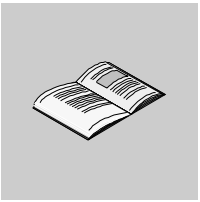
TSX Quantum
PROFIBUS DP using Concept
User's Manual

840 USE 487 00 eng

33001841.01

Table of Contents



Safety Information

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death, serious injury, or equipment damage.

WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

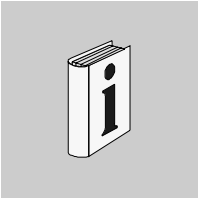
CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

PLEASE NOTE

Electrical equipment should be serviced only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material. This document is not intended as an instruction manual for untrained persons.

About the Book



At a Glance

Document Scope

This manual contains information on the TSX Quantum PROFIBUS DP Master Module 140 CRP 811.

Validity Note

This manual applies for using modules under Concept from Version 2.5 and the configuration software SyCon TLX L FBC 10 M.

Related Documents

Title of Documentation	Reference Number
TSX Momentum I/O Units, User's Manual	870 USE 002 00
TSX Momentum Bus Adapter for Profibus DP, User's Manual	870 USE 004 00

Note: Up-to-date information on the PROFIBUS DP is available on the PROFIBUS Website *http://www.profibus.com* as well as from the PROFIBUS user organization: PROFIBUS Nutzerorganisation e.V., Haid- und Neu-Straße 7, D-76131 Karlsruhe, Germany.

Product Related Warnings

	**CAUTION**
	For applications using programmable logic controllers with safety requirements, the relevant precautions should be observed. Repairs to components should only be carried out by the manufacturer for reasons of safety and protection of documented system data. **Failure to follow this precaution can result in injury or equipment damage.**

User Comments

We welcome your comments about this document. You can reach us by e-mail at TECHCOMM@modicon.com

Profibus

I

At a Glance

Overview

This section of the documentation contains general information on PROFIBUS and PROFIBUS DP communication.

What's in this Part?

This part contains the following chapters:

Architecture of Profibus

1

Introduction

Overview

This chapter contains basic information on the PROFIBUS architecture.

What's in this Chapter?

This chapter contains the following sections:

1.1 Primary Characteristics of Profibus

Introduction

Overview

This chapter contains information on the primary characteristics of Profibus.

What's in this Section?

This section contains the following topics:

Features of the PROFIBUS DP

Introduction

PROFIBUS DP is an open industrial standard for integrated communication. It is a serial field-bus, which provides a decentralized connection between sensors, actuators and I/O modules produced by various manufacturers, and connects them to the superset control level.

Profibus DP

PROFIBUS DP (**D**istributed **P**eriphery - Master/Slave Network) is a PROFIBUS communication profile which is optimized for performance. It is optimized for speed, efficiency and inexpensive hook-up cost and is designed especially for communication between automation systems and distributed peripheral equipment.

The PROFIBUS DP network supports multiple master systems with several slaves. The master can be a TSX Quantum PLC with the 140 CRP 811 00 coupling module. A PC or another controller device could also be used as an alternative.

Schneider offers the following components as slaves:

- Modular Slaves
  - A Momentum I/O unit with the 170 DNT 110 00 PROFIBUS adapter
  - A Compact I/O unit with a DEA 203 PROFIBUS adapter
- Compact Slaves
  - Classic TIO for PROFIBUS
  - Altivar Frequency Converter

Profibus DP Features

The following table contains the most important features of Profibus DP

Standard	EN 501 70 DIN 19245
Transmission equipment (physical profile)	EIA RS-485 IEC 1158-2 Fiber optic cable
Transfer procedure	Half-duplex
Bus topology	Linear bus with active bus termination
Bus cable type	Shielded twisted pair conductors
Connector	Mainly 9-pin D-Sub
Number of nodes on the bus	Max. 32 with no repeaters Max. 125 with 3 repeaters in 4 segments

Effective range

Effective range

Max. bus cable length per segment	Baud rates (for 12 Mbit/sec cable)
1.2 km	9.6 kbit/sec
1.2 km	19.2 kbit/sec
1.2 km	93.75 kbit/sec
1.0 km	187.5 kbit/sec
0.5 km	500 kbit/sec
0.2 km	1.5 Mbit/sec
0.1 km	3 Mbit/sec
0.1 km	6 Mbit/sec
0.1 km	12 Mbit/sec

Features of the TSX Quantum 140 CRP 811

The following table contains the most important features of Profibus DP

Class	Master class 1 (DPM1)
Supported Protocol	V0
PNO Ident. No.	5506
Supported User Profile	PA

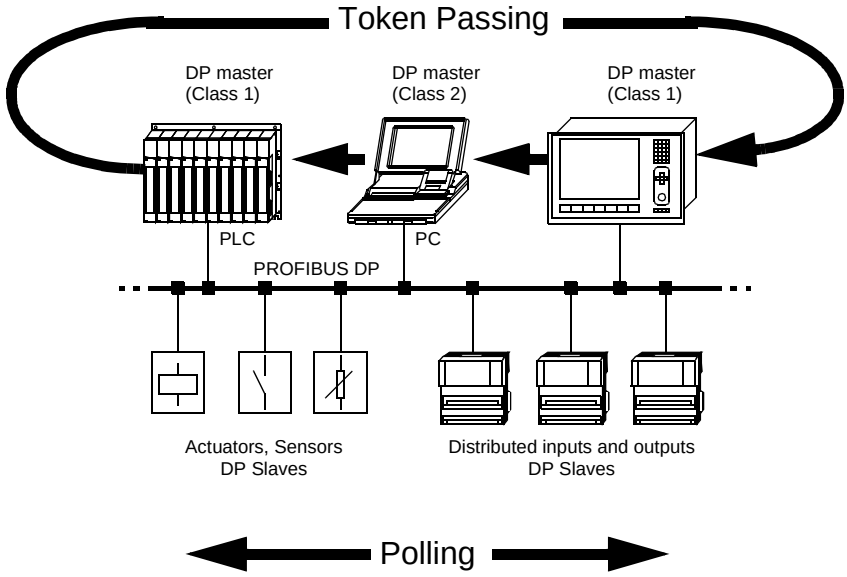
Bus Access Procedures

Overview

There are two different bus access procedures which handle the various communication requirements within the PROFIBUS topology:

- Token Passing
- Polling

This diagram shows you the PROFIBUS topology with both bus access methods.



Token Passing Ring

The token passing ring procedure is the basis for communication between the more complex, active stations (=Master). This is for creating bus access for several stations which all have the same rights. A token is passed from station to station in a logical ring. The token is passed to each and every station within a maximum, definable token cycle time. A station is given transmission rights for the duration of time that it has the token.

Master-Slave Polling

The master-slave polling procedure guarantees a cyclic, real-time based data exchange between the station with transmission rights, active station (=Master) and its subordinates, passive stations (=slaves). In this case, the master is able to pass data to the slave and/or request data. The services in layer 2 (field-bus data link in ISO-OSI reference model) organize this communication.

1.2 DP Communication Profile

Introduction

Overview

This section contains information on the PROFIBUS DP communication profile.

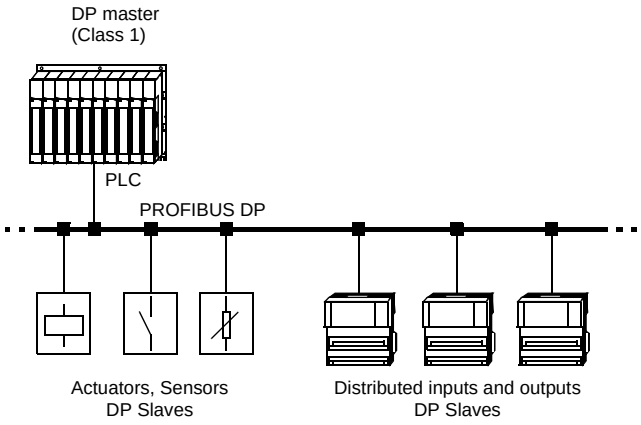
What's in this Section?

This section contains the following topics:

System Configuration and Equipment Classes

Overview The PROFIBUS DP can operate as a single master or as multi-master.

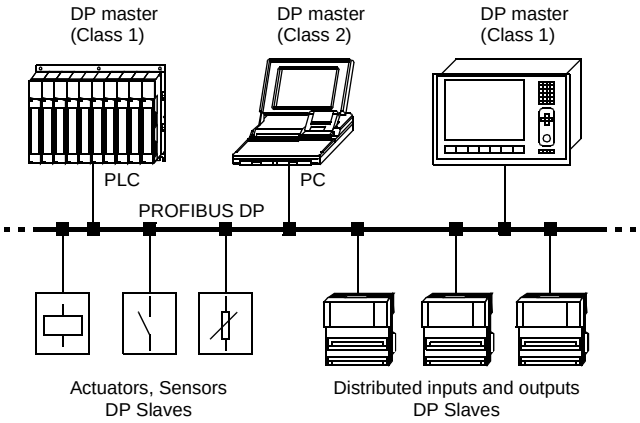
Single Master This diagram shows you a PROFIBUS DP Single Master System



Note: The shortest bus cycle time is achieved in single master operation.

Multi-master

This diagram shows you an example of a PROFIBUS DP Multi-master System



Note: Communication with a slave reserved to only the DPM1 Master which has been assigned for this slave during the configuration.

Equipment Classes

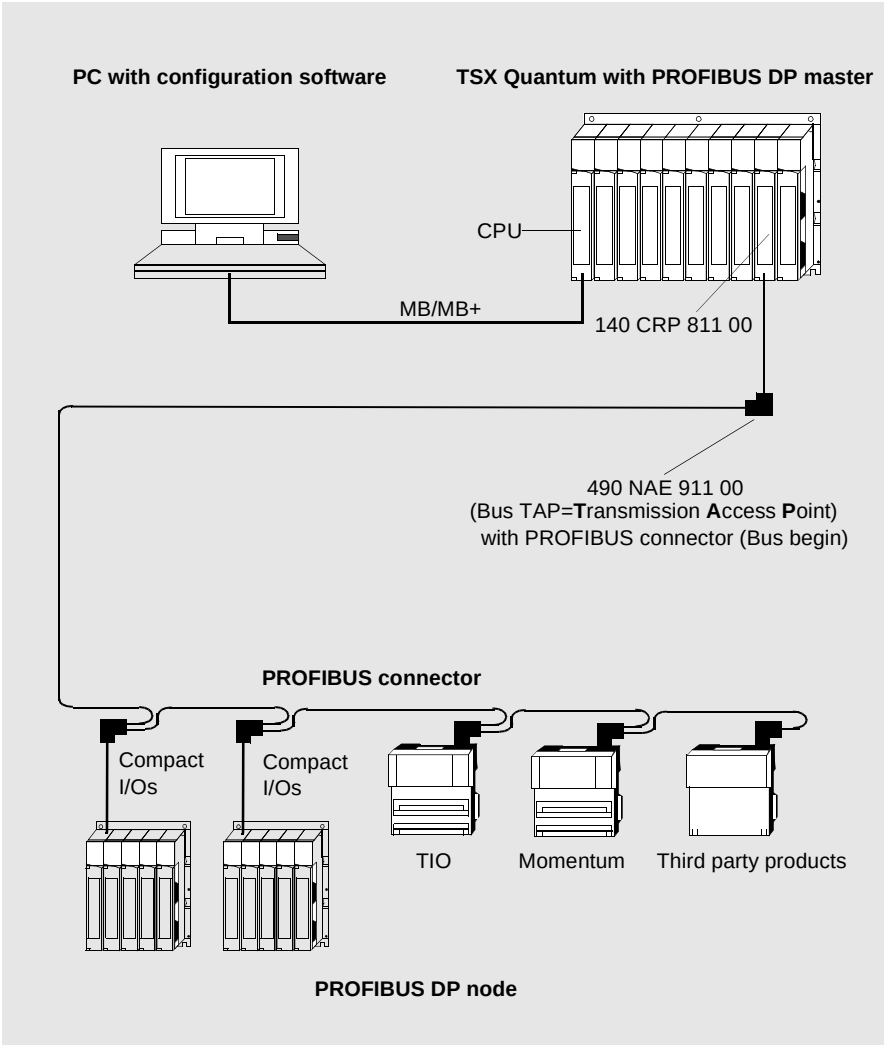
There are three different equipment classes:

- DP-Master class 1:
  The TSX Quantum 140 CRP 811 belongs to this equipment class.
  This is a centralized automation device which exchanges information cyclically with remote stations. Typical devices are PLC and PC.
- DP-Master class 2:
  These are engineering, configuration or diagnostic devices. This type of device is put in during the installation to configure the connected devices, evaluate measurement values and configuration parameters and for getting device states.
- DP Slave
  This is a field device with either binary or analog inputs and outputs.

PROFIBUS DP Network with CRP 811

Example of a PROFIBUS DP network with the CRP 811

This diagram shows you an example of a PROFIBUS DP network with the 140 CRP 811 as the master.



