Modicon Premium PLCs

TSX PBY 100
Profibus-DP

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Document Set

At a Glance

This manual deals with both the hardware and software implementation of the Profibus-DP module.

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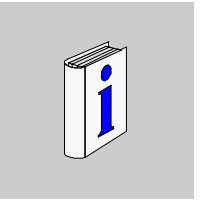


At a Glance

Document Scope

This manual is aimed at users who wish to install the TSX PBY 100 master Profibus DP communication module onto the Premium.

Validity Note

The update of this publication takes PL7 V4.5 functionality into account.

Related Documents

Title of Documentation	Reference Number
Profibus – Reference manual	See SIEMENS documentation

Product Related Warnings

Installation of the Profibus-DP bus is described in the Profibus-DP installation manual, reference 840 USE 468 00 (English version).

User Comments

We welcome your comments about this document. You can reach us by e-mail at techpub@schneider-electric.com

Introduction to Profibus DP

1

At a Glance

Subject of this Chapter

This chapter introduces the main features of communication on the Profibus DP.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
General introduction to Profibus-DP	10
General architecture and protocol for Profibus-DP	11
Multi-master architecture	13
Features of Profibus-DP	14

General introduction to Profibus-DP

At a Glance

Profibus-DP is a serial link field bus for sensors and actuators, which responds to the demands of the industrial environment.

This bus uses the master/slave procedure. The master subscriber manages and co-ordinates access to the bus, it transmits data to and receives data from all the subscribers.

Devices such as input/output modules are also available :

- compact Classic TIO slaves:
  - classic discrete inputs,
  - classic discrete outputs.
- DEA203 modular slaves
- Momentum modular slaves:
  - discrete inputs,
  - discrete outputs,
  - discrete inputs/outputs,
  - analog inputs/outputs.

Input/output modules

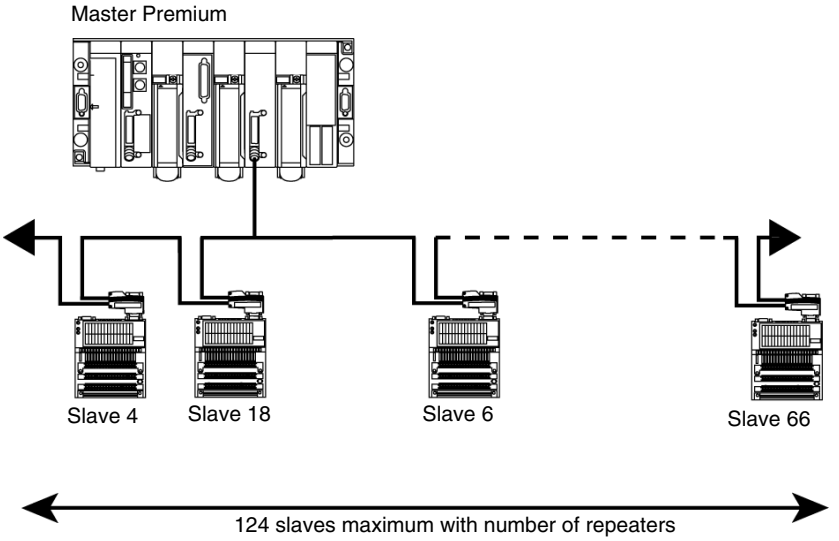
Input/output modules are used to link up sensors and actuators for checking or monitoring machines or processes to the Profibus-DP system.

General architecture and protocol for Profibus-DP

General architecture

The architecture of the Profibus-DP field bus is used to implement the TSX PBY 100 module and slave devices.

This illustration shows the shortest network cycle time.



Connection rules

A Profibus-DP bus can be made up of several electric and optic segments interconnected by repeaters.

Each of the electric segments must be adapted (impedance) and you must use:

- Two connectors: ref. 490NAD91103 (yellow) mounted on the devices situated at the ends of each electric segment.
- For the other connections, you must use these connectors: ref. 499NAD91104 or 490NAD91105 (gray).

You must ensure that there is cable screening continuity at connector level, otherwise the devices may be weakened.

It is advisable to use an optic segment between two constructions or to add surge absorbers on the electric segments.

Protocol

The protocol principle is based on a master/slave type bus. This principle guarantees excellent response times on I/O type exchanges (cyclic exchanges), with a maximum network cycle time less than 5 ms at 12 Mbds.

Only the master stations, sometimes called active stations, have access rights to the bus. The slave (or passive) stations can only respond to prompts and requests.

Several types of device are standardized:

- Master class 1 generally PLC, robot, digital command, etc.
- Master class 2 configuration devices, programming and master diagnostics.
- Slaves.

Profibus-DP station addressing

The Profibus-DP stations allocated to the PBY module can be identified using a number between 1 and 125.

This address corresponds to the station connection point on the bus registered in the configuration.

