps
Max. of 0.1 km	3 Mbps
Max. of 0.1 km	6 Mbps
Max. of 0.1 km	12 Mbps
Line redundancy	No

Bus Connection Specifications

A tabular summary of the bus connection details follows:

Table 11 Bus connection specifications

Bus cable type (bulk)	Shielded, twisted pair, rigid PROFIBUS cable type "A" for up to 12 Mbps
Connection interface	As per EIA RS–485
Bus connector (with/without cable termination)	As per standard: 390 / 220 / 390 ohms refer to Section 3.3.2 on page 82 Connector Specification
Stub cabling	None (with the exception for diagnostic purposes: 1 x 3 m to bus monitor)

Bus Specifications

A tabular summary of the bus specification details follows:

Table 12 Bus specifications and data security

Station type	Master (class 1)
Bus–access method	Master/slave to DP slave
Transmission mode	Half–duplex
Message length	Max. 255 Bytes
Data field length	Max. 244 Bytes
Data security	Hamming distance HD = 4
Node addresses	1 ... 126
FDL send/req. data services	For slave user data transmission, parameterization, configuration, and diagnostics

Breite: 185 mm
Höhe: 230 mm

3.2 Installation Guidelines

The topics presented in this section are:

- Bus Segment Installation, Section 3.2.1.
- Indoor Cable Routing, Section 3.2.2.
- Outdoor Cable Routing, Section 3.2.3.
- Grounding and Shielding for Installations with Potential Equalization, Section 3.2.4.
- Grounding and Shielding for Installations without Potential Equalization, Section 3.2.5.
- PROFIBUS DP Repeaters, Section 3.2.6.
- Subrack Grounding Procedures, Section 3.2.7.

3.2.1 Bus Segment Installation

Basic Rules

- The bus cable may never be twisted, stretched, or squeezed during cable routing.
- Each bus segment must be terminated on both ends with a terminating resistance. Termination is however not effective, when for example, the last slave with a bus terminal connector is without power. Since the bus terminal connector receives its voltage from the station, termination remains ineffective.
- A bus connector may be removed from a node's bus port without interrupting bus data traffic, as long as adjacent bus cables are still through–connected.

☞ **Note**
Special attention should be paid to ensure that those nodes on which a bus terminal connector is active are properly powered during normal operation and in the run–up phase.

3.2.2 Indoor Cable Routing

Within Cabinets
The following points should be taken into account:

- Cable arrangement within the cabinet plays an essential role for the system's noise immunity.
- Shielded data lines (for PROFIBUS DP, PG, etc.) must be routed separately from all cables carrying direct or alternating currents greater than 60 volts.
- In addition, all cables for direct or alternating currents in the range between 60 and 230 volts must be routed separately from cables carrying voltages above 230 volts. Separation criteria are fulfilled when the cables are laid in separate trunk groups or cable ducts.

- Signal lines must be routed a minimum of 20 centimeters from power cables. This is to be strictly observed, especially with regard to the voltage supply of electronic devices, such as PROFIBUS slaves, I/O modules, controllers, etc.
- The shield of the PROFIBUS DP data line must be connected with the cabinet's equipotential busbar.
- The shield must then be directed to the module, and installed there in accordance with the above regulations.

⚠ **Caution**
As a general principle, service cabinet illumination should always make use of starterless lamps, or such with EMC–compliant electronic starters.

⚠ **Caution**
Programming device screw fittings with integrated grounding are prohibited.

⚠ **Caution**
Stub cabling is not allowed for PROFIBUS network installations.

Outside Cabinets
The following points should be taken into account:

- Lines outside cabinets are generally laid out on metal cable carriers.
- Only cables below 60 volts, or 230 volts when shielded, may be routed together on the same cable carriers (lane, channel, trough, or conduit). Bulkhead dividers may be used for separation in metallic cable carriers. The 20 centimeter clearance must always be respected however.
- Cables carrying voltages above 230 volts must be laid in separate cable carriers. Bulkhead dividers may be used for separation in metallic cable carriers. The 20 centimeter clearance must always be respected however.
- PROFIBUS data lines must always be laid out on separate metal cable carriers. These cable carriers (lane, channel, trough, or conduit) may only carry communication lines.
- Cable channels or lanes carrying bus cabling must be linked together and grounded. This also applies to short, cable channel stubs.

Breite: 185 mm
Höhe: 230 mm

Drag Line
The following points should be taken into account:

- The drag line must be inserted fully twist–free into the guide chain or carrier.
- The drag line may not snarl as it leaves the cable drum.
- The drag line must either be routed in the guide chain next to cables carrying only up to 60 volts, or otherwise make use of dividers if present.
- The drag line must be able to move freely in the guide chain.
- The drag line must be firmly affixed to the dog and fixation point over large surfaces, using appropriate cable clamps.
- The drag line should never be suspended in a garland fashion. The mimimum bending radius of 15 x cable diameter must be respected.

☞ **Note**
Ensure that the drag line is unable to move within the fixation point and that cable conductors are not pinched.

3.2.3 Outdoor Cable Routing

Basic Rules
For outdoor routing the same general cable routing recommendations apply as for indoor routing. Cables should however also be routed through an appropriate plastic conduit.

Routing Tips & Procedures
The following points should also be taken into account:

- Outdoor bus cable routing requires the use of cables suitable for underground installation.
- Only suitable underground cables may be used for underground installation. Also take into account the temperatures to which the cable will be exposed.
- Outdoor to indoor transitions are always made through a specialized junction box. These junction boxes contain appropriate surge protection circuitry with overvoltage protection (lightning protection up to 500 Kbps).
- It is highly recommended that suitable fiber optic cable be used for any intra–building cabling at transmission rates above 500 Kbps.

☞ **Note**
Junction boxes are utilized to ensure a proper transition from underground to standard bus cable.

Surge Protection for Bus Cabling up to 12 Mbps

For the protection of communications equipment from any induced overvoltages (i.e. lightning), bus cabling must make use of appropriate surge protection devices, before exiting the building. The nominal discharge current should be at least 5 kiloamps.

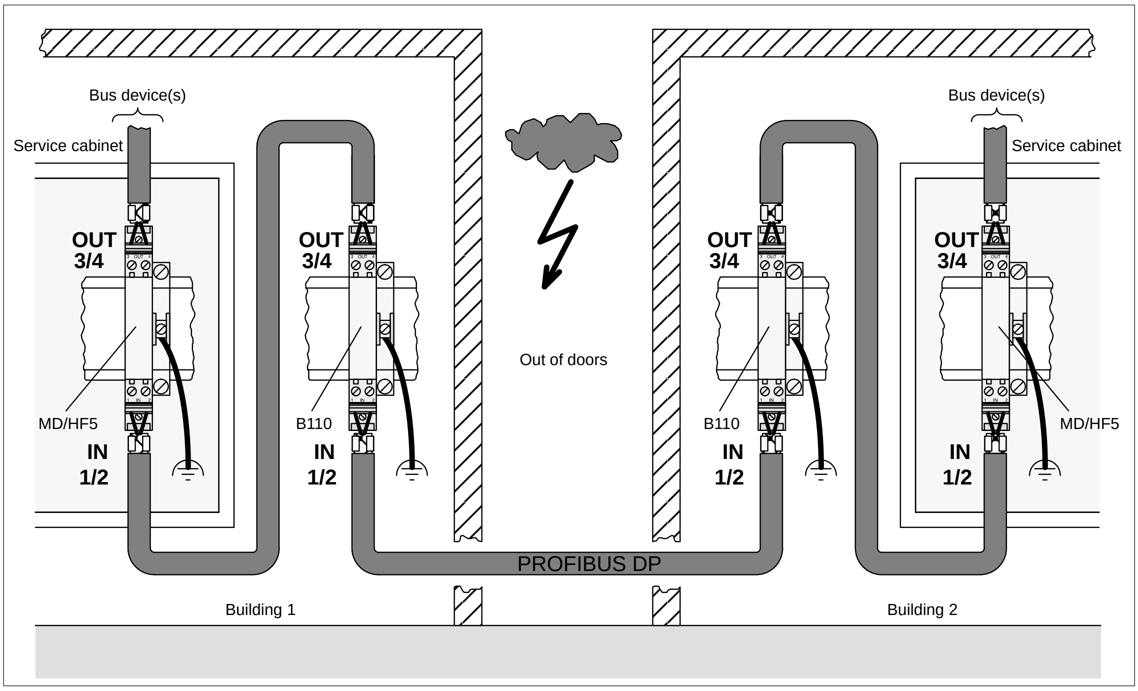
Components and Supplier

Suitable devices are: the type MD/HF as surge diverter near the first node, and the type B as lightning arrestor directly after entering the building, from Dehn und Söhne GmbH & Co KG, Postfach, D–92306 Neumarkt 1, Germany. For additional information refer to ”Building Lightning Protection Components with Blitzduktor CT”.

Configuration

Before exit into the open, or after building re–entry, both surge protection elements must be installed for the PROFIBUS cabling.

Figure 24 Lightning arrestor configuration for PROFIBUS DP



Breite: 185 mm
Höhe: 230 mm

Building Lightning Protection Components with Blitzductor CT
The following table contains the necessary components to traverse an outdoor area with PROFIBUS DP.

Quantity	Description	Type	Article no.
2	Surge module B	B(110)	919 510
2	Surge module MD/HF	MD/HF(5)	919 570
4	Base	Lead–through terminal	919 506
1	EMC spring terminal	Package of 10	919 508
2	Gas arrestor	for indirect shield earthing	919 502
	35 mm top hat rail (EN 50022)		

☞ **Note**
Information about mounting and connecting of the cables you will find in the respective installation instruction, which is delivered together with the Blitzductor.

Installation Rules
The following rules are to be observed during arrestor (Blitzduktor) installation:

- Install a functional ground (equipotential busbar).
- Mount the lightning arrestors (Blitzduktor) in close proximity to the functional ground, so that the surge current has the shortest possible path to the building ground.
  Keep the conductor (minimum diameter 6 sq mm) leading to the functional ground as short as possible.
- A PROFIBUS cable pair may pass through a max. of 10 lightning arrestors (Blitzduktors) in series, i.e. a maximum of 4 outdoor cable segments.
- Be careful to **not** switch the arrestor’s IN and OUT sides (IN = the outdoor side).

Grounding of Protection Device Shields
Shields on the protection devices can be grounded directly or indirectly. An indirect grounding will be carried out with a gas discharge tube (GDT).

In both cases the shield of the cable will be connected to EMC spring terminals (output and input side).

Type of grounding	**Implementation**
Direct shield grounding	The shield of the incomming connection line is connected to terminal IN and the shield of the outgoing connection line is connected to the terminal OUT. Now there is an electrical connection between the shields and the equipotential busbar.
Indirect shield grounding via gas discharge tube (GDT)	Connection of the shields as described under direct shield grounding. The GDT is layed in the insert below the shield bonding terminal on input side.

☞ **Note**
Information about grounding and shield grounding you will find in the respective installation instruction, which is delivered together with the Blitzductor.

Breite: 185 mm
Höhe: 230 mm

Rules for the Prevention of Destructive Discharges during Commissioning

The following rules should be observed to prevent destructive discharges during bus cable connection in the service cabinet:

- Immediately after entry into the service cabinet the shield of every cable must be galvanically attached through a large conductive surface to the service cabinet's equipotential busbar.
- Very long bus cables, which have been routed but not connected, must be freed from any static charges as follows:

Step	Action
1	Choose the cable's bus connector closest to the service cabinet's equipotential busbar.
2	Touch the equipotential busbar with the metal surface of the bus connector housing to dissipate any prevailing static charge.
3	Attach the bus connector to the node's socket.
4	Continue to discharge the remaining bus connectors of this bus line as explained in steps 2 and 3.

☞ **Note**

In order to achieve the shortest possible ground connection during cable confection between connector and socket, the cable shield is attached to the connector's metal guide. The resulting connection between bus cable and node thus provides a shortest–path connection to functional ground.

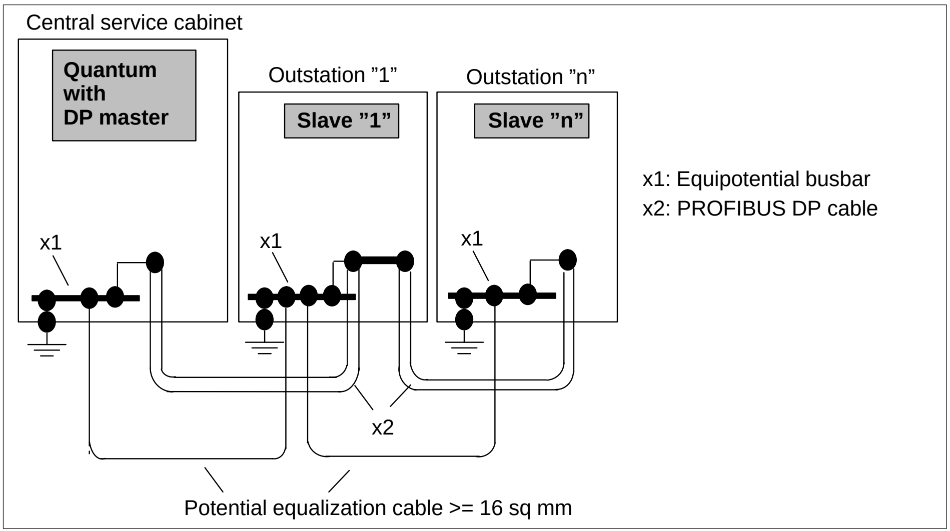
☞ **Note**

The use of electronically regulated speed controllers (hand drills, etc.), requires that the manufacturer's EMC guidelines be fully respected. These guidelines contain information regarding the correct use of filters, chokes, and shielding.

3.2.4 Grounding and Shielding for Installations with Potential Equalization

Guidelines
Bus shields should form a continuous containment and ideally be connected to the metallic housings of the connected bus devices to provide optimal EMC properties. Since the bus cable shielding is grounded several times, a properly executed potential equalization is of utmost importance.

Figure 25 Grounding with potential equalization



Grounding/potential equalization
An equalizing current may flow between both shield ends due to ground potential fluctuations. To prevent such fluctuations it is absolutely necessary that a potential equalization takes place between all connected installation components and devices. To this end, and to achieve maximum EMC, all installation components (machines, mounting cabinets, external consoles, devices, etc.) must be sufficiently grounded over large contact surfaces and connected through a cable diameter of at least 16 sq mm to the central mounting cabinet's equipotential busbar.

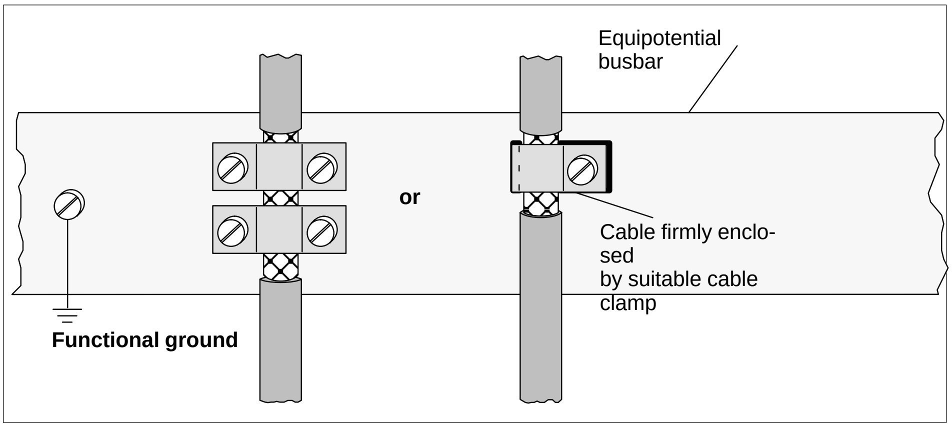
Breite: 185 mm
Höhe: 230 mm

Shielding
The bus cable's braided and foil shields improve the achieved EMC. The braided shield and the underlying foil must be connected to ground over large, highly–conductive metal surfaces at both ends. When stripping away the plastic casing, take every precaution to not damage the braided shield in any way.

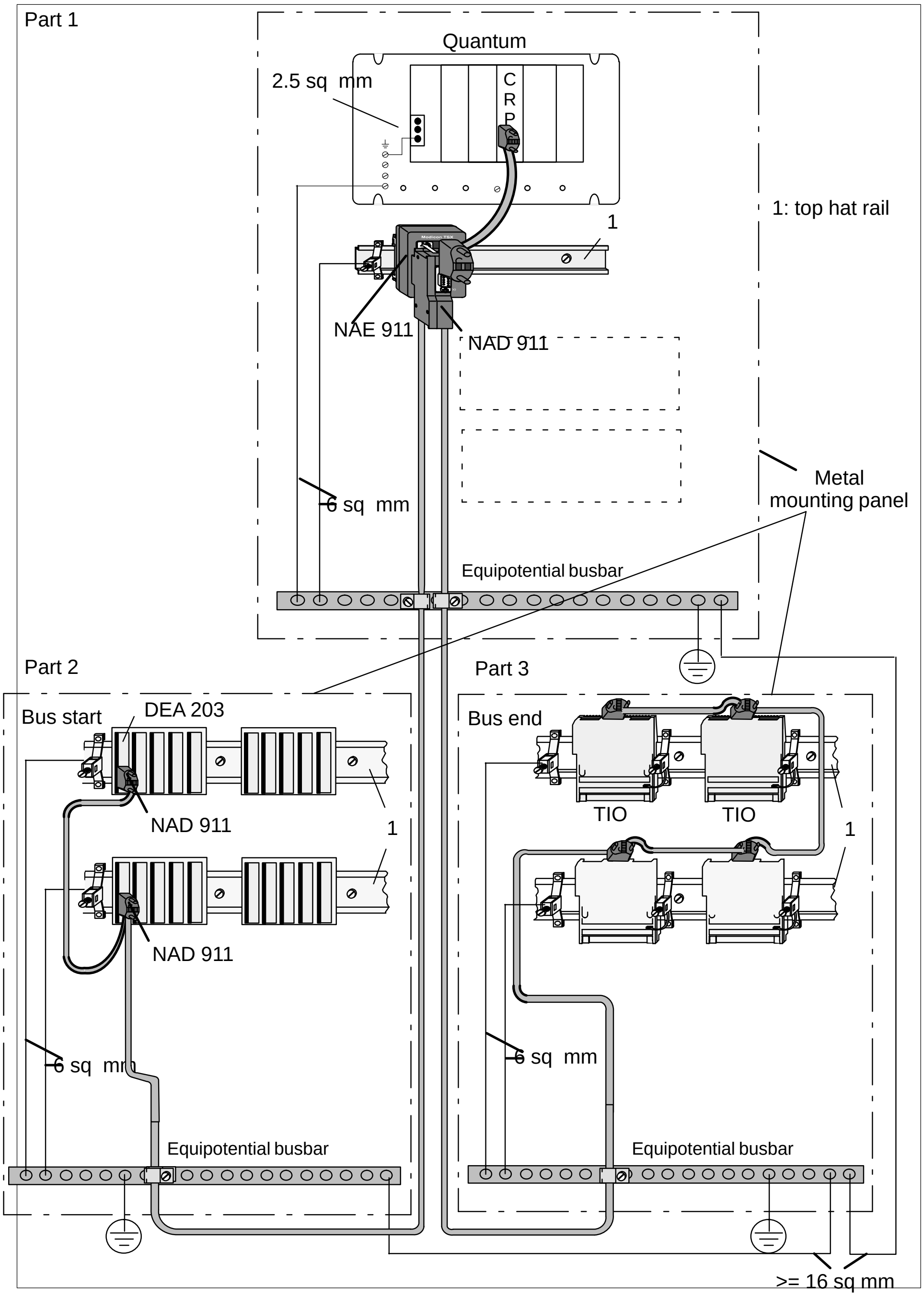
☞ **Note**
The braided shield of the bus cable must be connected with the cabinet's equipotential busbar directly after entering the service cabinet.

☞ **Note**
The equipotential busbar must be linked with the cabinet's ground over a large, highly–conductive surface (no painted surfaces).

Figure 26 PROFIBUS shield attachment as per PUO



Indoor facility example "with" potential equalization cable
The following figure presents a facility configuration consisting of 3 installation parts.



Breite: 185 mm
Höhe: 230 mm

Additional grounding procedures for section 1 (Quantum):
- Quantum back plane (6 sq mm)
- Galvanized top hat rail from NAE 911 (*) (6 sq mm)
- Grounding clamp EPS 001 (6 sq mm)
- Attach bus cable shield to equipotential busbar with grounding clamp

Additional grounding procedures for section 2 (A120):
- Galvanized top hat rail(s) from A120 (*) (6 sq mm)
- Attach bus cable shield to equipotential busbar with grounding clamp

(*) Grounding clamp EPS 000

Additional grounding procedures for section 3 (TIO):
- Galvanized top hat rail from TIO modules (6 sq mm)
- Attach bus cable shield to equipotential busbar with grounding clamp

(*) Grounding clamp EPS 000

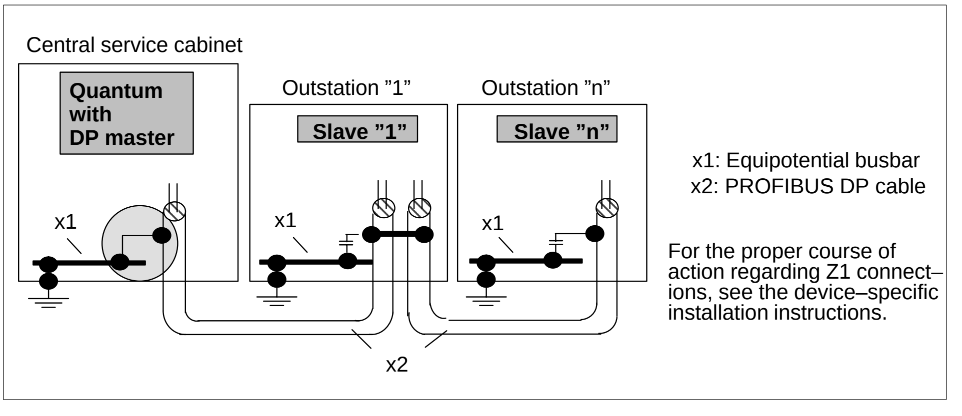
Additional grounding procedures between the equipotential busbars:
- >= 16 sq mm copper cable between equipotential busbars.

3.2.5 Grounding and Shielding for Installations without Potential Equalization

Guidelines

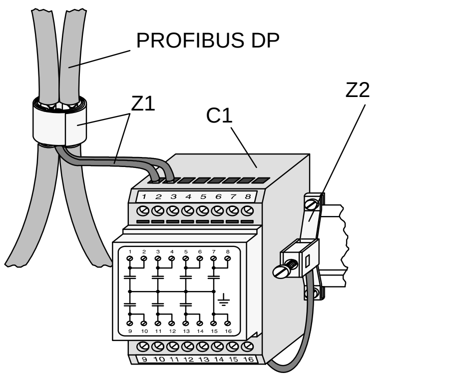
In particular installation constellations (e.g., separate halls/buildings) not allowing potential equalization to a central grounding point in the central mounting cabinet, the following grounding and shielding procedures may be applied. However, this method is not nearly as effective as the measures described under Section 3.2.4 and should thus only be considered as a stopgap.

Figure 27 Distributed grounding procedures



Shielding
In this case the bus cable shielding is only grounded on one end, (over large contact surfaces to the central mounting cabinet’s equipotential busbar) as depicted in Figure 27. The shield of bus cabling continues from there to the last bus device without making galvanic connection to any of the cabinet equipotential busbars. Capacitive grounding of the shielding to these remaining cabinets must be provided to by–pass high–frequency interference. See the following discharge procedures using the GND 001 capacitive by–pass clamp.

Figure 28 GND 001 capacitive by–pass clamp connection example

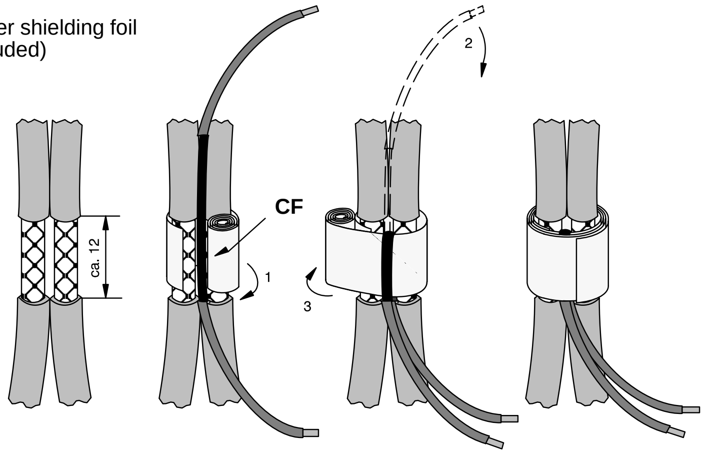


C1: GND 001
Z1: Shielding
Z2: Top hat rail connection

Proceed as follows to install the shield connection for the by–pass clamp connection:

Figure 29 Performing the shield connection for potential–free grounding

CF = Copper shielding foil (included)



Note: Only one cable is to be prepared at the bus ends (last nodes) for the discharge procedure.

Breite: 185 mm
Höhe: 230 mm

Indoor facility example ”without” potential equalization cable
The following figure presents a facility configuration consisting of 3 installation parts.

Additional grounding procedures for section 1 (Quantum):
- Quantum back plane (6 sq mm)
- Galvanized top hat rail from NAE 911 (*) (6 sq mm)
- Grounding clamp EPS 001 (6 sq mm)
- Attach bus cable shield to equipotential busbar with grounding clamp

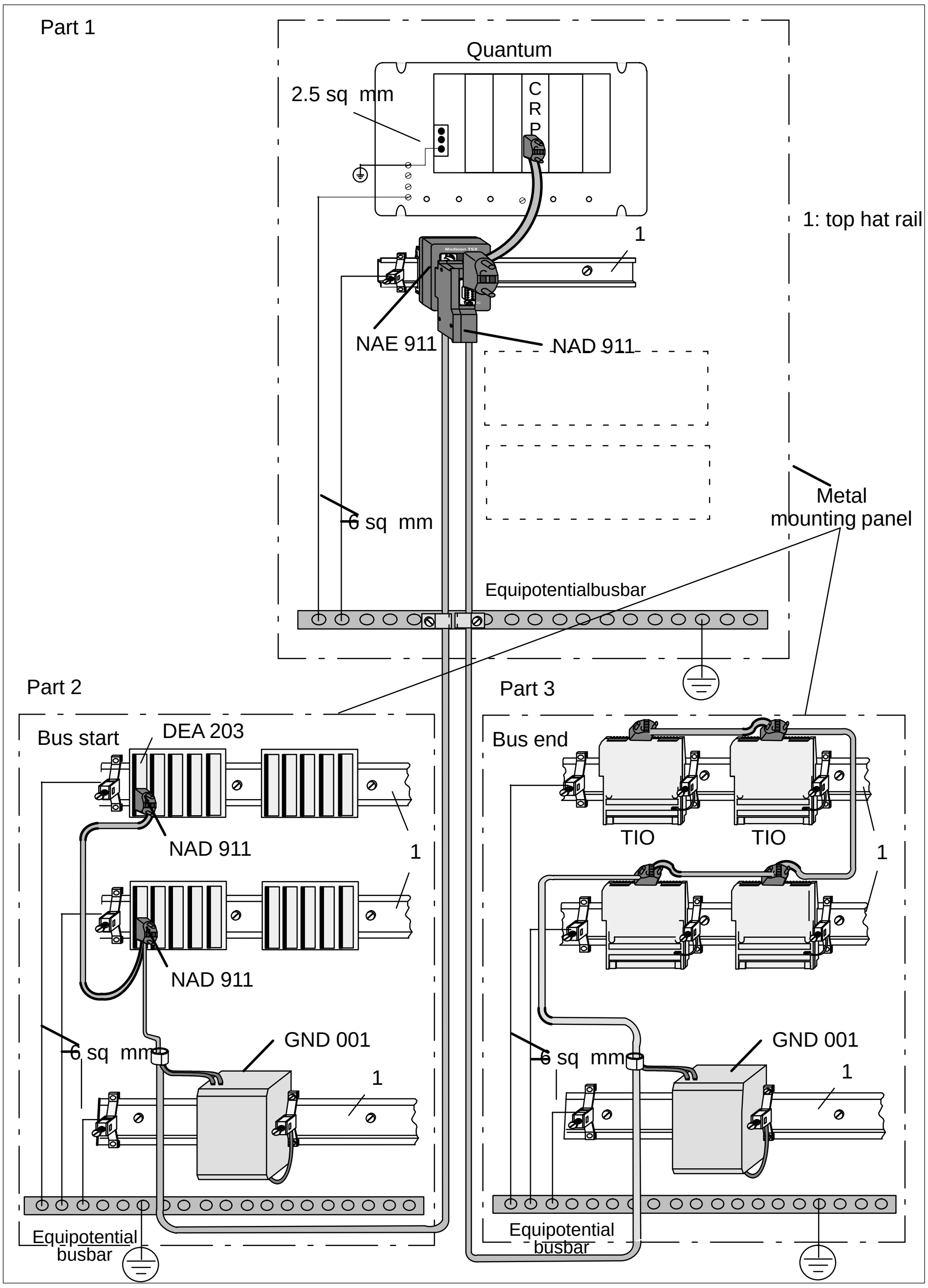
Additional grounding procedures for section 2 (A120):
- Galvanized top hat rail(s) from A120 (*) (6 sq mm)
- Attach bus cable shield to by–pass clamp with copper shielding foil

(*) Grounding clamp EPS 000

Additional grounding procedures for section 3 (TIO):
- Galvanized top hat rail from TIO modules (6 sq mm)
- Attach bus cable shield to by–pass clamp with copper shielding foil

(*) Grounding clamp EPS 000

Additional grounding procedures between the equipotential busbars:
- >= 16 sq mm copper cable between equipotential busbars.