Network Components

This table shows the hardware for the PROFIBUS DP network with the CRP 811.

Hardware			**Firmware**
Master		TSX Quantum 140 CRP 811	>=V.3.0
		PCMCIA card NHP 811	>=V.5.02
Slave modules	Modular	A Momentum I/O unit with the 170 DNT 110 00 bus adapter installed	
		A Compact I/O unit with a DEA 203 bus adapter	
	Compact	Classic TIO for PROFIBUS	

Note: Further information on PROFIBUS connectors can be found under *Bus Begin and Bus End, p. 37* and in the ordering information for PROFIBUS DP components *PROFIBUS Cables and Connectors, p. 100*

Types of Communication

Overview

Besides logical point to point data transfers, the PROFIBUS protocol can also handle the following types of communication:

- Broadcast communication:
  An active node sends an unacknowledged message to all other nodes (master and slaves)
- Multicast communication (control instructions):
  An active node sends an unacknowledged message to a group of nodes (Master and slaves)

Master-Slave Communication Phases

The communication between the DPM1 and the DP slaves is split up into the following phases:

- Parameterization and configuration phase
- Usable data transfer phase

Master-Slave Communication Establishment

Before a DP slave can be integrated into the usable data transfer phase, the DPM1 checks for whether the planned set configuration (see Notes) matches the real device configuration in the parameterization and configuration phase. A device identification test is run for every slave checking:

- whether the device is actually there
- whether it is the right type of device
- whether the address which is set on the device matches the station address on the bus
- whether the formats, telegram length information and bus parameters are correct and
- whether the number of configured inputs and outputs is correct.

Before the usable data transfer phase, the TSX Quantum 140 CRP 811 again initializes the PCMCIA card on which the PROFIBUS DP protocol is found.

Note: The set configuration is created with the SyCon Configurator based on the *Device Data Base , p. 24* for all slaves.

Device Data Base

Device Properties

In PROFIBUS DP, the performance features of the devices are documented by the manufacturer and provided for the user in the form of an equipment data sheet and a device data base file and are made available to the user. The structure, contents and coding for this device data base are standardised. They enable the comfortable configuration of any number of DP slaves using various manufacturers' configuration equipment. The PROFIBUS user organization archives this information by manufacturer and will provide information about the device data base upon request.

Manufacturers must register an identification number for every DP slave and every DPM1 master with the PROFIBUS user organization. The Profibus user organization coordinates these identification numbers along with the device data. More information can be obtained through the PNO (Profibus user organization).

Device Identification

The identification number enables a DP master to identify the types of devices that are connected without any significant protocol overhead. The master compares the Ident-number of the connected DP device with the Ident-number of the defined configuration data. Application data transmission begins only when the proper device types with the correct station addresses are connected to the bus. In this way, a relatively high security from configuration errors is achieved.

Modes of Operation and Operating Conditions

Standardized System Performance

System behavior and performance have also been standardized with PROFIBUS DP in order to guarantee a high degree of compatibility when exchanging devices. This is mainly done by defining the operating conditions of the DPM1. This can either be controlled locally or over the bus from a configuration device.

There are three different main conditions:

Main States	Meaning
Stop	No (usable) data traffic is found between the DPM1 and the DP slaves. This condition is used for diagnostics and parameterization.
Clear	The DPM1 reads the input information from the DP slaves and holds the outputs of the DP slaves in safe status.
Operate	The DPM1 is in its data transfer phase: ● When the data traffic is cyclic, the inputs of the DP slaves are read and the output information is transferred to the DP slaves. ● The DPM1 sends its local status cyclically to all DP slaves that are assigned to it in defined time intervals with a multicast instruction. ● The system reaction after an error in the data transfer phase of the DPM1, such as a DP slave not working properly for example, is determined by the operation parameter "Auto-Clear".

Auto-Clear Operating Parameter

CAUTION

TSX Quantum 140 CRP811 only supports Auto-Clear = False

If the Auto-Clear parameter is False, then the DPM1 remains in Operate status even if an error occurs. Therefore the user must define a sensible system reaction.

Failure to follow this precaution can result in injury or equipment damage.

The following table is a description of the operating parameter Auto-Clear

Parameter	Meaning
AutoClear = True (is not supported by the CRP 811)	If this parameter is set to "True", then the DPM1 switches the outputs of all of the DP slaves that are assigned to it to a safe state as soon as a DP slave is no longer ready for the usable data transfer. The DPM1 then changes to Clear status.
AutoClear = False	If the Auto-Clear parameter is False, then the DPM1 remains in Operate status even if an error occurs and maintains communication with the other slaves. The user must define the system reaction.

Operating Modes for Synchronization

Note: The following synchronization operating modes: "Sync" and "Freeze" are not supported by the TSX Quantum 140 CRP 811.

The following table is a description of the operating modes for synchronization

Operating Mode	Meaning
Sync	**1.** Freezes the momentary output status of all addressed slaves in the slaves. **2.** Temporarily saves any following output states in the slaves during the next usable data transfer. **3.** Sends the new output states only after the next Sync instruction is received.
Freeze	**1.** Freezes the momentary input status of all addressed slaves. **2.** Temporarily saves any following input states in the slaves during the next usable data transfer. **3.** Sends the new input states only after the next Freeze instruction is received.

Protective Functions

Overview

PROFIBUS DP has protective functions that guard against incorrect parameterization or transfer equipment break-down. These monitoring mechanisms are actually time monitors with the DP master and DP slaves.

The length of the monitoring interval is defined during the configuration of the system.

Data Control Time

The DPM1 monitors the usable data transfer of every DP slave with a separate Data Control Time (DCT). The monitor responds if an improper usable data transfer occurs within the DCT.

DP Slave Watchdog Monitor

The DP slave runs a watchdog monitor for recognizing errors from the DP master or the transmission path. If no data traffic with the assigned DP master is found within a watchdog interval then the DP slave switches the outputs to a defined shut-down value.

Note: The DCT and the watchdog times are bus parameters which are defined during the configuration by the configurator and depend on the number of slaves.

Access Protection

There is also access protection for the inputs and outputs of the DP slave during operation in multi-master systems so that direct access only occurs from the master with the assigned rights.

1.3 Topology

Introduction

Overview

This section contains information on the PROFIBUS DP topology.

What's in this Section?

This section contains the following topics:

Transfer Mode

Overview

Since it is impossible to satisfy all requirements with one method of transfer, there are three different methods available for Profibus:

RS-485

RS-485 is a method of transfer for universal applications in manufacturing technology.

It is the most widely used form of transfer in PROFIBUS. It guarantees high speed with simple and inexpensive cabling. Twisted pair copper cable is used as the conductor.

Speeds from 9.6 kbit/sec up to 12 Mbit/sec can be defined. This is defined uniformly for all devices during the configuration of the system and is based on the maximum *Bus cable lengths, p. 57* .

Network topology is a linear bus with active bus terminations on both ends (see *Segmentation example, p. 30*

IEC-1158-2

IEC-1158-2 is a method of transfer which is used in process automation with the PROFIBUS PA physical profile.

This bit synchronous transfer method is based on two wire technology and is noted for its inherent safety and bus feed. It can therefore be used in Ex-applications as well.

Network topology is a tree or linear structure or can be a combination of both.

Fiber optic cable

Fiber optic cable is used for applications where the environment is unstable (heavy disturbance), for potential isolation or for increasing the range at high transmission speeds.

The network topology of PROFIBUS fiber optics segments is either a star or ring structure. For connecting a fiber optic segment to an RS-485 transmission path, fiber optic couplers are available. When increasing distances however, note that no more nodes may be added to the fiber optic segment besides the couplers.

Segmentation with Repeaters

When should I use a repeater?

Repeaters can be integrated wherever the maximum cable length will be exceeded in a network segment or where the number of nodes exceeds the allowed number per segment. Repeaters are used in these cases to increase the bus cable length or the number of nodes.

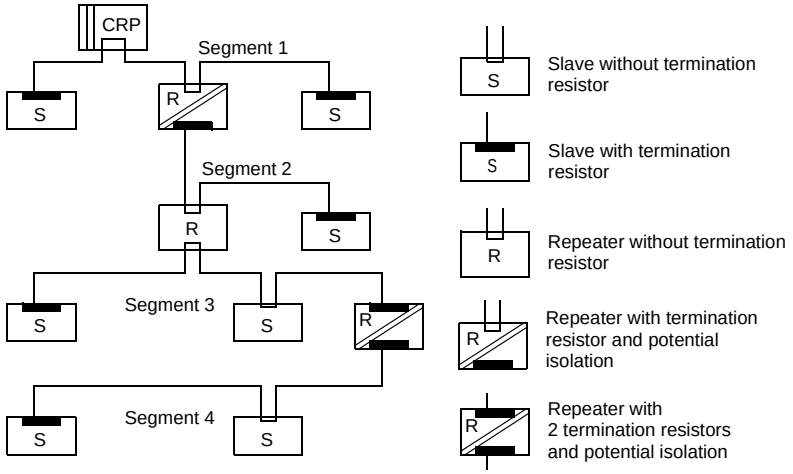
Note: Repeaters on the ends of segments must, just like the slaves, be terminated respectfully.(see *Bus, p. 57*).

Segmentation example

The following methods are used depending on the position of the repeater within the segment:

- Repeater with no termination resistor
- Repeater with one termination resistor
- Repeater with two termination resistors

This diagram shows you an example of segmentation with bus terminations for repeaters and slaves.



Installation

2

Introduction

Overview

This chapter contains information concerning the installation and first operational steps for the TSX Quantum 140 CRP 811 PROFIBUS DP.

	**DANGER**
	Follow general safety regulations, defined in the standards for installing or for the first operation of electrical systems and devices. There are also guidelines for the installation and operation of TSX Quantum controllers. When using additional components (lightning protection, etc.) please follow the manufacturer's guidelines. **Failure to follow this precaution will result in death, serious injury, or equipment damage.**

What's in this Chapter?

This chapter contains the following topics:

General Guidelines

Location

The PROFIBUS Master Quantum TSX 140 CRP 811 operates in the central module rack (local).

Operation in RIO (Remote I/O) or DIO (Distributed I/O) is not possible.

Operational Security

	**DANGER**
	Unrecognizable communication break-down between master and slaves. Do not, in any case, remove the 15 pin PROFIBUS connector on the Bus TAP during operation. This leads to a communication break-down which is not recognized by the PLC. **Failure to follow this precaution will result in death, serious injury, or equipment damage.**

Connecting Repeaters

Only repeaters for RS 485 which comply with IP20 protection for cabinet installation are permitted. An acceptable device is available from Siemens. The order number can be found in *Miscellaneous Accessories, p. 101*

The following table shows you the setup for this repeater.

Step	Action
1	The bus baud rate is set using the rotary switch
2	The repeater is supplied with 24 VDC. (Remove the bridge between M and PE beforehand)

Note: Do not define a bus address on the repeater.

Wiring

Guidelines for Bus Segment Installation

The following guidelines apply for wiring bus segments:

- Type "A" bus cable which complies with PROFIBUS standards is to be used the bus.
- The bus cable may not be twisted, pinched or stretched.
- A bus segment must be fitted with a termination resistor on both ends.
  The corresponding slave must be live at all times so that the termination resistor is effective however.
- Bus nodes that do not terminate a segment can be separated from the bus without interrupting regular data traffic.
- Branch lines are not allowed.

Wiring in Buildings

In Cabinets

Cable locations play a major role in the resistance to interference. Therefore, the following guidelines are applied:

- Data lines must be separated from all AC and DC power lines >= 60 V.
- A minimum spacing of 20 cm is to be kept between data lines and power lines.
- AC and DC feed wires > 60 V and <= 230 V must be run separately from AC and DC power feeds > 230 V
  Separated means that the cables are in different cable bundles and ducts.
- PG screws with integrated grounding are not allowed.
- Cabinet lighting must be done with EMC safe lights and wiring.

Outside of Cabinets

- Cables must be run in metal cable ducting (lines, troughs, ducts or tubing) wherever possible.
- Only wires of < 60 V or shielded < 230 V may be run in common cable ducts. Dividers in metal cable ducts may be used as long as the minimum spacing of 20 cm is kept between wires.
- PROFIBUS data lines must be run separately in metal cable ducts.

Wiring outside of buildings

Generally, the same rules apply for running lines outside of buildings as within.

However, the following applies to bus cable:

- Run in a suitable plastic tubing.
- When burying cables, only cable that is specifically designed for this purpose may be used.
  Pay special attention to the permitted temperatures.
- When running cables between buildings, use *Surge Protection for Bus Leads (lightning protection), p. 43*.
- For baud rates over 500 kBaud, fiber optics cable is recommended.