Multi-master architecture

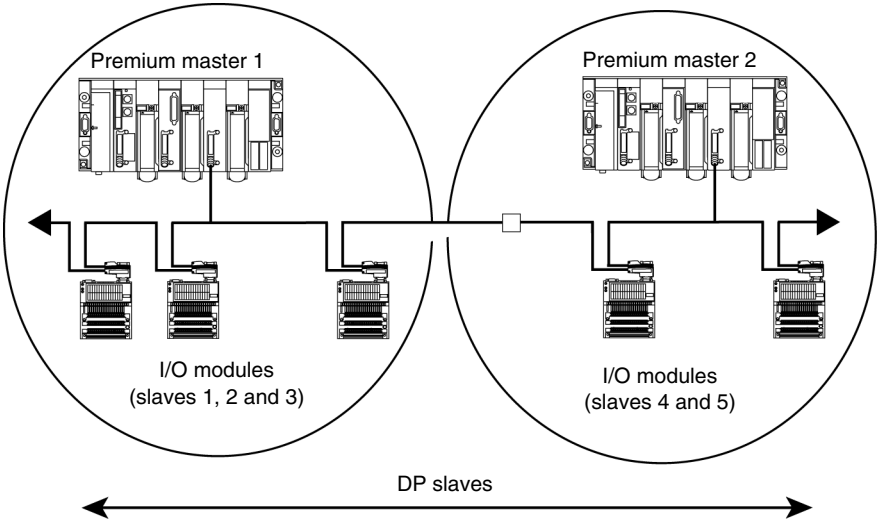
At a Glance

The Profibus DP field bus allows there to be several master stations.

In a multi-master configuration, each master station is associated to slaves and so forms a sub-system.

Illustration

This illustration describes a Profibus DP field bus multi-master architecture implementing a TSX PBY 100 module and slave devices.



Features of Profibus-DP

Introduction

Profibus-DP is a linear bus, designed for transfers of high speed data. The PLC communicates with its peripheral devices via a high-speed serial link.

Data exchange is mainly cyclic.

Transmission features

This table describes the transmission features of the Profibus-DP bus supported by the TSX PBY 100 module.

Topology	Linear bus with line terminations
Transmission mode	Half Duplex
Transmission rate	9.6 / 19.2 / 93.75 / 187.5 / 500 / 1500 Kbits/s up to 3 / 6 / 12 Mbit/s
Maximum segment length	100 m at 3 / 6 / 12 Mbit/s (400 m with 3 repeaters) 200 m at 1.5 Mbit/s (800 m with 3 repeaters) 546.81 yd at 500 Kbit/s (2,187.23 yd with 3 repeaters) 1000 m at 187.5 Kbit/s (4000 m with 3 repeaters) 1200 m at 9.6 / 19.2 / 93.75 Kbit/s (4800 m with 3 repeaters)
Possible transmission media	Twisted pair line (standard version, type RS 485) Fiber optic link Waveguide
Serial link	9 point DSUB, M12 or Domino Block

Capacity

This table describes the Profibus-DP bus transmission capacity for Premium PLCs.

Number of master stations per PLC	0 with TSX 57-10 processors 1 with TSX 57-20/25 processors (from version V3.0 onwards) 2 with TSX/PMX/PCX 57-30/35/40/45 processors (from version V3.0 onwards)
Number of slave stations	32 without repeaters 124 with repeaters (the number of authorized repeaters depends on the repeaters, please refer to the documentation of the repeaters used)
Number of inputs/ outputs	4096 inputs / 4096 outputs (corresponds to 242 input words and 242 output words)

Performance

2

At a Glance

Subject of this Chapter

This chapter introduces Profibus DP bus performance.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Data transfer capacity	16
Network cycle	17
Application response time	18

Data transfer capacity

At a Glance

The PBY 100 module requires configuration data slaves containing than 250 bytes and diagnostics data slaves containing less than 244 bytes.

It is used to store configuration data for 125 devices whose total maximum size is 16 Kbytes.

Transmitted data

The following table shows the size of input/output image data in words:

Data	minimum	maximum
Image of inputs in words (%IW) for configuration	-	242
Image of outputs in words (%QW) for configuration	-	242

Data per slave

The following table shows the size of data per slave in bytes:

Data	minimum	maximum
Configuration data per slave (in bytes)	31	250
Configuration data per slave	6	244
Maximum size of all configuration data	-	16 Kb

Network cycle

At a Glance

The network cycle depends on the rate of transfer, the number of slaves connected to the bus and the number of input/output words.

Configuration

The following table shows the network cycle times for several possible configurations.

Configuration	Network cycle time (ms)
Transfer rate 12 Mbit/s 124 slaves 242 input words and 242 output words	5 ms
Transfer rate 12 Mbit/s 124 slaves 126 input words and 126 output words	5 ms
Transfer rate 12 Mbit/s 32 slaves 32 input words and 32 output words	2.4 ms
Transfer rate 12 Mbit/s 1 slave 1 input word and 1 output word	1 ms
Transfer rate 500 Mbit/s 124 slaves 126 input words and 126 output words	100 ms
Transfer rate 500 Mbit/s 32 slaves 32 input words and 32 output words	25 ms
Transfer rate 500 Mbit/s 1 slave 1 input word and 1 output word	1.8 ms