Breite: 185 mm
Höhe: 230 mm

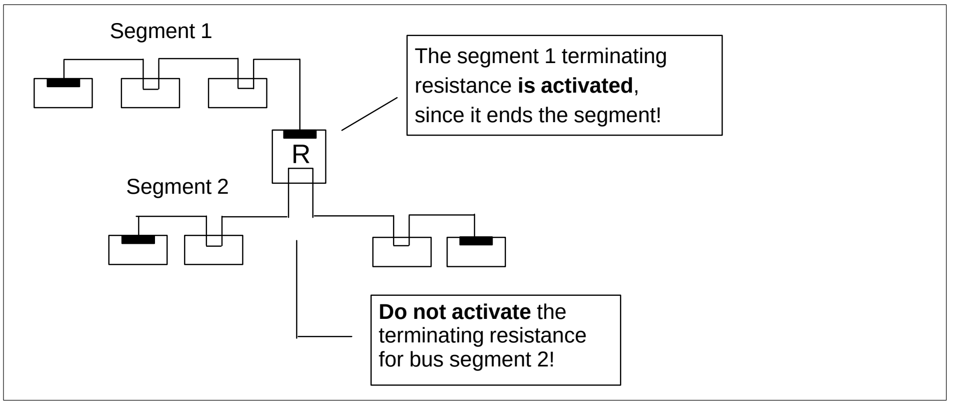
3.2.6 PROFIBUS DP Repeaters

When is a repeater necessary?
Repeaters may be used wherever the maximum line length of a network segment is exceeded, or where the number of nodes exceeds the maximum number allowed per segment. Using a repeater can extend the line length or raise the number of nodes in these cases.

☞ **Note**
Bus termination is to be observed when repeaters are employed at the end of net segments.

Example
Installation example of terminating resistance locations:

Figure 30 Connection of two bus segments to a RS–485 repeater



Only RS–485 repeaters of the IP 20 safety classification are allowed for rack installation (e.g., Siemens, order no. 6ES7 972–0AA00–0XA0)

Adjustments of the above–mentioned repeater:

- Set the repeater to the desired bus transfer rate with the <Bitrate> rotary switch.
- The repeater requires a 24 VDC supply, i.e. the jumper present between the repeater power supply terminals M and PE must be removed.
- There is no adjustment required for bus address. A max. of 32 nodes (master, slaves, and repeaters) may be connected per segment.

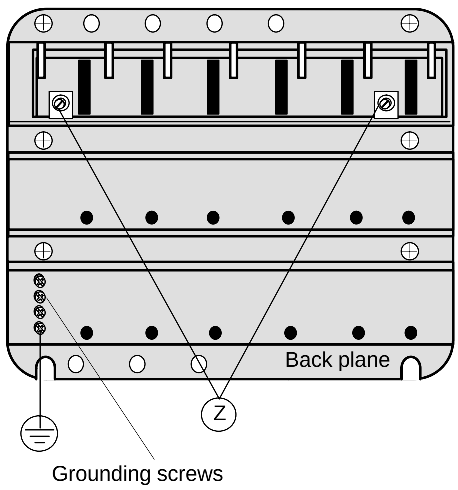
☞ **Note**
Refer to the manufacturer’s documentation for specifics.

3.2.7 Subrack Grounding Procedures

Quantum CPU

- Every subrack’s grounding screws must be connected with protective earth (PE) through a conductor of at least 6 sq mm for interference suppression, and protection against accidental contact.
- In general (as delivered), the XPB 00 X subrack’s internal 0 V reference potential is connected to the back plane through the Z screws. See the figure below.

Figure 31 Quantum back plane

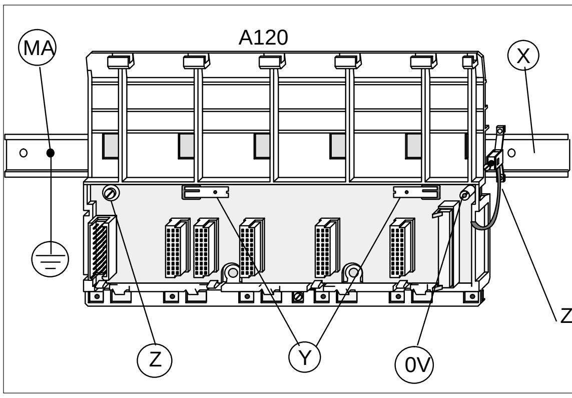


DTA 200 Compact peripheral subrack

- Every galvanized top hat rail with mounted components must be connected with protective earth (PE) through a conductor of at least 6 sq mm for interference suppression, and protection against accidental contact.
- DTA 200 back planes may be installed either with or without a galvanic connection to electrical ground. Please verify prior to commissioning that the Z screw provided for this purpose is firmly screwed–in to the subrack, i.e. that the internal 0 V reference potential is connected to PE. See the figure below for the Z screw location.

Breite: 185 mm
Höhe: 230 mm

Figure 32 Compact grounding and EMC measures, Z screw location

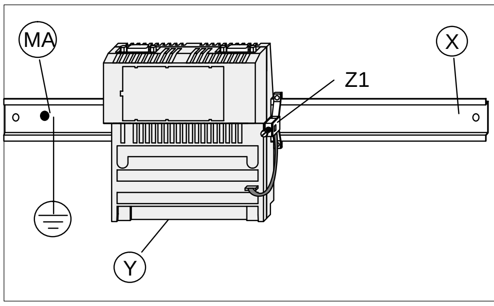


(MA) = Functional ground connection terminal
(X) = Galvanized top hat rail
(Y) = Ground connection through discharge springs
(Z) = DTA 200 subrack Z screw
(0V) = Reference potential of the internal electronics

TIO components

- Every TIO component must be connected with protective earth (PE) through a conductor of at least 6 sq mm for interference suppression, and protection against accidental contact.
- Mounting of the TIO component upon the top hat rail automatically provides a connection between the component's PE and the top hat rail over a discharge spring.
- The component's internal 0 V reference potential is usually buffered internally from PE by appropriate RF capacitors.
- The Z1 connection is additionally required as a protective measure. Proper grounding is ensured through a 2.5 sq mm cable with Faston or screw connection, and a (EDS 000) grounding clamp.

Figure 33 Grounding the top hat rail and TIO components



(MA) = Functional ground connection terminal
(X) = Galvanized top hat rail
(Y) = TIO component Ground connection through discharge springs
(Z1) = Top hat rail cable connection as a protective measure.

3.3 Specifications

The topics presented in this section are:

- Cable Specification, Section 3.3.1
- Connector Specification, Section 3.3.2
- Cable Testing with 490 NAD 911 03/04/05 Bus Connectors, Section 3.3.3

3.3.1 Cable Specification

Twisted pair cable
Due to the maximum bps rate of 12 Mbps, only type ”A” cable may be used, as defined by the PROFIBUS standard. As per EN 50 170, this is a shielded, twisted pair cable with shielding consisting of an inner foil and a braided outer layer. The cable parameters are as follows:

Cable characteristics

Parameter	Value
Impedance level	135 ... 165 ohm for 3 to 20 MHz
Capacitance per unit length	< 30 pF/m
Loop resistance	< 110 ohms/km
Wire diameter	> 0.64 mm
Wire cross section	> 0.34 sq mm

Rigid routing
The following cable may be used as PROFIBUS cable for rigid routing in cable troughs or conduits:

FromSchneider Automation, order no. KAB PROFIB	
The following wire color designations hold for cable installation (example)	Line A: red
	Line B: green

Breite: 185 mm
Höhe: 230 mm

3.3.2 Connector Specification

Connector characteristics
Connectors are available with a switchable terminating resistance (up to 1.5 Mbps), as well as such in fabricated lengths (up to 12 Mbps), as ”integrated bus termination” , ”bus node”, and ”bus node with service port”.

Connector types
The following Schneider Automation connectors have been defined for various field devices:

DP master	Bus connector with service port (12 Mbps/IP 20) From Schneider Automation: order no. 490 NAD 911 05 (up to 12 Mbps)
DP slave	Bus connector with/without service port (12 Mbps/IP 20) From Schneider Automation: order no. 490 NAD 911 03 (termination for start or end) order no. 490 NAD 911 04 (node) – up to 12 Mbps order no. 490 NAD 911 05 (node with service port) – up to 12 Mbps

☞ **Note**
Assembly instructions for the NAD 911 03/04/05 bus connectors can be gathered from the respective component’s installation guide.

NAD 911 connector pin assignments
The following table lists the pin assignments and signal descriptions for the Sub–D9 connectors.

Pin/housing	Signal	Description
Connector housing	Shield	Functional ground
3	RxD/TxD–P	Pos. receive/send data
5	DGND	Data transmission reference potential (to 5 VDC)
6	VP	Terminating resistance supply voltage, (P5V)
8	RxD/TxD–N	Neg. receive/send data

3.3.3 Cable Testing with 490 NAD 911 03/04/05 Bus Connectors

Bus analyzer
Due to the absence of jumpers in the connectors with the identifiers 03/04/05, a bus analyzer must be utilized to validate bus cable correctness. Siemens markets a suitable analyzer under the name BT200.

3.4 Schneider Automation Products for PROFIBUS Installation with Quantum

TIO master and I/O modules
Available I/O modules and their functionality:

Table 13 Master and slave modules (TIO)

Quantum	As per catalog
140 CRP 811 00	PROFIBUS DP master for use with Quantum
BDI 344 01	PROFIBUS TIO 16 discrete inputs, 24 VDC
BDI 354 01	PROFIBUS TIO 32 discrete inputs, 24 VDC
BDM 344 01	PROFIBUS TIO 16 discrete inputs, 24 VDC & 16 discrete outputs 24 VDC/0.5 A
BDO 354 00	PROFIBUS TIO 32 discrete outputs 24 VDC/0.5 A

Compact I/O modules accessable through the DEA 203 PROFIBUS DP coupler
Available I/O modules and their functionality:

Table 14 Compact I/O modules for the DEA 203 (Compact)

Modules	Input/Output
AS BDEA 203	PROFIBUS DP slave connecting module for Compact PLC
DEP 208	8 bit input
DEP 209	8 bit input
DEP 210	8 bit input
DEP 211	8 bit input
DEP 214	16 bit input
DEP 215	16 bit input
DEP 216	16 bit input
DEP 217	16 bit input
DEP 218	16 bit input
DEP 220	16 bit input
DEP 296	16 bit input
DEP 297	16 bit input
DEO 216	16 bit input
DEX 216	16 bit input
DAP 204	4 bit output

Breite: 185 mm
Höhe: 230 mm

Table 14 Compact I/O modules for the DEA 203 (Compact)

Modules	Input/Output
DAP 208	8 bit output
DAP 209	8 bit output
DAP 210	8 bit output
DAP 216	16 bit output
DAP 217	16 bit output
DAP 218	16 bit output
DAO 216	16 bit output
DAX 216	16 bit output
DAP 212	8 bit input/4 bit output
DAP 220	8 bit input/8 bit output
DAP 252	8 bit input/4 bit output
DAP 253	8 bit input/4 bit output
DAP 292	8 bit input/4 bit output
DAU 202	2 word output
DAU 208	8 word output
ADU 204	5 word input
ADU 205	5 word input
ADU 206	5 word input/1 byte output
ADU 210	5 word input/4 byte output
ADU 214	9 word input/8 byte output
ADU 216	5 word input/1 byte output
ZAE 201	3 word input/11 word output

Momentum I/O modules for a communications adapter
Available I/O modules and their functionality:

Table 15 Momentum modules

Modules	High/ Low ID	In/Out	Brief description
170 DNT 110 00			Communications adapter per I/O module
170 ADI 350 00	0/1	2/0	32 inputs 24 VDC
170 ADI 340 00	0/2	1/0	16 inputs 24 VDC
170 ADI 540 50			16 inputs 115 VAC
170 ADI 640 50	0/3	1/0	16 inputs 120 VAC
170 ADI 740 50	0/4	1/0	16 inputs 240 VAC
170 ADO 340 00	0/5	0/1	16 outputs 24 VDC, 0.5 A per output
170 ADO 350 00	0/6	0/2	32 outputs 24 VDC, 0.5 A per output in 2 separately powered groups
170 ADO 530 50			8 outputs 115 VAC, 2 A per output
170 ADO 540 50			16 outputs 115 VAC
170 ADO 730 50			8 outputs 230 VAC, 2 A per output
170 ADO 740 50			16 outputs 230 VAC
170 ADM 350 10 (170 ADM 350 11)	0/8	1/1	16 inputs 24 VDC 16 outputs 24 VDC, 0.5 A per output in 2 separately powered groups
170 ADM 370 10	0/11	1/1	16 inputs 24 VDC 8 outputs 24 VDC, 2 A per output in 2 isolated groups
170 ADM 390 10	0/12	3/1	16 inputs 24 VDC, monitored 12 outputs 24 VDC, 0.5 A per output in 2 separately powered groups
170 ADM 390 30	0/10	1/1	10 inputs 24 VDC 8 outputs 24 VDC, 1 relay per output in 2 isolated groups
170 ADM 690 50 170 ADM 690 51	0/9	1/1	10 inputs 120 VAC 8 outputs 120 VAC, 0.5 A per output in 2 separately powered groups
~~170 ADM 680 50~~			~~16 inputs/8 outputs 10 – 60 VDC~~
170 AAI 030 00	2/192	8/2	8 differential channels
170 AAI 140 00	4/193	16/4	16 individual channels
170 AAI 520 40	2/194	4/2	4 differential channels
170 AAO 120 00	1/195	0/5	4 output channels
170 AAO 921 00			4 output channels (+/– 10 VDC, 4 – 20 mA)
170 AMM 090 00	2/224	5/5	Analog: 4 inputs/2 outputs Discrete: 4 inputs/2 outputs 24 VDC, 1 A

Breite: 185 mm
Höhe: 230 mm

Table 15 Momentum modules

Modules	High/ Low ID	In/Out	Brief description
170 AEC 920 00	0/160	8/8	High–speed counter
170 AEC 910 90	0/128	8/8	Stepping motor controller

Configuration tool

Software and functionality:

Table 16 Required software

Concept 2.2	Concept configuration software
TLX L FBCM (Hilscher SyCon PB/GS) incl. DDB (GSD) files	Configuration tool for parameterization of all devices on PROFIBUS DP, incl. DDB files for all Schneider Automation I/O modules

Accessories

Available accessories and their functionality:

Table 17 PROFIBUS accessories

KAB PROFIB	PROFIBUS cable, type ”A” (bulk), O2Y (ST) CY 2 x 0.64 sq mm
YDL 052 or 990 NAA 263 30	Cable, PC (9–pole) ↔ CRP (9–pole), 3 m long
490 NAD 911 03	PROFIBUS terminating connector (up to 12 Mbps)
490 NAD 911 04	PROFIBUS node connector (up to 12 Mbps)
490 NAD 911 05	PROFIBUS node connector with service port (up to 12 Mbps)

Installation accessories

Available accessories and their functionality:

Table 18 Installation Accessories

GND 001	Capacitive by–pass clamp (for installations without potential equalization)
HUT 3575	Galvanized top hat rail adhering to DIN_EN 50022 (bulk)
EDS 000	Grounding clamp

4 Software Configuration

Information about the following software configuration subjects is presented:

- PROFIBUS DP Information, Section 4.1.
- Incremental Configuration, Section 4.2.

Breite: 185 mm
Höhe: 230 mm

4.1 PROFIBUS DP Information

The topics presented in this section are:

- General Information, Section 4.1.1.
- Configuration Limits, Section 4.1.2.
- Single Master Bus Line Example, Section 4.1.3
- Dual Master Bus Line Example , Section 4.1.4
- A Configuration Example with Slave Nodes , Section 4.1.5
- Exemplary Load and Commissioning Configuration, Section 4.1.6.
- Software Installation of the Bus Configuration Tool, Section 4.1.7.
- Configuration Sequence, Section 4.1.8.

4.1.1 General Information

The goal of this chapter is to generally describe PROFIBUS configuration steps. Since this is not possible without some knowledge of the surrounding network environment, these, and the interaction between the two software packages for Concept and bus configuration will be handled.

☞ **Note**
The involved principles and PROFIBUS functional relationships (e.g. DIN 19245, Parts 1, 2, and 3) should be known to the reader of this documentation.

4.1.2 Configuration Limits

I/O types
In the simplest case the description is based upon a facility configuration consisting of a Quantum PLC, a DP bus master module, and various slave I/O modules from the
–TIO,
–Momentum, and
–Compact (A120) series, and
–third–party manufacturers.

Data exchange
These slave components are linked with the Quantum PLC over an appropriate bus cable and a CRP 811 interface module (with NAE 911). A purely data–orientented exchange takes place over this connection.

Definition of terms
This interface module, also known as an option board, is always referred to as the master during the course of configuration, and the connected I/O nodes as slaves.

CPU–specific master complement per Quantum
Depending upon the CPU type, up to 6 master modules can be configured in a Quantum. The assignments can be found in the following table:

CPU type	Max. number of CRP 811 modules supported
CPU 113 02/S/X	2
CPU 113 03/S/X	2
CPU 213 04/S/X	2
CPU 424 0x/X	6
CPU 434 12	6
CPU 534 14	6

Max. number of nodes (slaves) per bus
Up to 125 nodes (master + slave) are allowed on a single bus.

Number of masters per bus
Several masters are operable on each bus, in principle. As a rule, a differentiation is made between 2 variants.

- A practical scenario is, e.g. the configuration of 2 master modules to different Quantum controllers.
- Another application makes use of 2 master modules within a single Quantum controller.

☞ **Note**
In this configuration each slave on this bus can only be assigned to a single master.

Master complement per Quantum
Depending upon the CPU type, up to 6 master modules can be configured in a Quantum. The masters can alternatively be active on:

- a common bus, or on
- separate busses (the normal case).

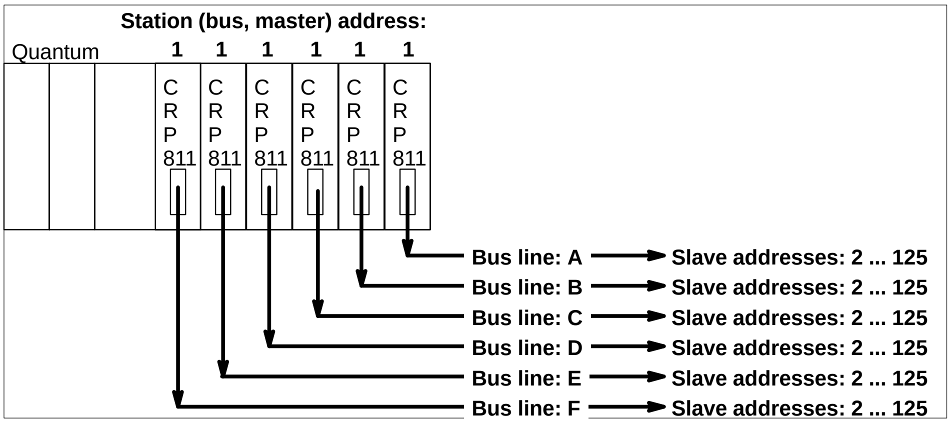
☞ **Note**
In these configurations each slave can only be assigned to a single master.

4.1.3 Single Master Bus Line Example

Plant configuration
Hereafter principal configuration options and configuration guidelines will be offered.

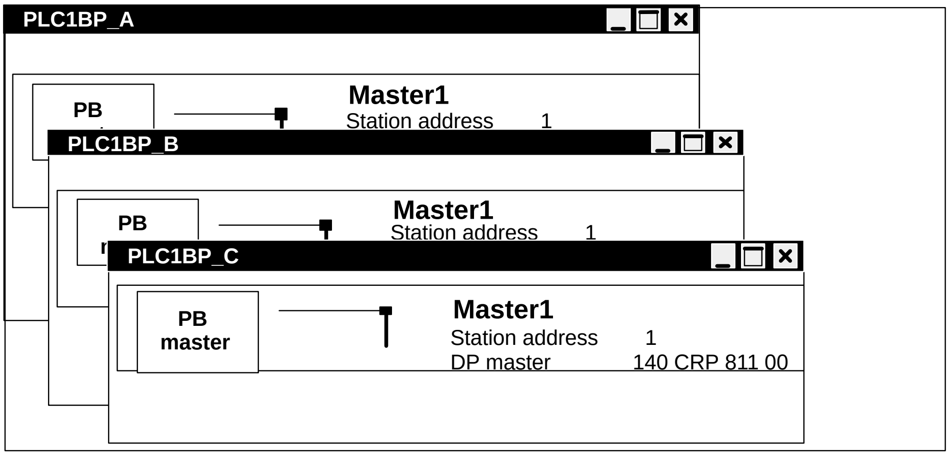
Breite: 185 mm
Höhe: 230 mm

One bus line per master (within a single Quantum)
Depending upon the CPU type, up to 6 masters may be operated within a single Quantum, with up to 124 slaves.



Note
After roughly 30 slaves a repeater is required.

Figure 34 Recommended master addressing for several busses

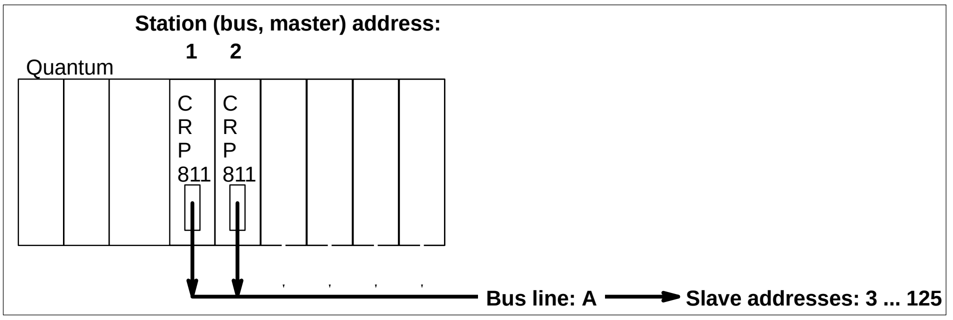


Note
The configuration tool allows each bus to be configured alone in an individual configuration window.

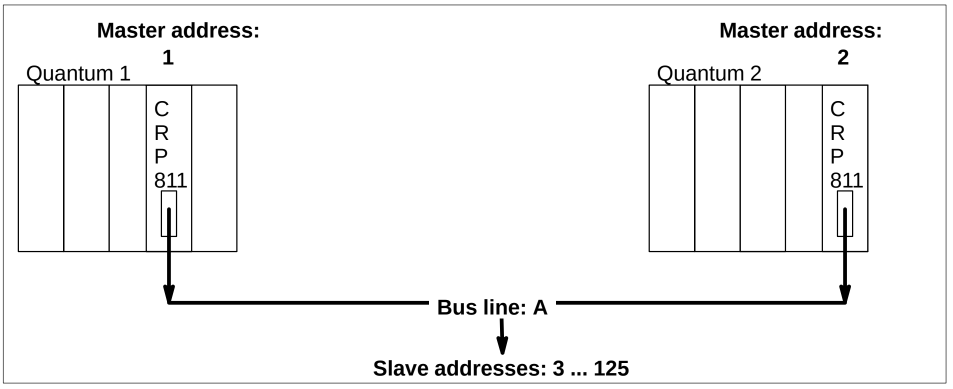
4.1.4 Dual Master Bus Line Example

Plant configuration
Hereafter principal configuration options and configuration guidelines will be offered.

Several master modules on one bus line (within a single Quantum)
It is possible for instance, to operate 2 masters in a single Quantum on one bus line.



Several master modules in different stations with a common bus
Up to 2 independent PLC stations may serve a bus line.



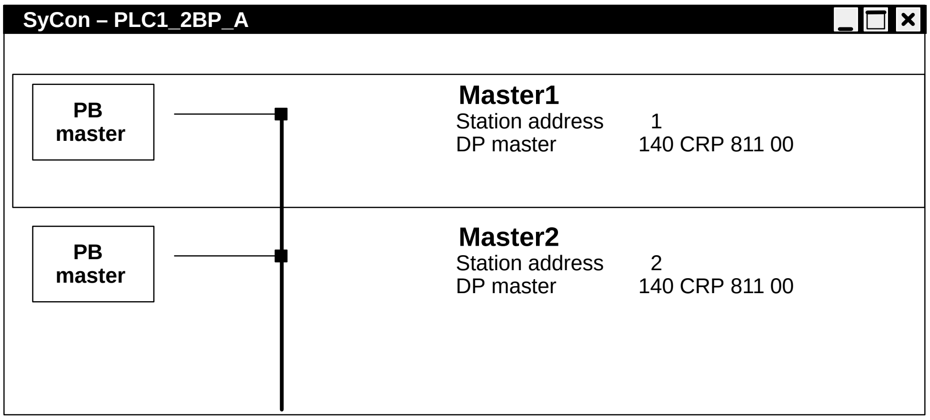
☞ **Note**
A slave module can only be assigned to a single master (CRP 811).

Breite: 185 mm
Höhe: 230 mm

Configuration of a bus line

The configuration tool can configure all the masters on a bus line together within a single configuration window.

Figure 35 Recommended master addressing



Note

A slave module can only be assigned to a single PLC (master).

Note

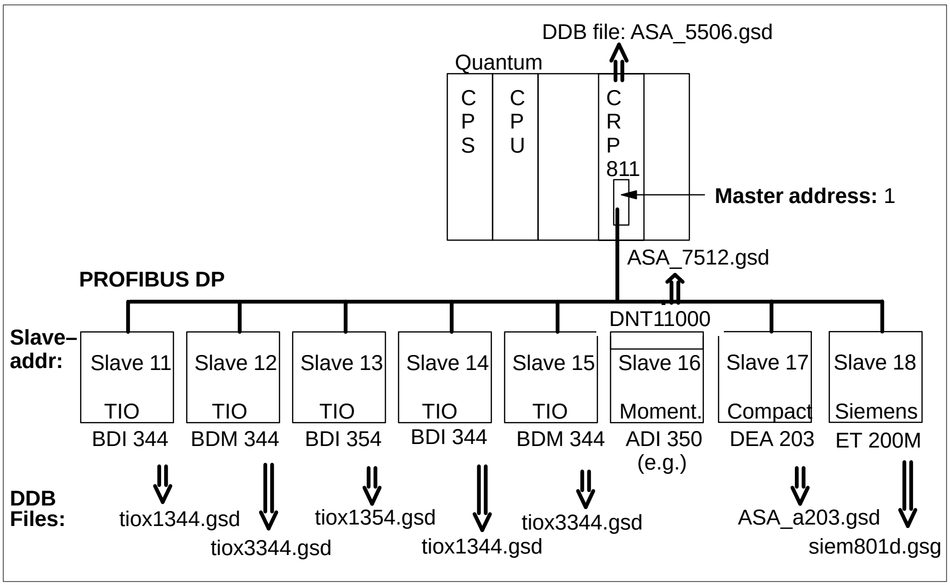
The configuration tool can produce the necessary export files either by station, or master.

Note

When all masters are in the beginning address range, the TTR time (Total Token Rotation time – only in multi–master mode) is reduced to a minimum.

4.1.5 A Configuration Example with Slave Nodes

Figure 36 PROFIBUS DP project example



Why have DDB/GSD files?
Different manufacturers devices can be operated on PROFIBUS. A standardized entry for a device data base is available to allow the identification of the differing device types on the bus. For PROFIBUS DP this Device Data Base (DDB) is known in it's original german form as GSD. Such device data base entries are made available for every device type in the form of a specialized GSD file.

☞ **Note**
The availability of these files is a prerequisite to beginning bus project configuration (with the Hilscher SyCon tool).

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DDB files on the internet
The manufacturer's own device data base entries (GSD files) are included on the installation CD. These files can also be found:

- on the internet at: WWW.MODICON.COM. The path to follow is:**Support/Training / File Fixes and Update / For all other File Fixes and Patches / Software for SA–Products / Communication Products / PROFIBUS**.

☞ **Note**
The "loading" of the DDB (GSD files) is made through a Copy function within the SyCon tool: FILE/COPY GSD.

☞ **Note**
I/O and diagnostic data assignment is performed under Concept. These data are also transferred to the PLC when the user program is loaded.

4.1.6 Exemplary Load and Commissioning Configuration

General information
Generally speaking, a differentiation is made between the one time preparations of the configuration–dependent components for PROFIBUS operation, such as:

- Loading the CPU with the proper Exec software
- Installing the PC hardware (SA85) when required
- Ready the proper CRP 811 firmware (or update if necessary)
- Establishing necessary connections with cable, accessories, and proper termination

and the loading and commissioning activities for transfer of the data to the PLC, using the planned configuration.

☞ **Note**
The load configuration and sequence are in accord with those during normal user program load. The user program and CRP data are loaded simultaneously.

Updating the CRP 811 master module
Generally speaking, an update should only to be performed with the assistance of technical support. This holds in particular when an update to an older firmware version is to be undertaken. The files required for an update can be procurred over the internet through the Schneider homepage, WWW.MODICON.COM.

The path to follow is:**Support/Training / File Fixes and Update / For all other File Fixes and Patches / Software for SA–Products / Communication Products / PROFIBUS.**

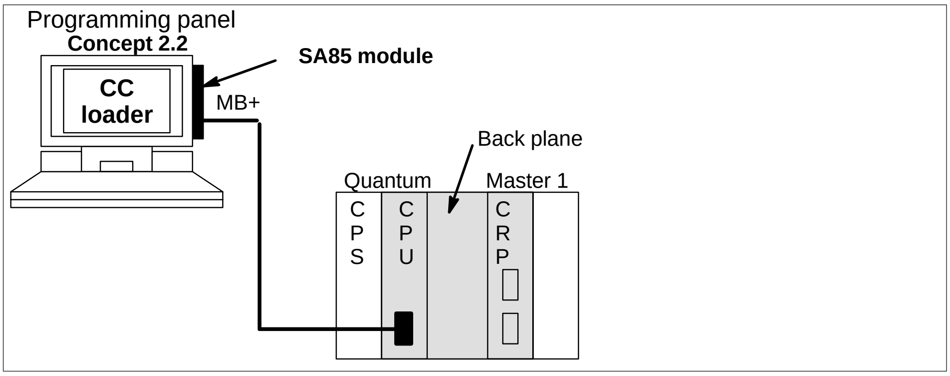
Note
Updating older firmware versions is coupled with an update of the loader file.