Constructing the Bus Cable for PROFIBUS DP

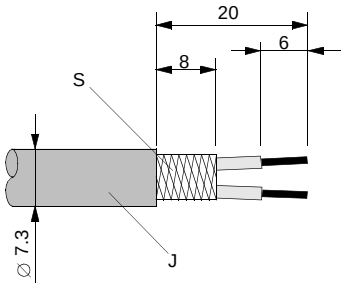
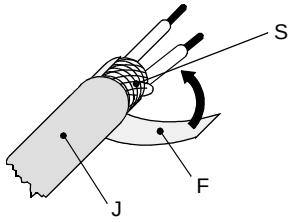
Overview

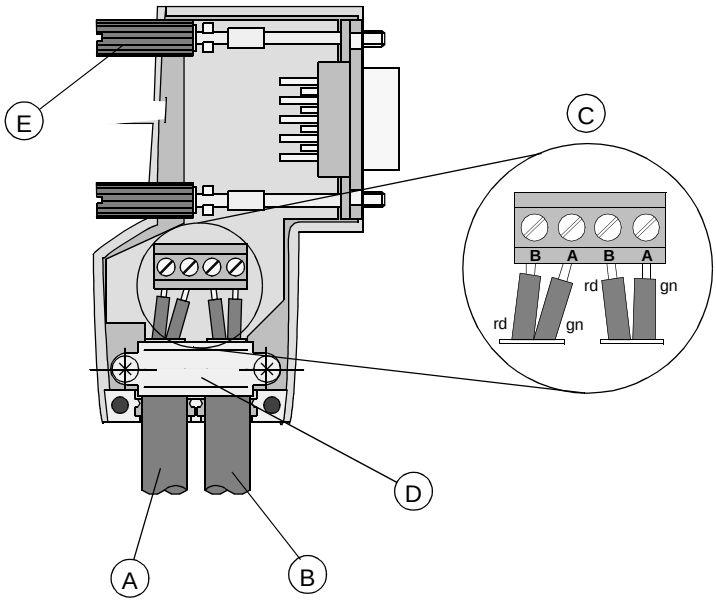
The bus cable for connecting PROFIBUS DP devices must be constructed by the user.

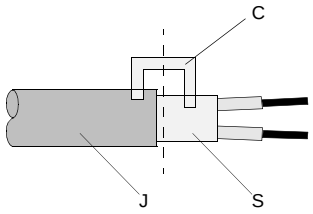
A special PROFIBUS cable (twisted pair) is required here. This standard cable is available at Schneider Automation. There are also three different connectors (see *PROFIBUS Cables and Connectors, p. 100*).

Constructing the Bus Cable

To construct the cable, proceed as follows:

Step	Action
1	Cut the cable to the required length.
2	Prepare the cable ends as shown in the illustration (dimensions in mm):  **J** PVC jacket **S** Braided shielding
3	Remove the PVC jacket **J** to the indicated length.
4	Wrap the provided copper shielding**F** around the shield braiding **S**:  **J** PVC jacket **S** Braided shielding **F** Copper foil shielding Additional foil can be obtained from 3 M (see *PROFIBUS Cables and Connectors, p. 100*).

Step	Action
5	Plug the leads of the corresponding cable(s) into the terminals as shown: • **Green** lead in terminal **A** • **Red** lead in terminal **B** **Note:** Do **not** tighten the corresponding screws yet. Connection terminal assignment on the PROFIBUS DP (Example: 490 NAD 911 04 PROFIBUS connector):  **A** Incoming cable KAB PROFIB **B** Outgoing cable KAB PROFIB (not available with 490 NAD 911 03) **C** Connection terminals (only once (B,A) with 490 NAD 911 03) **D** Cable cleat for relieving tension **E** Bus connector screws

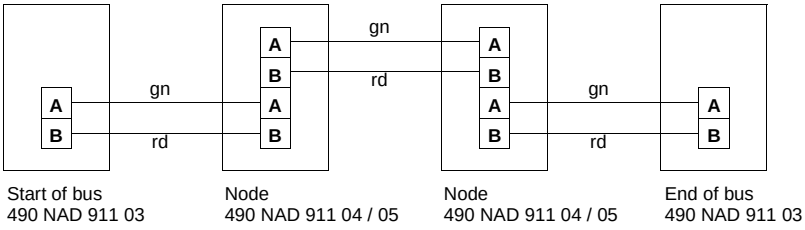
Step	Action
6	Attach the cables with the provided cable cleat to create a robust shielded connection and to relieve any tension as shown:  **J** PVC jacket **S** Braided shielding with foil shielding **C** Cable cleat **Note:** Half of the cable jacket must lie under the cable cleat! Pay attention to the cable cleat installation instructions.
7	Fasten the individual wires of the PROFIBUS cable to the terminals
8	Close the connector housing. **Note:** The shielding of both cables is connected internally with the metal housing of the connector.
9	Complete the *Central Shielding Measures, p. 40* and grounding operations for the shielding before you connect the cable connector to the module.
10	Plug the PROFIBUS DP connector into the corresponding module and secure it with the screws.

Bus Begin and Bus End

The PROFIBUS connector with termination (490 NAD 911 03) is required at the beginning and the end of the bus. These connectors emulate the line impedance.

It is recommended that at least one connector with diagnostics interface (490 NAD 911 05) is used.

Wiring diagram for a PROFIBUS DP cable



Note: Siemens has manufactured a bus testing device called a BT200 for testing the status of the bus cable.

Trouble Shooting

Finding the Source of the Error

When an error occurs, check the configured hardware against the following list of error sources:

- Compare configured module types with the existing modules
- Examine the voltage supply to all modules
- Compare configured addresses with the addresses specified on the bus adapter
- Examine the parameters for complex (analog) modules
- Check EMC and equipotential bonding precautions
- Test all cabling and connections:
  - Bus connector screws
  - Proper cable location
  - Termination resistors
  - Proper connectors (for 12 MBaud, special connectors with built-in restrictors must be used)
- General contact problems with connections

Note: If you cannot find the source of the problem then take advantage of the diagnostics route (*Diagnostics Interface, p. 94* and *Diagnostics, p. 90*).

EMC Measures

3

Introduction

Overview

This chapter contains information concerning the EMC measures with PROFIBUS DP communication with the TSX Quantum 140 CRP 811.

Note: Basic information on grounding and shielding can be found by referring to the *Related Documents, p. 9* section.

What's in this Chapter?

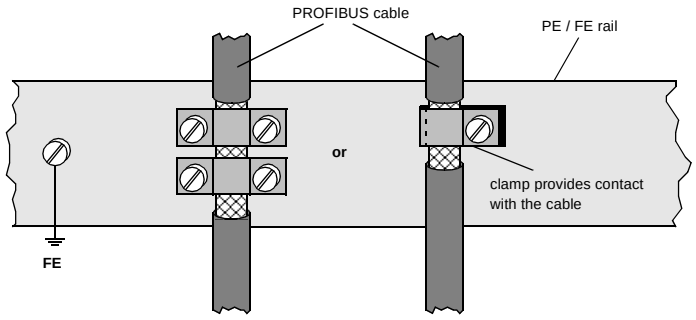
This chapter contains the following topics:

Grounding and Shielding for Systems with Equipotential Bonding

Central Shielding Measures

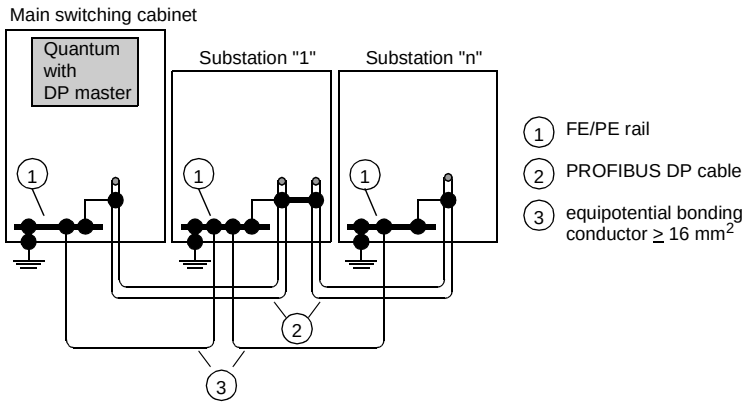
Each cable shield should be galvanically grounded with the earth using FE/PE grounding clamps immediately after the cable has been connected to the cabinet.

This example indicates the shielding connection from the PROFIBUS cable to the FE/PE rail.



Note: An equalization current can flow across a shield connected at both ends because of fluctuations in ground potential. To prevent this, it is imperative that there is potential equalization between all the attached installation components and devices.

This example indicates the system components and devices in a system with equipotential bonding.



Grounding and Shielding for Systems without Equipotential Bonding

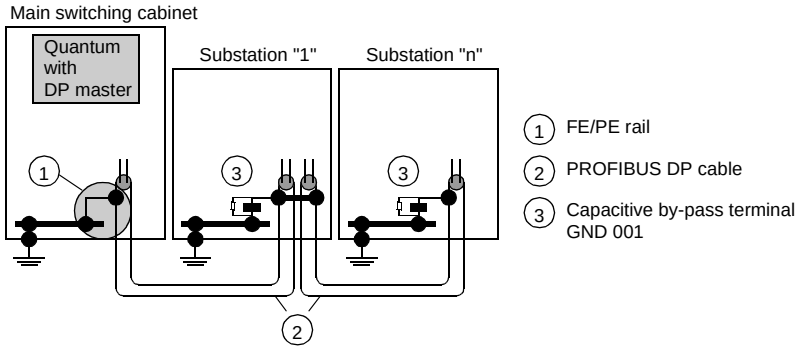
Principle

Note: Basically, grounding and shielding is to be carried out the same as for systems **with** equipotential bonding.

If this is not possible because of system or construction specific reasons however, distributed ground with a capacitive coupling of high frequency interference signals. Procedures

Overview

This representation shows distributed grounding with capacitive coupling



Distributed Grounding with Capacitive Coupling

This table shows you the steps in setting up distributed grounding with capacitive coupling.

Step	Action	Comments
1	Galvanically ground the shielding (only) to the end of the bus cable and with as much surface area as possible to the central cabinet	
2	Run the bus cable from there to the last bus node, **without** any other ground connections	
3	Shielding for all bus nodes should be ground "capacitive only" This is done with e.g. the GND 001 terminal connection.	This is achieve at least one discharge route for high frequency interference **Note:** A transient current cannot flow without a galvanic connection
4	Refer to the *Connection Example, p. 47* and the *Making Shielding Connections, p. 48* in the instructions for the corresponding device.	

Surge Protection for Bus Leads (lightning protection)

Surge Protection for Bus Leads up to 12 Mbps Signals

To protect transmission systems from extraneous surges (lightning), the PROFIBUS DP lead should be equipped with suitable surge protection equipment once it extends outside a building.

The nominal discharge current should, in this case, be at least 5 kA.

The following lightning arrestors e.g. **type CT MD/HF5** and **type CT B110** from Dehn und Söhne GmbH & Co KG may be used. Addresses and order numbers for these devices can be found in the appendix under *Surge Protection Equipment, p. 101*).

For adequate protection of a PROFIBUS DP cable, two sets of protection equipment are required for each building. The first set of protection devices (type B110), located where the cable enters the building, works as a lightning conductor, the second (type MD/HF5), located near the first device, works as a surge protection device.

Connection rules for protection devices

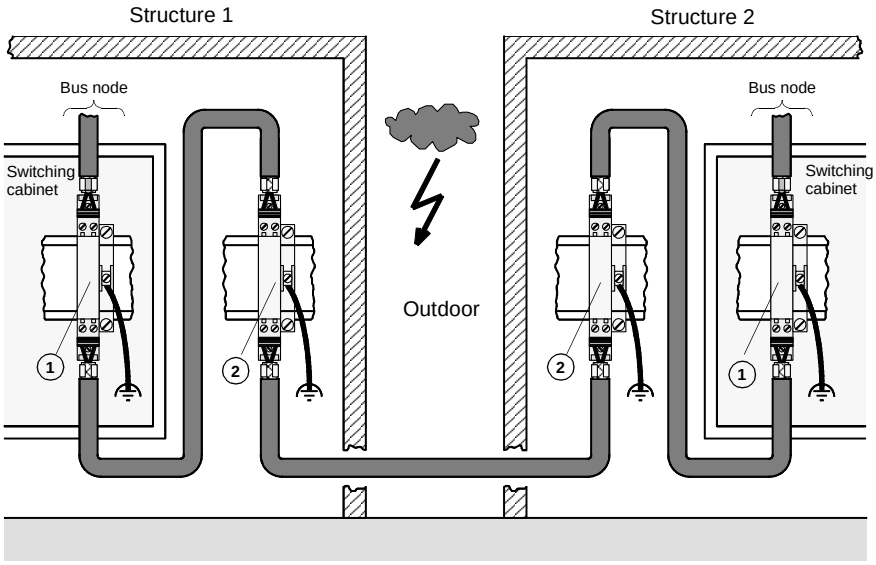
Before connection of the protection devices please observe the following rules:

- Install a functional ground (equipotential bonding rail)
- Install the protection equipment near the functional ground, to keep surge current path as short as possible.