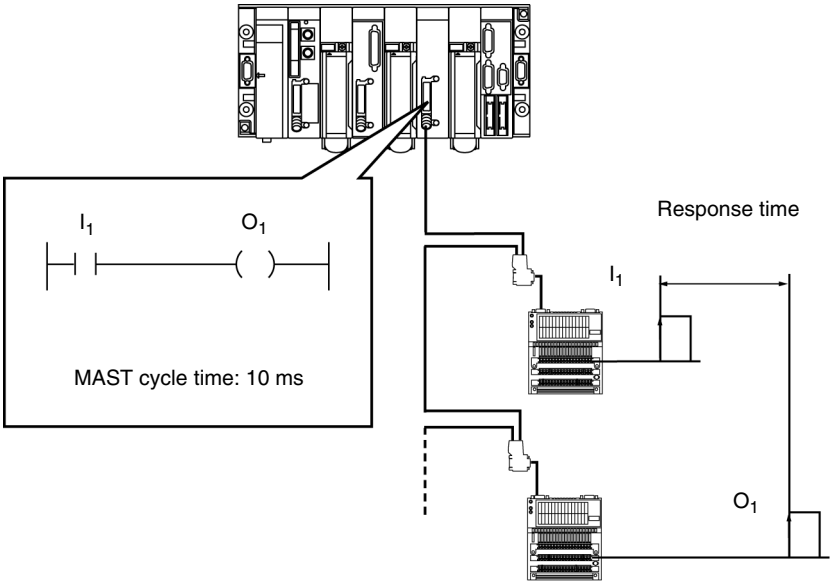
Application response time

At a Glance

The application response time is a logical response time, which does not take into account the filtering time or the response time of the sensor and actuator interfaces.

Illustration

The following example shows the time elapsed between acquiring an input and setting an output at a transmission rate of 12 Mbit/s.



Calculation example

The following table groups together the different elements for calculating the application response time.

max. updated %IW / QW	32		128		242	
Maximum number of I/O for the process	1024		4096		7744	
Maximum number of I/O modules	64		124		124	
	Min.	**Max. =** 2 x min.	**Min.**	**Max. =** 2 x min.	**Min.**	**Max. =** 2 x min.
Scanning time (ms) (acquiring image I_1)	2,44	4,8	5	10	11	22
MAST cycle time (in ms) ($I_1 = O_1$)	10,00	20,00	10,00	20,00	10,00	20,00
IBS scanning time (in ms) (updating O $image_1$)	2,44	4,8	5	10	11	22
Application response time (in ms)	**14,88**	**29,6**	**20**	**40**	**32**	**32**

Description of the TSX PBY 100 module

3

At a Glance

Subject of this Chapter

This chapter introduces the main features of the TSX PBY 100 module.

What's in this Chapter?

This chapter contains the following sections:

Section	Topic	Page
3.1	Description of module	22
3.2	Installing the module	27
3.3	Technical specifications	31

3.1 Description of module

At a Glance

Subject of this Section

This section describes the physical appearance of the module and its operation.

What's in this Section?

This section contains the following topics:

Topic	Page
General description	23
Operating mode	25
Connecting the Profibus-DP bus	26

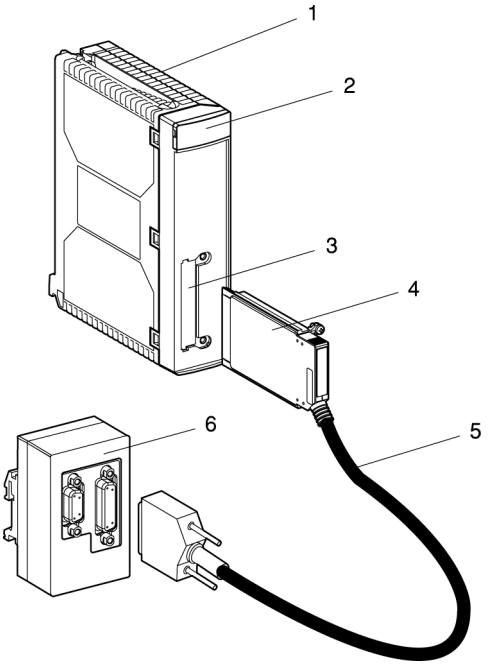
General description

At a Glance

The TSX PBY 100 module can be installed on a standard or extendable Premium PLC rack.

Illustration

The TSX PBY 100 module is made up of several elements:



Description of elements

The following table describes the different elements:

Number	Function
1	A reception module to be placed in any I/O slot.
2	An indicator block made up of 4 LEDs.*Diagnostics of the module's status from the LEDs, p. 73*
3	A slot for receiving a PCMCIA card.
4	A Profibus-DP PCMCIA card.
5	A cable of 0.6m for linking up to a connection box.
6	A Profibus connection box, Profibus-DP bus connection interface.