Possible update situations
The cases to be handled are:

- Updating the CRP 811 firmware from V 4.10D to any future versions.
- Updating the CRP 811 firmware from V 3.00D to V 4.10D (including the replacement of the RS–232C loader through Exec loader V 1.0)

Updating from V 4.10D to any future versions
An update to future CRP 811 firmware versions is achieved with the help of the Exec loader included with Concept. The update procedure is depicted below for 2 possible configurations.

Figure 37 Updating a single device



Note
For a less extensive or individual installation, the CPU can also be loaded over the MB port (the SA85 module is then not required). A loading time longer by a factor of 7 to 8 should then be taken into account.

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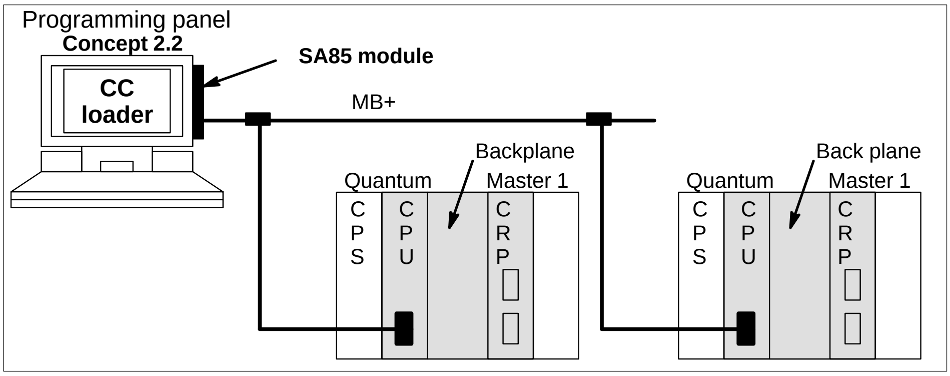
Figure 38 Loading CRP 811 firmware through the CPU and back plane



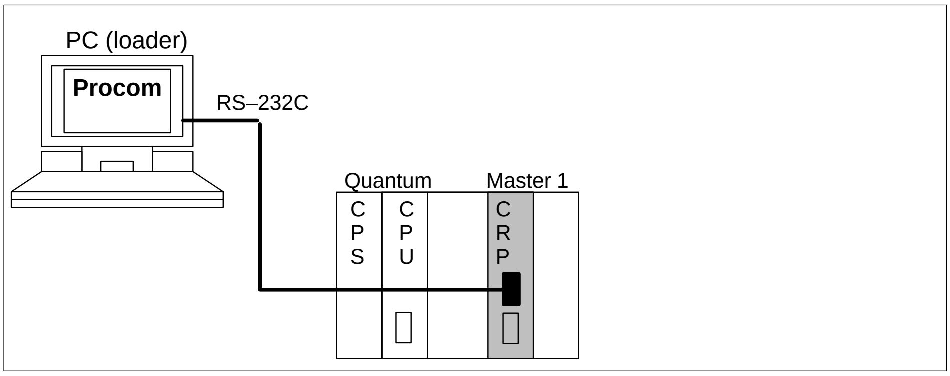
☞ **Note**
The load operation can alternatively be carried out through the bus (MB+) or serial port (MB). The corresponding settings are then to be performed under Concept.

☞ **Note**
The loading procedure to be followed with the Exec loader can be gathered from the readme file, which is an integral part of the CRP 811 firmware updates.

Updating from V 3.00D to V 4.10D

An update to CRP 811 firmware version 4.10D is achieved with the help of the Exec loader included as part of the firmware update. Before the firmware can be loaded, the old RS–232C loader must be replaced by the new Exec loader through the RS–232C interface. The update procedure is depicted below.

Figure 39 Updating from CRP 811 V 3.00D firmware over RS–232C



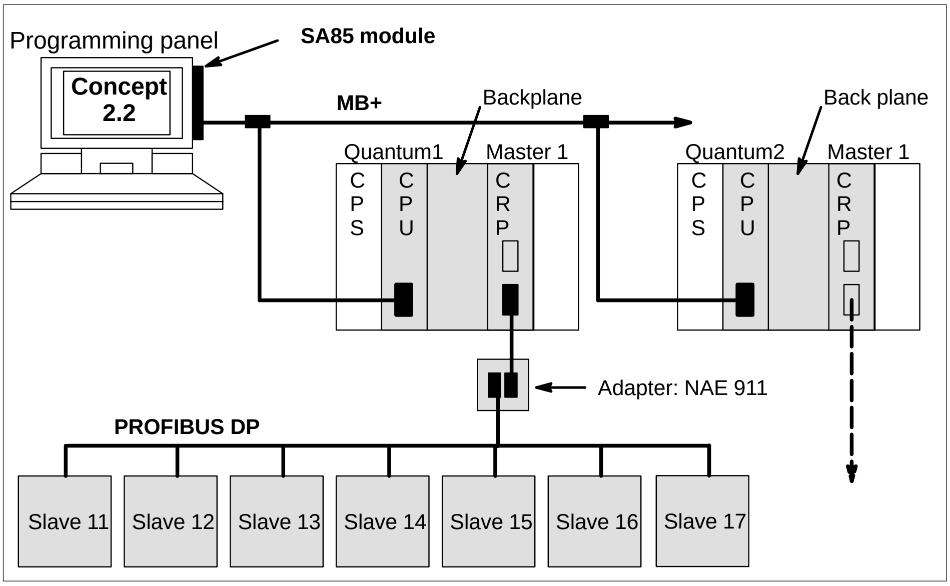
Note
The loading procedure to be followed with the Exec loader can be gathered from the readme file, which is an integral part of the CRP 811 firmware updates.

Caution
Once a CRP 811 module has been updated through the Exec loader, it may be no longer be returned to the V 3.00D level through a terminal program.

Loading the PROFIBUS DP configuration
Since the PROFIBUS DP configuration data are part of the Concept configuration, they are

- Loaded simultaneously in the CPU with the user program.
- The PROFIBUS DP data are then automatically transferred on to the bus master.
- The bus specific parameters are then automatically passed on to the CRP 811's PCMCIA card.
- After a connection has been successfully made to the NAE 911 adapter, the connected, error–free slaves are automatically supplied with the parameter data, and
- I/O communication is automatically started with those process outputs set to "0" signal.

Figure 40 Configuration for the loading of PROFIBUS DP



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☞ **Note**
The I/O data exchange with live values takes place at PLC start.

⚠ **Caution**
Should the bus connection be interrupted during running I/O communication, e.g. broken at the NAE 911 adapter and restored thereafter, then the I/O communication is initiated again immediately with live values.

4.1.7 Software Installation of the Bus Configuration Tool

The information necessary for the activation and operation of the software can be gathered from the booklet accompanying the CD. The points to be observed are:

- System requirements
- Software installation (of the Hilscher SyCon–PB/GS tool)
- Explanation of the directory structure

☞ **Note**
Which of the CRP 811 00 master module firmware versions are authorized can be found within the Validity Reference at the beginning of the document.

4.1.8 Configuration Sequence

The global sequence of configuration steps is executed as follows:

Bus Configuration
Determination of the bus configuration with the TLX L FBCM bus configuration tool.

- Node selection and the allocation of names and addresses.
- Parameterization of the global bus parameters.
- Configuration of the I/O modules for modular slaves.
- Setting of user parameters.
- The resulting CNF file is created through an ”Export” function.

☞ **Note**
The manufacturer’s own device data base entries (GSD files) necessary are installed during the bus configuration tool installation.

☞ **Note**
Should several bus masters be configured, a **bus configuration** must be performed for each bus line.

PLC configuration
I/O and bus configuration processing with Concept.

- Master module determination in accord with the I/O mapping (type and slots).
- CNF file ”import” and
- Assignment of the I/O and diagnostic data to state RAM references.

Load
Loading the PLC with the configuration data produced under Concept.

The following illustration depicts the configuration sequence and interactions:

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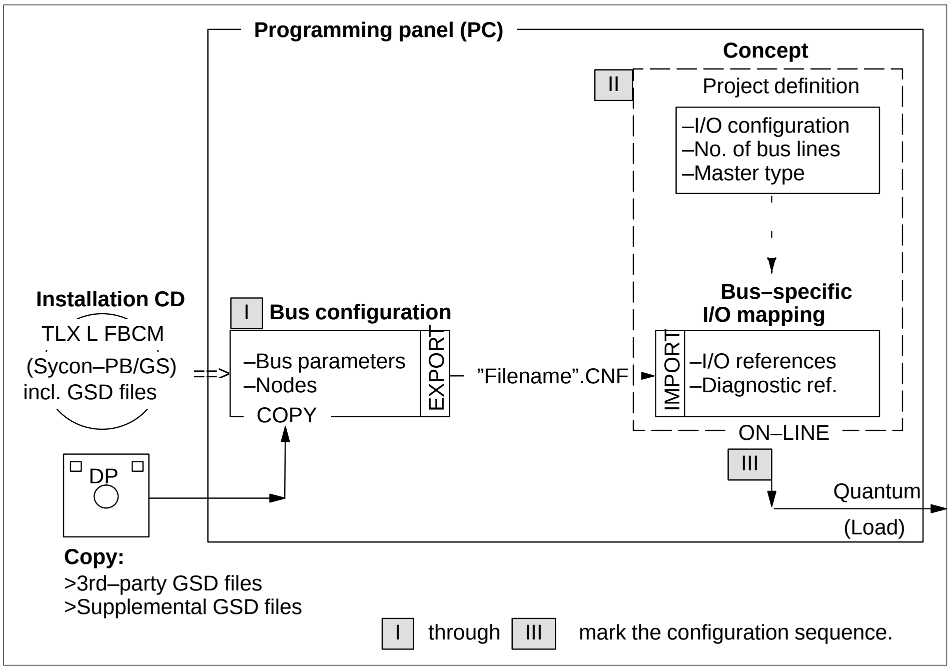
Figure 41 PROFIBUS DP configuration sequence



Note
The bus project is not bound to a particular PLC station. It can be imported into totally different Concept projects.

Note
The bus configuration descriptions are predominatly based upon the on–line help and manuals available on the Hilscher CD. This manual only handles those features essential to configuration. Make use of the on–line help for any additional questions.

4.2 Incremental Configuration

The topics presented in this section are:

- Example Guidelines, Section 4.2.1.
- Handling Peculiarities of the Bus Configuration Tool, Section 4.2.2.
- Bus Topology Configuration (1st Step), Section 4.2.3.
- Bus Assignment and I/O Mapping under Concept, Section 4.2.4.
- Assignment of the I/O and Diagnostic Signals, Section 4.2.5.
- Loading and Starting the PLC Station, Section 4.2.6.

4.2.1 Example Guidelines

A description of the main configuration steps follow. The example is based upon a provided bus layout.

The example concerns a plant configuration (PLANT1), in which a PLC station (PLC1) with a single PROFIBUS DP line (PLC1PB_A) is to be configured. The basis for the configuration can be gathered from Figure 42.

The steps are in detail:

- Bus topology configuration
- Import of the bus topology into Concept
- Assignment of the I/O and diagnostic signals
- Activation of the PLC station

4.2.2 Handling Peculiarities of the Bus Configuration Tool

Save / Export The bus configuration result file is generated in two steps:

1. SAVE: Stored as a PB file.
2. EXPORT—>ASCII: Then as a CNF file for import by Concept / Quantum.

Multiple bus projects Several new files can be opened simultaneously for the configuration of bus projects. WINDOW / NEW WINDOW or chose the small window format with the corner–resident Minimize icon.

Duplication of BPn Existing configured bus projects can be duplicated. WINDOW / NEW WINDOW.

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Everything at a glance The representation of all project nodes is made through a module table in tabular form. VIEW / DEVICE TABLE

Master I/Os The illustration of all I/O nodes belonging to a selectable master is shown in an address table. VIEW / ADDRESS TABLE and select MASTER. A sort can be performed by data or station address.

GSD & proj. paths The directory paths where GSD and project files are to be stored can be defined separately. SETTINGS / DIRECTORY is the menu sequence.

Target Rotation Time is automatically re–calculated when the set value is exceeded.

☞ **Note**
The bps rate must be invoked again should the TTR be reduced, e.g. through a reduction in the number of slave nodes.

Delete node The deletion of existing, configured nodes is accomplished through EDIT / DELETE or the Del key.

Data addresses Data addresses have **no** significance with the CRP 811 00, and are not evaluated.

Watchdog There is a single supervision time valid for all slave nodes. If a slave is **not** to be monitored for an interruption of its communications with the master, it can be excluded.

⚠ **Caution**
If watchdog monitoring is disabled, outputs will remain at their last value before the failure.

Auto addressing The auto addressing setting for the initial node address allocation is **fixed** to enabled.

Auto clear This functionality is not supported by the CRP 811 00.

Re–determining BPs The actual **B**us **P**arameters can be determined by the system itself after configuration has been completed.

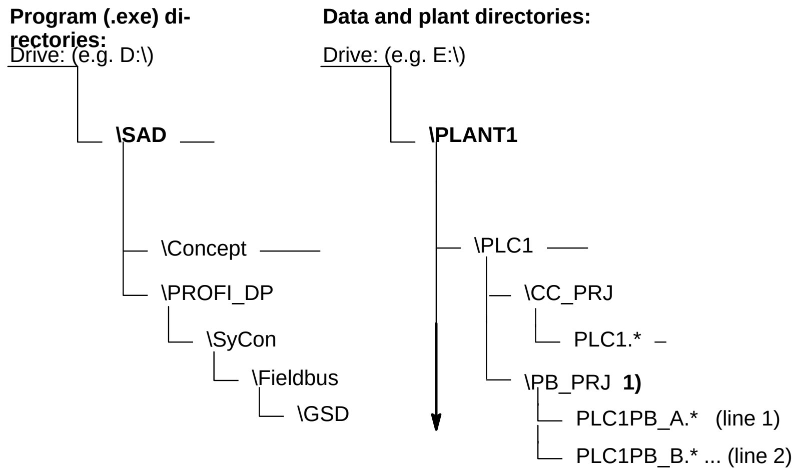
4.2.3 Bus Topology Configuration (1st Step)

In this step the characteristics of the bus and connected nodes are defined and parameterized. Refer to the gray, highlighted portion of Figure 42.

The TLX L FBCM configuration tool is used for bus topology configuration.

Prerequisites
The necessary DDB/GSD files are available.
Examine through TOOLS / GSD VIEWER.

Directory paths
as presented here should be considered **exemplary**. Specific paths can be entered under SETTINGS / DIRECTORY.



1) = Directory for the CNF and PB file(s) of the configured bus projects (example)

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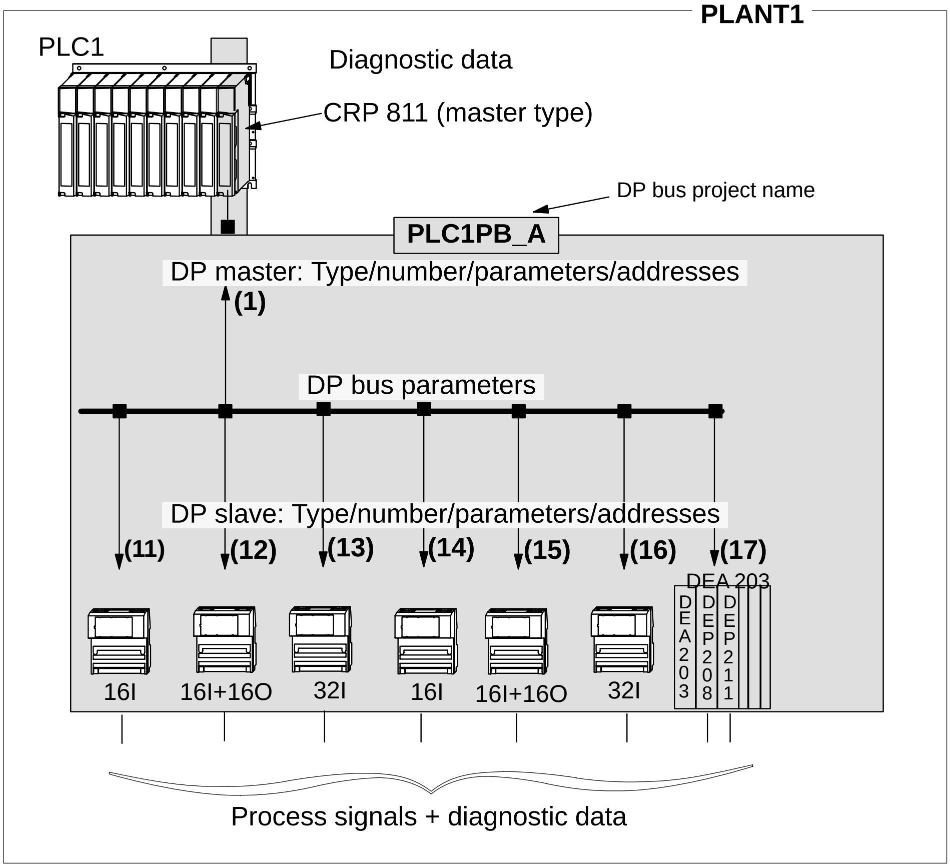
Figure 42 Bus topology configuration example



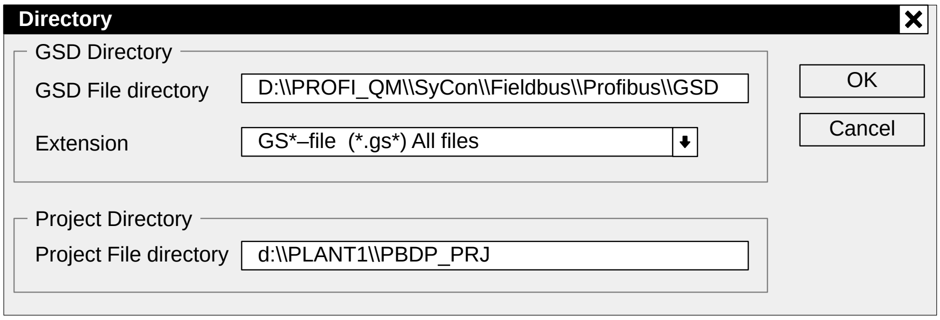
Creating the bus project (BP):

Start the configuration tool. After the firm's logo has been displayed, an operator interface appropriate for further processing appears.

▶ **Allocating a BP name**

1. Define the plant name by creating an appropriate directory (e.g. PLANT1 / PBDP_PRJ) with Explorer or another tool
2. Specify the project directory path name created (SETTINGS / DIRECTORY ...) to SyCon

Figure 43 Directory path menu



3. Open a new file: FILE / NEW
4. Store under a name with at most **8 characters**:
   FILE / SAVE AS / PLANT1 / PBDP_PRJ / PLC1PB_A

☞ **Note**

This directory structure is not mandatory. It was chosen for reasons of clarity. The corresponding Concept project is setup under PLANT1 as well, and named PLC1_PRJ.

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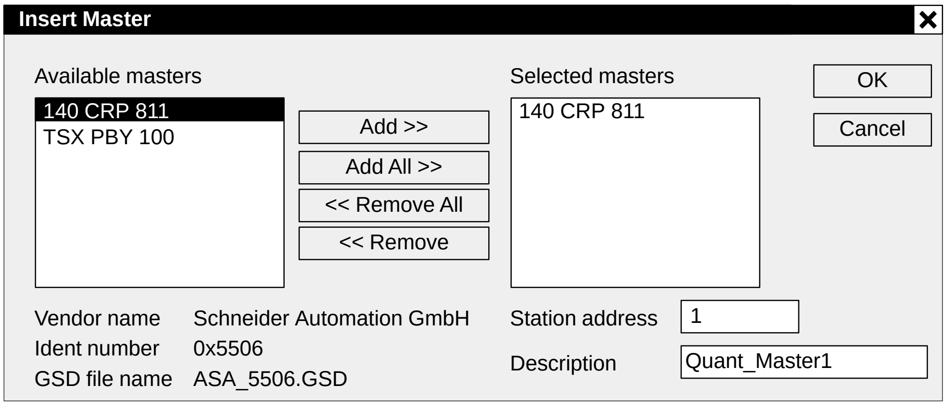
▶ **Define and parameterize the master module**

1. Enter the first master by:
   either INSERT / MASTER
   or
   a left–click on the ”M”aster icon in the toolbar
   and
   then a left–click at the desired cursor position within the configuration text block.

Reaction The following window opens with a list of diverse masters.

Figure 44 Master module entry



2. Selection and acceptance of the Quantum CRP 811 PROFIBUS DP master: ADD button or double–click

Note
Should two or more masters be required on the bus, the desired number of masters can be assigned to the bus through multiple double–clicks. Ascending addressing takes place on the bus automatically. A change of addresses is possible at any time.

Station address
Master addresses normally range between 1 and 10 (due to the TTR time), with slaves beginning at 11.

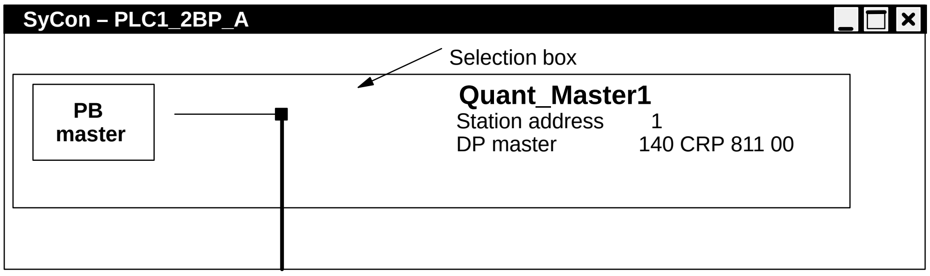
Description
A text entry of up to 32 characters is possible here, e.g. Quant_Master1. Special characters and mutated vowels are not permitted.

Note
Be sure to select the TSX PBY 100 master module as PLC system when using the Premium product line.

3. Assign the selected master to the desired bus line with the OK button.

Reaction The following window with selection box opens.

Figure 45 Initial master entry



Supplementary information: PDF file on CD, resp. the tool’s on–line help

4. If desired, the master’s bus parameters (station address) can be changed/checked by:
   SETTINGS / MASTER CONFIGURATION
   or a double–click on the marked selection box
   or a right–click and then the MASTER CONFIGURATION selection

Reaction The following window opens for master configuration.

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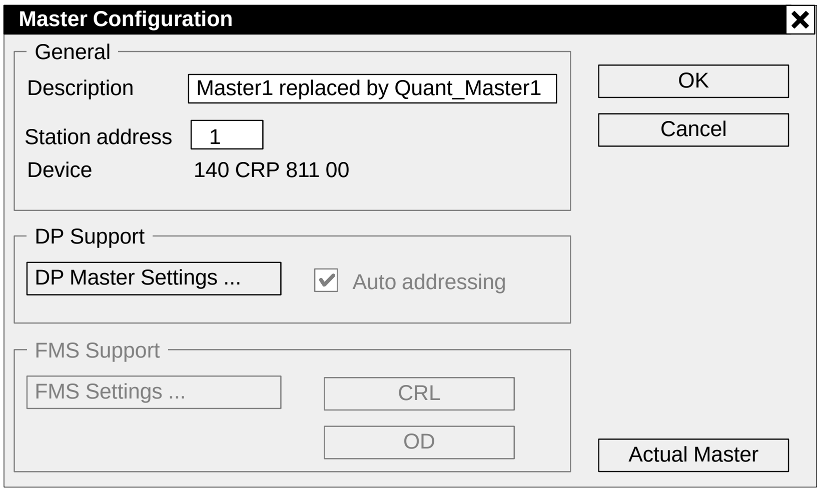
Figure 46 Menu for master parameter settings



Auto addressing
Cannot be disabled.

Description
A text entry of up to 32 characters is possible. Special characters and mutated vowels are not permitted.

Station address
Master addresses normally range between 1 and 10 (due to the TTR time), with slaves beginning at 11.

Value range for master and slaves on a single bus: 1 – 125

Actual master
The activation of this button determines, e.g the active master for a download.

DP master settings
Setting/check of the watchdog time. This value determines how long the DP master waits for a slave response before setting all process outputs to ”0” signal. The corresponding settings must have been performed under Concept.
This menu command is also accessible under:

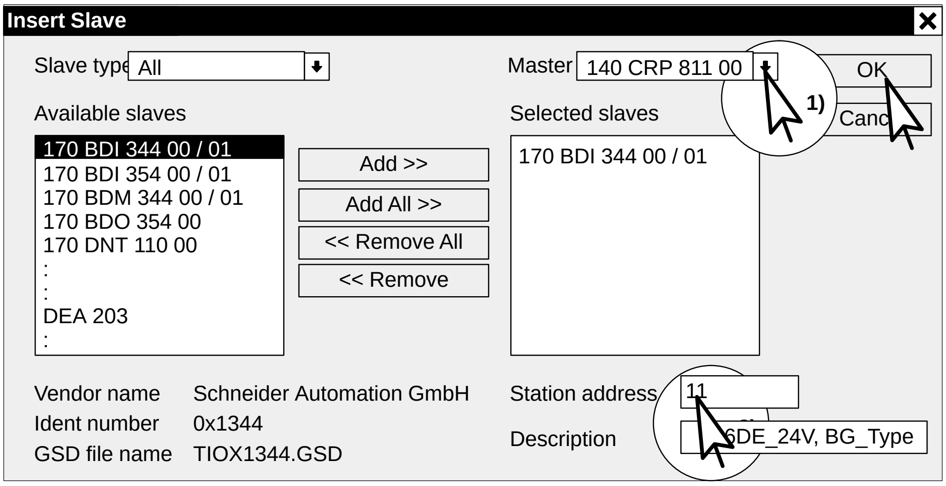
SETTINGS / MASTER SETTINGS or
a right–click on the marked selection box and then the MASTER SETTINGS selection

▶ **Define and parameterize slave modules**

1. Enter a slave from a node list by:
   INSERT / SLAVE / left–click on the desired cursor position.
   or a left–click on the ”S”lave icon in the toolbar
   and
   then a left–click at the desired cursor position within the configuration text block.

Reaction The following window opens for slave configuration.

Figure 47 Slave module entry



Note
A list of the available slave nodes and interface modules is presented. Should two or more nodes be required on the bus, the desired number of nodes can be assigned to the bus through multiple double–clicks. Ascending addressing takes place on the bus automatically. A change of addresses is possible at any time.

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Available slaves
Schneider modules for operation on a Quantum PLC are:

- **TIOs** (slaves)
  –170 BDI 344 00 / 01
  –170 BDI 354 00 / 01
  –170 BDM 344 00 / 01
  –170 BDO 354 00
- PROFIBUS DP **interface module for Momentum TIOs**
  –170 DNT 110 00 for individual I/O modules (single slave)
- PROFIBUS DP **interface module for Compact** (A120)
  –DEA 203 for up to 18 I/O modules (modular slaves)

☞ **Note**
For all separate interface modules (Momentum and Compact) the attached I/O modules must be assigned in an additional step. Refer to the appendix for appropriate I/O nodes.

Master (assignment to slave)
The master which is to be assigned to a new slave can be selected here (refer to 1) in Figure 47). The sequence of configured masters presented in the drop–down list corresponds to the sequence in the configuration text block.

Station address (for the slave)
The slave's station address on the bus may require some manual intervention to be consistent (refer to 2) in Figure 47).

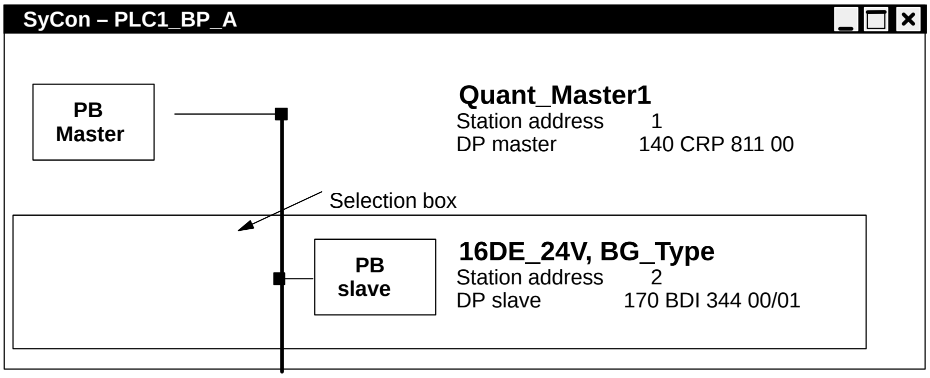
Address range for master and slaves: 1 – 125

Description (slave)
Entry of correctable texts up to 32 characters can be made here, e.g. "16DE_24V, BG_Type".

2. Assign the selected slave to the desired bus line with the OK button.

Reaction The following window opens for slave configuration.