  Keep the lead to the functional ground as short as possible. (min. 6 mm^2)
- The maximum lead length depends on the transfer rate.
  - **At transfer rates up to 500 kBaud** you can configure a maximum of **4 outdoor segments** with 8 pairs of protection devices (CT B110 and CT MD/HF5).
  - **At transfer rates of 1 MBaud** or higher, you may only configure **one outdoor segment** with 2 pairs of protection devices.
- Do **not** confuse the IN and OUT ends of the lightning arrestor (IN = outdoor end)
- Make certain that you *Shield grounding with protection devices, p. 45* according to the type of lightning arrestor (CT B110 or CT MD/HF5) that is used.

Protection device connection plan

Protection device connection plan:



Type and number of lightning conductors made by the firm Dehn und Söhne GmbH &Co KG suitable for a PROFIBUS DP cable

No.	Model	Number per group
1	CT MD/HF 5	2
2	CT B110	2

Note: Information about assembly and connection of the cables can be found in the relevant installation instructions that come with lightning arrestor.

Shield grounding with protection devices

Direct or indirect shield grounding are offered by the protection devices. An indirect grounding occurs using gas conductors.

In both cases EMC spring terminals grasp the input and output sides of the cable shield.

Note: When the system permits it, we recommend you use direct shield grounding.

Types of shield grounding assignment

Type of grounding	Technique
Direct shield grounding	Connect the shield of the incoming cable to the IN terminal, and that of the outgoing cable to the OUT terminal. The shields are now galvanically connected with PE.
Indirect shield grounding using gas conductors	Connection of the shield as described for direct shield grounding. Insert the gas-type surge protector in the rack beneath the cabinet connection terminals on the input side.

Note: Further information about grounding and shield grounding can be found in the relevant installation instructions that come with the lightning arrestor.

Static Discharge in Long PROFIBUS DP Cables

Static Discharge

Very long bus cables, which have been laid but not yet connected, are discharged as follows:

Step	Action
1	Select **the** PROFIBUS DP connector **closest to the FE/PE grounding clamp**.
2	Touch the **metal of the connector housing** to the cabinet's FE/PE grounding clamp to discharge any static electricity.
3	Now connect the bus connector to the device.
4	Discharge the other PROFIBUS DP cable connectors as described in steps 2and 3.

Notes

Note: During mounting, the metal part of the PROFIBUS DP connector is connected internally to the cable shield. When the bus cable connector is inserted into the module's PROFIBUS port, a short connection between the shield and the FE/PE is created automatically.

Capacitive By-Pass Terminal GND 001

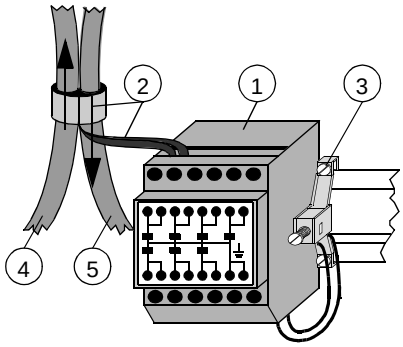
Overview

Distributed grounding with capacitive by-passing is used in systems without equipotential bonding.

Mount the Schneider by-pass terminal (GND 001) as shown in the following representations.

Connection Example

This example shows the connection from the PROFIBUS cable to the by-pass terminal.



1 GND 001

2 Shielding

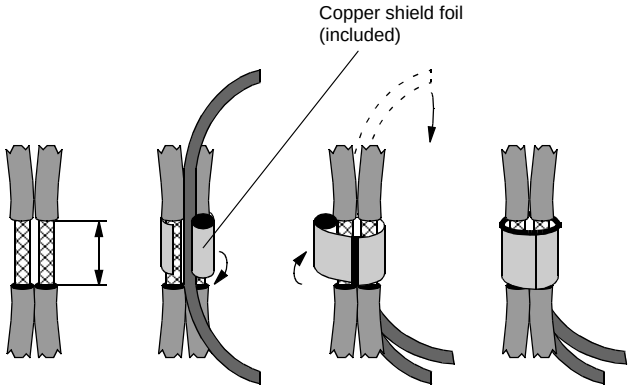
3 Connection to Rail

4 PROFIBUS cable entering switching cabinet

5 PROFIBUS cable exiting switching cabinet

Making Shielding Connections

This example shows the shielding connection with the PROFIBUS cable.



Note: The by-pass for the bus ends is to be prepared on **one** cable only

Hardware

II

At a Glance

Overview

This portion of the documentation contains information on the structure of the hardware as well as performance and functionality information for the TSX Quantum 140 CRP 811 PROFIBUS DP Master.

What's in this Part?

This part contains the following chapters:

Module Description

4

Introduction

Overview

This chapter contains information on the TSX Quantum 140 CRP 811 PROFIBUS DP master module.

What's in this Chapter?

This chapter contains the following topics:

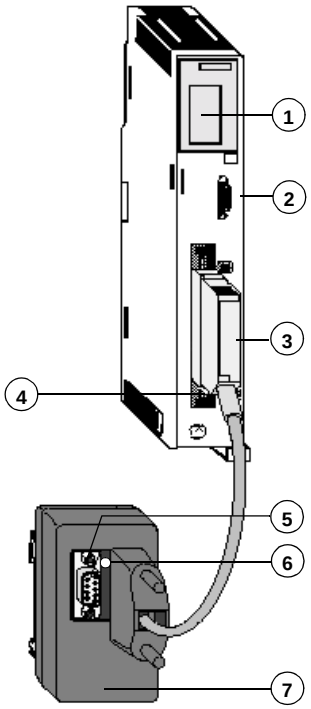
Short Description

Overview

The TSX Quantum 140 CRP 811 is a Class 1 PROFIBUS DP Master. It connects a Quantum controller with the slave modules using PROFIBUS DP. The interface to PROFIBUS DP is an RS-485 interface on the bus tap (**T**ransmission **A**ccess **P**oint)

The bus TAP is also used as potential isolation for the PLC

This representation shows you the master module with the PROFIBUS interface.



1 LED display field

2 Diagnostics interface (RS 232C)

3 PCMCIA card (467 NHP 911)

4 LED (always off)

5 PROFIBUS interface (RS 485)

6 LED (always on)

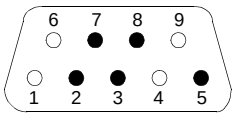
7 Bus TAP / Transmission Access Point (490 NAE 911)

Operational Security

	DANGER
	Unrecognizable communication break-down between master and slaves. Do not, in any case, remove the 15 pin PROFIBUS connector on the Bus TAP during operation. This leads to a communication break-down which is not recognized by the PLC. **Failure to follow this precaution will result in death, serious injury, or equipment damage.**

RS 232C Interface Assignments

RS 232C interface

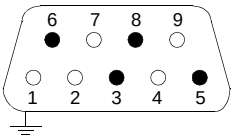


RS 232C interface pin-outs

Connector	Signal	Meaning
2	D2 (RxD)	Receive data
3	D1 (TxD)	Send data
5	E2 (GND)	Reference Ground
7	S2 (RTS)	Request transmission (Request to Send
8	M2 (CTS)	Clear to send

RS 485 Interface Assignments

RS 485 interface



● occupied
○ unused

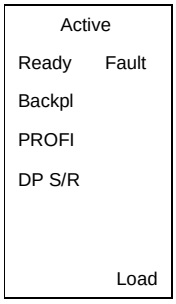
RS 485 interface pin-outs

Connector	Signal	Meaning
3	RxD-P/TxD-P	Receive data (RxD) positive, Outgoing data (TxD) positive
5	DGND	Reference potential for terminations (supplied by the I/O module)
6	VP	Supply voltage for bus signals, used by nodes with termination resistor (+5V)
8	RxD-N/TxD-N	Incoming data (RxD-N) negated, Outgoing data (TxD-N) negated
1, 2, 4, 7, 9		Pin not connected
Connector case		Cable shield connection (internally connected)

Display Element Description

LED display field

This representation shows you the LED display field of the TSX Quantum DRP 811 PROFIBUS DP master module.



The Backpl, DP S/R, PROFI and Load LEDs are dual purpose indicators.

1. For indicating usable data and configuration data transfers
2. For displaying error status

Description of the LEDs in the display field

This table shows you LED states and their descriptions

LEDs	Color	Status	Description
Active	Green	On	Signals the existence of backplane communication
		Flashing	The Flash RAM loading procedure is active
Ready	Green	On	Module is in operation, firmware running
Fault	Red	On	Indicates and error (see LED Error Codes)
Backpl	Green	Off	Indicates error-free operation
		Flashing with error code	Backplane error
PROFI	Green	Flashing with error code	Erroneous configuration data or PROFIBUS fault
DP S/R	Green	Flashing (quick[3] frequency)	Sending/receiving DP data
		Flashing (medium[2] frequency)	Slaves being configured
		Flashing (slow[1] frequency)	Waiting for configuration data
		Flashing with error code	Erroneous configuration data
Load	Yellow	Flashing	Configuration data load operation is active
		Flashing with error code	Erroneous load operation

Flashing frequency

	Flashing frequency	Turn-on time	Off-time
1	Slow	400 ms	400 ms
2	Medium	200 ms	200 ms
3	Fast	100 ms	100 ms

Notes

Note: To reset the error indicator LED(s), the module must be restarted or a hot swap must be performed.

Note:

- The LED on the PCMCIA card is always "off" during error-free operation
- The LED on the Bus TAP is always "on" when an error occurs

Specifications

Overview

Overview

Equipment class	Master class 1
PNO identification number	5506
Supported User Profile	PA
Supported Protocol	V0
Device data base	ASA_5506.GSD
Firmware	>= V.4.5 recommended
Supply on the bus	5 VDC, 1.2 A max.
Power Dissipation	6.5 W max.
Maximum CRP per Quantum	2 with CPU 140 x13 0x 6 with CPU 140 424 02 or CPU 140 x34 1x (A)

Physical Structure

Physical structure

Format	Standard housing (width: 40.34 mm) Quantum module equipped with PCMCIA card model III and bus TAP
Weight	0.68 kg (complete)
Connection area	In the main rack
PCMCIA Card	NHP 811 Firmware V.5.02

Interfaces

Interfaces

PROFIBUS	On the bus TAP as EIA RS 485 up to 12 Mbit/sec maximum Connectors: 9-pin D-Sub
RS-232C	as per DIN 66 020, potentially connected Baud rate: 19.2 kbit/sec (default) Max. cable length 3m (shielded)

Bus

Bus

Bus access procedures	Master-slave	
Transfer procedures	Half-duplex	
Bus topology	Linear bus with active bus termination	
Bus cable type	Shielded twisted pair conductors The PROFIBUS standard determines the parameters of the cable (type "A" for 12 Mbit/sec) per EN 50 170:	
	Wave resistance	135 ... 165 Ohm at 3 to 20 Mhz
	Capacitance per unit length	< 30 pF/m
	Loop resistance	< 110 Ohm/km
	Cable diameter	> 0.64 mm
	Cable cross section	> 0.34 mm^2
Branch lines	None (with the exception of 1 x 3m to the bus monitor)	
Bus termination	Standard 390 Ohm / 220 Ohm / 390 Ohm for 12 Mbit/sec cable)	
Number of nodes on the bus	Max. 32 with no repeaters Max. 125 with repeaters	
Addressing range	1 ... 125	

Bus cable lengths

Bus cable lengths

Max. bus cable lengths	**Baud rates (for 12 Mbit/sec cable)**
1.2 km	9.6 kbit/sec
1.2 km	19.2 kbit/sec
1.2 km	93.75 kbit/sec
1.0 km	187.5 kbit/sec
0.5 km	500 kbit/sec
0.2 km	1.5 Mbit/sec
0.1 km	3 Mbit/sec
0.1 km	6 Mbit/sec
0.1 km	12 Mbit/sec

Data format and security

Data format and security

Telegram length	Max. 255 bytes
Data field length	Max. 244 bytes
Data Security (backup)	Hamming distance, HD = 4

Software

Software

Software	Model	Valid versions
Configuration	Concept	>= V.2.2
Configurator	SyCon-PB/GS TLX L FBC M or TLX L FBC 10 M incl. GSD files	>= V.2.6.00

Hardware structure

Hardware structure

Memory	RAM	256 KB for program data + 8 KB dual port memory in the CRP module. 512 KB for program data +16 KB dual port memory in the PCMCIA card.
	EEPROM	128 Bytes in the PCMCIA card
	Flash-ROM	256 Kb in the CRP module 256 Kb in the PCMCIA card
Processor	25 MHz Intel 80386 in the CRP module (Controller) Siemens 80C 165 and Siemens ASIC ASPC2 in the PCMCIA card	

Software

III

At a Glance

Overview

This section of the documentation contains information on the software for the TSX Quantum 140 CRP 811 PROFIBUS DP.