Utilities

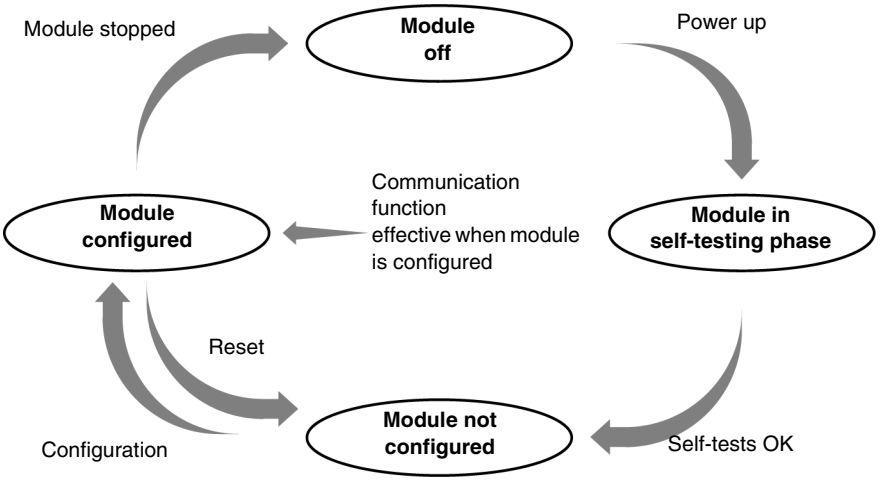
The TSX PBY 100 module is a master class 1 type device and provides the following utilities:

Utilities	Request or response	To or from	Comments
DATA_EXCHANGE	request	slave	input/output data transfer
SLAVE_DIAG	request	slave	slave diagnostics utility
SET_PRM	request	slave	transmission of parameters to slaves on power-up
CHK_CFG	request	slave	configuration check on power-up
GLOBAL_CONTROL	request	slave	global bus control (automatically taken on by the Profibus card)
GET_MASTER_DIAG	request	master class 2	master diagnostics utility (automatically taken on by the Profibus card)

Operating mode

Operation

The following illustration shows how the module operates:



Behavior

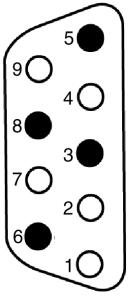
Description of the different operating modes of the module:

- **Profibus DP in RUN mode**: data exchange on the bus.
- **Task in RUN mode**: input/output update.
- **Task in STOP mode**:
  - input update,
  - output fallback strategy (maintained or reset to zero).

Connecting the Profibus-DP bus

Illustration

Female 9 point Sub-D 9 connector RS 485



Description

Number	Description
1	Shield
2	M24: 24 V output voltage ground
3	**RxD/TxD-P**: positive data transmission (RD+ / TD+)
4	CNTR-P: positive repeater monitoring signal (direction monitoring): not used
5	**DGND**: data transmission ground
6	**VP**: line termination bias voltage
7	P24: output voltage 24 V
8	**RxD/TxD-N**: negative data transmission (RD- / TD-)
9	CNTR-N: negative repeater monitoring signal (direction monitoring): not used

Note: RxD/TxD-P, DGND, VP, RxD/TxD-N signals are mandatory. The other signals are optional

3.2 Installing the module

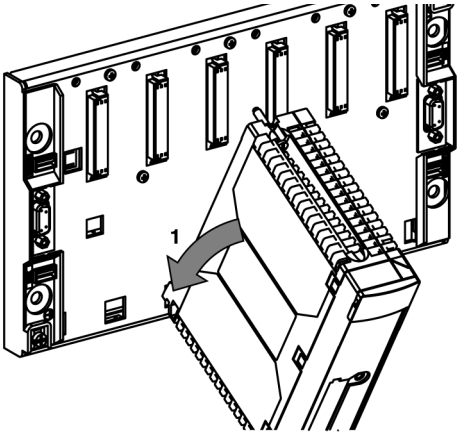
Mounting the module in a rack

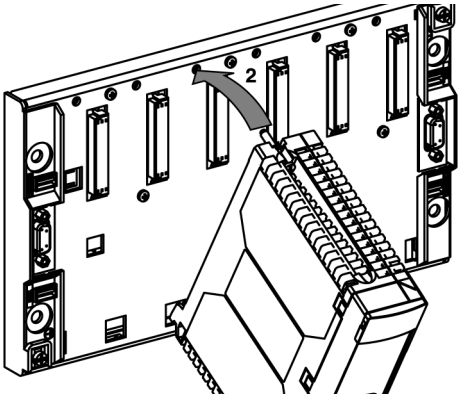
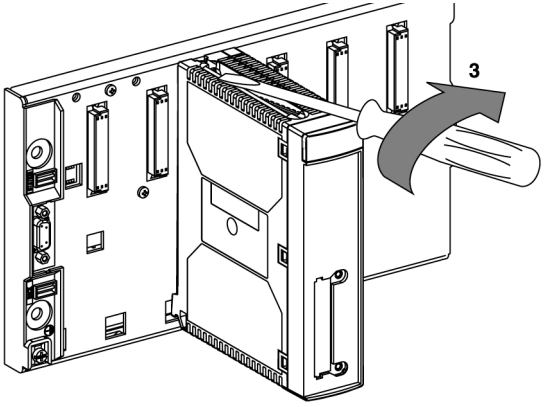
General