Figure 48 Initial slave entry



3. Interface modules can alter settings and/or perform I/O module assignments with a:

   double–click on the marked selection box or
   SETTINGS / SLAVE CONFIGURATION

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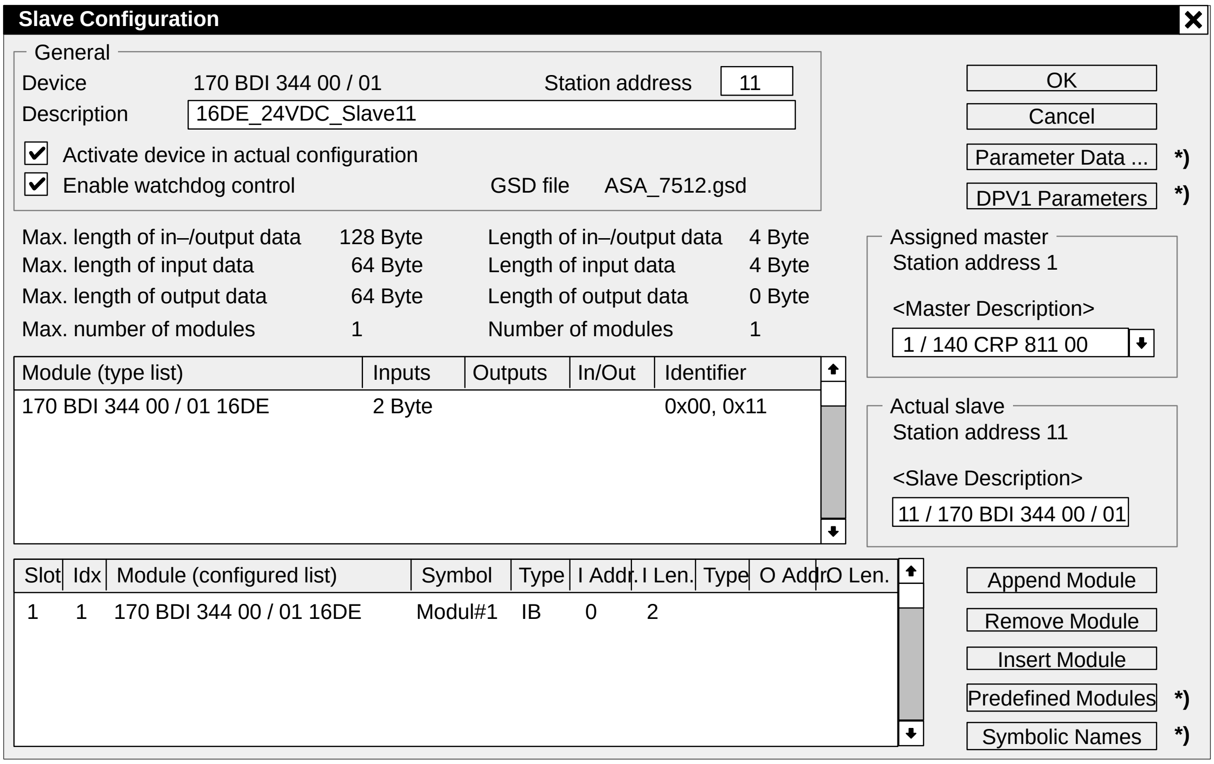
The windows of the 3 possible slave types with their individual characteristics are presented below:

- **TIO:**

Opening the window **registers** the associated I/O module.

Figure 49 TIO: Definition menu for bus–resident I/O nodes



Explanation of the slave parameters

Station address / description
can be altered here.

Activate device in actual configuration
Enabled: In this configuration the module is recognized and processed continously.
Disabled: The absence or failure of this module will not influence bus operations, i.e. the slave will neither be parameterized nor configured by the master.

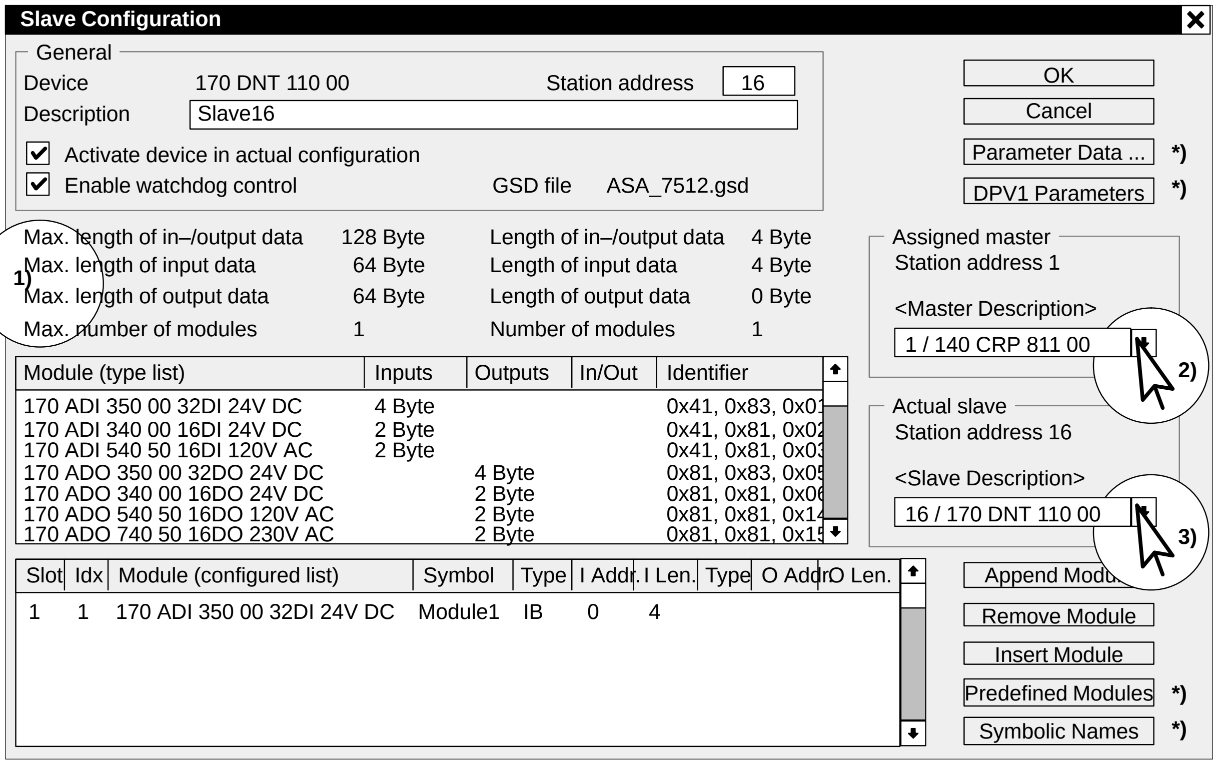
Enable watchdog control
Enabled: Process outputs are not set to ”0” signal, should the set supervision time be exceeded (refer to DP Master Settings).

Disabled: The states of the process outputs are not influenced, even if an interruption in the communication to the master has exceeded the set supervision time.

- **Momentum:**

A **single** desired I/O module is to be **entered** after this window is opened.

Figure 50 Momentum interface modules: I/O node assignment menu



Explanation of the slave parameters (continued)

Append I/O module with:
a left–click on the desired module within the type list / APPEND MODULE or
a double–click directly on the desired module.
INSERT MODULE is not effective here, as only one module can be entered.

***)** Buttons marked with this asterisk symbol are not to be utilized for Schneider modules. Any parameters offered are not to be changed.
4 x Max. length / length columns (1)
Module count and the figures for total data resources available, and as allocated through the configured I/O mapping are shown in both columns.

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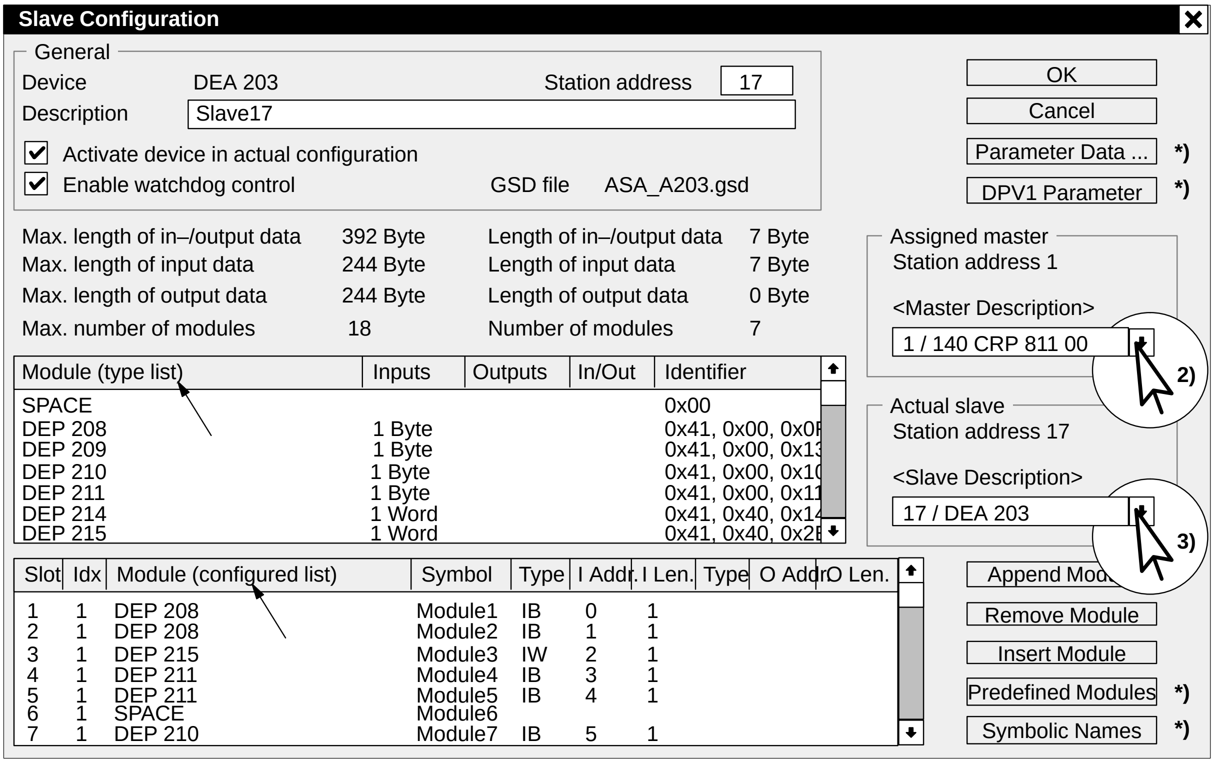
- **Compact:**
  Up to **18** I/O modules can be **entered** after this window is opened.

Figure 51 Compact interface modules: I/O node assignment menu



Explanation of the slave parameters (continued)

I/O module entry procedure:
Modules are entered in succession into the configured list by a:
left–click on the desired module (in the type list) / APPEND MODULE or
double–click the desired module directly.
Insert the **module** ahead of a chooseable position in the configured list by a
left–click on the desired module (in the type list) / left–click on the next position in the project list / INSERT MODULE. The slot number is generated automatically.

Assigned master (2)
View: The master is shown which belongs to the currently displayed slave.
Change: The current slave can be assigned to another master here.

Actual slave (3)

View: With the opening of this window the currently selected slave is shown with type identifier and address.
Change: Using the arrow–keys, all slaves assigned to the currently active master can be invoked for edit/check.

Parameter data (for slaves with file extension, e.g. GSG or GSF)
The parameters behind this button apply exclusively to those modules, whose DDB (GSD) files have a country–specific file extension (e.g. GSG for Germany or GSF for France). They permit the module and user–specific adaptation of the control process, such as the specification of limiting values for current and voltage ranges.

☞ **Note**
For Schneider slaves (Classic TIO, Momentum, and Compact) the Parameter button is meaningless, (i.e. the DDB files have the GSD file extension).

Type list: List of the available I/O modules
This list contains all I/O modules suitable for the respective interface module.
The required modules are to be taken from this list and then entered in the list below (with the help of the first 3 buttons next to the configured list).

Meaning of the type list columns
- Inputs: Indication of module input memory allocation; significance under CRP 811: Number of input data (byte or word) per slave (for compact slaves) resp. per module (for modular slaves).
- Outputs: Indication of module output memory allocation; significance under CRP 811:
  Number of output data (byte or word) per slave (for compact slaves) resp. per module (for modular slaves).
- In/Out: Indication of module combined I/O memory allocation; significance under CRP 811:
  Number of combined I/O data (byte or word) per slave (for compact slaves) resp. per module (for modular slaves).
- Identifier: Display of the module identification as per PROFIBUS standard.

☞ **Note**
Type list column widths are user–variable.

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Configured list: List of the employed I/O modules
The I/O modules a slave requires for a bus project are entered in this list (with the help of the first 3 buttons next to this list).

Meaning of the configured list columns

- Slot: Slot indicator within the modular slave ”subrack”.
- Idx: Display of the running data index number within the module, only meaningful for modular or compact slaves (not currently implemented for Schneider slaves).
- Symbol: Display/change of the successive numbering for the selected modules as provided by the system. These names are used in connection with the window opened by the”Symbolic Names” button.
- Type: Indication of the data type employed; significance under CRP 811:
  –IB: Byte input data
  –IW: Word input data
  –QB: Byte output data
  –QW: Word output data
- I Addr.: Relative input data byte address for the selected module of a slave. Meaningless for CRP 811.
- I Len.: Number of input data byte/words per module of a slave (type–specific).
- O Addr.: Relative output data byte address for the selected module of a slave. Meaningless for CRP 811.
- O Len.: Number of output data byte/words per module of a slave (type–specific).

☞ **Note**
Configured list column widths are user–variable.

▶ **Determination/control of bus parameters**

For bus parameters a distinction is made between bps rate dependent and independent parameters:

1. Bps rate selection: SETTINGS / BUS PARAMETER ...

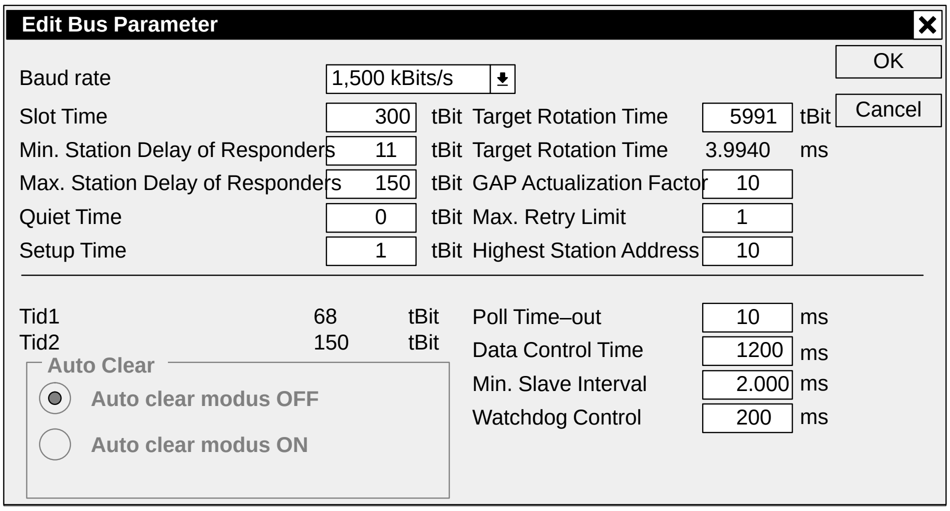
Value range: 9.6 Kbps through 12 Mbps in fixed increments.
Default value: 1,500 Kbps.

☞ **Note**
A standard parameter setting is automatically offered for each bps rate.

The bps rate dependent parameters can be modified through an Edit button. The relationships prescribed in the PUO guidelines and PROFIBUS standard (DIN 19245, Parts 1/ 3, resp. EN 50170) are to be taken into account.

Note
The edit function can be enabled through the "User–defined" setting under the OPTIMIZATION menu command.

Figure 52 Bus parameter menu with standard settings



Bps rate dependent bus parameters (standard)
The exemplary value combinations presented in Table 19 are valid as global relationships between the bps rate and bus parameters when using the **CRP 811** master module.

Caution
The standard setting as offered is not applicable. Rather make use of the appropriate values as assigned in Table 19.

Note
The settings shown by the SETTINGS / MASTER SETTINGS menu sequence have no significance for the CRP 811.

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Handling for bus parameter refresh
An option is available to rescan bus parameter values after configuration has been completed. Multiple changes to the set of selected nodes leave the values shown in a non–optimal state, since the values displayed function according to the trailing pointer principle. This means that any maximum interim value reached is never reduced, leaving values at their ”high water marks”.

Recalculation
In order to achieve a more valid recalculation of the values involved, one reduces the Target Rotation Time to a value below the true value, accepting the data with ”OK”, ”OK”, then making a renewed opening of the BUS PARAMETER menu where the ”Highest Station Address” is then altered to reflect the actual givens (i.e. max. master address).

Table 19 Response times for a CRP 811 with 9 slaves (170 BDI 344 00)

Parameter	<=187.5 Kbps	500 Kbps	1.5 Mbps	3 Mbps	6 Mbps	12 Mbps
Slot time	100	200	400	400	600	1000
Min. St. Delay of Resp.	11	11	11	11	11	11
Max. St. Delay of Resp.	60	100	250	250	450	800
Quiet time	0	0	3	3	6	9
Setup time	1	1	4	4	8	16
TTR (multi–master) (tBit) (ms)	3640 19.4133	4862 9.7240	6107 4.0713	7459 2.4983	9789 1.6315	14493 1.0228
Gap actualization factor	10	10	10	10	10	10
Max. retry limit	1	1	1	2	3	4
Highest station address	10 *)	10 *)	10 *)	10 *)	10 *)	10 *)
(Watchdog / TTR ratio)	1	1	1	1	1	1
Poll time–out (ms)	10	10	10	10	10	10
Data control time (ms)	1200	1200	1200	1200	1200	1200
Min. slave interval (ms)	0.100	0.100	0.100	0.100	0.100	0.100
Watchdog control (ms)	200	200	200	200	200	200

Explanation of bus parameters

Slot time (T_SL)
Slot time supports bus protocol supervision in two ways. First of all, the sender of a request telegram expects a response telegram within the assigned time interval. Furthermore, a station must reply within the slot time with a request telegram of its own after receiving the token, or pass the token off. The declaration is made in bit times (1/bps rate).

Allowable value range: 1 ... 2 exp(16) – 1 (T_Bit)

The allowed setting varies with the bus speed: refer to Table 19

Min. station delay of responders (min T_SDR)
Minimum station delay of responder, i.e. a responder may only send its response telegram after expiration of this period.

Allowable value range: 1 ... 2 exp(16) – 1 (T_Bit)

The allowed setting varies with the bus speed: refer to Table 19

Max. station delay of responders (max T_SDR)
Maximum station delay of responder, i.e. a responder must have begun to send its response telegram before expiration of this period.

Allowable value range: 1 ... 2 exp(16) – 1 (T_Bit)

The allowed setting varies with the bus speed: refer to Table 19

⚠ **Caution**
The master's maximum T_SDR parameter value is not less than the slave's maximum T_SDR parameter value.

Quiet time (T_QUI)
is the modulator decay time after end of message. It only comes into use when repeaters and modulators are utilized.

Allowable value range: 0 ... 255 (T_Bit)

The allowed setting varies with the bus speed: refer to Table 19

Setup time (T_SET)
Definition: Setup time is the reaction time required between the arrival of an interrupt request, and the execution of the necessary response.

Allowable value range: 1 ... 255 (T_Bit)

The allowed setting varies with the bus speed: refer to Table 19

Breite: 185 mm
Höhe: 230 mm

TTR, total token rotation time (only in multi–master mode)
Period for the circulation of a token.
Token interchange to the next master up to the hold time expiration. Single masters pass off the token to themselves. This entry is meaningless for passive nodes.

☞ **Note**
If the token comes back before TTR expiration, additional (prio1) messages can be sent in the remaining time. Thereafter the token is passed on to the next master.

Allowable value range: 1 ... 2 exp(24) (4294967294) – 1 (T_Bit)

Appropriate preset values: refer to Table 19

Gap actualization factor (G)
This factor determines after how many token passes a GAP telegram for the acceptance of a new station into the logical ring will be sent. This entry is meaningless for passive nodes.‹

Allowable value range: 1 ... 255

Appropriate preset values: refer to Table 19

Retry limit (max_retry_limit)
This factor specifies how often layer 2 must repeat a request telegram, when it fails to receive a response telegram from a known station within the assigned time frame.

Allowable value range: 1 ... 8

Appropriate preset values: refer to Table 19

Highest station address (HSA)
is the highest bus address to which a test for the presence of active bus masters is performed. The Gap factor determines how many token passes are carried out thereafter.

☞ **Note**
The response time between the node rescans is shortest, when the highest station address (HSA) is lowest.

Allowable value range: 2 ... 125

Appropriate preset values: refer to Table 19

Bps rate independent bus parameters (standard)

☞ **Note**
This independence holds for data rates from 93.75 Kbps through 12 Mbps.

Poll time–out
is the period, after which a DP master (class 1/2) is reset, when a fault has occurred.

Permitted value range/default: 0 ... 65535 (ms): >>100 (ms) / 500 (ms)

T_DC, data control time
is the time frame required for the checking of DP slave status, when auto clear mode is active.

☞ **Note**
Auto clear is **not** supported by the CRP 811 type master.

⚠ **Caution**
Should changes be performed by the user, the dependency between bps rate and the slave watchdog time interval is to be respected.

⚠ **Caution**
The T_DC value must be 6 times longer than the slave T_WD (T_DC = 6 x T_WD). Should different times exist when several slave are present, the largest value must be used.

Permitted value range/default: 10....65535 (ms) / 1000 (ms)

Min. slave interval
This parameter specifies the earliest period after which the master may poll the next slave, when the slave has not passed data. The next slave is polled immediately after completion of such a data transfer.

Permitted value range/default: 0.1 ... 6553.5 (ms) / 2 (ms)

☞ **Note**
The value of this parameter is automatically adapted to that of the slave having the maximum value for ”Min. Slave Interval”.

Example: The values are 0.1 ms for TIOs, 2.0 ms for Compact.

Breite: 185 mm
Höhe: 230 mm

Watchdog control (for Slave Watchdog Time, T_WD)
is the time frame during which the presence of every slave is monitored. This supervision can be disabled for individual slaves.

Permitted value range/default: 1 ... 65535 (ms) / 200 (ms)

☞ **Note**
Value entry automatically adapts the Data Control Time with a factor of 6.

▶ **Save bus project (generate a PB file for all masters on a bus line)**

Produce a **PB file** over FILE / SAVE. The file name may be up to 8 characters long.

▶ **Export a bus line per master module from the saved bus project**

Generate a CNF file through FILE / EXPORT / ASCII.

▶ **Document a configured bus project**

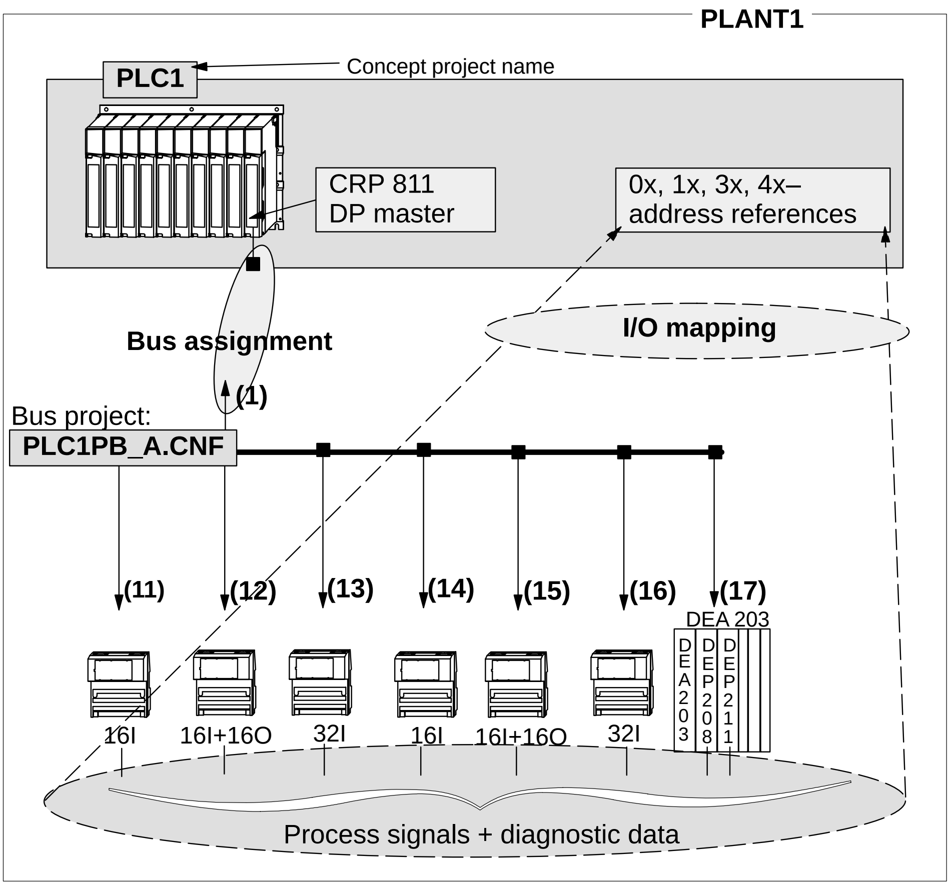
Through the FILE / PRINT function all parameter settings (one page per node including bus parameters) can be output to printer.

4.2.4 Bus Assignment and I/O Mapping under Concept

For the further PROFIBUS processing the generated bus data are to be imported within the framework of the I/O configuration, and a corresponding I/O addressing to be made. The number of bus lines must however first be defined in the PLC configuration. The following points are to be handled:

- Define number of bus lines
- The bus project is assigned to the DP master in its slot
- The address offset is set
- Import of the bus project
- Modification of the I/O addressing as necessary
- Load data into the PLC station

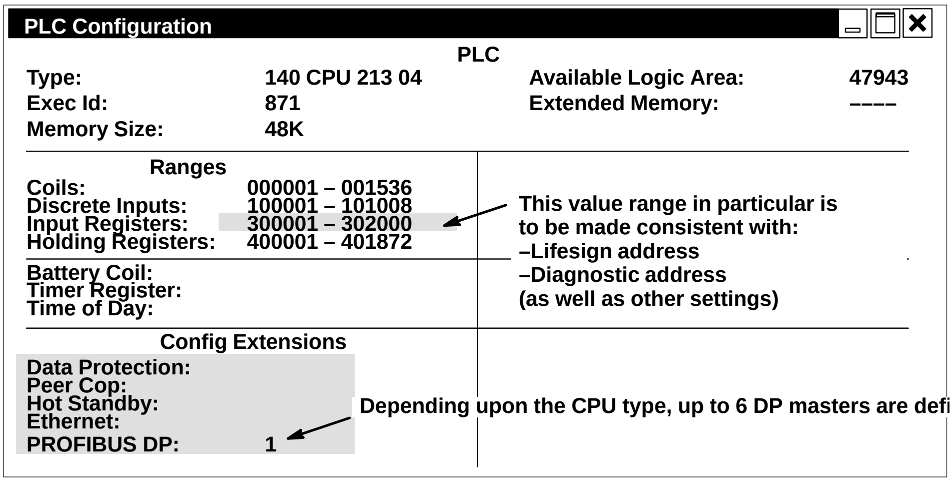
Figure 53 Bus node configuration



Breite: 185 mm
Höhe: 230 mm

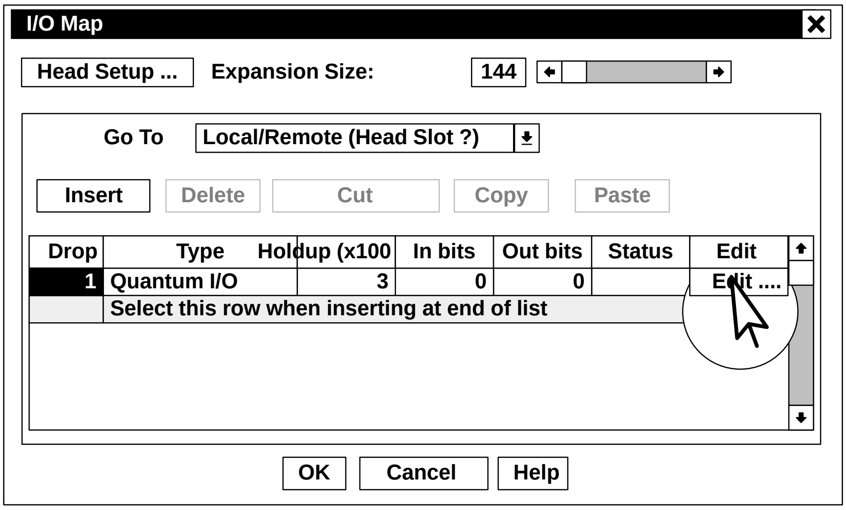
Determine the number of bus masters
After calling up a new project, and the selection of the Quantum system and CPU, e.g. a 140 CPU 213 04, the following processing steps are to be implemented.
The result can be seen in the following Figure 54. With a double–click in the gray, highlighted portion of the ”Config Extensions” text box, the number of bus masters is released for further editing.

Figure 54 Define the number of PROFIBUS masters



Choosing a bus master type
The fixation of the DP master type, it’s slot, and addressing is performed through the following menus (beginning with Figure 55).
Called through CONFIGURE / I/O MAP.

Figure 55 I/O mapping



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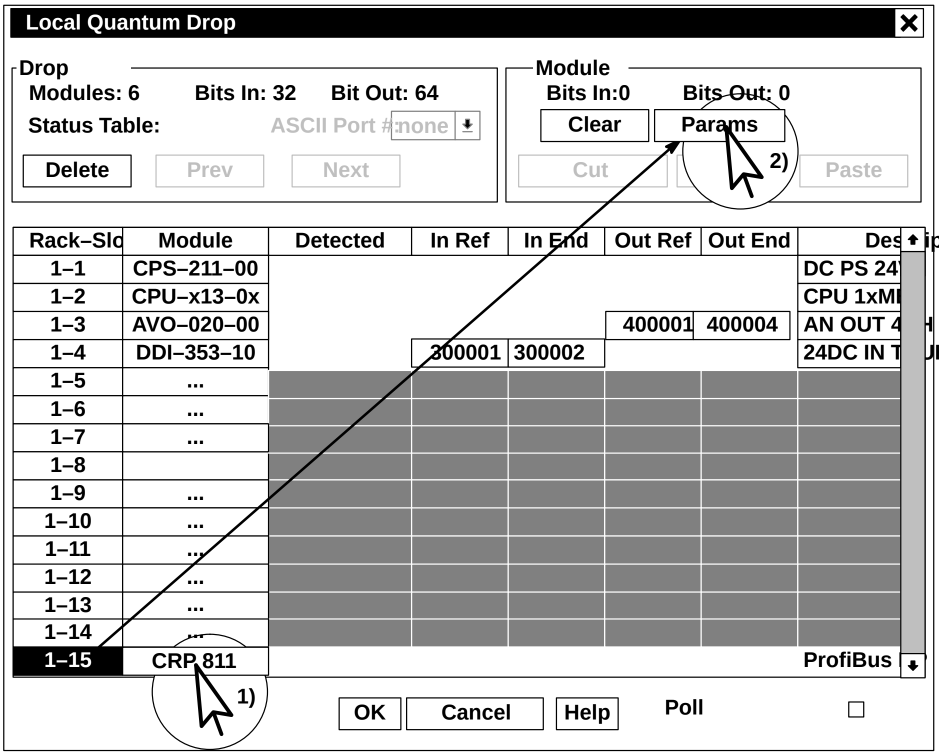
Höhe: 230 mm

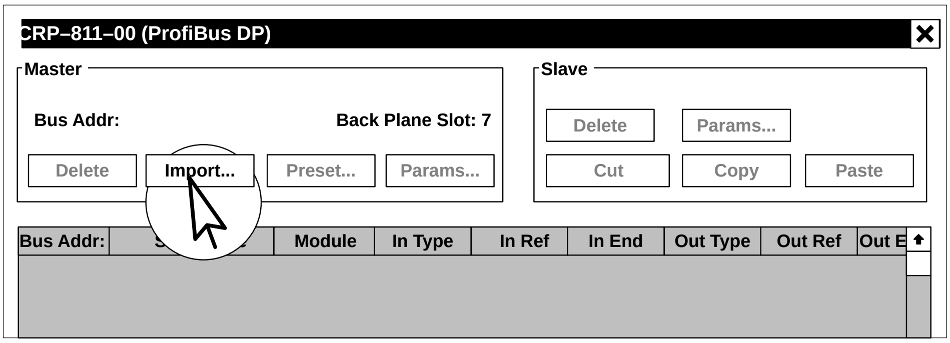
Enter bus master type
After I/O mapping has been selected (Quantum I/O is chosen), left–click the ”Edit...” button of the Quantum drop station. The following window is opened for further processing.