What's in this Part?

This part contains the following chapters:

Configuration

5

Introduction

Overview

This chapter contains information concerning the software configuration for the TSX Quantum 140 CRP 811 PROFIBUS DP.

What's in this Chapter?

This chapter contains the following sections:

5.1 Introduction

Introduction

Overview

This section provides you with an overview of the procedures and the required hardware for the configuration with the TSX Quantum 140 CRP 811 PROFIBUS DP.

What's in this Section?

This section contains the following topics:

Configuration Limits

Overview

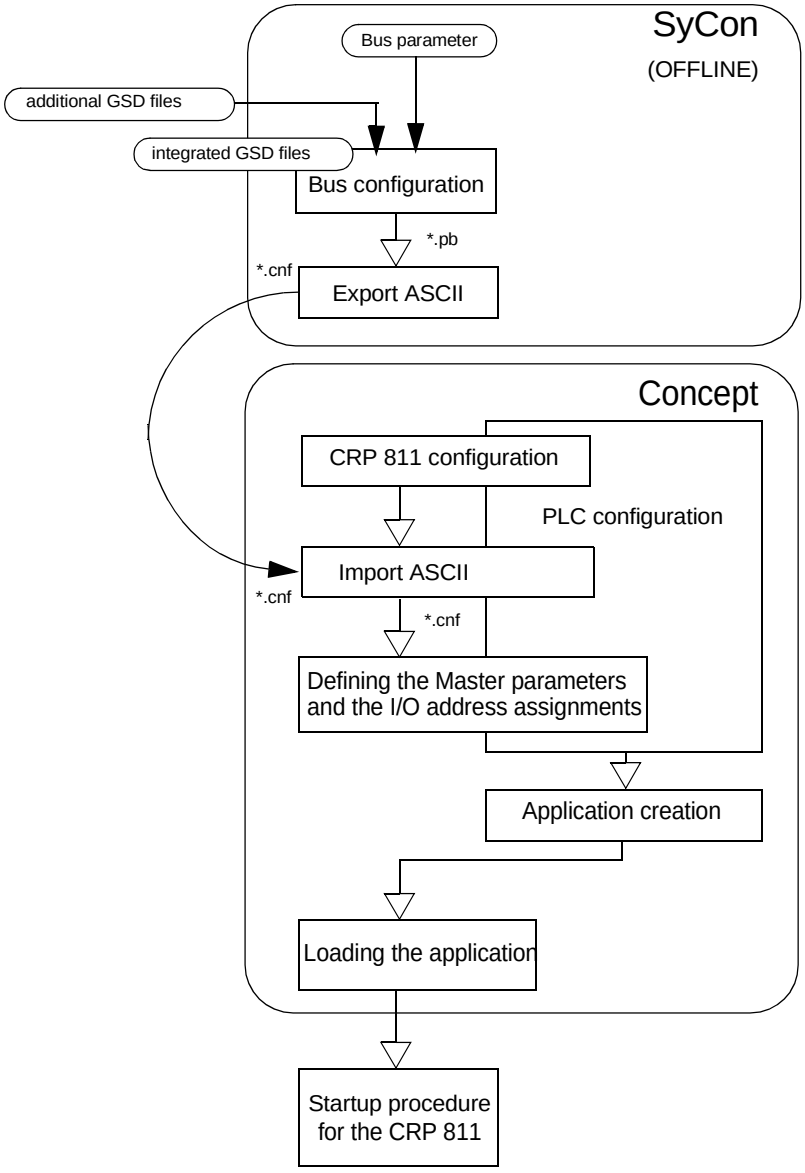
The configuration limits of the PROFIBUS DP network all depend on the CPU that is used. The following table shows you how:

CPU type	**140 CPU x13**	**140 CPU 4x4, 140 CPU 534**
Max. number of CRP modules	2	6
Max. number of I/O bytes per slave:		
Modular slaves	122 bytes IN 122 bytes OUT	244 bytes IN 244 bytes OUT
Compact Slaves	64 bytes IN 64 bytes OUT	244 bytes IN 244 bytes OUT
Max. number of slaves	124 + Master	124 + Master
Max. number of I/O bytes	976 bytes IN 976 bytes OUT	15616 bytes IN 15616 bytes OUT

Entire Procedure

Overview

The following representation shows the entire process after the hardware installation up until the first time the PROFIBUS DP Master is started.



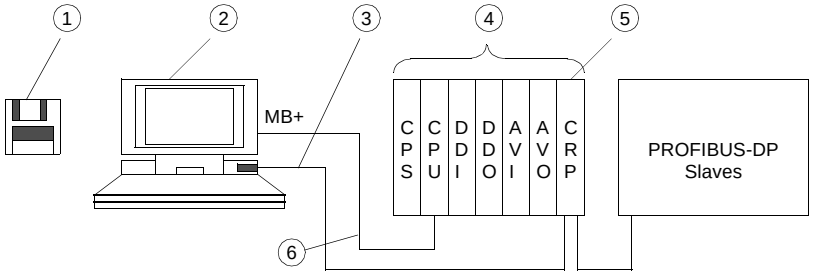
Procedure

Configuration procedures

Step	Software	Action	Comment
1	SyCon	Bus Configuration	The bus configuration for the PROFIBUS DP is done by means of the SyCon Configurator. GSD files for various Schneider PROFIBUS products are also included with the software. A bus project (*.PB) file is now made in SyCon.
		Bus configuration export	Exporting the bus project (*.PB) as a configuration file (*.CNF) in ASCII format.
2	Concept	CRP 811 configuration	Enabling the CRP 811 Adding the CRP 811 in the I/O Map
3	Concept	Bus configuration import	After importing the configuration file (*.CNF) the I/O map for the Concept PLC Configurator appears.
4	Concept	Defining the master parameters and the I/O address assignments:	Allocating status memory to the individual PROFIBUS nodes
5	Concept	Loading the Concept application into the CPU	At the same time, the CRP 811 receives its configuration from the CPU over the backplane.

Hardware scenario

The following representation shows the hardware for the configuration and diagnostics.



1 GSD files for loading to SyCon

2 Programming device for Concept and SyCon

3 V24 cable for diagnosis

4 Local Quantum Drop

5 PROFIBUS DP Master

6 Programming cable

5.2 Bus Configuration

Introduction

Overview

This segment contains information concerning the configuration of the TSX Quantum 140 CRP 811 PROFIBUS DP with the SyCon Configurator.

What's in this Section?

This section contains the following topics:

Introduction

Overview

Configuring the PROFIBUS DP network is done using the SyCon Configurator TLX L FBC M or the TLX L FBC 10 M.

Note: GSD files for the following PROFIBUS DP master and slave modules are included with the software for the SyCon Configurator.

- Master
  - TSX Quantum 140 CRP 811
  - TSX Premium PBY 100
- Slave modules:
  - 170 BDI 344 00 /01
  - 170 BDI 354 00 /01
  - 170 BDM 344 00/01
  - 170 BDO 354 00
  - 170 DNT 110 00
  - DEA 203
  - Altivar 58

Procedure

Follow these steps for creating and exporting the bus configuration:

Step	Action	Comment
1	Creating a bus project	
2	Define and address the master(s)	A maximum of two CRP masters can be defined
3	Slave configuration ● Define and address the slaves and assign them to the corresponding master ● Configuration of the I/O modules (This includes empty slots with modular slaves)	
4	Define bus parameters and save the bus project	This step can also be performed after step 2
5	Export bus project	This procedure must be performed for every master with multi-master operation.

Notes

Note: The following description concerns the fundamental configuration steps only.

For detailed information, please refer to the online help for the SyCon Configurator and the corresponding help files on the installation CD.

Creating a Bus Project

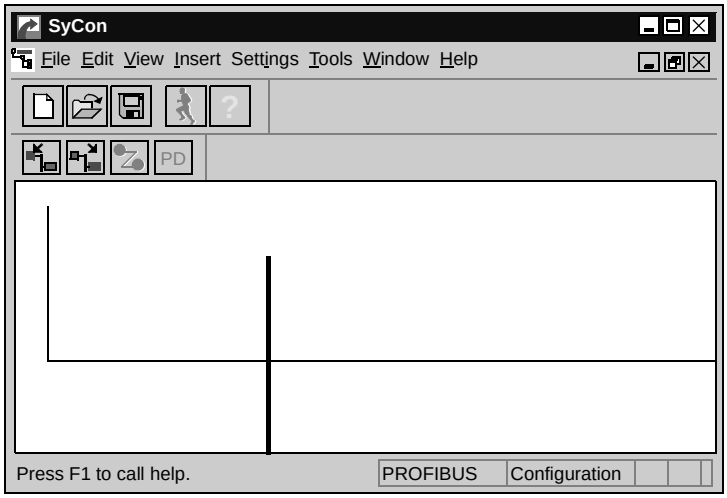
Defining the target directory

Define the target directory for your bus project:

Step	Action
1	Select from the main menu **Settings** → **Path...**. **Result:** The dialog **Directory** is opened and the path of the SyCon directory is shown as the project directory (e.g. `C:\Schneider\Sycon\Project`).
2	Enter the path of the Concept directory in the **Project File directory** text box. **Note:** The default can also be used. **Result:** Executing menu commands **Save** and **Export** (in the main menu **File**) saves all files into the defined Concept directory.

Creating a Bus Project

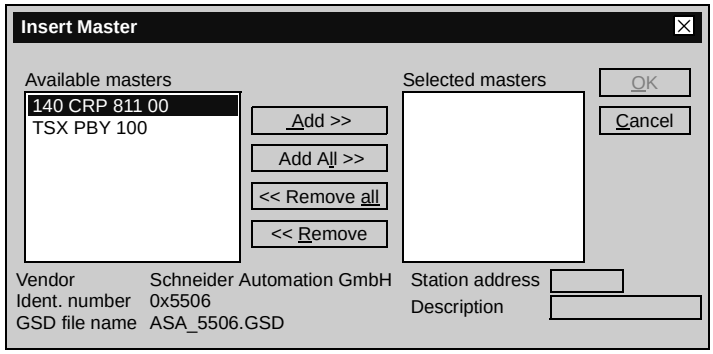
This table shows you the steps in setting up a bus project with SyCon.

Step	Action
1	Open a bus project with **File** → **New.** Result: 

Defining and Addressing the Master(s)

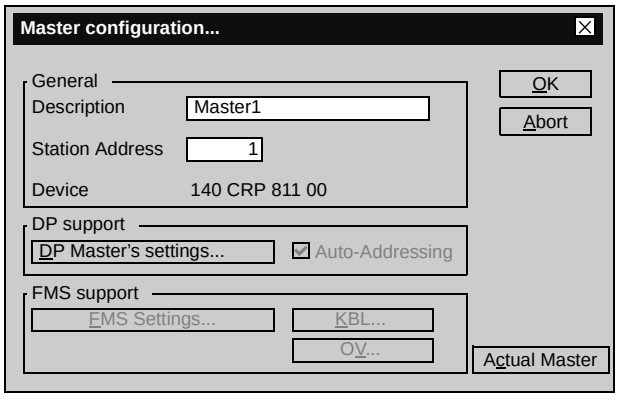
Defining a Master

This table shows you the steps in defining the master(s).

Step	Action
1	List the available masters with **Insert** → **Master.** **Result:** 
2	Select the CRP 811 (Example of single master operation)

Addressing a Master

This table shows you the steps in addressing a master.

Step	Action
1	Selecting a Master.
2	Address the master with **Settings** → **Master Configuration.** **Result:** 

Example of a Slave Configuration

Overview

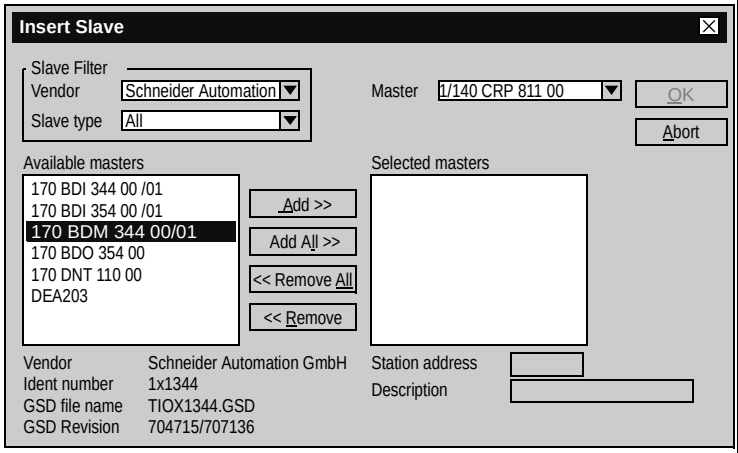
The table shows you an example configuration for various slave modules by Schneider, equipped with a selection of I/O modules:

Slave modules	Components
TIO	Digital I/O
Momentum Slave (170 DNT 110 00)	Analog I/O
Momentum Slave (170 DNT 110 00)	Digital I/O
Compact Slave (DEA 203)	Analog I/O and Digital I/O

The following tables show you how the example configuration is created in the SyCon Configurator.