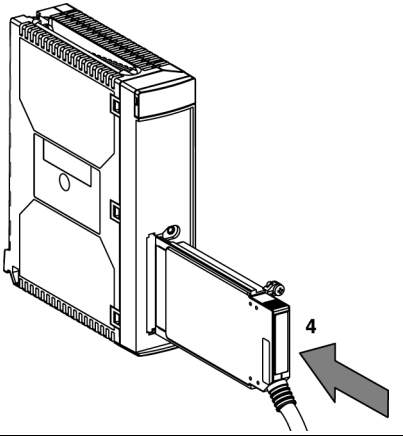
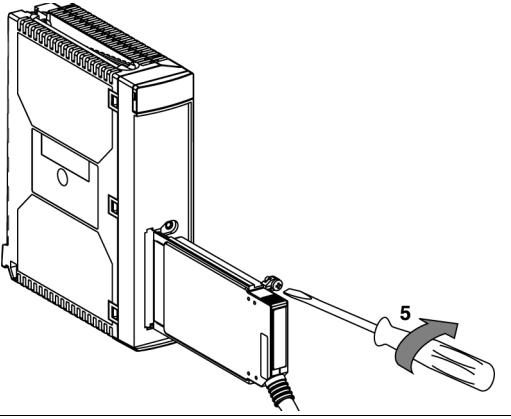
The mounting and removal of a module can be done with the power on.

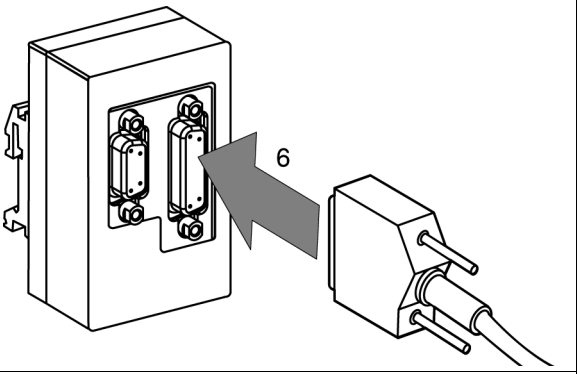
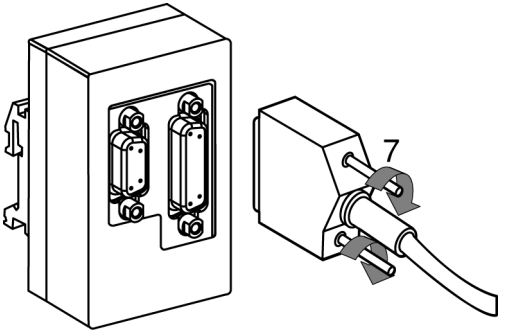
Inserting/extracting module with the power on must be done by doing/undoing the screws manually in order to maintain an adequate sequencing of the connection/ disconnection of the signals on the X bus. Using an electric screwdriver cannot assure this sequencing.

Procedure

Step	Action	Illustration
1	Place the pins situated on the back of the module in the centering holes situated on the lower part of the rack.	

Step	Action	Illustration
2	Pivot the module in order to bring it into connect with the rack.	
3	Fix the module to the rack by tightening the screw situated on the upper part of the module	

Step	Action	Illustration
4	**You must not insert or take out the communication card while the reception module is powered up.**	
	Insert the card into its slot	
5	Screw the card in so that it cannot move, thus ensuring it will operate properly.	

Step	Action	Illustration
6	**You must not connect or disconnect the connection unit while the module is powered up.**	
	Connect the cable to the connection unit	
7	Screw the connector in so that it cannot move, thus ensuring a good connection.	

3.3 Technical specifications

At a Glance

Subject of this Section

This section describes the technical specifications for using Profibus DP communication with the TSX PBY 100 module.

What's in this Section?

This section contains the following topics:

Topic	Page
Compatibility	32
Standards and characteristics	33
Operating conditions	34

Compatibility

Hardware

The following table shows the number of TSX PBY 100 modules available for each processor:

Version	Processor type			Module number
	TSX	PMX	PCX	
V3.0	P57 102	P57 102	57 1012	0
	P57 202/252 P57 302/352 P57 402/352	P57 202/352/452	57 3512	1
≥V3.3	P57 102	P57 102	57 1012	0
	P57 202/252	P57 202	-	1
	P57 302/352 P57 402/452	P57 352 P57 452	57 3512	2
≥V5.0	P57 103/153	-	-	0
	P57 203/2623/253/ 2823	-	57 203	1
	P57 303/353/3623/ 453/4823	-	57 353	2

The TSX PBY 100 reception module is a master class 1 type device and can be integrated into a multi-master configuration. It is compatible with the communication methods of:

- master / slave,
- logical token ring.

Software

The TSX PBY 100 module is compatible with the software SYC SPU LF (SyCon) from version V2.8 and PL7 software version from V3.0.

These two software applications operate under Windows XP Professional.

Note: Windows VISTA Professionnel Edition 32 does not supporte the SyCon software.

Standards and characteristics

Standards

The TSX PBY 100 communication module complies with the following international standards:

EC Standards	IEC 1131-2, CENELEC (50081-2)
US Standards	UL508
Canadian Standards	CSA C22.2 No. 142-M1987

The TSX IBY 100 module also complies with the following standards:

Marine classification	• Germanischer Lloyd • Det Norsk Veritas • Bureau Veritas • Lloyds Register
US Standards	FM, Class I.Div.2 (CSA C22.2 No 213-M1987)

Certification

PBO

Characteristics

The electric characteristics are as follows:

- Logical DC V supply: 5 V DC provided by the rack power supply.
- Current consumed on 5 V: 400 mA.