Figure 56 Positioning the DP master and opening the import window.



Accepting generated bus data (from the bus configuration tool)
After selecting the PROFIBUS master from the I/O module list with a left–click on the desired slot (see 1) in Figure 56), the next window is opened with the ”Params” button (see 2) in the same figure).

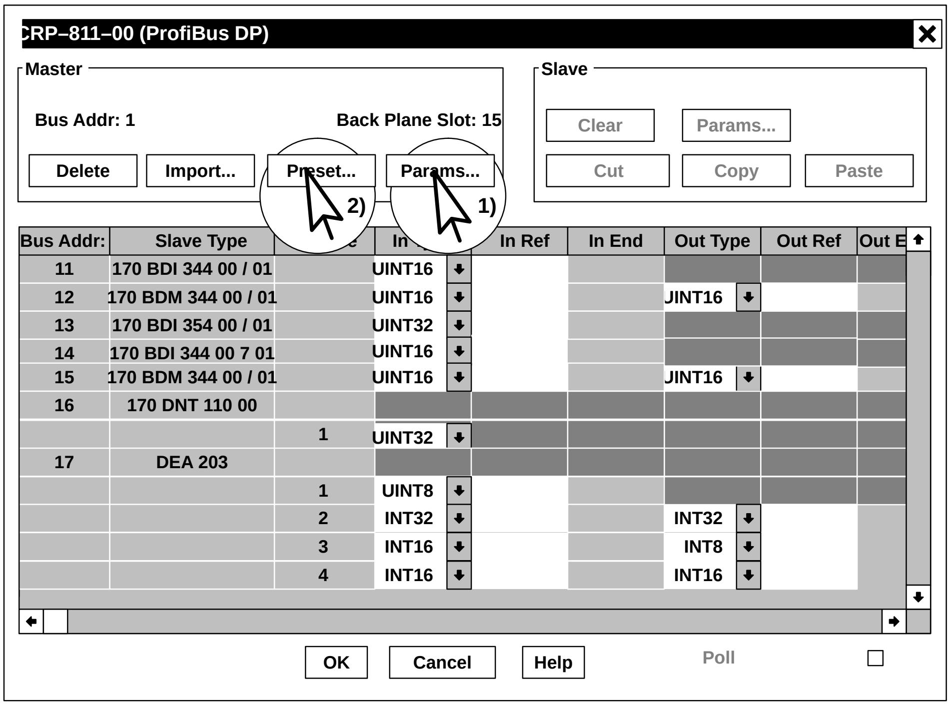
Figure 57 Import window for acceptance of the configured data



CNF file acceptance
The import button opens a file select dialog box where the PROFIBUS configuration data file (CNF file) to be imported can be specified. After completing the file selection and the data import successfully, the configured modules are registered as per the following Figure 58.

Breite: 185 mm
Höhe: 230 mm

Figure 58 Entry window for the I/O and diagnostic data references



Data type selection (example)

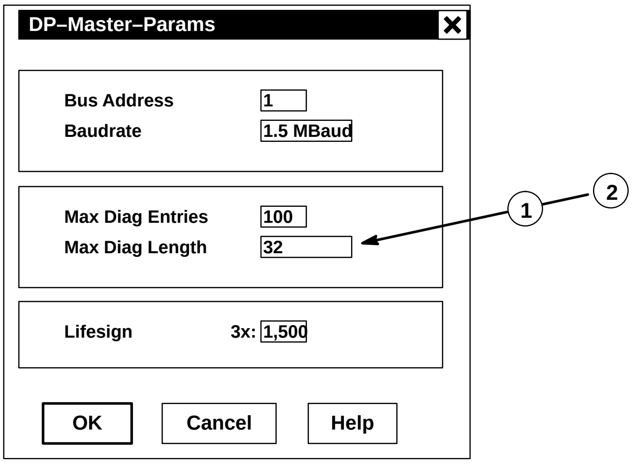
The modules configured through the bus configuration tool are registered with their bus addresses. The BOOL data type is suggested by default. The data type as required by the project specifications is selected manually from a drop–down list, as exemplarily depicted in the figure above.

4.2.5 Assignment of the I/O and Diagnostic Signals

In the next steps the master parameters and the desired I/O and diagnostic data references are introduced into the Concept project.

Master parameters
The master bus address setting and the set bus transmission rate can be checked through the ”Params...” button (see 1) in Figure 58).

Figure 59 DP master parameters



1 The maximum values for Schneider modules can be gathered from Table 2 on page 25.

2 Special care should be paid to the relationship with the actually required data length (diag. data length) as stated in Figure 61.

Scope of the diagnostic data
It shouldn’t be forgotten that the maximum number of diagnostic entries and the length of the data made available in the GSD file are for diagnosis purposes. The offered values are normally accepted.

☞ **Note**
The storage area for the lifesign is to be taken into account for the allocation as well. This entity occupies 1 word. Its evaluation must be programmed by the user. Bits 14 through 16 can be evaluated (refer to Table 3 on page 33)

Breite: 185 mm
Höhe: 230 mm

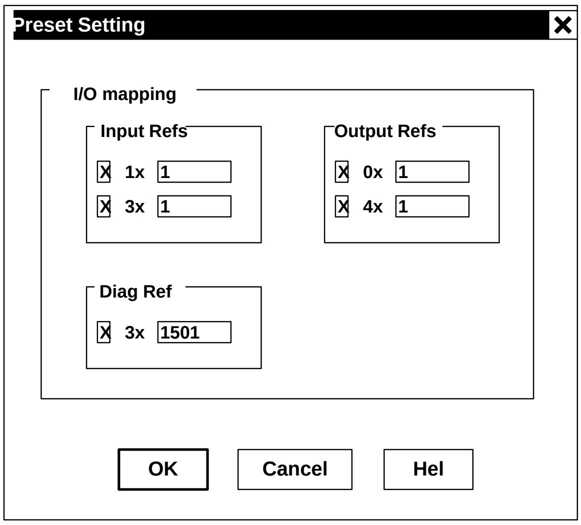
I/O references

The allocation of memory references can be alternatively carried out manually or automatically (with a definable offset). Manually means an individual input for all references. Automatically means the continuous allocation of addresses in ascending order on the basis of a definable offset.

Setting I/O and diagnostic offsets

The offset menu is accessable through the ”Preset...” button (see 2) in Figure 58).

Figure 60 Offset settings for I/O and diagnostic data references



The exemplary I/O offset values are: 000001, 100001, 300001, 400001.

Note
The illustration of the assignment between I/O terminals and memory references in the above–named documentation is made in mode 984 (MSB right).

Supplementary documentation: Modicon TSX Momentum, PROFIBUS DP communications adapter: 870 USE 004 02.

Diagnostic reference
The offset for the diagnostic reference is 301501. After registration of the set values a self–initiated allocation of memory addresses takes place.

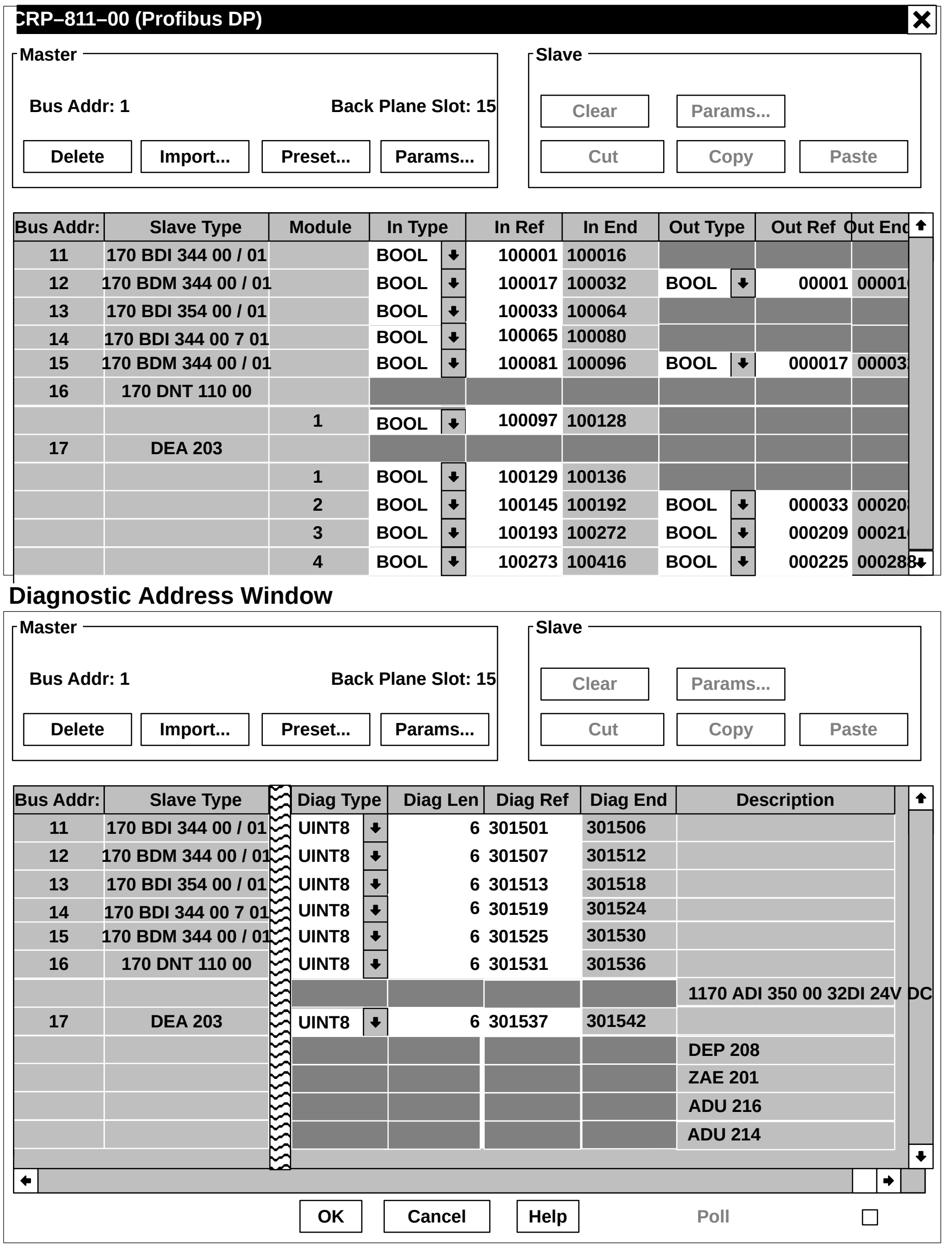
Note
The illustration of the assignment between I/O terminals and memory references in the above–named documentation is made in mode 984 (MSB right).

Supplementary documentation: Modicon TSX Momentum, PROFIBUS DP communications adapter: 870 USE 004 02

Automatic reference allocation
After acceptance of the default settings as perFigure 60 with OK, a window opens automatically with the registered reference as shown in Figure 61.

Breite: 185 mm
Höhe: 230 mm

Figure 61 Automatic I/O assignment with offsets for I/O and diagnostic signals



Note to Figure 61
The diagnostic data entries in the figure above cannot be seen due to space restrictions. But even here the addresses are allocated continuously from the address 301501.

End of configuration
The actual configuration process is terminated with this action.
After data registration is completed and the file saved, the user program along with the I/O configuration is to be loaded into the PLC with the steps known under Concept.

4.2.6 Loading and Starting the PLC Station

The configured data can alternatively be loaded through:

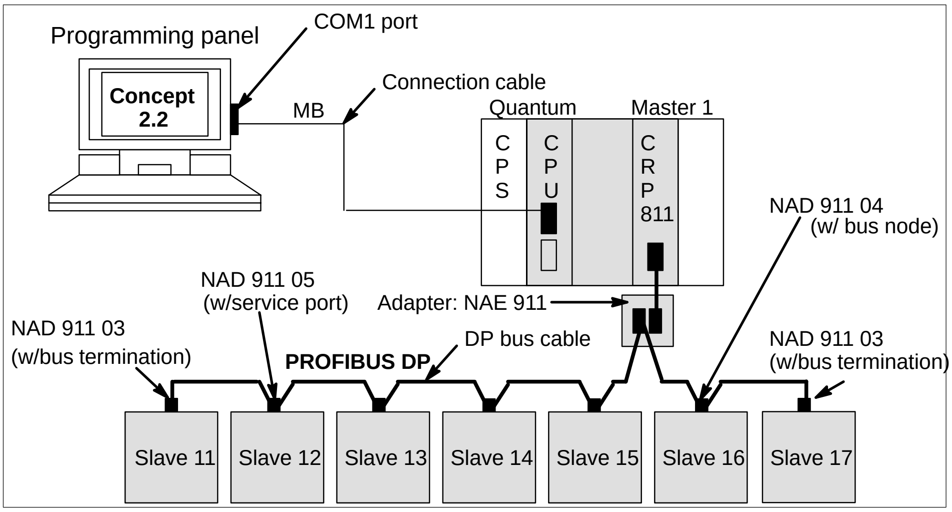
- RS–232C (MB) or
- MB+

This is illustrated in the following figures.

Transfer over RS–232C (MB)
The load operation requirements are:

- Successful installation of the CRP 811 and CPU xxx firmware
- Concept software V 2.2 or higher
- Connection cable: 990 NAA 263 30 / 50 or YDL 52
- PROFIBUS DP cable (bulk): KAB PROFIB
- PROFIBUS connectors:490 NAD 911 03 /04 /05

Figure 62 Single station commissioning configuration through MB

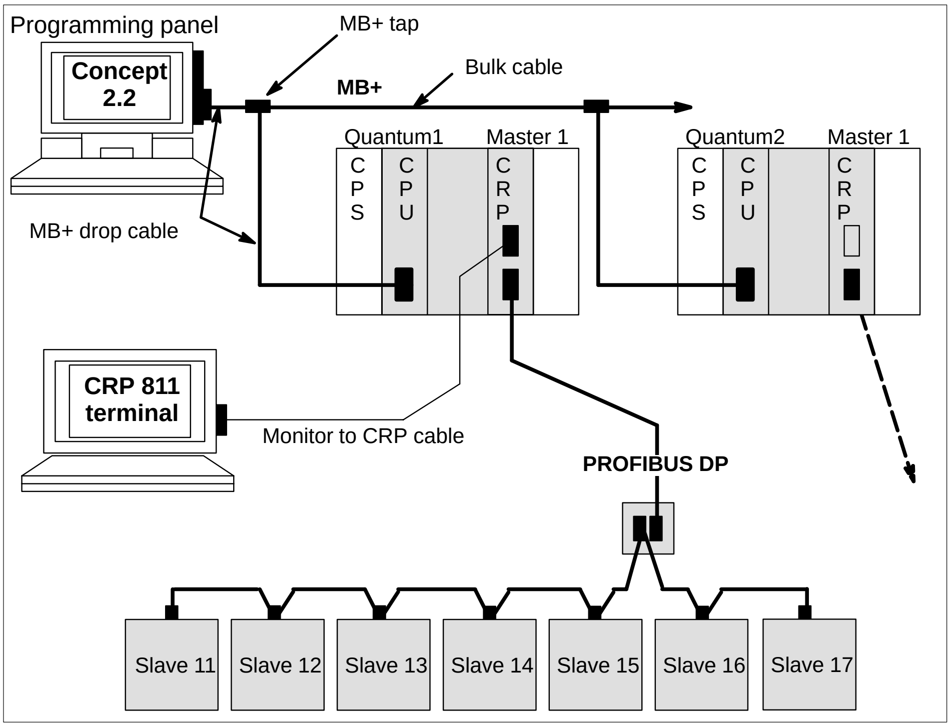


Breite: 185 mm
Höhe: 230 mm

Transfer over MB+
The load operation requires a running communications connection. As well as:

- Concept software
- A SA85 communications module (head)
- MB+ drop cable: 990 NAD 211 10 resp. 30 (2.4 m resp. 6 m)
- MB+ tap: 990 NAD 230 00
- MB+ cable (bulk): 9841
- MBX driver configuration software for SA85 PC operation on MB+
  –Node address setting (hardware)
  –SA85 communications module, (hardware)
  –Free PC memory address (e.g. 0D1000H, as available), (hardware)
  –Free PC interrupt (as available), (hardware)
  –Operation mode (polling recommended).
- Monitor for CRP 811 terminal operation (as needed)
- Monitor to CRP cable: 990 NAA 263 30 / 50 or YDL 52

Figure 63 Load through an existing system bus



Loading and starting the DP configuration (including the user program)
The load operation is performed through the standard
Concept handling procedures ON–LINE / CONNECT ... LOAD.

CRP 811 Diagnostic Facilities

5

The topics presented in this chapter are:

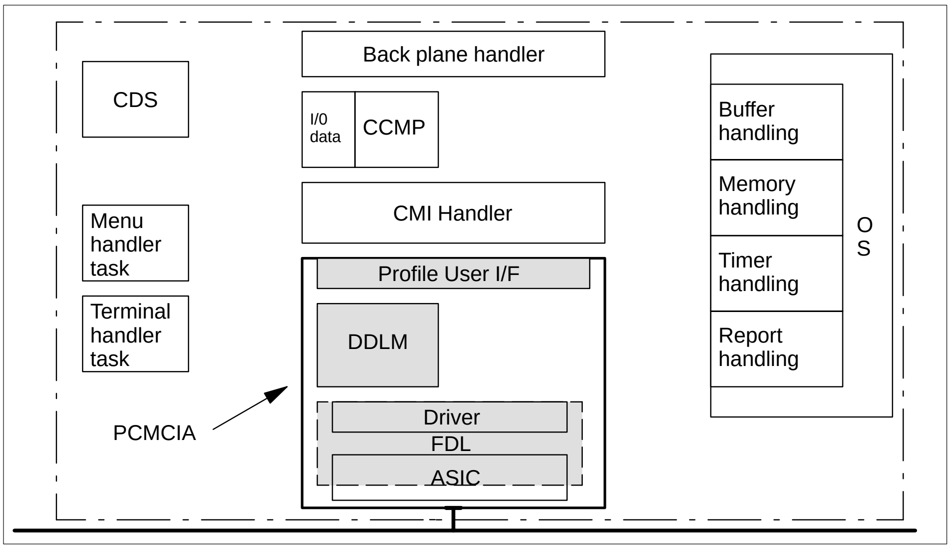
- Scope of the Diagnostic Support, Section 5.1.
- RS–232C Diagnostic Interface, Section 5.2.
- LED Diagnostics, Section 5.3.
- CDS Task Diagnostics, Section 5.4.
- CCMP Task Diagnostics, Section 5.5.
- Back Plane Handler Task Diagnostics, Section 5.6.
- PC Card Handler Task Diagnostics, Section 5.7.
- Terminal Menu Handler Screens , Section 5.8.

Breite: 185 mm
Höhe: 230 mm

5.1 Scope of the Diagnostic Support

The diagnostic LEDs and RS–232C diagnostic interface provide an on–line diagnosis capability for all relevant option board software tasks and modules, as well as the configuration data and all data transferred between the PROFIBUS network and Quantum state RAM.

Figure 64 CRP 811 software tasks and modules



Acronyms
CDS: Configuration Data Server: A handler controlling the configuration process and distribution of configuration data for a communications adapter.

CCMP: Coordination Channel Communication Manager: Profile–specific module

CMI: Common Memory Interface

OS: Operating System

DDLM: Direct Data Link Mapper

FDL: Fieldbus Data Link

ASIC: Application Specific Integrated Circuit

PCMCIA: Personal Computer Memory Card International Association = PC Card

5.2 RS–232C Diagnostic Interface

The topics presented in this section are:

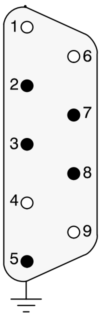
- Output to Printer, Section 5.2.1.
- Menu System, Section 5.2.2.

Use of the RS–232C diagnostic interface requires either a terminal, or a PC running a terminal emulation program (e.g. ”PROCOMM”) to be connected to the RS–232C (Sub–D9) port socket.

For diagnostic purposes the PC is to be connected to the RS–232C (Sub–D9) port socket.
This requires one of the following cable configurations:
Modbus serial cable 990 NAA 263–x0 or YDL 052.

Figure 65 RS–232C port diagram

RS–232C

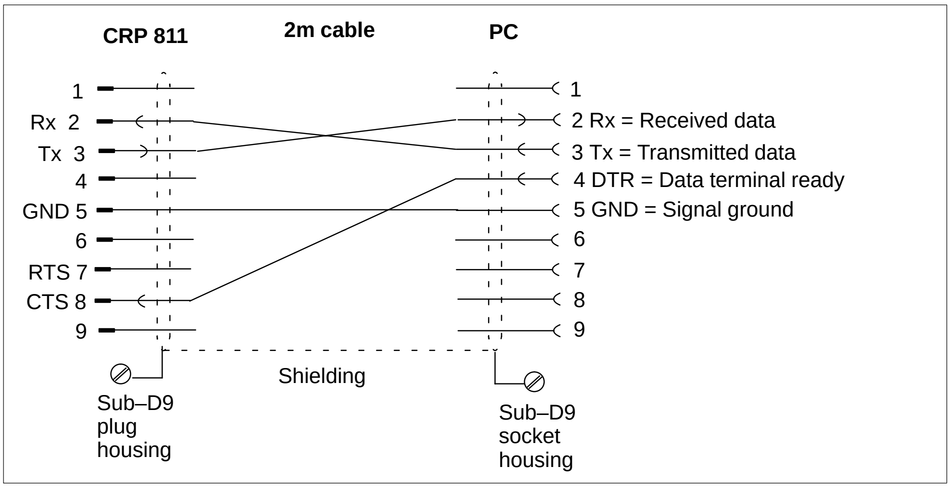


Pin	Signal	Function
2	D2 (RXD)	Received data
3	D1 (TXD)	Transmitted data
5	E2 (GND)	Signal ground
7	S2 (RTS)	Request to send
8	M2 (CTS)	Clear to send

● Pin occupied
○ Pin not occupied

Breite: 185 mm
Höhe: 230 mm

Figure 66 Example of a cable connecting PC and CRP 811



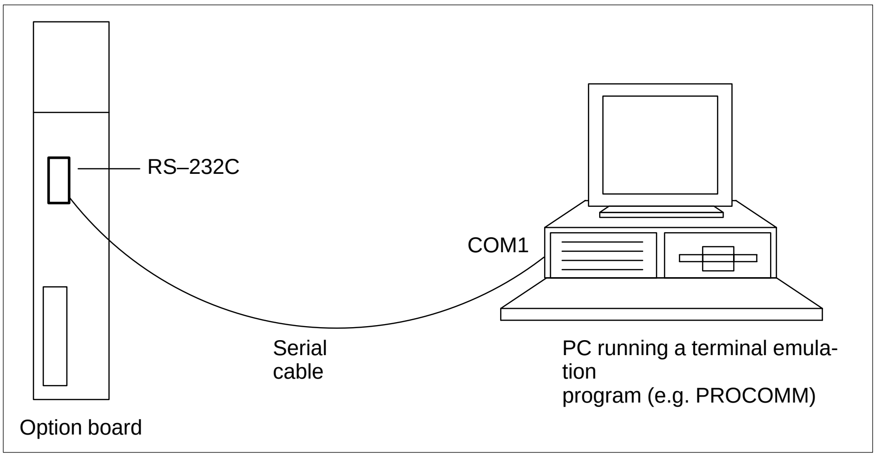
The CTS pin of the CRP 811 option board's diagnostic interface must receive a "high" signal over the cable connector from the terminal device before it can output data.

Default terminal connection settings:

- 19,200 bps
- 8 data bits
- 1 stop bit
- no parity

Remark
When a PC is employed as the terminal, a bps rate higher than the conventional 19,200 bps for a terminal may be used. This allows a much higher data rate to the PC and thus it's log file.

Figure 67 RS–232C interface connection



5.2.1 ## Output to Printer

The operator can toggle the RS–232C diagnostic interface between the menu system and normal print output mode from his terminal. The ”output to printer” mode is activated at power–up and whenever the menu system is left with the <CTRL>–<C> double–stroke.

The normal output in the ”output to printer” mode encompasses error report data as well as data output from the tasks according to their own task–specific debug mask. In expert mode these masks can be set/reset in the debug mask menu, the settings staying in effect until power–down.

5.2.2 ## Menu System

The menu system can be activated in the ”output to printer” mode directly from the keyboard (by pressing either carriage return or space), bringing up the main menu for function selection. The menu system can be left for the ”output to printer” mode with the <CTRL>–<C> double–stroke. The ”ESCAPE” key (Esc) cancels a given input or menu.

Main menus
The RS–232C diagnostic interface makes a distinction between the normal main menu and the expert mode main menu.
The normal main menu (active after power–up) is depicted in Figure 69, on page 157.
The expert mode main menu can be seen in Figure 70, on page 158.
All listed menu items are activated by pressing the letters shown surrounded by parenthesis.

Breite: 185 mm
Höhe: 230 mm

Error Report menu (e)
This submenu allows the user to view each task's error report ring buffers (refer to Figure 71, on page 158), even if the task's debug mask has disabled report output. If output is (once again) enabled by the debug mask, any error report output data will be automatically sent to the terminal handler task. If no terminal is connected to the RS–232C diagnostic interface, error report output data is not accepted into the task message queue. This data is still buffered in the reporting task's error report ring buffers, so that it can be displayed later (refer to Figure 72, on page 159).

DP Data menu (d)
The display of global CCMP information can be selected in this submenu. This information concerns every slave connected to this CCMP, and the data transferred to the PLC. Additional information can be found in Section 5.5 (page 150) and Figure 74 (page 160) ... Figure 82 (on page 164). The "s" submenu displaying slave data information shows I/O data as it appeared on the bus to/from the DP slaves. This format is not identical with the state RAM format!

Global Data menu (g)
This submenu presents the user with a host of information: CRP 811 firmware variant (in the screen's top line), PC Card (PCMCIA) firmware variant, global option board status, global heap base segment and size, print task ID and several print–related handles along with the max. number of error reports per task (refer to Figure 73 , on page 159). A supplemental menu screen is available which provides detailed information for each task – refer to the "Task Information" menu (i)" in this chapter. **The configured PROFIBUS data rate is presented for the user in the bottom line of the global data menu.**

Firmware Update menu (u)
This submenu (refer to Figure 84, on page 165) lets the user load the board's flash Eprom with new firmware images. Pay attention to the fact, that the board will remain in the flash load state forever, should no image be loaded from the PC's flash loader. The only possibility of canceling a firmware update (flash load request) once issued, is to toggle the board's power (refer to Figure 85, on page 165)!

Terminal Setup menu (t)
This submenu (refer to Figure 86 and Figure 87, on page 166) allows the user to change the bps rate of the board's RS–232C diagnostic interface for a PC acting as a "logging device" in "output to printer" mode. Port speed can be raised from 2.400 up to 115.000 bps.

Expert Mode menu (x)
This submenu can switch the menu system into the expert mode (refer to Figure 88, on page 167) – a mode which permits access to the following additional, specialized submenus. The user must enter a valid password to enable the expert mode (refer to Figure 89). This password has a value of ”ASADE 42” by default, but can be changed for the user’s convenience to a value of between 6 to 31 characters (refer to Figure 91... Figure 93, on page 168). The menu system only displays the additional, specialized submenus (refer to Figure 90, on page 168) after the expert mode has been successfully activated. An overview of the normally accessible submenus follows:

Table 20 Menu Overview

Selection letter	Menu
(d)	DP Data menu
(e)	Error Report menu
(g)	Global Data menu
(t)	Terminal Setup menu
(u)	Firmware Update menu
(x)	Expert Mode menu

The password is RAM–resident. Any new password entered by the user is only valid until the next board power–up. As an aid to the user, the Password menu displays a different message if a user–defined, or the original, default password is to be entered.
The expert mode is to be used solely for debug purposes by skilled ASA technicans, or by the customer when directly requested by ASA, to assist in the fault diagnosis of the board. It is only expected that the customer be acquainted with the details of the board’s normal main menu.

Board Reset menu (r)
This specialized submenu (refer to Figure 83, on page 164) is only accessable in expert mode, allowing the user to perform a board reset directly through the software. But be aware that this RESET only affects the connected option board and not the PLC host!

Memory Browser menu (b)
This specialized submenu (refer to Figure 94, on page 170) is only accessable in expert mode. The user is prompted for the start segment and offset values of the memory region to be displayed. The memory display starts at the given address; each line displaying the segment address and it’s contents (16 bytes) in both HEX and ASCII. A new start address can be entered after one page (256 bytes) has been output.