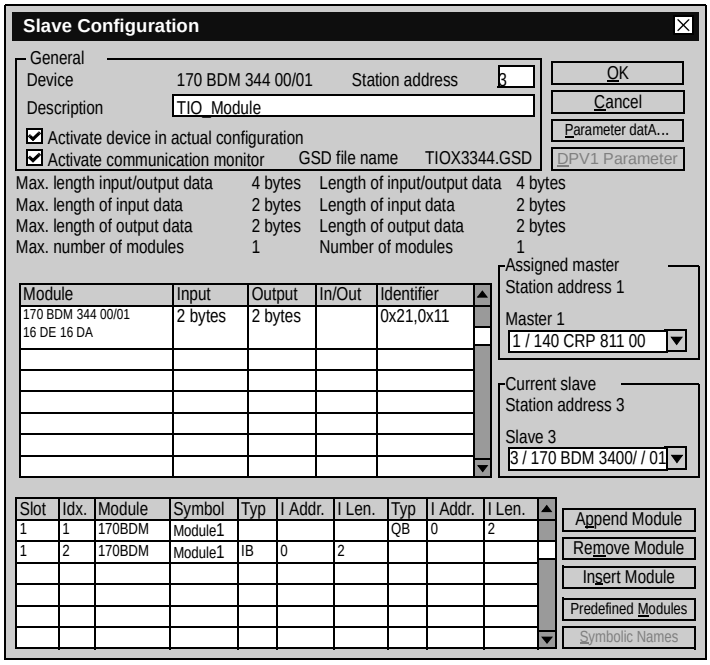
Defining and Addressing the Slave Modules

This table shows you the steps in defining a slave module.

Step	Action
1	List the available slave modules with **Insert** → **Slave** **Result:** 
2	TIO module selection
3	Addressing the selected TIO module
4	Allocating the TIO module to the CRP 811
5	Repeat the previous steps for the other slave modules of the configuration example

Configuration of the I/O Modules

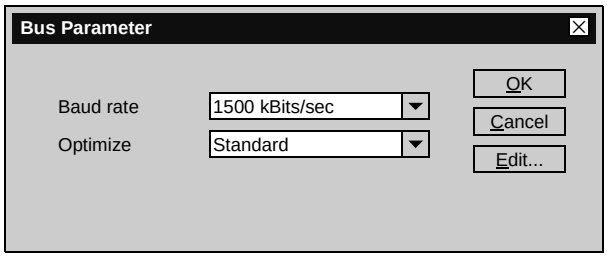
This table shows you the steps in configuring the I/O modules of the slave modules.

Step	Action
1	Select the TIO module
2	Configure this module with **Settings** → **Slave Configuration** **Result:** 
3	Insert all I/Os for the TIO module
4	Repeat steps 1 to 3 for the other slave modules of the configuration example **Notes** on modular slave module DEA 203: If slots are empty then they must be configured as empty slots.

Defining Bus Parameters and Saving the Bus Project

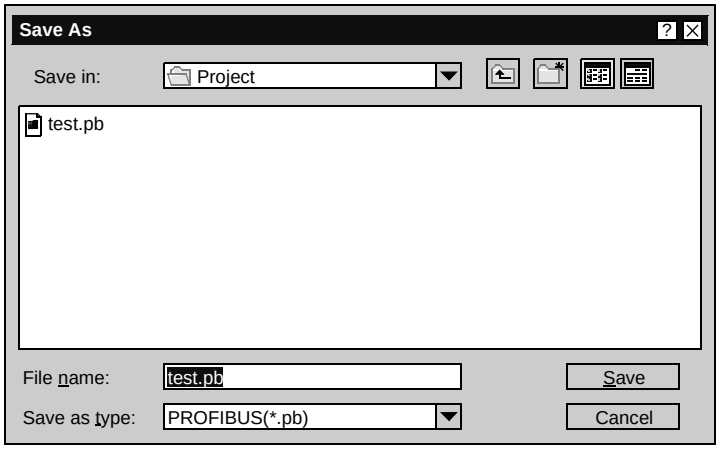
Defining Bus Parameters

This table shows you the steps in defining bus parameters.

Step	Action
1	Selecting a Master.
2	View bus parameters with **Settings** → **Bus Parameter.** Depending on the optimization, bus parameters can be changed with **Edit**. **Note:** The default optimization defines default bus parameters for every baud rate in PROFIBUS DP systems. **Result:** 

Saving the Bus Project

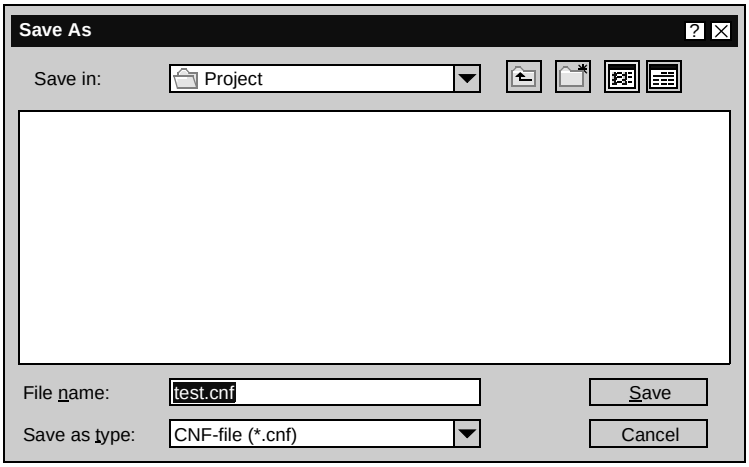
This table shows you the steps in saving a bus project.

Step	Action
1	Save the bus project with **File** → **Save as....** Result: The configuration is stored in the defined directory as a database file *.PB. **Result:** 

Exporting a Bus Project

Exporting the Bus Project

This table shows you the ASCII export of the file *.CNF.

Step	Action
1	Select the master which has the configuration that you want to export
2	From the main menu, select **File** → **Export** → **ASCII** . **Result:** The configuration is stored in the ASCII file *.CNF within the defined directory. 
3	Repeat steps 1 and 2 for all masters
4	Exit the SyCon Configurator and start Concept.

Notes on saving

The configuration must always be saved as a database file *.PB first and the ASCII file can only be generated from the saved *.PB file. Every change must therefore also be saved as a *.PB file before an ASCII file can be generated for the export.

The *.PB and *.CNF files should always be in the same project directory.

PROFIBUS DP Configuration in Concept

Following the configuration of the PROFIBUS DP nodes in SyCon, the PROFIBUS DP configuration is imported into the Concept I/O component list.

5.3 Configuration using Concept

Introduction

Overview

This section contains information concerning the software configuration for the TSX Quantum 140 CRP 811 PROFIBUS DP using Concept.

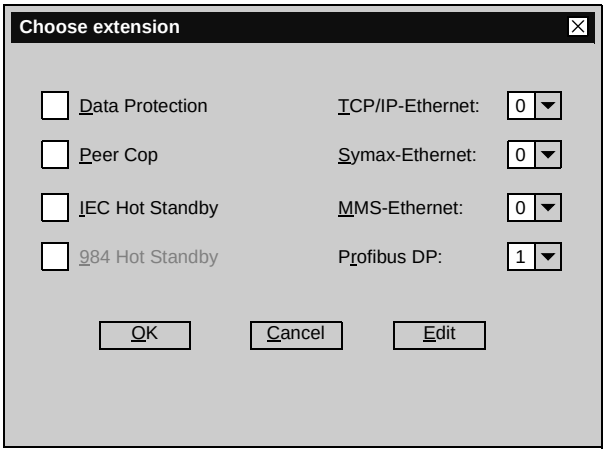
What's in this Section?

This section contains the following topics:

CRP 811 Configuration

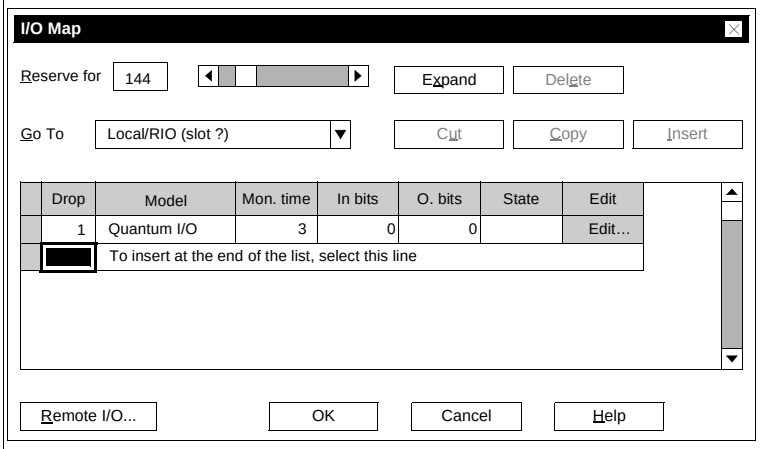
Enabling the PROFIBUS DP

To enable the PROFIBUS DP, proceed as follows:

Step	Action
1	Select from the main menu **Configure** → **Config extensions...**. **Result:** The **Select Extensions** dialog is opened. 
2	Select the number of profibusses that you want to enable from list field **Profibus DP** . Note: Make sure that the sum of all communication modules, depending on the CPU that you are using, is restricted to a value from 2 to 6. **Result:** The communication module the appears in the **I/O Module Selection** dialog and can be used in the I/O map.

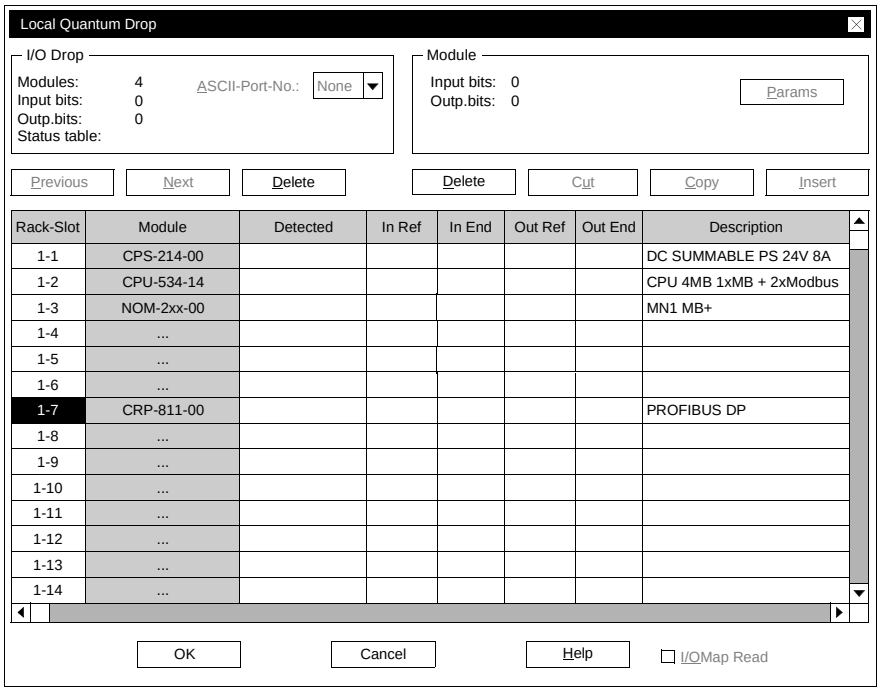
I/O Map with CRP 811

To equip the Quantum with the CRP 811, proceed as follows:

Step	Action
1	Go to main menu **Configure** and open dialog **I/O Map**. **Result:** The **I/O Map** dialog is opened and the first I/O station (Drop) is entered into the table automatically. **Result:** 
2	Select the line with **Quantum I/O** . Select the command button **Edit...**. **Result:** The module mapping appears.
3	Double click on the text field **...** in column **Module**. **Result:** The **I/O Module Selection** dialog is opened.
4	In column **Module** select the module CRP-811-00 and activate command button **OK** . **Result:** The 140 CRP 811 module is entered in the I/O map.

Dialog display

Following module mapping the dialog looks like this:



Importing a PROFIBUS DP Configuration

The import of configured PROFIBUS DP nodes occurs in the parameter dialog of the coupling module CRP-811-00. This dialog is opened, as the row CRP-811-00 is selected in the component list and the command button **Params** is pressed.

Note: Make sure that **all** masters to be configured in Concept are assigned a bus configuration with the SyCon Configurator otherwise other masters will not start-up.

Bus Configuration Import

Requirement

1. The configuration of the PROFIBUS DP nodes is created with the SyCon Configurator and is exported as a `*.CNF` file.
2. The CRP 811 is enabled and added to the components of a local Quantum I/O station.