Operating conditions

Operating temperature

- Ambient operating temperature: 0 °C to + 60 °C (IEC 1131-2 = + 5 °C to + 55 °C).

Hygrometry

- 30 % to 95 % (without condensation)

Altitude

- 0 to 2000 meters

Mechanical standards

- Vibration immunity: complies with the IEC 68-2-6 standard, Fc test.
- Shock immunity: complies with the IEC 68-2-27 standard, Ea test.

Electrostatic discharge standard

- Electrostatic discharge immunity: complies with the IEC 1000-4-2 standard, level 3.

Note: minimum level in conditions defined by the standards

HF parasite standard

- Immunity to radiated electromagnetic fields: complies with the IEC 1000-4-3 standard, level 3.
- Immunity to rapid burst transients: complies with the standard IEC 1000-4-4, level 3.
- Immunity to radiated electromagnetic fields: complies with the IEC 1000-4-12 standard, level 3.

Note: minimum level in conditions defined by the standards

BF parasite standard

- Complies with prescriptions of the IEC 1131-2 standard.

Premium PLC protection handling

Premium PLCs meet the **"ACP"** processing demands (All Climate Processing)

For installations in industrial production workshops, or in an environment corresponding to **"PWH"** (Processing for Warm and Humid environments), Premium PLCs must be inserted into IP54 minimum protection envelopes as prescribed by IEC 664 and **NFC 20 040** standards.

Reminder

Premium PLCs have an IP20 protection index. They can therefore be installed without an envelope in premises with restricted access which do not exceed pollution level 2 (control room with no machines or dust-producing activity).

Note: when a position is not occupied by a module, a TSX RKA 02 protection cover must be installed in it.

Instructions relating to transport and storage

These instructions comply with the IEC 1131-2 standard.

- Storage temperature: -25 degrees C to +70 degrees C.
- Relative humidity: 5 % to 95 % (without condensation).

Software implementation

4

At a Glance

Subject of this Chapter

This chapter describes the different possibilities for the configuration and diagnostics of a Profibus-DP application.

What's in this Chapter?

This chapter contains the following sections:

Section	Topic	Page
4.1	General	38
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4.3	Debugging	58
4.4	Programming	63
4.5	Diagnostics	72
4.6	Language objects associated with the TSX PBY 100 module	87

4.1 General

At a Glance

Subject of this Section

This section describes the principles of installing the TSX PBY 100 module.

What's in this Section?

This section contains the following topics:

Topic	Page
Principle	39
Physical or logical addressing of inputs/outputs	41
Mapping IW and QW addresses	43

Principle

Introduction

When installing Profibus-DP, the physical context of the application into which it will be integrated (rack, supply, processor, modules or devices, etc.) must be defined, and its software must be installed.

This second aspect is done from the various PL7 editors:

- either offline,
- or in online mode (modification is limited to certain parameters).

Installation principle

The table below shows the different phases of installation.

Mode	Phase	Description
Offline	Module declaration	Selection: ● of geographical position (number and slot when a module is on a rack), ● of module type.
	Configuration (1)	● Entering the configuration parameters, ● Declaring bus configuration using the software SyCon and creating a *.CNF text file.
On or offline	Symbolization	Symbolizing variables associated with the Profibus-DP bus using the variables editor.
	Programming	● Bit and word objects associated with the module or the Profibus-DP link. ● Module-specific instructions (OFs).
Online	Transfer	Transferring the application to the PLC. An application transfer to a PLC or a cold start of the application configures and starts up the Profibus-DP.
	Debug Diagnostics	Different methods are accessible for debugging the application, controlling inputs/outputs and fault diagnostics: ● PL7 language objects, ● the PL7 debugging screen, ● the SyCon software, ● module signalization.
On or offline	Documentation	Printing the various pieces of information relating to Profibus-DP bus configuration.
(1) When configuring a Profibus-DP installation, SyCon software (available on CD-ROM) needs to be used. This software comprises a library of profiles which describe each device which can be connected to Profibus-DP. For an update, consult our regional office.		

Physical or logical addressing of inputs/outputs

At a Glance

Inputs/outputs respect the topology used by the PL7 software and can be identified:

- either by physical addressing,
- or by logical addressing.

Topology

Addressing is defined in the following way:

%	I or Q	X, W or D	xy	.	i	.	r	:	Xj
Symbol	Type of objects I = input Q = output	Format X = Boolean W = word D = double word	Rack address x = 0 to 7 Module position y = 0 to 10		Channel no. i = 0		Position r = 0 to 253		Bit j = 0 to 15

Block assignment

DP data is exchanged in the form of input/output blocks. All a slave's input data is indexed by adjacent %IW blocks, and a slave's output data is indexed by adjacent %QW blocks. The continuity of %IW and %QW blocks is valid even for a modular slave.

Each data block for a slave or modular slave slot starts with a new %IW or %QW. As a result, the first I/O word of a slave is always associated to a new %IW or %QW.

In the event where a slave image (%IW or %QW) has a special size (for example 1 byte or 3 bytes), it is completed by unused bytes in order to manipulate the I/O words.