Task Information menu (i)
This specialized submenu is only accessable in expert mode. The user is presented a menu of individual board tasks (handlers) for which information screens are available (refer to Figure 97, on page 171). Menu items can be chosen to obtain detailed information for specific tasks. A typical output screen can be seen in Figure 98 (on page 172). Some tasks are introduced by further submenus. The screen output is always task–specific, usually including internal states and dynamic values over several screens.

Breite: 185 mm
Höhe: 230 mm

The DP submenus accessible here under (d), are the same as the submenus accessed via ’d’ in the main menu (DP Data menu).

Additional submenus only exist for the following tasks:

Table 21 Additional submenus

Selection Letter	Menu
(b)	back plane interface handler
(c)	configuration data handler
(d)	DP communication handler (only for DP)
(n)	network interface handler

–Back Plane Interface Handler menu
This submenu displays global information of the back plane handler, e.g. hook counters and other internal information. Additional information can be found in Section 5.6 (page 155) and Figure 104 (page 175) ... Figure 106 (on page 176).

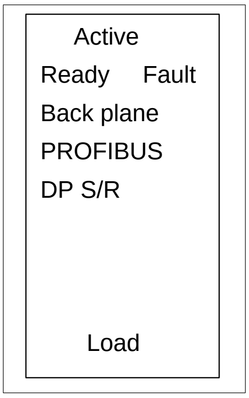
–Network Interface Handler menu
This submenu presents global information of the PC Card handler, e.g. send/receive counters and other internal information. Additional information can be found in Section 5.7 (page 156) and Figure 107 (page 176) ... Figure 108 (on page 177).

–Debug Mask menu (m)
This specialized submenu is only accessable in expert mode. It presents a further submenu to access the debug mask details of all board tasks. The user can also edit each task’s debug mask (refer to Figure 95 and Figure 96, on page 170). These changes are only valid until the next board power–up, when the default debug mask values will be restored again.

5.3 LED Diagnostics

7 diagnostic LEDs are provided on the option board’s front panel for on–line LED diagnosis.

Figure 68 CRP 811 option board status LEDs



- The Active, Ready, and Fault LEDs have the same standard meanings as for the Quantum I/O and option modules.
- The Active LED is used to indicate a firmware download in–progress from a PC to the option board.
- The Back plane, DP S/R, PROFIBUS, and Load LEDs all have two meanings: Either to show a transfer of PROFIBUS user and config data, or to indicate error/fault conditions from option board internal software moduls and tasks.

Meaning: Either to show a transfer of PROFIBUS user and config data, or to indicate error/fault conditions from option board internal software moduls and tasks.

The following basic blink frequencies and abbreviations have been defined to indicate the various LED block functions for the option boards:

- OFF: LED is off (dark)
- ON: LED is on
- SLOW flashing rate: 400 ms on/off
- MEDIUM flashing rate: 200 ms on/off
- FAST flashing rate: 100 ms on/off
- Fault code: A blink sequence ranging from 1 to 12 on/off states, followed by a pause. The blink sequence and pause are repeated every 6.4 sec.
- ODD blink: Repeated irregular blink sequence

Breite: 185 mm
Höhe: 230 mm

Table 22 LED state descriptions

LEDs	Color	Function
Active	green	ON: CPU is in operation and the back plane communication active Blinking: Flash ROM load operation is active
Ready	green	ON: Module in operating state
Fault	red	OFF: Error free operation ON: Other LEDs are flashing with a fault code
Back plane	green	OFF: Error free operation Flashing with a fault code: Back plane fault is set
PROFIBUS	green	OFF: Error free operation Flashing with a fault code: Erroneous configuration data or PROFI-BUS fault set
DP S/R	green	FAST flashing rate: Sending/receiving DP bus data MEDIUM flashing rate: Slave configuration SLOW flashing rate: Waiting for configuration data Flashing with a fault code: Erroneous configuration data set
Load	Yellow	Blinking: Configuration data load operation is active Flashing with a fault code: Load operation fault set

Caution
To reset the (red) Fault LED the CRP 811 must itself be powered–up/down through a back plane hot swap, or the PLC powered–up/down.

5.4 CDS Task Diagnostics

The meanings of the fault representations are listed in the following tables.

- CDS server LED blink codes
- CDS error reports
- Fault codes for CDS error reports
- PC card handler
- DP communication handler

The ”Load” LED is used exclusively by CDS to signal state and error conditions through the following blink codes:

Table 23 CDS server LED blink codes

LEDs	Meaning
Steady OFF	No task messages received / positive confirmation
Steady ON	Start–up. Still not registered with the system interface
SLOW flashing rate	CDS is initialized and waiting for messages
MEDIUM flashing rate	Loading configuration data from the PLC
FAST flashing rate	Loading task configuration data (CMI handler, CCMP, ICMP)
ODD blink	Error report incoming, when not signaled by blink codes 1 to 12
Blinking	Not used
Blink code 01	Error in PC Card configuration data
Blink code 02	Error in CCMP configuration data
Blink code 03	Error in ICMP configuration data
Blink code 04	Error in ICOM configuration data
Blink code 05	Fault in ”CDS_Handler_Received_Sent_Data” function
Blink code 06	Fault receiving/sending a task message
Blink code 07	Fault while loading configuration data from PLC to CDS
Blink code 08	Fault while loading configuration data from CDS to tasks (PC card, CCMP, ICMP, resp. ICOM)
Blink code 09	Wrong board type configured
Blink code 10	Fault in ”Handle_Service_Msg” function for the PC card, CCMP, ICMP, or ICOM subsystems
Blink code 11	Fault in ”Handle_Service_Msg” function for the back plane handler sub-system
Blink code 12	Fault in ”Handle_Service_Msg” function for the CDS subsystem

Breite: 185 mm
Höhe: 230 mm

In the ”Detail” element of the error report the CDS_State value is in the upper word and the sending subsystem in the lower. The line number of the error report call is in the ”Screen Line” element. The cause of error (e.g. service_class, subsystem, ...) is usually found in the ”Code” element. If the cause for an error report cannot be expressed by the blink codes 1 to 12, there will be an ”ODD” blink.

Table 24 CDS error reports

Message ID	Member code	Message ID meaning
3	Slot ID wanted	No configuration data found for this slot ID
9	Timer model	Wrong timer model received
102	Service class / service	Requested memory resources unavailable
103	Fault code	Fault while receiving a task message for CDS
104	Fault code	Fault while sending a task message from CDS
105	Message type	An invalid message type was received
106	Service	Unrecognized service received
107	Service class	Unrecognized service class was received
108	Received PLC state	Unrecognized PLC state received
109	Received connection type	Unrecognized connection type received
110	CDS state	Unrecognized CDS state encountered
111	Configuration load status	Fault while loading configuration data
112	Service class / service	PDU rejected as invalid
113	Service class / service	Invalid subsystem received
114	Invoke ID	Received message has invalid invoke ID
115	Fault code	Fault while loading configuration data from the PLC
116	PDU type	Invalid PDU type received
117	Fault code	Fault while sending an unconfirmed START service
118	Service class / service	Subsystem/task does not exist
119	Board type	Invalid board type configured

Table 25 Fault codes for CDS error reports

Fault code	Meaning of the ”Status” fault code in the table above
– 4101	No memory available or no response data attached
– 4103	No resources available / time–out at call of task message receive
– 4107	Time–out at call of task message receive
– 4109	Invalid PDU parameter
– 4112	Invalid timer message type
– 4118	Invalid message type received
– 4119	Invalid sending subsystem received
– 4300	Other initialization error while initializing CDS task
– 4303	Invalid service received and rejected
– 4307	Not supported
– 4401	Invalid PDU type received
– 4403	Invalid service received
– 4404	Invalid service class received
– 4406	Service rejected
– 5110	No entry in the extended configuration area for an option board
– 5801	Unrecognized CDS state
– 5802	Fault while loading configuration data for a task
– 5803	Invalid subsystem received
– 5804	New configuration request received from back plane handler
– 5805	Invalid board type configured
– 5806	Invalid invoke ID to a previous request received
– 5807	Fault while reading PLC data with hookout protocol

The CDS (configuration data handler) submenu is only accessible in expert mode from the Task Information menu. The following 5 submenus are presented:

Table 26 5 CDS submenus

Invoked by:	Menu item
(g)	Global data
(m)	Last sent message
(l)	Load information
(s)	Status notify events
(v)	Internal counters/values

Breite: 185 mm
Höhe: 230 mm

The following values are displayed in the ”global data” submenu:

- CDS internal task state
- Protocols supported by the option board (DP, FMS)
- Back plane slot ID where this CRP 811 is mounted
- Maximum number of bytes transferable in one request
- Type of the last hook from the PLC
- PLC status of the last hook from the PLC (global PLC state)
- Board status bitmap (also see screen 2 of the ”global data” submenu)

If the PLC_MEM_INFO function should return a valid status, a further submenu becomes available displaying PLC internal data (e.g. PageF address, number of 4X registers, ...). This information is only relevant for the board software developer.

In the ”last sent message” submenu the last message sent from the CDS is presented, including the data addresses and lengths to be read from the PLC, provided the message had a non–NULL data pointer.

The ”load information” submenu lists the data volumes sent to the PC card handler, CCMP, ICMP, and the ICOM. Information concerning the error context of the loaded data is also available. This error context encompasses the following context code as well as an error return value from the configuration data loading function.

Hereafter follow overviews regarding the significance of context codes for each task:

Table 27 PC card handler

Bit	Meaning
No bits set	Everything OK
Bit 0 set	Error from PROFIBUS_init() or cmi_init() call
Bit 1 set	Error from DP_Master_INIT() function call
Bit 2 set	Error in bus parameters
Bit 3 set	Error while activating the bus parameter call
Bit 4 set	Error from CRL Download_Init call
Bit 5 set	Error from CRL Load_Conf_Data call
Bit 6 set	Error from CRL Download_Terminate call

Table 28 DP data handler

Value	Meaning
0	Everything OK
1	Error outside the configuration data
2	Error returned from PLC_mem_info()
3	Error in the global DP configuration
4	Error in the slave part of the DP configuration

In the ”internal counters/values” submenu the following counters/values are displayed:

- Number of request PDUs to the back plane handler
- Number of request PDUs to the PC card handler
- Number of request PDUs to the DP data handler
- Number of positive response PDUs
- Number of negative response PDUs
- Error report counter
- Reconfiguration counter
- Number of power–up hooks since last reset

Breite: 185 mm
Höhe: 230 mm

5.5 CCMP Task Diagnostics

- CCMP manager LED blink codes
- DP communication handler error reports

The ”DP S/R” LED is used exclusively by CCMP to signal state and error conditions through the following blink codes:

Table 29 CCMP manager LED blink codes

LEDs	Meaning
Steady OFF	Reset (status: resetting). No task messages received (status: running).
Steady ON	Start–up. Still not registered with the system interface (status: initializing).
SLOW flashing rate	Waiting for configuration data (status: initializing, loading)
MEDIUM flashing rate	Downloading slave parameter sets (status: configuring slaves).
FAST flashing rate	Ready to run (status: stopped, synchronizing).
ODD blink	Not used
Blinking	Task message received (status: running).
Blink code 01	Unable to register error reporting service with OS
Blink code 02	Error during basic task initialization
Blink code 03	Memory allocation inactive while creating internal buffers and data management tables
Blink code 04	Global configuration data inconsistent
Blink code 05	Slave configuration data inconsistent (slave number: see error report)
Blink code 06	Slave parameter download service failed
Blink code 07	Time–out while waiting for slave parameter download confirmation
Blink code 08	Unable to set stack operating mode
Blink code 09	Unable to synchronize with back plane handler
Blink code 10	Unable to synchronize with PCMCIA handler
Blink code 11	Start command not allowed in current state
Blink code 12	Reserved for future use

The normal status blink feature can be turned on/off by setting/clearing the corresponding CCMP debug mask bits. Fault code blinking is not affected through debug mask settings. The same applies for the message flash feature in the running state.

The following table lists the message ID’s for CCMP error reports. Every error report has a unique message ID. For each message ID there is an explanation of the cause of error and additional information accessable through the ”Detail” element.

Table 30 DP communication handler error reports

Message ID	Explanation and detail codes. The 32–bit detail code may hold multiple segments of additional information, whose size is given in brackets.
	Standard error messages
0	No error. (Not used)
1	Unknown error. (Not used)
	Fatal initialization error messages
2	Illegal state in task state machine. Detail = DP service (8), DP service primitive (8), handler task state (16)
3	Did not get CDS task ID. Component not started? Detail = 0 (32)
4	Did not get profile handler task ID. Component not started? Detail = 0 (32)
5	Did not get back plane handler task ID. Component not started? Detail = 0 (32)
6	Did not get profile handler event flag group handle. Detail = 0 (32)
7	Did not get back plane handler event flag group handle. Detail = 0 (32)
8	Did not get communication message buffer handle. Buffer not created? Detail = 0 (32)
9	Did not get communication message buffer info. Buffer not created? Detail = 0 (32)
10	Out of memory. Detail = handler task state (16), service_class (8), service (8)
11	Out of memory while creating state RAM output data image buffer. Detail = max. back plane message size (16), image buffer number (16)
12	Out of memory while creating state RAM input data image buffer. Detail = max. back plane message size (16), image buffer number (16)
13	Out of memory while creating state RAM diagnostic data image buffer. Detail = max. back plane message size (16), image buffer number (16)
14	Out of memory while creating slave output data image buffer. Detail = slave_number (32)
15	Out of memory while creating slave input data image buffer. Detail = slave_number (32)
16	Out of memory while creating slave diagnostic data image buffer. Detail = slave_number (32)
17	Out of memory while creating slave output template buffer. Detail = slave_number (32)
18	Out of memory while creating slave input template buffer. Detail = slave_number (32)
19	Out of memory while creating slave diagnostic template buffer. Detail = slave_number (32)
20	Out of memory while creating slave parameter set buffer. Detail = slave_number (32)

Breite: 185 mm
Höhe: 230 mm

Table 30 DP communication handler error reports

Message ID	Explanation and detail codes. The 32–bit detail code may hold multiple segments of additional information, whose size is given in brackets.
	Task communication error messages
21	Did not get a task communication buffer. Detail = message buffer pool ID (32)
22	Error while receiving task message. Detail = message_type (32)
23	Error while sending task message. Detail = destination task ID (16), service_class (8), service (8)
24	Error while setting flag in flag group. Detail = destination task ID (16), flag group ID (16)
25	Invalid task message type Detail = message_type (32)
26	Invalid system task message Detail = command code (32)
27	Invalid service task message Detail = source subsystem/task ID (32)
28	Invalid service class. Detail = source subsystem/task ID (16), service_class (16)
29	Invalid service code. Detail = source subsystem/task ID (16), service_class (8), service (8)
30	Invalid PDU type. Detail = source subsystem/task ID (16), PDU type (16)
31	Unknown task message source entity. Detail = source subsystem/task ID (16), PDU type (16)
32	Destination entity of received task message not CCMP. Detail = source subsystem/task ID (16), destination task ID (16)
33	Service message rejected. Detail = destination task ID (16), service_class (8), service (8)
34	Service message not accepted after multiple send retries. Detail = destination task_ID (16), service_class (8), service (8)
	DP data and DP configuration error messages
35	Invalid slave ID. Detail = slave number (16), slave node ID (8), master node ID (8)
36	Invalid slave data DPM offset. Detail = slave number (16), offset (16)
37	Invalid slave data template. Detail = slave ID (16), template entry number (16)
38	CC data size too large for back plane transfer image. Detail = slave ID (16), template entry number (16)
39	Invalid or no PLC memory/state RAM information. Detail = health table segment (16), register segment (16)
	Task state and task configuration error messages
40	Not reset to accept a CDS InitLoad request. Detail = handler task state (16), service_class (8), service (8)
41	Require CDS InitLoad request at beginning of (re–)configuration. Detail = handler task state (16), service_class (8), service (8)

Table 30 DP communication handler error reports

Message ID	Explanation and detail codes. The 32–bit detail code may hold multiple segments of additional information, whose size is given in brackets.
42	Configuration data inconsistent Detail = handler task state (16), service_class (8), service (8)
43	Multiple configuration messages received from CDS. Detail = handler task state (16), service_class (8), service (8)
44	CDS TerminateLoad request received while not in loading state. Detail = handler task state (16), service_class (8), service (8)
45	CCMP not in configured/stopped state while receiving CDS Start request. Detail = handler task state (16), service_class (8), service (8)
	Global configuration data error messages
46	Not in range of configuration data buffer. Detail = 0 (32)
47	Invalid master network node ID. Detail = master node ID (32)
48	Invalid number of slave devices. Detail = number of slaves (32)
	DP slave configuration data error messages
49	Invalid slave output data DPM offset. Detail = slave number (16), DPM output data offset (16)
50	Invalid slave input data DPM offset. Detail = slave number (16), DPM input data offset (16)
51	Configured slave output data size too large (template). Detail = slave number (16), data size (16)
52	Configured slave input data size too large (template). Detail = slave number (16), data size (16)
53	Configured slave diagnostic data size too large (template). Detail = slave number (16), data size (16)
54	Configured slave output state RAM data size too large (template). Detail = slave number (16), data size (16)
55	Configured slave input state RAM data size too large (template). Detail = slave number (16), data size (16)
56	Configured slave diagnostic state RAM data size too large (template). Detail = slave number (16), data size (16)
57	Configured slave output bit offset too large. Detail = slave number (16), number of bits in 0xxxx area (16)
58	Configured slave input bit offset too large. Detail = slave number (16), number of bits in 1xxxx area (16)
59	Configured slave diagnostic bit offset too large. Detail = slave number (16), number of bits in 1xxxx area (16)
60	Configured slave output register offset too large. Detail = slave number (16), number of registers in 4xxxx area (16)
61	Configured slave input register offset too large. Detail = slave number (16), number of registers in 3xxxx area (16)
62	Configured slave diagnostic register offset too large. Detail = slave number (16), number of registers in 3xxxx area (16)
63	Configured slave parameter length too small. Detail = slave number (16), size of configured slave parameter set

Breite: 185 mm
Höhe: 230 mm

Table 30 DP communication handler error reports

Message ID	Explanation and detail codes. The 32–bit detail code may hold multiple segments of additional information, whose size is given in brackets.
	Profile download and service error messages
64	Invalid PDU size in PDU from profile. Detail = DP service (16), DP primitive (16)
65	Invalid service code in PDU from profile. Detail = DP service (16), DP primitive (16)
66	Invalid service primitive in PDU from profile. Detail = DP service (16), DP primitive (16)
67	Unexpected service PDU from profile. Detail = DP service (16), DP primitive (16)
68	Service request to profile failed. Detail = DP service (8), DP primitive/on download: slave number (8), response status code (16)
69	Time–out while waiting for service confirmation from profile. Detail = handler task state (16), DP service (8), slave number/operating mode (8)
70	No handling of unexpected profile messages in current state. Detail = DP service (8), DP primitive (8), handler task state (16)
71	Invalid profile operating mode specified. Detail = DP profile operating mode (32)
72	Unable to set required profile stack operating mode. Detail = profile response status (16), required operating mode (16)
	Task synchronization error messages
73	Unable to send synchronization messages to profile handler. Detail = 0 (32)
74	Unable to send synchronization messages to back plane handler. Detail = 0 (32)
75	Communication message buffers too small for DP parameter download. Detail = message buffer pool ID (32)
76	Invalid PLC status in notification from back plane handler. Detail = PLC status code (32)
77	Time–out while waiting for output scans. CPU failure? Detail = configured time–out value (32)

5.6 Back Plane Handler Task Diagnostics

This specialized submenu is only accessable in expert mode. The back plane submenu offers two menu items. The first item displays 2 screens of global data, the first as follows:

- Board module ID (e.g. 0x0400 for DP)
- Back plane handler state

Table 31 Back plane handler status

Value	Meaning
0	Back plane handler inactive
1	Back plane handler waiting for configuration data
2	Back plane handler configuring DP master
3	Back plane handler error while configuring DP master
4	Back plane handler is active

- Time–out counter (reserved : 0 as default)
- Time–out on wait counter (reserved : 0 as default)
- Hook delay time (reserved : 0 as default)

- Maximum time for DP hook
- Last time for DP hook
- Maximum time for configuration hook
- Last time for configuration hook

Time values are in microseconds.

The second screen displays counters for the various hook types, divided into the hooks received while the PLC is in ”stopped” state, and those from the ”running” state. Only hooks which are used by the board have these separate counters. All others have a single, general counter.

The second menu item clears the back plane handler counters.

Breite: 185 mm
Höhe: 230 mm

5.7 PC Card Handler Task Diagnostics

This specialized submenu is only accessable in expert mode. The first menu item in the PC card handler menu displays it’s global data. If interrogation of the PC card returns a valid version, the version string will be shown. Otherwise only the following counters will be displayed:

Table 32 PC card handler counters

Counter type	Meaning
Time–out counter	How many time–outs has the PC card detected?
Diagnostics counter	How many diagnostics messages were received?
DP data output counter	How many messages were sent to the PC card for DP output?
DP data input counter	How many messages has the PC card received over the DP input?
Sent messages counter	How many messages were sent to the PC card?
Received messages co-unter	How many messages has the PC card received?

The second menu item clears the PC card handler counters.

5.8 Textboxes for Terminal Menu Handler

Figure 69 Output normal Main Menu after power up

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                          Main Menu
                          ---------



             Select one of the following options:

                  (d)  DP Data Menu
                  (e)  Error Report Menu
                  (g)  Global Data Menu
                  (t)  Terminal Setup Menu
                  (u)  Firmware Update Menu
                  (x)  Expert Mode Menu



  Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```

☞ **Note**
The top line each textbox shows the current firmware version of CRP 811.
This Main Menu is starting at Version 4.10D

Breite: 185 mm
Höhe: 230 mm

Figure 70 Output Main Menu for Expert Mode, selected with submenu (x) in Figure 69

```
Quantum CRP 811 V4_10D,       Schneider Automation, 1999

                    Main Menu (Expert Mode)
                    -----------------------



              Select one of the following options:

                   (b)  Memory Browser Menu
                   (d)  DP Data Menu
                   (e)  Error Report Menu
                   (g)  Global Data Menu
                   (i)  Task Information Menu
                   (m)  Debug Mask Menu
                   (r)  Board Reset Menu
                   (t)  Terminal Setup Menu
                   (u)  Firmware Update Menu
                   (x)  Expert Mode Menu


  Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 71 Menu for viewing Error Reports from Task Circular Buffer, selected with submenu (e) in Figure 69 or Figure 70

```
Quantum CRP 811 V4_10D,       Schneider Automation, 1999

                     Error Report Menu
                     -----------------

The number of buffered report entries per task is given in brackets.


                 Select one of the following tasks:

              (b)  backplane interface handler (00)
              (c)  configuration data handler  (00)
              (d)  DP communication handler    (00)
              (f)  FMS communication handler   (00)
              (m)  terminal menu handler       (00)
              (n)  network interface handler   (00)
              (o)  system object handler       (00)
              (s)  system timer handler        (00)
              (t)  terminal interface handler  (00)


  Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 72 Output of an Error Report Entry,

selected with submenu (e) in Figure 69 or Figure 70

```
 Quantum CRP 811 V4_10D,       Schneider Automation, 1999

                      Error Report Menu
                      -----------------

The DP communication handler (Ver.00.100a) was created at Mar18 1996
            It was started at system startup + 00:00:00,00.
                Its error report buffer holds 1 reports.

        Error report number 1 from the DP communication handler:

                     time of creation : 00:00:16,27
                     module name      : CCMP.C
                     source line      : 348
                     error code       : –4107
                     error detail     : 0003E700h
                     error message ID : 69
                     caller           : 0792:07C5



   Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 73 Output of global data of the board,

selected with submenu (e) in Figure 69 or Figure 70

```
  Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                        Global Data Menu
                        ----------------

         build date                         : Mar 18 1996
         build time                         :    14:13:47
         PC Card firmware version           :        5.01
         PC Card firmware build date        :  25.01.1996
         global option board status         :       003Ch
         global heap base segment           :       0845h
         global heap size (bytes)           :      228272
         largest free block on global heap  :      141936
         print task ID                      :       F607h
         print flag group handle            :       0502h
         print buffer pool handle           :       0601h
         task message buffer pool handle    :       0602h
         maximum task message buffers       :          30
         task message buffers used          :           1
         max. error reports per task        :          16
         Profibus data rate                      12MBit/s

    Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```


Breite: 185 mm
Höhe: 230 mm

Figure 74 Submenu for selection of DP data, selected with main menu (d) in Figure 69 or Figure 70

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                         DP Data Menu
                         ------------

             This task controls all DP data mapping.



               Choose one of the following options:

                 (h)  DP handler task information
                 (s)  DP slave information
                 (m)  DP slave diagnostic (manual)
                 (c)  DP slave diagnostic (cyclic)
                 (o)  DP slave diagnostic (overview)
                 (t)  DP slave diagnostic (statistic)



             Press <CR> to accept, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 75 Ouput of global DP data, selected with submenu (h) in Figure 74

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                         DP Data Menu
                         ------------
          global state                    :         12
          profile startup enabled         :          1
          profile stack operating mode    :        C0h
          output data transfer enabled    :          0
          output transfers since startup  :          0
          input transfers since startup   :       3895
          configuration error code        :          0
          configuration error context code :         0
          PROFIBUS master node ID         :          1
          PROFIBUS master PNO identifier  :      B204h
          number of slaves configured     :         25

          slave status bit table (1=active, 0=inactive)
1111111111111111 1111111110000000 0000000000000000 0000000000000000
0000000000000000 0000000000000000 0000000000000000 0000000000000000


  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 76 Information for a configured slave, selected with submenu (s) in Figure 74

```
 Quantum CRP 811 V4_10D,        Schneider Automation, 1999

         Information for DP Slave  2: (RUNNING)
        ----------------------------------------------

      output discretes area              : 0xxxx–0xxxx
      input discretes area               : 10065–10080
      diagnostics discretes area         : 1xxxx–1xxxx
      output registers area              : 4xxxx–4xxxx
      input registers area               : 3xxxx–3xxxx
      diagnostics registers area         : 30410–30422
      DP parameter data size             :          14
      PNO identifier                     :       1344h
      diagnostics data byte #1           :   00000000b
      diagnostics data byte #2           :   00001100b
      diagnostics data byte #3           :   00000000b
      diagnostics data byte #4 (master)    :         1
      diagnostics data byte #5/6 (vendor) :      1344h
      station not reachable count        :           0
      station not ready count            :           0
      invalid response count             :           0
      input register for life sign       :      300013

   Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 77 Actual output values of a configured slave, selected with submenu (s) in Figure 74

```
 Quantum CRP 811 V4_10D,       Schneider Automation, 1999

                          DP Data Menu
                          ------------

         DP output data of DP slave 2:



         No DP output data defined for this slave.



   Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```


Breite: 185 mm
Höhe: 230 mm

Figure 78 Actual input values of a configured slave, selected with submenu (s) in Figure 74

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                         DP Data Menu
                         ------------

          DP input data of DP slave 2:

00h 00h











  Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 79 DP slave diagnosis with manual update, selected with submenu (m) in Figure 74

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                         DP Data Menu
                         ------------

          Diacnostic for DP slave 2 (Slave is running):

Byte #1   Byte #2   Byte #3    Byte #4 (Master)   Byte #5/6 (vendor)
00000000b  00001100b  00000000b          1          1354h


           Diagnostic bytes #1 to #13 in Hexa Decimal

   00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19
0  –– 00 0C 00 01 13 54 07 00 00 00 00 00 00




  Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 80 DP slave diagnosis with automatic update after change of diagnosis data, selected with submenu (c) in Figure 74

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                         DP Data Menu
                         ------------

             Diacnostic for DP slave 2 (Slave is running):

Byte #1   Byte #2   Byte #3    Byte #4 (Master)   Byte #5/6 (vendor)
00000000b  00001100b  00000000b         1          1354h


              Diagnostic bytes #1 to #13 in Hexa Decimal

   00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19
0  -- 00 0C 00 01 13 54 07 00 00 00 00 00 00




  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 81 Overview DP slave diagnosis with manual update, selected with submenu (o) in Figure 74

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                         DP Data Menu
                         ------------

                     DP diagnostic overview

R: Slave is running, ?: Slave is not running,C: No Diagnostic avail
                                                able
P: Slave is passive

addr\offs  00 01 02 03 04 05 06 07 08 09
      0                                R
     10    R     R  R






  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```


Breite: 185 mm
Höhe: 230 mm

Figure 82 DP slave diagnosis statistic with manual update by keystroke, selected with submenu (t) in Figure 74

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                        DP Data Menu
                        ------------

                    DP diagnostic statistic



addr\offs  00  01  02  03  04  05  06  07  08  09
      0                                       003
     10  003      003 003










  Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 83 Software RESET of CRP boards, selected with main menu (r) in Figure 70

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                     Board Reset Menu
                     ----------------

    The board will be completely reset to power up state.

All parameters that have been changed using the diagnostics terminal
(e.g. baud rate settings, debug masks) will be reset to default
state.



             Choose one of the following options:

          (a)  abort action and resume in normal mode
          (r)  reset and re–initialize board




  Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 84 Activities of flashloader, selected with main menu (u) in Figure 69 or Figure 70

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                     Firmware Update Menu
                     --------------------


    The board will be switched to firmware download mode. Having
finished the download successfully, the new firmware will be started.
The parameters of the serial interface will be reset to default.

In case of a download failure or user abort it may be necessary to
restart the board with a power down / power up to resume normal
operation.