Note: To guarantee an error free transfer of the PROFIBUS DP configuration make sure that sufficient memory is available. To optimize memory allocation, open the dialog (**Configure** → **Memory partitions...**).

Bus Configuration Import

To import the configuration (`*.CNF`) into Concept follow these steps:

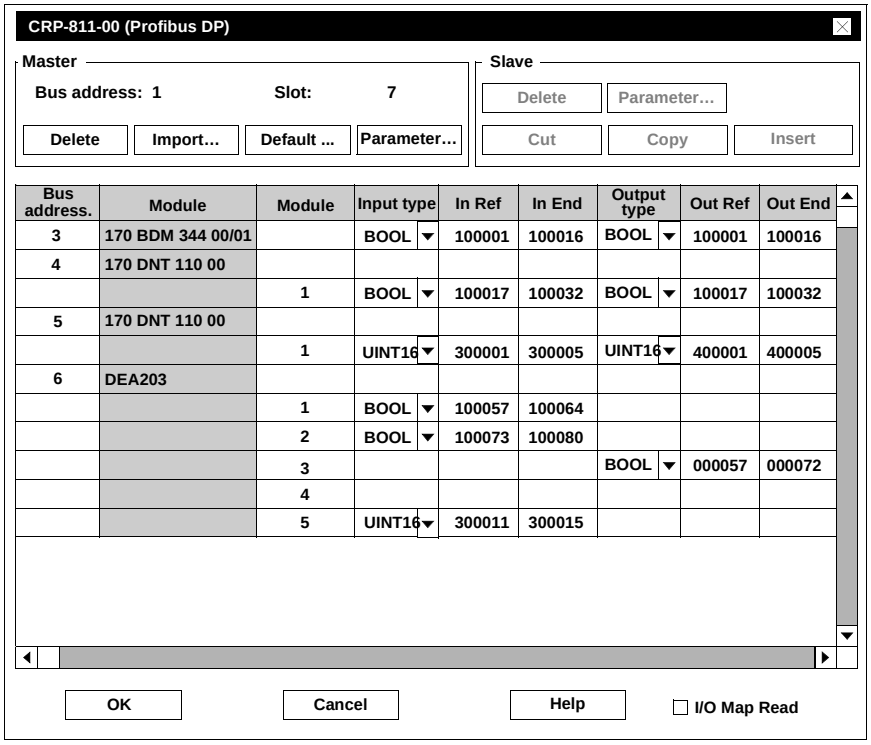
Step	Action
1	Go to the main menu **Configure** and open dialog **I/O Map**. **Result:** The **I/O Map** dialog is opened and the first I/O station (Drop) is entered into the table automatically.
2	Select the line with **Quantum I/O**. Select the command button **Edit...**. **Result:** The module mapping is shown.
3	Select the line for the corresponding bus controller (140 CRP 811) from the dialog and activate the command button **Params**. **Result:** The **140 CRP 811 (PROFIBUS DP)** dialog is opened.
4	By activating the command button **Import...** you will open the window **Select Source File**.
5	Enter the path of the CNF file for importing and activate the command button **OK.** **Result:** The PROFIBUS DP configuration is entered in the Concept I/O component list.
6	Assign the data types and the state RAM addresses corresponding with the modules. **Note:** Refer to the *Data Types and Bit Allocation for I/O Modules, p. 87* and for addressing the diagnostics data refer to *Data Type and Addressing, p. 90*

Dialog display

After importing the example configuration (see *Example of a Slave Configuration, p. 71)* the dialog appears as follows.

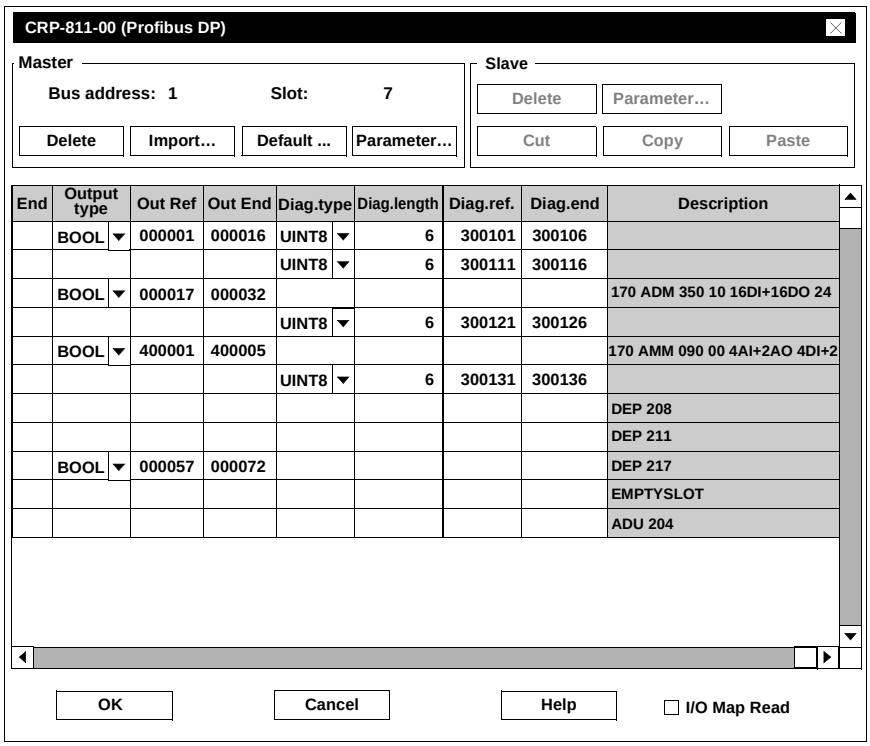
Manual data types and state RAM addresses are already assigned in the representation.

View scrolled to far left:



Bus address.	Module	Module	Input type	In Ref	In End	Output type	Out Ref	Out End
3	170 BDM 344 00/01		BOOL	100001	100016	BOOL	100001	100016
4	170 DNT 110 00							
		1	BOOL	100017	100032	BOOL	100017	100032
5	170 DNT 110 00							
		1	UINT16	300001	300005	UINT16	400001	400005
6	DEA203							
		1	BOOL	100057	100064			
		2	BOOL	100073	100080			
		3				BOOL	000057	000072
		4						
		5	UINT16	300011	300015			

View scrolled to far right:



Parameters and Default Settings

Note: In the **Slave** zone, you will find the command button **Parameter...** for displaying the slave parameters.

In the **Master** zone, you will find the command button **Parameter...** for displaying and editing the master parameters. By activating the command button **Default...** I/O addresses can be assigned automatically. Both dialogs can be found under *Defining the master parameters and the automatic I/O address allocation, p. 83* .

Defining the master parameters and the automatic I/O address allocation

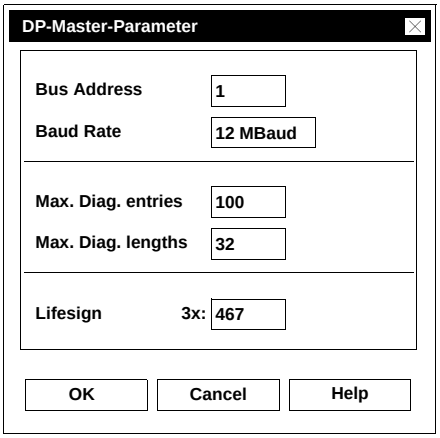
Overview

The following table shows the procedures to follow in defining the parameters for the master and the automatic I/O address assignments:

Note: More detailed information on the parameters can be found under *Master Parameters, p. 85*

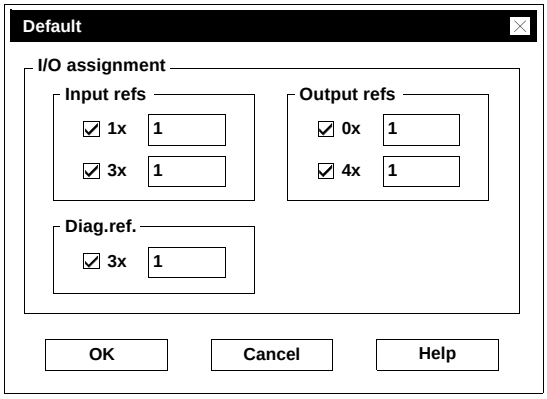
Defining master parameters

To define parameters for the master, proceed as follows:

Step	Action
1	In the **Master** area, select the command button **Parameter...** . **Result:** The **DP-Master-Parameter** dialog is opened. Dialog display 
2	Adopt the default settings as shown in the figure above or redefine them.
3	Exit the dialog with **OK**. **Result:** You are returned to the **CRP-811-00 (PROFIBUS DP)** dialog.

Automatically defining I/O Addresses

To automatically define the I/O addresses proceed as follows:

Step	Action
1	Select the command button **Preset...**. The **Default** dialog is opened. Dialog display 
2	Adopt the default settings as shown in the figure above or redefine them.
3	Exit the dialog with **OK**. **Result:** You are returned to the **CRP-811-00 (PROFIBUS DP)** dialog where the defined references are assigned automatically.

Master Parameters

Introduction

The following is a description of the parameters as they are found in the *Defining master parameters , p. 83* dialog.

Bus Address

The bus address of the configured PROFIBUS DP master as it was defined in the SyCon Configurator is shown in this text field.

Baud Rate

The baud rate as it was defined in the SyCon Configurator is shown in this text field.

Max. Diag. Entries

The maximum number of diagnostic data entries made on the PCMCIA card is defined in this text field. The default is 100 (10 – 400 valid).

The value should be greater than 3 times the amount of slaves on the bus.

If the value that is defined here is too low then the master cannot start due to diagnosis-buffer-overrun.

Note: The following rule should be followed due to limited memory on the PCMCIA card: Max. Diag. entries x Max. Diag. length < 59520

Max. Diag. Length

The maximum number of diagnostic data bytes per slave that are buffered on the PCMCIA board is defined in this text field. The default is 32 (6 - 244 valid). The required minimum value is determined by the slave with the greatest number of diagnosis bytes. Slaves that exceed this value will not start up. The corresponding number of diagnostic bytes can be found in the manufacturer's documentation or the device data base.

Max. value entries means:

All diagnostics data will be received. The amount that is transferred to the PLC depends on the addressing however.

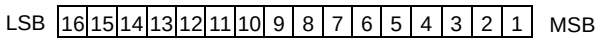
The following applies for Schneider slaves:

- Classic TIOs - max. 13 bytes diagnostics data
- Momentum - max. 19 bytes diagnostics data
- DEA203 - max. 22 bytes diagnostics data

Note: The following rule should be followed due to limited memory on the PCMCIA card: Max. Diag. entries x Max. Diag. length < 59520

Lebenszeichen This text field defines a 3x address (a word) for the PROFIBUS DP status message.

Bit	Status message	Meaning
1-13	-	No significance
14	0 or 1	No slaves operating on PROFIBUS DP.
	Flashing	One or more slaves operating on PROFIBUS DP.
15	0 or 1	Not all the slaves are running on the PROFIBUS DP.
	Flashing	All the slaves are running on the PROFIBUS DP.
16	0 or 1	• CRP 811 has been removed from the bus board • CRP 811 is faulty. • Quantum is running on CRP 811 PROFIBUS DP, without slaves running.
16	Flashing	The CRP 811 runs on the bus board without problems.



Note: Diagnostic content is valid only if one slave was active at least one time.

Data Types and Bit Allocation for I/O Modules

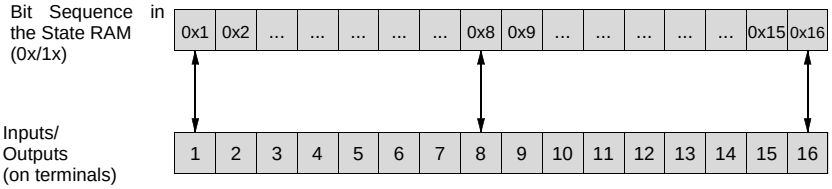
Preferred Data Types

The following data types are favored for use in addressing I/O modules:

I/O module type	Favored data type	Organization in status RAM
Binary	BOOL	Bitwise, as a multiple of 16
Analog	UINT 16, 32	Wordwise

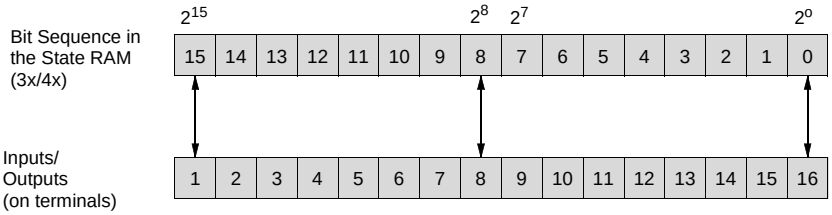
Data Type BOOL, Byte Module (in 0x/1x-range)

Addressing byte modules for data type BOOL is done using data mapping in the 0x/1x range according to the following illustration:



Data Type BOOL: Byte Module (in 3x/4x range)

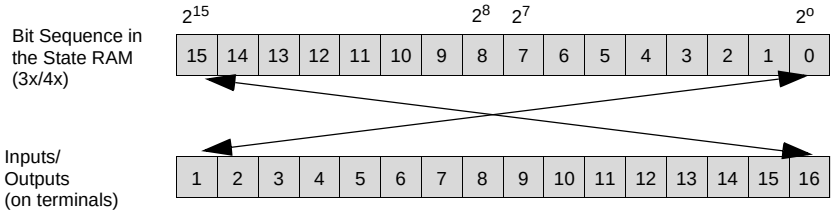
Addressing byte modules for data type BOOL is done using data mapping in the 3x/4x range according to the following illustration:



Terminal block 1 is shown on register 3x or 4x and terminal block 2 on the following register 3x+1 or 4x+1.