Example

The table below describes an example of assignment:

Input image			
Slave 2 2 words	Slave 1 1 byte	Unused byte	Slave 17 1 word
%IWm.0.i	%IWm.0.i+1	%IWm.0.j Only bits 0 to 7 are significant	%IWm.0.k
Output image			
Slave 17 2 words		**Slave 2 1 byte**	**Unused byte**
%QWm.0.i	**%QWm.0.i+1**	**%QWm.0.j Only bits 0 to 7 are significant**	

Mapping IW and QW addresses

General

Mapping input/output data addresses is used to achieve the clearest possible addressing.

A slave can be made up of several modules of different data sizes. In this case, misalignment of addresses can happen.

To avoid this, modules can be physically positioned in the slave rack by:

- grouping together input modules of a particular size (e.g.: 1 byte) for each pair,
- grouping together output modules of a particular size (e.g.: 1 byte) for each pair,
- positioning a single input module of a particular size (e.g.: 1 byte) at the last input module position,
- positioning a single output module of a particular size (e.g.: 1 byte) at the last output module position.

Example: non-mapped modules

Slave x in non-mapped modules

Module A 1 input word	**Module B** **1 input byte**	**Module C** **1 output byte**	Module D 1 input word	Module E 1 output word	Module F 1 output byte

Input image

%IWm.0.x	%IWm.0.x+1	%IWm.0.x+2	
Module A 1 input word	**Module B** **1 input byte**	Module D 1 input word	Unused byte

Output image

%IWm.0.x	%IWm.0.x+1	
Module C **1 output byte**	Module E 1 output word	Module F 1 output byte

Example: mapped modules

Slave x in mapped modules

Module A 1 input word	Module D 1 input word	**Module B** **1 input byte**	Module E 1 output word	**Module C** **1 output word**	Module F 1 output byte

Input image

%IWm.0.x	%IWm.0.x+1	%IWm.0.x+2	
Module A 1 input word	Module D 1 input word	**Module B** **1 input byte**	Unused byte

Output image

%IWm.0.x	%IWm.0.x+1	
Module E 1 output word	**Module C** **1 output byte**	Module F 1 output byte

4.2 Configuration

At a Glance

Subject of this Section

This section describes the Profibus-DP configuration screen.

What's in this Section?

This section contains the following topics:

Topic	Page
Declaring the TSX PBY 100 module and accessing application screens	46
Configuration screen	48
Data to be provided	50
Data resulting from decoding the *.CNF text file	51
Viewing Profibus-DP master configuration	53
General module configuration	54
Module configuration file	56

Declaring the TSX PBY 100 module and accessing application screens

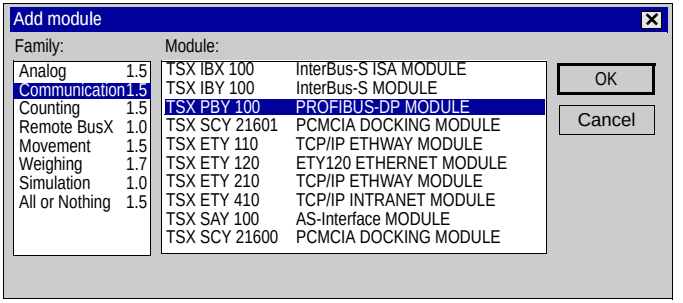
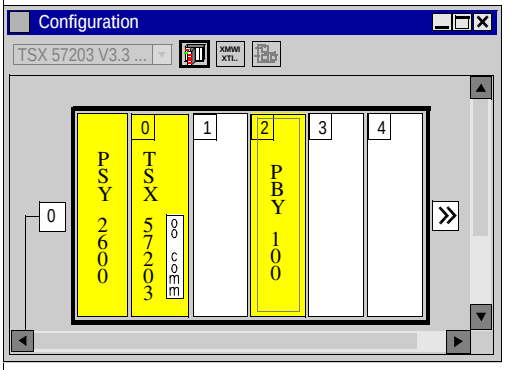
Declaring the TSX PBY 100 module

To declare a TSX PBY 100 module, refer to the PL7 Premium Applications documentation.

Procedure

This operation allows you to use the software to declare a TSX PBY 100 module in a PLC rack.

The example below concerns a TSX PBY 100 module, the procedure being identical regardless of the module type in the rack.

Step	Action
1	Access the application's hardware configuration screen.
2	Double click on the slot in which the module is to be configured. **Result:** the **Add module** screen appears. 
3	Select from the field **Family** → **Communication**.
4	Select the module reference from the **Module** field (in the example **TSX PBY 100**).
5	Click on **OK** to confirm the selection. **Result:** the module is declared in its slot; the slot is grayed out and contains the module reference. 
6	Double click on the module (in the example **TSX PBY 100**) to access the configuration screen (See: PL7 Micro, Junior, Pro; Communication module for Modicon Premium PLCs).