               Choose one of the following options:

           (a)  abort action and resume in normal mode
           (e)  enter firmware download mode



  Press <CR> to accept, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 85 Message after activating the flashloader, selected with main menu (e) in Figure 84

```
Quantum CRP 811 V4_10D,         Schneider Automation, 1999

                    Firmware Upgrade Menu
                    ---------------------



     Ready to perform firmware download. Keyboard input
will not be accepted until this operation has been finished.

  To cancel this operation turn power off and then on again.
```


Breite: 185 mm
Höhe: 230 mm

Figure 86 Output of the terminal settings after Power Up, selected with main menu (t) in Figure 69 or Figure 70

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                     Terminal Setup Menu
                     -------------------

          Default Settings for Diagnostics Terminal

       serial interface  : r=19200, p=off, d=8, s=1
        cursor home       : ESC+H or CTRL+^ / CHR (30)
        cursor up         : ESC+A or CTRL+K / CHR (11)
        cursor down       : ESC+B or CTRL+J / CHR (10)
        cursor right      : ESC+C or CTRL+L / CHR (12)
        cursor left       : ESC+D or CTRL+H / CHR (8)
        toggle ins/overw  : TAB
        confirm selection : CR
        cancel action     : ESC
        enter menu mode   : CR or SPACE
        exit menu mode    : CTRL+C



  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 87 Selection of a different baudrate, selcted with <CR> in Figure 86

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                     Terminal Setup Menu
                     -------------------

The parameters of the serial I/F will be set before return to the
main menu.

                   Choose one of the following options:

          (0)  19200 Baud, 8 data bits, 1 stop bit, no parity
          (1)  14400 Baud, 8 data bits, 1 stop bit, no parity
          (2)   9600 Baud, 8 data bits, 1 stop bit, no parity
          (3)   4800 Baud, 8 data bits, 1 stop bit, no parity
          (4)   2400 Baud, 8 data bits, 1 stop bit, no parity
          (5)   1200 Baud, 8 data bits, 1 stop bit, no parity
          (6)   9600 Baud, 7 data bits, 1 stop bit, even parity
          (7)   2400 Baud, 7 data bits, 1 stop bit, even parity
          (8)  38400 Baud, 8 data bits, 1 stop bit, no parity
          (9) 115200 Baud, 8 data bits, 1 stop bit, no parity

  Press <CR> to accept, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 88 Menu for the Expert Mode available also in normal mode, selected with submenu (x) in Figure 69

```
   Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                           Expert Mode Menu
                           ----------------




                  Select one of the following options:

                         (e)  enter password




     Press <CR> to accept, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 89 Input of the password to enter ”Expert Mode”, selected with submenu (x) in Figure 88

```
  Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                        Password Menu
                        -------------

               The default password is active.







            Enter password:
```


Breite: 185 mm
Höhe: 230 mm

Figure 90 Menu for Expert Mode in Expert Mode, selected with submenu (x) in Figure 70

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                       Expert Mode Menu
                       ----------------




              Select one of the following options:

                     (e)  enter password
                     (s)  set new password
                     (x)  exit expert mode



  Press <CR> to accept, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 91 Input of a (new) customer password, selected with submenu (s) in Figure 90

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                       Password Setup Menu
                       -------------------









                Enter new password:  ********
```

Figure 92 Reenter new password once again, selected with submenu (s) in Figure 90

```
 Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                     Password Setup Menu
                     -------------------














                     Enter new password: ********
```

Figure 93 Do you want to save the new password in RAM?, selected with submenu (s) in Figure 90

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                    Password Setup Menu
                    -------------------


                 Your new password is valid.

      Do you want to save the new password permanently?
If you enter ’w’, your new password will be written to memory
            and the option board will be reset.
DP communication will be disabled during the time needed to restart
the board.


             Select one of the following options:

             (n)  do not write password to memory
             (w)  write password to memory


  Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```


Breite: 185 mm
Höhe: 230 mm

Figure 94 Memory Browser Menu, selected with submenu (b) in Figure 70

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999
                     Memory Browser Menu
                     -------------------
addr\offs|00010203 04 05 06 07 08 29 0A 0B 0C0D0E0F|0123456789ABCDEF
---------+----------------------------------------+----------------
FD00:0000|FAFCEB5C 90 00 00 00 00 00 00 00 00000000|...\............
FD00:0010|4153415F 44 45 55 54 53 43 48 4C 414E445F|ASA_DEUTSCHLAND_
FD00:0020|4C4F4144 45 52 5F 4E 4F 50 39 31 315F5F5F|LOADER_NOP911___
FD00:0030|50524F54 4F 54 59 50 45 5F 5F 5F 5F5F5F5F|PROTOTYPE_______
FD00:0040|5645522E 5F 54 30 30 30 30 30 30 2E30325F|VER._T000000.02_
FD00:0050|32302E31 31 2E 31 39 39 35 5F 5F 5F5F5F5F|20.11.1995______
FD00:0060|B810008E D8 8E D0 F8 B8 14 00 2D 1000BB10|..........–....
FD00:0070|00F7E305 BE 02 8B E0 B8 4C 00 BB 40004B2B|.........L..@.K+
FD00:0080|C3B103D3 E0 8B C8 E3 13 B8 48 FE 408ED8BE|..........H.@...
FD00:0090|0000B840 00 8E C0 BF 00 00 F3 A5 B88100BB|...@............
FD00:00A0|4D00432B C3 B1 03 D3 E0 8B C8 E3 0A8EC3BF|M.C+............
FD00:00B0|0000B800 00 F3 AB B8 1A 0C BB 5A 0B2BC3B1|...........Z.+..
FD00:00C0|01D3E88B C8 E3 11 8C C8 8E D8 BE 5A0BB800|............Z...
FD00:00D0|008EC0BF 00 00 F3 A5 B8 10 00 8E D8B81000|................
FD00:00E0|8ED88ED0 F8 B8 14 00 2D 10 00 BB 1000F7E3|........–.......
FD00:00F0|05BE028B E0 E9 38 00 F4 00 E8 C3 09B0FFA2|......8.........

        Enter address to continue dump from: FD00:010
```

Figure 95 Menu for viewing and changing the debug masks of all tasks, selected with submenu (b) in Figure 70

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                       Debug Mask Menu
                       ---------------


      The current debug mask value is given in brackets.

              Select one of the following tasks:

         (b)  backplane interface handler (00000A01h)
         (c)  configuration data handler  (00001201h)
         (d)  DP communication handler    (00001A01h)
         (f)  FMS communication handler   (00000A01h)
         (m)  terminal menu handler       (00000A01h)
         (n)  network interface handler   (00000A01h)
         (o)  system object handler       (00000201h)
         (s)  system timer handler        (00000201h)
         (t)  terminal interface handler  (00000A01h)


  Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 96 Menu for setting/ resetting each bit in the debug mask of a given task, selected with <CR> in Figure 95

```
 Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                       Debug Mask Menu
                       ---------------

Debug mask for the configuration data handler (select bit to change)

         XXXXXXXXh (xxxxxxxxxxxxxxxxAaflibphSsRrTtEe)
         00001201h (00000000000000000001001000000001)

     (a/A) additional debug support output
     (b)   beep when displaying critical messages
     (e/E) display error reports in short/long format
     (f)   enable LED flash mode during message/data transfers
     (h)   display buffer headers when sending/receiving
     (i)   display initialization status messages
     (l)   enable LED task state blink codes
     (p)   display task printouts (needed for the following)
     (r/R) display received task messages in short/long format
     (s/S) display task messages in short/long format before send
     (t/T) display timer messages in short/long format

   Press <CR> to accept, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 97 Menu for selecting the internal task for which display of internal data is requested, selected with submenu (i) in Figure 70

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                   Task Information Menu
                    ---------------------



              Select one of the following_tasks:

               (b)  backplane interface handler
               (c)  configuration data handler
               (d)  DP communication handler
               (m)  terminal menu handler
               (n)  network interface handler
               (o)  system object handler
               (s)  system timer handler
               (t)  terminal interface handler



  Press <CR> to accept, <ESC> to cancel, <CTRL-C> to quit:
```


Breite: 185 mm
Höhe: 230 mm

Figure 98 Submenu for the Backplane Interface Handler, selected with submenu (b) in Figure 97

```
 Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                    Task Information Menu
                    ---------------------

  System task information of the backplane interface handler:
             version                : 0.001a
             date of creation       : Mar 18 1996
             task ID                : FC02h
             status                 : 0
             priority               : 50
             debug mask             : 00000A01h
             stack base             : 3476h
             stack size             : 2048
             stack used             : 382
             local heap base        : 0000h
             local heap size        : 0
             local heap free        : 0
             message queue size     : 32
             message queue used     : 0
             CPU usage hh:mm:ss,ddd : 00:00:43,117

   Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 99 Output for global Information of the CDS, selected with submenu (c) in Figure 97

```
 Quantum CRP 811 V4_10D,        Schneider Automation, 1999

            Configuration Data Handler Global Data
            --------------------------------------



                   internal task state:   0

              protocol(s) supported   :      DP
              backplane slot ID       :      10
              max. DPM transfer size  :    2510
              last hook type          :     01h
              global PLC state        :     20h
              board status bit mask   :    0000


                 PLC memory info is valid



   Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 100 Output of the last sent message from the CDS, selected with submenu (c) in Figure 97

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

         Configuration Data Handler Last Sent Message
         -------------------------------------------

                 sending subsystem   :    247
                 destination task ID :  FB05h
                 message type        :      5
                 send count          :      1
                 service class       :      2
                 service             :      5
                 PDU type            :      3
                 service specific    :    251
                 status              :      0
                 invoke ID           :     19
                 data length         :      0




  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 101 Output of the state of the configuration data load, selected with submenu (c) in Figure 97

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

         Configuration Data Handler Load Information
         ------------------------------------------


            PC Card data length      :         138
            PC Card error detail     :     0/0000h


            DP handler data length   :        1894
            DP handler error detail  :     0/0000h






  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```


Breite: 185 mm
Höhe: 230 mm

Figure 102 Output of ringbuffer for status notify requests, selected with submenu (c) in Figure 97

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

       Configuration Data Handler Status Notify Events
       ----------------------------------------------

     hook type                :  Reconfiguration    (FF)
     controller state         :  reconfiguring      (FF)
     time of request in msec  :                     0 ms

     hook type                :  Power Up           ( 1)
     controller state         :  stopped            (20)
     time of request in msec  :                     0 ms








  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 103 Output of the internal counters and variables of the CDS, selected with submenu (c) in Figure 97

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

     Configuration Data Handler Internal Counters/Values
     ---------------------------------------------------

      request PDUs to backplane handler      :         9
      request PDUs to PC Card handler        :         5
      request PDUs to DP data handler        :         5
      request PDUs to FMS data handler       :         0

      positive response PDUs                 :        14
      negative response PDUs                 :         0

      error report counter                   :         0
      reconfiguration counter                :         1
      Power UP hooks since last reset        :         1





  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 104 Menu for Backplane Handler global data, selected with <CR> in Figure 98

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                    Backplane Handler Menu
                    ----------------------

       This task performs all backplane data transfer.



             Choose one of the following options:

                     (g)  global data
                     (r)  reset counters






  Press <CR> to accept, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 105 Global data of Backplane Handler, selected with submenu (g) in Figure 104

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

               Backplane Handler Internal Data
               -------------------------------

           module ID                  :       0400h
           handler state              :           4
           timeout counter            :           0
           timeout on wait            :           0

           hook delay                 :           0

           max. time for DP/FMS hook :        4380
           last time for DP/FMS hook :        2860

           max. time for config hook :       36000
           last time for config hook :       36000



  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```


Breite: 185 mm
Höhe: 230 mm

Figure 106 Number of hooks from PLC, selected with <ESC> in Figure 105

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

               Backplane Handler Internal Data
               -------------------------------

                 PLC in STOPPED state
       Powerup hook counter               :          1
       Exit Dim Awareness hook counter    :          1
       End of Scan hook counter           :      10930
       Dummy End of Scan hook counter     :          0
       Port 3 Preprocessing hook counter :          0
       User Logic hook counter            :          0
       other hooks counter                :      10932
                  PLC in RUNNING state
       Powerup hook counter               :          0
       Exit Dim Awareness hook counter    :          0
       End of Scan hook counter           :          0
       Dummy End of Scan hook counter     :          0
       Port 3 Preprocessing hook counter :          0
       User Logic hook counter            :          0
       other hooks counter                :          0
  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 107 Menu for PC Card Handler global data, selected with <CR> in Figure 98

```
Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                     PC Card Handler Menu
                     --------------------

        This task performs all PC Card data transfer.



             Choose one of the following options:

                     (g)  global data
                     (r)  reset counters





  Press <CR> to accept, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 108 Counter values for PC Card Handler, selected with submenu (g) in Figure 107

```
 Quantum CRP 811 V4_10D,        Schneider Automation, 1999

                     PC Card Handler Menu
                     --------------------


PC Card ident string: @(#1) PROFIcard PBFW_DP.SBN V5.01  25.01.1996


          timeout counter            :            0

          diagnostics counter        :           33

          DP data output counter     :       371616
          DP data input counter      :       403960

          sent messages counter      :           66
          received messages counter  :           69



   Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```


Breite: 185 mm
Höhe: 230 mm

Module Description Appendices

The supplemental information included here is not absolutely necessary for document comprehension.

The following module descriptions are contained in this appendix:

–140 CRP 811 00
–AS–BDA–203
–Make use of the corresponding manuals for Momentum and TIO.

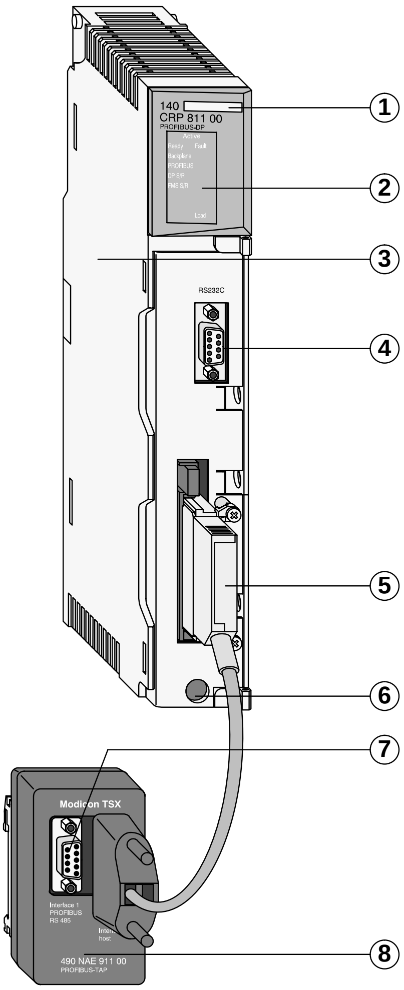
Breite: 185 mm
Höhe: 230 mm

1 140 CRP 811 Communication Module PROFIBUS–DP

140 CRP 811 00 link TSX Quantum devices to the PROFIBUS–DP as per DIN 19 245 Parts 1 and 3 (EN 50170).

Module type	max. 32 PROFIBUS–DP Nodes per Bus
Supply	5 VDC, max. 1.2 A

Breite: 178 mm
Höhe: 216 mm



Module Elements:

1. Color code
2. LED Status Display
3. Quantum Module 140 CRP 811 00
4. RS–232C Port
5. PCMCIA Card (467 NHP 811)
6. Module Mounting Screws
7. PROFIBUS RS–485 Port
8. Transmission Access Point, 490 NAE 911

1.1 Features and Function

The communication module serve ar the connecting linkage between the CPU and external PROFIBUS nodes.

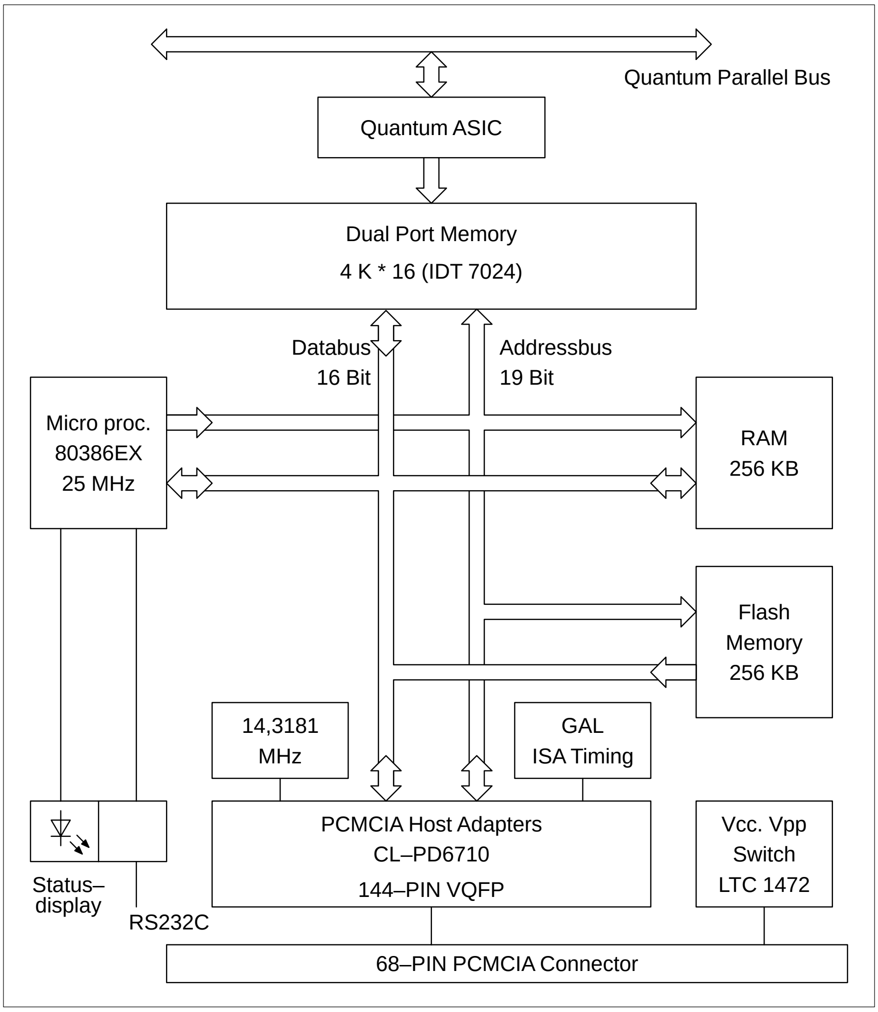


Figure 1 Functional Block Diagram of the Quantum Module

Breite: 178 mm
Höhe: 216 mm

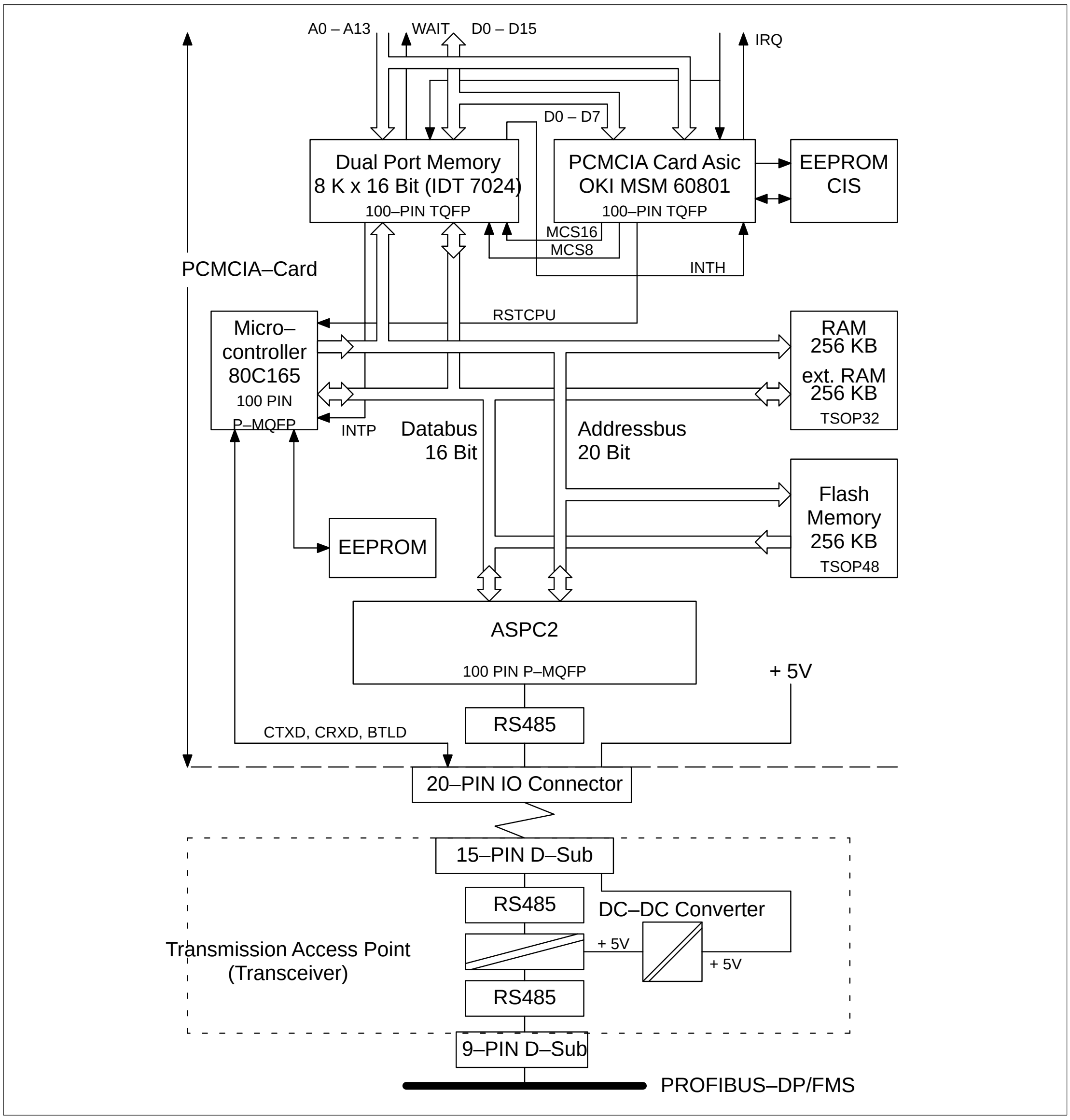


Figure 2 Functional Block Diagram of the PCMCIA Card + the Transmission Access Point

To Figure 1 :
The architecture of the module is based upon an 80386EX microprocessor coupled with a Quantum parallel bus and PCMCIA interface card (PCMCIA PC Card Standard, Release 2.01).
The communications module sends and receives data from the Quantum bus through the dual port ram interface.
The firmware which manages the data exchange between the PCMCIA interface card and the CPU is resident within the flash rom.

To Figure 2 :
The PCMCIA card defines the complete interface with the PROFIBUS.
The conversion into the RS–485 standard connection is made by the transceiver (Transmission Access Point).
The PCMCIA card is executed as a Type III and finds use in both communications modules, CRP 811 and NOP 911.
The PCMCIA card is based on the 80C165 microcontroller and PROFIBUS ASIC APSC2. The ASPC2 performs all the tasks related to Layer 2 of the PROFIBUS (corresponding to Layer 2 of the ISO–OSI reference model). The remaining layers are processed with the help of the 80C165 running the protocol software resident in flash rom.

Breite: 178 mm
Höhe: 216 mm

1.1.1 Configuration

You must configure:

Mounting Slot in the Subrack
Install the module into any free I/O slot within the TSX Quantum primary subrack. The individual installation steps should proceed as shown in the accompanying user information.

PROFIBUS RS–485 Port
The PROFIBUS port utilizes varied Sub–D9 plug connectors 490 NAD 911 02. The individual connection steps should proceed as shown in the accompanying user manual.

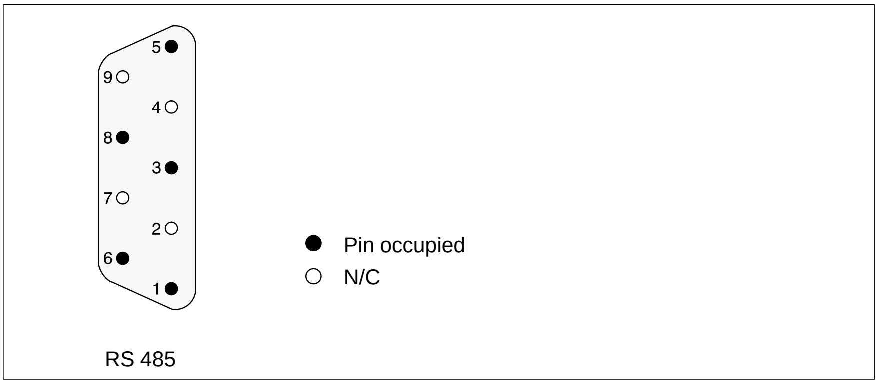


Figure 3 PROFIBUS Port Diagram

Pin	Signal	Function
1	SHIELD	Shield, Protective Ground
3	RxD/TxD–P	Receive/Transmit–Data–P (+)
5	DGND	5 V Signal Ground
6	VP	Positive Supply (+5V)
8	RxD/TxD–N	Receive/Transmit–Data–N (–)

RS–232C Port
For diagnosis connect the PC to the RS–232C (Sub–D9) port socket.
This requires one of the following cable configurations:

- Serial cable YDL 052 (cable exits up)
- Serial cable YDL 054 (cable exits down)

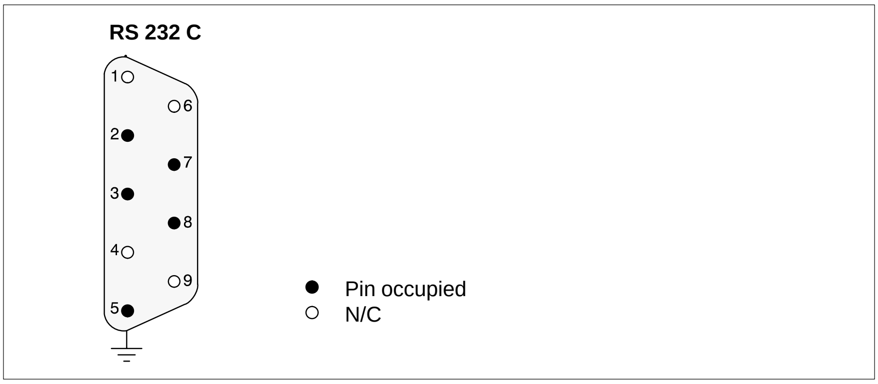


Figure 4 RS–232C Port Diagram

Socket	Signal	Function
2	D2 (RXD)	Received Data
3	D1 (TXD)	Transmitted Data
5	E2 (GND)	Signal Ground
7	S2 (RTS)	Request to Send
8	M2 (CTS)	Clear to Send

Breite: 178 mm
Höhe: 216 mm

1.1.2 Diagnosis

The module contain the following LED status display:

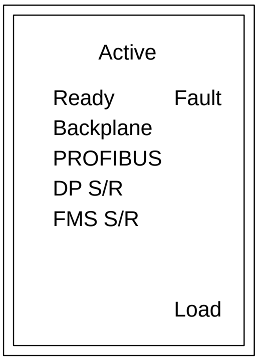


Figure 5 Status LEDs of the CRP 811

LEDs	**Color**	**Function**
Active	Green	On: CPU is in ”Run” mode and the backplane communication active Flashing: The flash rom load operation is active
Ready	Green	On: Module in operation
Fault	Red	Off: Error free operation On: Other LEDs are flashing with fault code
Backplane	Green	Off: Error free operation Flashing with fault code: on backplane fault
PROFIBUS	Green	Off: Error free operation Flashing with fault code: on erroneous configuration data or PROFIBUS fault
DP S/R	Green	Fast flashing frequency: Sending/Receiving DP bus data Medium flashing frequency: Configuration Slaves Slow flashing frequency: Waiting for configuration data Flashing with fault code: on erroneous configuration data
FMS S/R	Green	not used
Load	Yellow	Flashing: Configuration data load operation active Flashing with fault code: on load operation fault

Diagnosis through the RS–232C serial port
Required serial port presets:

- Baud rate: 19.2 kBaud
- 8 Databits
- 1 Stopbit
- Parity: off

Table 33 Main menu functions callable over the RS–232C port:

Name	Function
(d) DP Data Menu	View PROFIBUS–DP data (CRP 811)
(e) Error Report Menu	View error output
(g) Global Data Menu	View global data / Status
(t) Terminal Setup Menu	RS–232C port settings
(u) Firmware Update Menu	Update CRP 811 firmware
(x) Expert Mode Menu	Extended and password protected expert mode menu

Breite: 178 mm
Höhe: 216 mm

1.1.3 Technical Specifications

Communication Module CRP 811

Assignment	
Device	TSX Quantum at Concept Version 2.2 or higher
Module Area	I/O area of the primary subrack
Compatible CPU Modules	140 CPU 113 02 (8 K),140 CPU 113 03 (16 K) 140 CPU 213 04 (32 K), 140 CPU 424 02 (64 K), 140 CPU 434 12 (64 K), 140 CPU 534 14 (64 K)
Number CRP per Quantum	2 mit CPU 113, CPU 213 6 mit CPU 424, CPU 434, CPU 534 *) No Quantum Hot Stand By
Updating of time with 32 slaves (for every 16 bit inputs, 16 bit outputs)	4 ms with CPU 424 at 12 M Bit/s
Necessary Configuration Tools for Concept	TLX L FBC M (Eng./Germ.) PROFIBUS–DP configuration tool SyCon
PNO–Ident–No.	5506
Device Data Base (DDB)	ASA_5506.GSD
Supply Voltage	
over the Internal I/O Bus	5 VDC, max. 1.2 A
Data Interface	
PROFIBUS	Up to 12 Mbps off the transceiver RS–485 port
RS 232C Baud rate max. line length	as per DIN 66 020, non–isolated 19.2 Kbps default 3 m shielded cable
Backplane	Quantum parallel bus
Processor	
Microcontroller	25 MHZ Intel 80386EX in the Quantum module (Controller) Siemens 80C165 and Siemens ASIC ASPC2 in the PCMCIA card
Memory	
RAM	256 KB for program data + 8 KB DPR in the Quantum module 512 KB for program data + 16 KB DPR in the PCMCIA card
EEPROM	128 Byte in the PCMCIA–Card
Flash ROM	256 KB in the Quantum module 256 KB in the PCMCIA card

Mechanical Design	
Dimensions	Width = 40.34 mm (standard–size module) Quantum module with PCMCIA Type III card mounted
Weight	0.68 kg (gross)
Environmental Conditions	
System Data	See the Quantum User Manual, Chap. 3.1
Power Dissipation	max. 6.5 W

PROFIBUS–DP with CRP 811

Transmission Specifications	
Bus Nodes	max. 32 (without repeater)
Bus lengths, transmission rates (for 12 Mbps cable)	max. 1.2 km at 9.6 Kbps max. 1.2 km at 19.2 Kbps max. 1.2 km at 93.75 Kbps max. 1 km at 187.5 Kbps max. 0.5 km at 500 Kbps max. 0.2 km at 1,5 Mbps max. 0.1 km at 3 Mbps max. 0.1 km at 6 Mbps max. 0.1 km at 12 Mbps
Transmission media (per meter)	shielded twisted pair KAB PROFIB, PROFIBUS cable up to 12 Mbps, rigid
Connection Interface	EIA RS 485
Bus Connector (Cable Termination)	490 NAD 911 01, 490 NAD 911 02 (as per Norm 390 / 220 / 390 W for 12 Mbps cable)
Stub Cabling	none (except 1 x 3 m from the bus monitor)
Bus Specifications	
Node Type	Master Class 1
Bus–Access Procedure	Master/Slave to DP bus slaves
Transmission Procedure	half–duplex
Frame Length	max. 255 Bytes
Data Unit Length	max. 246 Bytes
Data Security	hamming distance, HD = 4
Node Addresses	1 ... 126
FDL Send/Req. Data Services	for slave services: parameter assignment, configuration, diagnosis, data transfer

Breite: 178 mm
Höhe: 216 mm

Master Class 1 DP Bus Functionality	
Read Diagnostic Information from DP Bus Slave	on slave initialization, automatically, should new slave diagnostic data be available, data filed in state ram area (Input Reference 3x) n x INT8 n = 0 no filing of diagnostic information n = 6 default value for standard diagnostic data
Send Parameter Data to DP Bus Slave	only on slave initialization, Uses parameter data from the DP bus configuration tool and DP bus slave device master data
Send Configuration Data to DP Bus Slave	only on slave initialization, Uses configuration data from the DP bus configuration tool and DP bus slave device master data

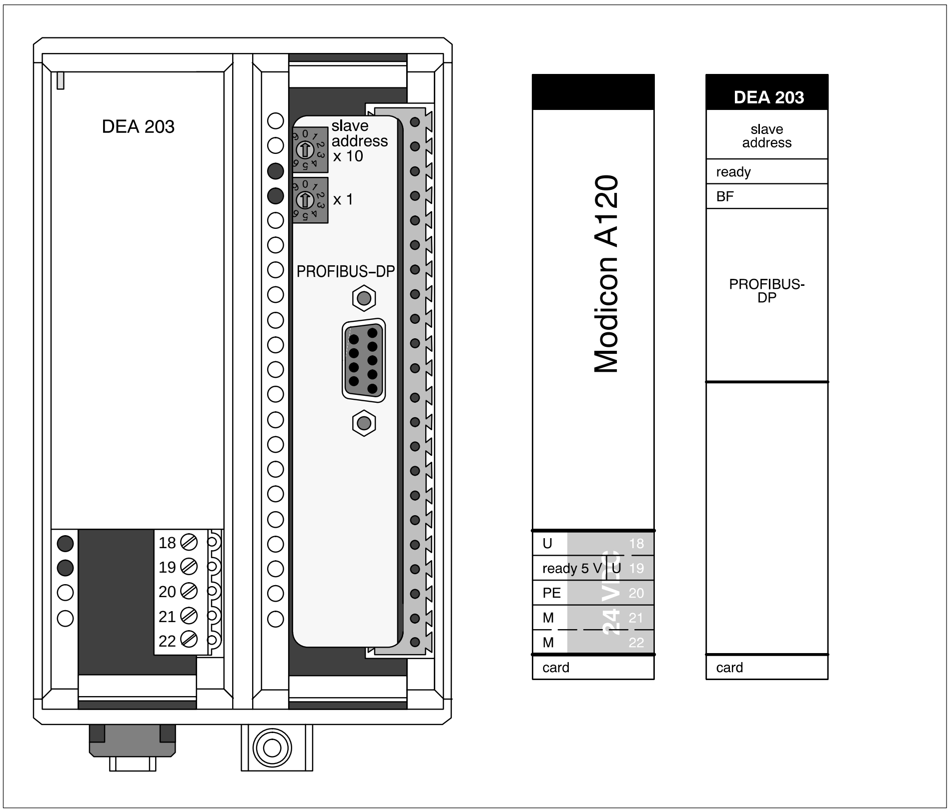
Operation

Cyclically transfer in– & output data from the state ram	
Outputs	Output Reference 0x and 4x (Boolean, packed) Output Reference 4x (Integer 8 / 16 / 32, Unsigned 8 / 16 / 32, RAW / String, packed e.g. ASCII)
Inputs	Input Reference 1x and 3x (Boolean, packed) Input Reference 3x (Integer 8 / 16 / 32, Unsigned 8 / 16 / 32, RAW / String, packed e.g. ASCII)

AS–BDEA 203
PROFIBUS–DP Coupler

The **AS–BDEA 203** is a PROFIBUS–DP coupling module adhering to DIN 19 245 Parts 1 and 3 with integrated (non–isolated) power supply. It is used to drive the remote I/O modules of the Modicon TSX Compact family.

Figure 1 AS–BDEA 203 Front View and Label Inlays



Breite: 185 mm
Höhe: 230 mm

1 Features and Fnctions

1.1 General Information

The AS–BDEA 203 is a PROFIBUS–DP coupling module adhering to DIN 19 245 Parts 1 and 3 with integrated (non–isolated) power supply. It is used to drive the remote I/O modules of the Modicon TSX Compact family. It provides a 5 VDC supply at 1.6 A for the modules on the parallel I/O bus.

The AS–BDEA 203 can address a maximum of 18 I/O modules (288 I/Os) via the subracks DTA 200, DTA 201 or DTA 202. With the exception of intelligent modules, all analog and discrete Compact I/O modules can be employed. When analog modules are utilized, there is a particular total data volume which may not be exceeded.

The device master data file from the 381 SWA 000 00 discette must be utilized for AS–BDEA 203 configuration.

1.2 Features

The module shows the following features:

- Standardized, isolated PROFIBUS Port
- Transmission rates of up to 12 Mbps
- Automatic adaptation to master transmission rate setting
- Slave address adjustment per rotary switch.
- DIP switch adjustment of disconnection behavior

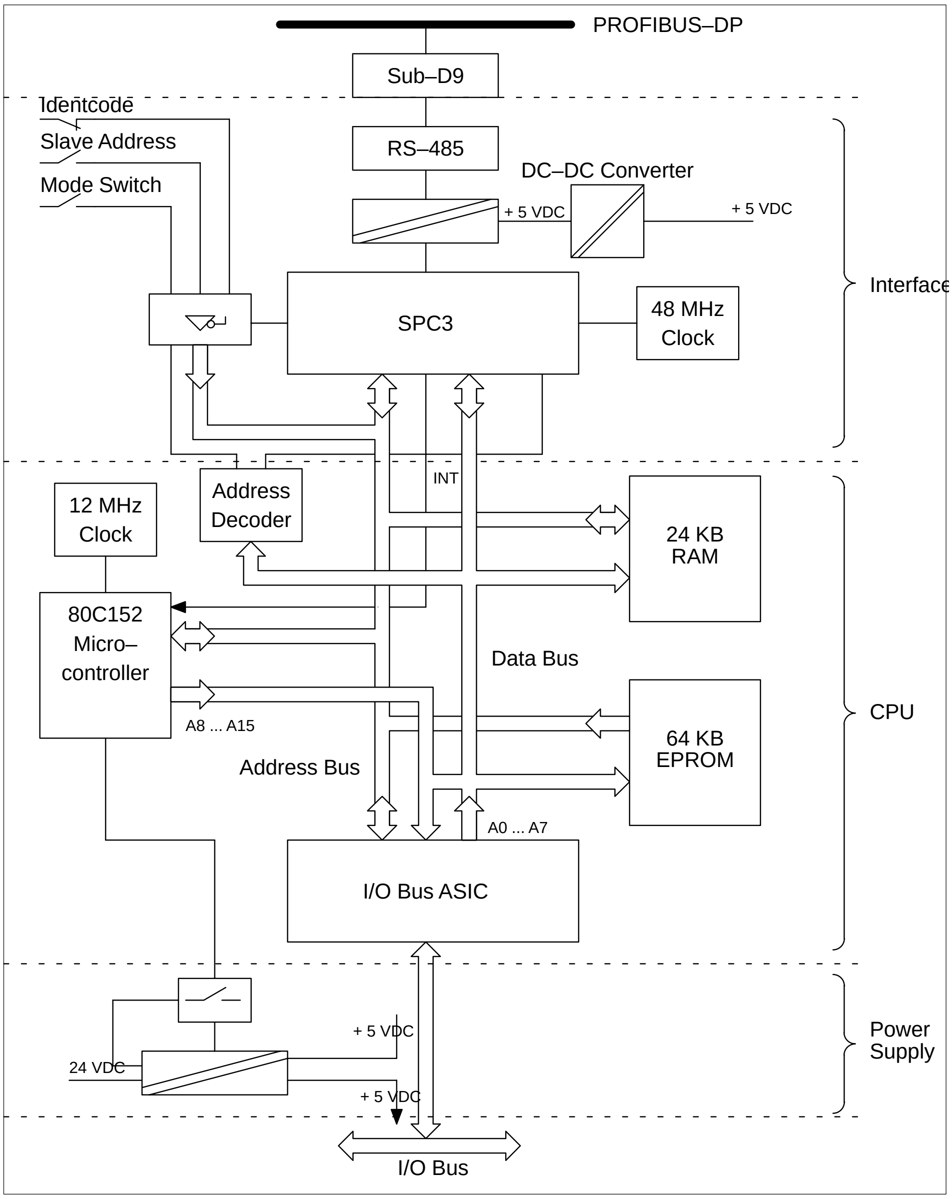
1.3 Functional Details

The AS–BDEA 203 serves as the coupling element between the PROFIBUS–DP and the internal I/O bus.

The set disconnection behavior is activated by watchdog when PROFIBUS communication is interrupted longer then the supervision time set by the master.

The AS–BDEA 203 collects messages from the associated modules and reports these further to the master as diagnostic information.

Figure 2 AS–BDEA 203 functional details



Breite: 185 mm
Höhe: 230 mm

2 Configuration

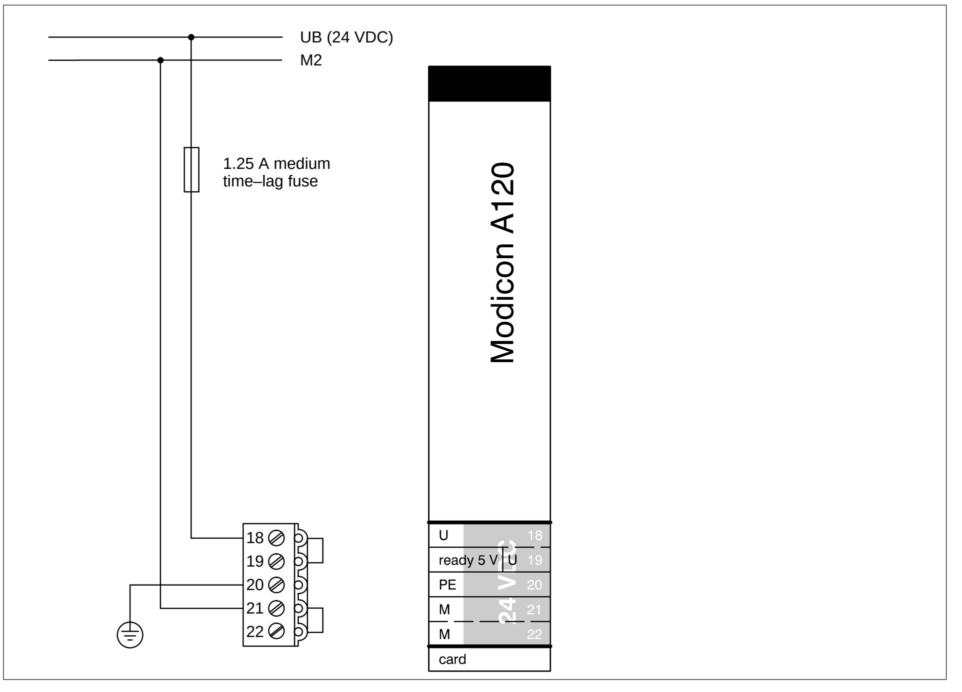
The following configuration tasks must be performed:

2.1 Subrack Mounting Slot

Install the module in DTA 200 primary subrack slot 0.
The individual installation steps are to be carried out in adherence with the accompanying user documentation.

2.2 Power Supply Connection

Figure 3 Connection example



Caution
The module's integrated power supply is non–isolated. Improper connection, e.g. absence of the M2 connection, can lead to module destruction.

Enter system relevant power supply information in the label inlay.
Noise immunity can be improved when by–pass capacitors are installed at the power supply module U and M terminals.
Details can be found in the User Manual ch. "A120 Grounding Procedures".

2.3 PROFIBUS Connection

The PROFIBUS port utilizes varied Sub–D9 plug connectors:

- 490 NAD 911 02 for transmission rates up to 12 Mbps or
- PBS1 for transmission rates up to 500 Kbps.

The individual installation steps are to be carried out in adherence with the accompanying user documentation.

Figure 4 PROFIBUS port pin assignments

Pin	Signal	Function
3	RxD/TxD–P	Receive/transmit data (+)
5	DGND	Signal ground
6	VP	+5 VDC supply
7	RxD/TxD–N	Receive/transmit data negated (–)

Breite: 185 mm
Höhe: 230 mm

2.4 **Settings (Slave Address, Disconnection Behavior)**

Slave Address (x10, x1)

The slave address (node address) is to be set on the front panel ”x10, x1” rotary switches. Addresses from 1 ... 99 are allowed (0=as shipped).

2.5 **Disconnection Behavior (S2, S3)**

Figure 5 Module rear view

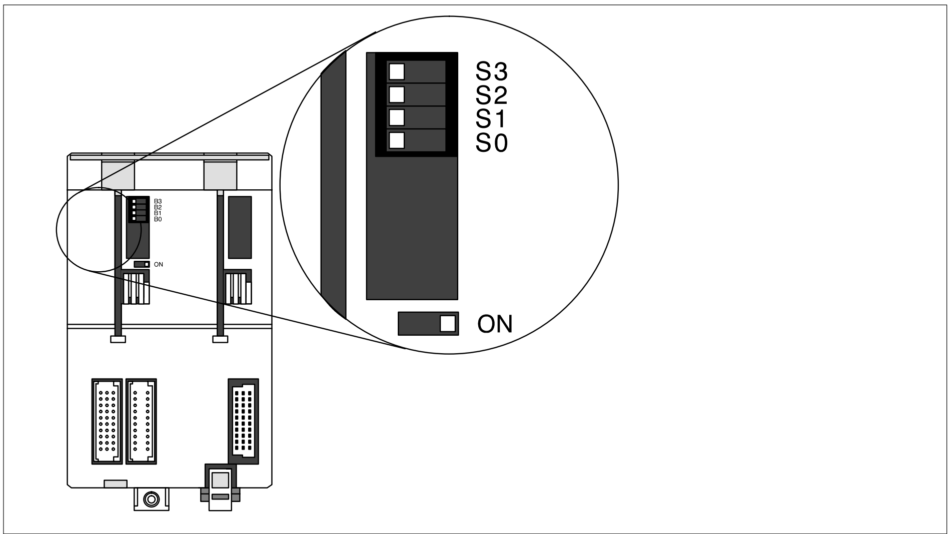
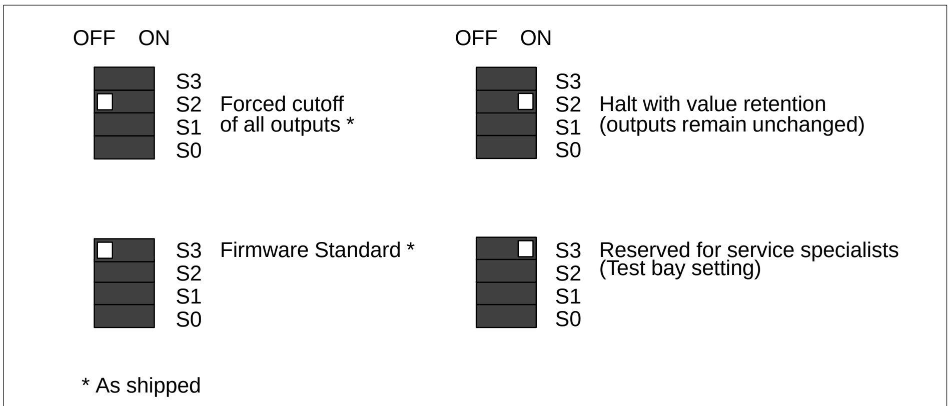


Figure 6 DIP Switch Settings



2.6 I/O Expansion Limitations

Arbitrary I/O combinations are only possible with discrete I/O modules. Use of analog I/O modules restricts total data volume to a particular level.

Total data volume is the sum of data from the PROFIBUS master to the AS–BDEA 203 (D out), and from the AS–BDEA 203 to the PROFIBUS master (D in).
The feasibility of a particular combination can be verified with the following tables. The first table lists data volume by respective module (D out / D in) in bytes.

In accordance with the (D in) data volume, this table permits the data volume calculation for PROFIBUS master to AS–BDEA 203 (D out).
With the second table the (D out) data volumes of all employed modules is to be checked against the max. permissable (D out) data volume.

Table 1 Data volume by module

Module	D in Data Volume (Bytes)	D out Data Volume (Bytes)
DEP 208, DEP 210, DEP 211	1	0
DAP 204, DAP 208, DAP 210	0	1
DAP 212, DAP 220, DAP 292	1	1
DEO 216, DEP 214, DEP 215, DEP 216, DEP 217, DEP 218, DEP 220, DEP 296, DEP 297, DEX 216	2	0
DAO 216, DAP 216, DAP 217, DAP 218, DAX 216	0	2
DAU 202	0	4
DAU 208	0	16
ADU 204, ADU 205	10	0
ADU 206, ADU 216	10	1
ADU 210	10	4
ADU 214	18	8

Breite: 185 mm
Höhe: 230 mm

Table 2 Max. permissable ”D out” data volume in respect to ”D in” data volume

D in Data Volume Sums (Bytes)	**Max. D out Data Volume Sums (Bytes)**
241 ... 244	144
233 ... 240	152
225 ... 232	160
217 ... 224	168
209 ... 216	176
201 ... 208	184
193 ... 200	192
185 ... 192	200
175 ... 184	208
169 ... 176	216
161 ... 168	224
153 ... 160	232
145 ... 152	240
0 ... 144	244

Table 2 is based on following equation:

$$392 \geq \left(\left\lceil \frac{D\ in}{8} \right\rceil + \left\lceil \frac{D\ out}{8} \right\rceil \right) \times 8 \qquad \lceil\ \rceil : \text{Upper limit = nearest higher integer}$$

Example (Determination of Total Volume

Figure 7 I/O–Configuration of a PROFIBUS DP Node with the Compact Components: 2 x AS–BDAP–220, 1 x AS–BADU–210, 11 x AS–BADU–214

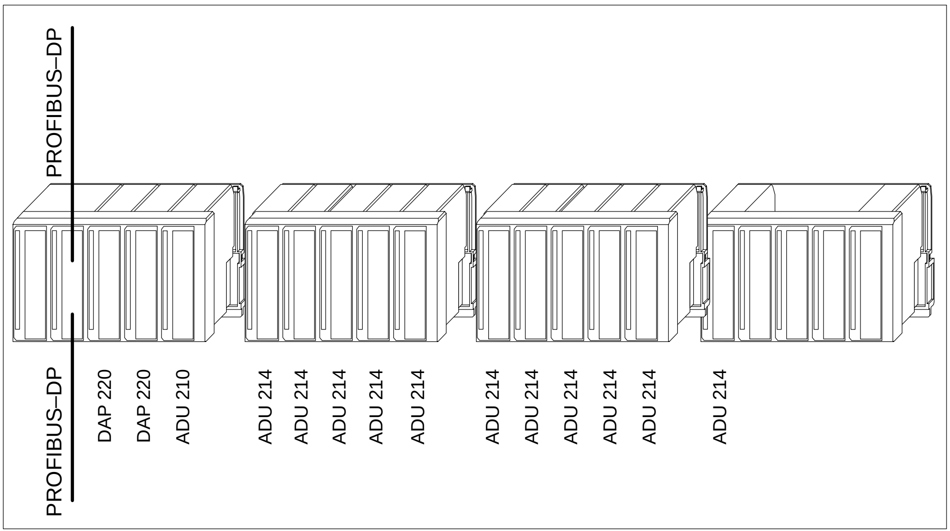


Table 3 Determination of Data volume by module , according toTable 1

Module	D in–Datavolume (Bytes)	D out–Datavolume (Bytes)
2 x AS–BDAP–220	2 x 1 = 2	2 x 1 = 2
1 x AS–BADU–210	1 x 10 = 10	1 x 4 = 4
11 x AS–BADU–214	11 x 18 = 198	11 x 8 = 88
Sum	210	94

According to Table 2 (row 5): D in = 209 ... 216 results in D out = 176 (max.).

So the I/O configuration is valid.

Breite: 185 mm
Höhe: 230 mm

3 Diagnosis

The module front plate contains the following displays:

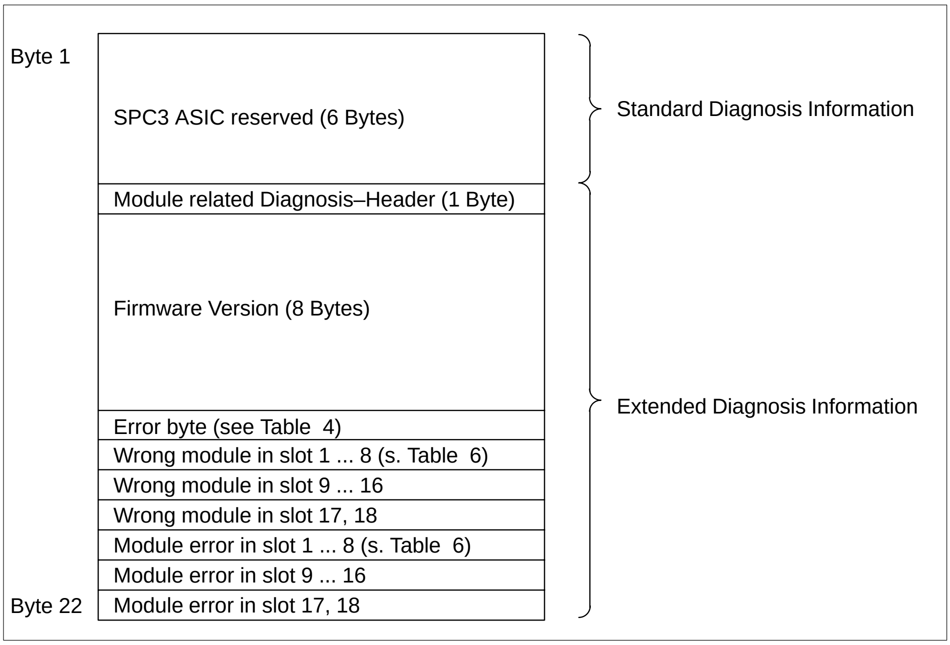
Table 4 AS–BDEA 203 LED status display

No.	Label Inlay Identifier	Color	Function
18 (left)	U	Green	24 VDC supply present
19 (left)	ready 5 V	Green	Module ready for service, 5 VDC output voltage present
3 (right)	ready	Green	Coupler ready
4 (right)	BF	Red	Bus coupling faulty (bus failure), Probable cause: The AS–BDEA is not parameterized and initialized, the PROFIBUS–DP protocol is not running

4 Diagnosis Data

4.1 Structure of the diagnosis data telegram

Figure 8 Diagnosis Telegram



Error Byte

Table 5 Listing ”Error Byte”

Bit	Error Number	Meaning	Information
0	1	AS–BDEA–203 total	This bit results from an OR operation on the errors for register driver, module error and wrong module. It is set if at least for one slot of the rack an error (register driver, module error or wrong module) is indicated.
1	2	Wrong module	In one or multiple slots of the rack there is a wrong module.
2	3	Module Error	Error on one or multiple modules in the rack.
3	4	Register Driver	If an error occurs while operating modules using the register interface, the error bit for register driver is set. There is no decoding of the slot which causes the error. The following modules use the register interface: AS–BADU–210/214, AS–BADU–208 and AS–BZAE–201. If an error occurs the last valid input value will continuously be transmitted.
4	reserved		
5	reserved		
6	reserved		
7	reserved		

Wrong module
A wrong module error will be indicated if for a slot in the rack no ident code (ident code =0) or an ident code other than defined in the configuration is read. This will happen if a module is removed during operation, swapped with a wrong module or at the complete failure of a module.

During configuration the module for each slot is detected. If the actual and the desired module type are equal the AS–BDEA–203 module transits to the ”Data Exchange” mode. In this state there is a cyclical module type checking. Only slots which during configuration contained modules are checked, all others will be ignored.

In case a slot encounters a wrong module error the input data for that slot will be deleted (transmission of 00Hex to the master) and the output of data to this slot will be suppressed. This means for the user that data exchange with the affected slot is not possible.

Table 6 List of ”Wrong Module”, ”Module Error”

Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Slot No.	8	7	6	5	4	3	2	1
Slot No.	16	15	14	13	12	11	10	9
Slot No.	res.	res.	res.	res.	res.	res.	18	17

Breite: 185 mm
Höhe: 230 mm

Module error
The meaning of this error message is module specific. You can find detailed information on the meaning and how to handle it, in the according module description. The corresponding bit will be described as SMx.1.

This message has no influence on the data transmission of the AS–BDEA–203. That is, all data of the effected modules will be transmitted continuously.

Generally:

Module Type	**Meaning of the Message**
discrete input (DEx xxx)	(there will be no message)
discrete output (DAP 216N and DAP 220 only))	missing switch voltage, output overload
discrete output (all other: DAx xxx)	(there will be no message)
analog output (DAU xxx)	external 24V supply missing
analog input (ADU xxx)	external 24V supply missing, channel overflow

4.2 Systemreaction on Module Failure

You can think of the following possible faults:

- Impossible to read ident code (for example module is missing or defective, ident code = 0 is handled as wrong module error)
  For a slot with a wrong module error all input data will be deleted (transmission of 00 Hex to the master) and the slot will not be processed through AS–BDEA–203 as long as the error is present.
- Ident code can be read but the module has an internal error (the module has detected an internal error: Bit 7 in the ident code is set to 1, message module error)
  This message has no effect on the data transmission and the processing through the AS–BDEA–203.

5 Technical Specifications

5.1 PROFIBUS DP Coupling AS–BDES–203

Assignment	
System	TSX Compact (A120, 984)
Module area	Slot 0 of DTA 200 primary backplane
Identcode	Hex A203, entry through the device master data file type 381 SWA 000 00
Power Supply	
External input voltage	UB = 24 VDC, max. 0.85 A
Primary fusing	1.25 A medium time–lag fuse
Power on current	20 A, time constant = 1 ms
Tolerances, limiting values	Refer to the TSX Compact User Manual, ch. ”Technical Specifications”
Reference potential M	M2
Protective earth	PE
Secondary voltage	5.15 VDC, max. 1.6 A, non–isolated
Buffering time	Typically 5 ms for 24 VDC
Overload protection	Through current limiting
Data Interface	
PROFIBUS–DP	Through a potential–free RS–485 interface up to 12 Mbps
Pin assignments	Refer to ch. PROFIBUS Connection NO TAG
Back plane	Parallel I/O bus, refer to TSX Compact User Manual, ch. ”Technical Specifications”
Processor	
Processor type	Intel 80C152 / 12 MHz
Data memory	32 KB RAM
Firmware	64 KB EPROM
Mechanical Design	
Module	Standard double–size module
Format	3 HE, 16 T
Weight	Approx. 500 g
Connection Styles	
Power supply	5–pole screw/plug–in terminal block
PROFIBUS	Sub–D9 socket, matching to 490 NAD 911
Back plane	2 plug connectors 1/3 C30M, 1 socket connector 1/3 R30F

Breite: 185 mm
Höhe: 230 mm

Environmental Characteristics	
Regulations	Meets VDE 0160, UL 508
System data	Refer to TSX Compact User Manual, ch. ”Technical Specifications”
Permissable ambient temperature	0 ... +60 degrees C.
Power dissipation	Typically 6 W

5.2 AS–BDEA 203 on the PROFIBUS DP

Transmission Specifications	
Nodes per bus	Max. 32
Bus lengths, transmission rates	max. 1.2 km at 9.6 Kbps or at 19.2 Kbps or at 93.75 Kbps max. 1 km at 187.5 Kbps max. 0.5 km at 500 Kbps max. 0.2 km at 1.5 Mbps max. 0.1 km at 3 Mbps or at 6 Mbps or at 12 Mbps
Bulk transmission media	Shielded twisted pair (S–UTP) KAP PROFIB, PROFIBUS cable up to 12 Mbps, rigid
Connection interface	Adhering to EIA RS–485
Cable termination	As per Norm 390 / 220 / 390 Ω
Stub cabling	None
Data security	Hamming distance, HD = 4
Bus Specifications	
Node type	Slave
Node addresses	1 ... 99
Operation Cyclically transfer in– & output data from the state ram	
DP Bus Byte Output	Output Reference 0x (Boolean, packed) Output Reference 4x (Integer8, unpacked; Unsigned8, unpacked; RAW, packed e.g. ASCII)
DP Bus Byte Input	Input Reference 1x (Boolean, packed) Input Reference 3x (Integer8, unpacked; Unsigned8, unpacked; RAW, packed e.g. ASCII)
Bus Word Output	Output Reference 0x (Boolean) Output Reference 4x (Integer16 = Unsigned16 = RAW)
Bus Word Input	Input Reference 1x (Boolean) Input Reference 3x (Integer16 = Unsigned16 = RAW)

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Breite: 185 mm
Höhe: 230 mm