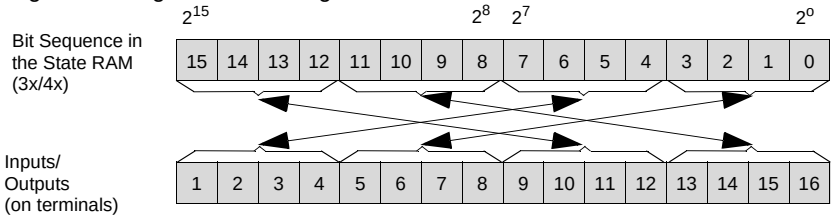
Data Type UINT16, STRING: Byte Module (in 3x/4x range)

Addressing byte modules for data type UINT/INT16, UINT/INT32 or STRING is done using data mapping in the 3x/4x range according to the following illustration:



Data Type RAW, Byte Module (in 4x range)

Addressing byte modules for data type RAW is done using data mapping in the 4x range according to the following illustration:



Note: When using data type RAW, a byte swap is performed.

Diagnostics and Firmware Update

6

Introduction

Overview

This chapter contains information concerning diagnostics and the firmware update for the TSX Quantum 140 CRP 811 PROFIBUS DP.

What's in this Chapter?

This chapter contains the following topics:

Diagnostics

Overview

Besides a few exceptions, the diagnostics data is created by the slaves.

There are two different methods of diagnosing:

- **Standard diagnostics:**
  - Provides information on the communication status.
  - This is the same for all DP slaves and is standardized by the PNO in DIN 19245-3.
  - The length is 6 bytes
- **Extended Diagnostics**
  - Provides information on the internal status of the slaves: overload/short circuit, out of range, parameter fault,...
  - Is optional and manufacturer specific
  - The length is restricted by the permitted length of the PROFIBUS telegram. Rule: Standard diagnosis + Extended diagnosis <= 244 bytes This produces a maximum length of 238 bytes

Data Type and Addressing

During the addressing of the PROFIBUS nodes in Concept, the diagnostic data addresses are given as well as the input and output data addresses.

Address range	Data type	Comment
3x input references	UINT8	1 Byte = 1 Word

These 3x input references do not have to lie within any connection to the module's input data but can be any input area in the PLC's state memory.

If new diagnostics data exists, a bit is set by the slave. If the master detects this bit, it automatically requests the diagnostics.

Structure of the Diagnostics Diagram

The extended diagnostics is manufacturer specific in length and content. The table shows you the number of extended diagnostics bytes for a selection of slave modules from Schneider. The interpretation for these can be found in the documentation for the corresponding module.

Standard diagnostics			6 bytes
Extended diagnostics	Slave	Classic TIO	7 bytes
		Momentum I/O	13 bytes
		DEA 203	16 bytes

Structure of the diagnostic message

Byte No.	Diagnostics type	Content
1	Standard diagnostics	Station status 1
2		Station status 2
3		Station status 3
4		Master address
5		Ident. No. of the DP slave that is sending the diagnosis
6		
7	Extended diagnostics	Meaning and number is specific to the corresponding slave
.		
.		
.		
.		
.		
.		
.		
.		
.		
.		
.		
n		

Station byte 1 Standard diagnosis byte 1

7	6	5	4	3	2	1	0

Bit	Function	Meaning, if Bit = 1
0	Station Non Existent	Master cannot establish communication with slave
1	Station Not Ready	Slave cannot establish communication with master
2	Config. Fault	Error in configuration data for slave
3	Extended Diagnosis	Slave provides extended diagnostics as well as standard diagnostics
4	Not supported	A function has been called that the slave does not support
5	Invalid Slave Response	Master received an implausible response from slave
6	PRM Fault	Set by the slave in the case of incorrect bus parameters
7	Master Lock	The slave was configured by a different master than the one providing the diagnostic data

Station byte 2 Standard diagnosis byte 2

7	6	5	4	3	2	1	0

Bit	Function	Meaning, if Bit = 1
0	PRM Request	Slave requires new bus parameters
1	Static Diagnostics	Slave reports that it has received invalid I/O data/ parameters
2	Const. 1	Slave reports that it is ready for operation
3	Watchdog On	Watchdog is active
4	Freeze Mode	Slave received the "freeze" command
5	Sync Mode	Slave received the "Sync" command
6	Unused	
7	Deactivated	Master reports that the slave is inactive

Station byte 3 Standard diagnosis byte 3

7	6	5	4	3	2	1	0

Bit	Function	Meaning, if Bit = 1
0... 6	Unused	
7	Extended Diagnosis Overflow	Set by the master when the diagnostic buffer has overrun.

Master address

Standard diagnosis byte 4

7	6	5	4	3	2	1	0

Bit	Meaning
0... 7	Address of the master that parameterized the slave (e.g. 1). In the case of a connection interruption the value here is 255 (decimal) or FF (hex).

Ident. No. of the slave

Standard diagnostics bytes 5 and 6

7	6	5	4	3	2	1	0

Byte	Bit No.								Meaning
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**	
5	0	1	1	1	0	1	0	1	Ident. No. of the DP slave that is sending the diagnosis The value 7512 (hexadecimal) is in this position for Momentum slaves for example.
6	0	0	0	1	0	0	1	0	

Note: If the connection to the master is interrupted, both bytes have the value 0 (master diagnosis).

Diagnostics Interface

Overview

The 140 CRP 811 bus controller is equipped with a serial interface (RS 232C).

This interface can be used during a terminal session to read out important diagnostics data for example.

Establishing a Terminal Session

Establishing a terminal session

Step	Action
1	Connect the serial interface of the 140 CRP 811 with a suitable end device (normally a PC) **Note:** You should use an appropriate cable for this *Interface Cables, p. 100*
2	Start the terminal emulation software (HyperTerminal for example)
3	Define the following transmission parameters: ● 19.2 kBaud ● 8 Data bits ● 1 stop bit ● No parity
4	Establish the connection to the 140 CRP 811 **Result** The main menu along with the corresponding options is opened
5	Select an option ● (d) DP Data Menu ● (e) Error Report Menu ● (g) Global Data Menu ● (t) Terminal Setup Menu ● (u) Firmware Update Menu ● (x) Expert Mode Menu and follow the instructions that appear on the screen

Firmware Update

Overview

Note: The 140 CRP 811 is delivered with firmware installed. The procedures described for loading new firmware are only required if an update is being made. Before replacing the firmware, you should carefully study the corresponding instructions and contact the Schneider Electric support.

The firmware version that you are currently using for your PCMCIA can be found in a terminal session (Main menu, Option (g:)) on the diagnostics interface (see *Establishing a Terminal Session, p. 94*)

Version before the update	Version after the update	Updating steps
≤3	≥4.00	**1.** Loader update with terminal session (Main menu options (u:), **2.** Firmware update with EXECLoader (see *Loading with the EXECLoader, p. 96*) **3.** Check to see whether Loading the update with a terminal session was successful (Main menu option (g:)) **4.** Should the version of the PCMCIA card not correspond with 5.02I then it must also be updated with the BOOTLoader.
≥4.00	≥4.00	Load the firmware with the EXEC-Loader (a Loader Update is no longer required)

EXECLoader

The EXECLoader is included with Concept and speeds up the firmware update process compared to using the terminal emulation software. Updating the firmware in this way (version 4.00 and higher) transfers the data from a PC to the CPU. It is then run over the backplane to the CRP 811.

More information on the EXECLoader can be found in the corresponding README file and the online help.

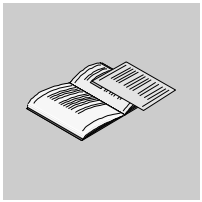
Loading with the EXECLoader

Note: Loading the firmware may not be interrupted under any circumstances as it means the module can no longer be accessed via the EXECLoader. Ensure that neither the communication connection nor the main power input is disconnected or deactivated in any way and do not deactivate the procedure with **ABORT** .

To load the firmware using the EXECLoader, carry out the following steps:

Step	Action
1	Establish a connection between the CPU and the controller. The following options are supported: ● Modbus Plus ● TCP/IP Ethernet ● Modbus
2	Start the EXECLoader.
3	Select the protocol used.
4	Enter the address and, in the case of Modbus, the transfer parameters for the CPU.
5	Select **Device Type** → **Local Head**.
6	Enter the slot number of the master in **Slot number**.
7	Select **Select Operation** → **Transfer EXEC to Device** an.
8	Enter the name and the directory of the firmware in **Filename**.
9	Activate the **Close** button to end the operation.
10	Stop the PLC and establish the connection between the CPU and the PC again.

Appendices



At a Glance

Overview

This section of the documentation contains more information on the TSX Quantum 140 CRP 811 PROFIBUS DP.

What's in this Appendix?

The appendix contains the following chapters:

Accessories and Replacement Components

A

Introduction

Overview

This chapter contains information concerning the accessories and replacement components for the TSX Quantum 140 CRP 811 PROFIBUS DP.

What's in this Chapter?

This chapter contains the following topics:

Overview

Ordering Components

The following components can be ordered for the TSX Quantum 140 CRP 811:

- *PROFIBUS Cables and Connectors, p. 100*
- *Interface Cables, p. 100*
- *Surge Protection Equipment, p. 101*
- *Miscellaneous Accessories, p. 101*

Ordering Information for PROFIBUS DP Components

PROFIBUS Cables and Connectors

The following cables and connectors are available for constructing a PROFIBUS DP cable:

Model	Order No.
PROFIBUS Cable (Meterware), Type "A", 02Y (ST) CY 2x0.64 mm^2	KAB PROFIB Belden 3079A (for up to 12 Mbit/sec)
PROFIBUS connector with termination (yellow)	490 NAD 911 03
PROFIBUS connector node (gray)	490 NAD 911 04
PROFIBUS connector node with interface for programming unit (gray)	490 NAD 911 05
Bus tester	Siemens, BT200
Foil shielding	3M, part No. 1183

Note: Foil shielding supplier:
3M Deutschland GmbH, Carl-Schurz-Straße 1, D-41453 Neuss, Germany

Interface Cables

The following cable can be used for connecting diagnostics devices to the PROFIBUS DP:

Model	Part No.
Serial cable	YDL 052
Modbus programming cable	990 NAA 263x0

Surge Protection Equipment

The following protection equipment and accessories can be connected to the PROFIBUS DP, and are available from the firm Dehn und Söhne GmbH &Co KG.

Model	Order No.
Lightning conductor type CT MD/HF 5	Dehn Company, type no. 919,570
Lightning conductor type CT B 110	Dehn Company, type no. 919,510
Base component for lightning conductor type CT	Dehn Company, type no. 919,506
Gas-type surge protector for lightning conductor type CT	Dehn Company, type no. 919,502
EMC spring terminals	Dehn Company, type no. 919 508

Note: Supplier for the lightning arrestors and accessories:

Dehn und Söhne GmbH & Co KG, Postfach 1640, D-92306 Neumarkt/Opf.

Miscellaneous Accessories

The following accessories are available:

Model	Order No.
Capacitive by-pass terminal (in systems without equipotential bonding)	GND 001
Zinc coated rail complies with DIN EN 50022 (Meterware)	HUT 3575
Grounding clip	EDS 000
Repeater	Siemens, Part No. 6ES7 972-0AA00-0XA0

Compatibility with PROFIBUS PA

B

PROFIBUS PA

PA Application Profile

Application profiles describe applications within the scope of a communication profile with a physical profile. The PA application profile is based on the DP communication profile and stands for applications in process automation.

The PA profile defines device parameters and the device behavior for typical field devices (e.g. measurement transducers, control valves) by manufacturer. This makes exchanging devices and device operation much easier.

DP/PA Gateways by other manufacturers

The following suppliers manufacture gateways and segment couplers for making the switch from PROFIBUS DP to PROFIBUS PA:

- Siemens
- Pepperl + Fuchs

The following transfer rates are achieved:

- 45.45 kBit/s
- 93.75 kBit/s

Note: While configuring the 140 CRP 811 with the DP/PA gateways, the bus parameter must be adjusted to match in the configurator. There are also certain restrictions regarding the addressing.

Index