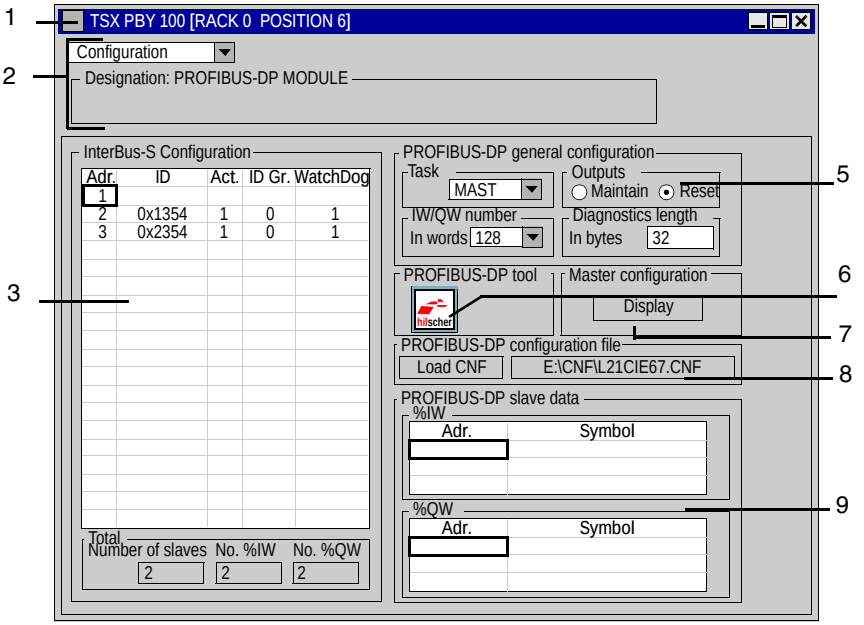
Configuration screen

At a Glance

The configuration screen is made up of two zones and is used to set the features required for a Profibus-DP link

Illustration

This screen allows the following parameters to be displayed and modified:



Description

The table below shows the different zones of the configuration screen:

Number	Element	Function
1	**Title bar**	Indicates the reference of the selected module and its physical position in the rack
2	**Module zone**	Allows the parameter type to be selected: • from a drop-down menu enabling configuration or de-bugging mode to be selected (online mode only), • from a window displaying the designation of the selected module.
3	**Specific zones**	Drop-down list showing the configuration of the Profibus-DP bus. See *Data resulting from decoding the *.CNF text file, p. 51*
4		The three fields show: • No. of slaves: total number of slaves. • No. %IW: total number of input words. • No. %QW: total number of output words.
5		General parameters allow definition of the strategy to be applied upon the application stopping. See *General parameters, p. 50*
6		Icon for starting the software.
7		"**View** button for starting the file converter. See *Viewing Profibus-DP master configuration, p. 53*
8		This window is used to select the *.CNF configuration file. See *General module configuration , p. 54*
9		This window is used to display addresses and symbols associated with input and output data for a device on the list. See *Profibus-DP slave data, p. 52*

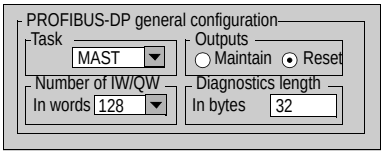
Data to be provided

At a Glance

To configure the communication channel, you must complete the parameters in the **General parameters** window dedicated to the application:

General parameters

The window looks like this:



- The **Task** field is used to select the task which drives the Profibus-DP bus:
  - **MAST**: default value, selects the master task as the bus driver.
  - **FAST**: selects the fast task as the bus driver.
- The **IW/QW Number** field is used to select the number of words used for the inputs/outputs: 32, 64, 128 or 242.
- The **Output** field is used to select the fallback mode of the outputs when the PLC is switched off :
  - **Maintain**: the value of the outputs is maintained.
  - **Reset**: reset to zero.
- The Diagnostics length field is used to select the diagnostics length in bytes from 6 to 244 bytes (32 by default). The size configured should be sufficient to contain the most important bus diagnostics. If the size is insufficient, the slave concerned will not be active on the bus because its diagnostics will be invalid.

Note: in order to optimize performance, select a minimum number of input/output words and diagnostics bytes compatible with the actual bus configuration.

Data resulting from decoding the *.CNF text file

At a Glance

One part of the configuration screen is used to display the Profibus-DP field bus topology as well as information on the slaves, which are associated to the module.

It is split into two windows:

- the **Profibus-DP configuration** window,
- the **Profibus-DP slave data** window.

Profibus-DP configuration

The **Profibus-DP configuration** drop-down list shows the configuration of the Profibus-DP field bus. It shows the contents of the *.CNF text file selected. The configuration of the 125 possible devices can be accessed in this manner.

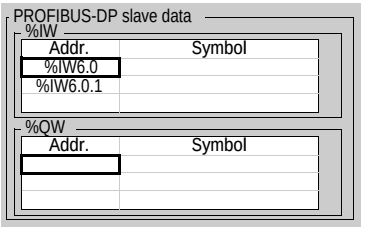
Each line of this drop-down list shows the status of a single device. A line is presented in the format:

Addr.	ID	Act.	Gr. ID	WatchDog
1				
2	0x1354	1	0	1
3	0x2354	1	0	1

- The first field indicates the address of the slave device (between 1 and 125).
- The second field indicates the Profibus identification code from the GSD file of the slave device.
- The third field shows whether the slave is activated in the Profibus configuration file.
- The fourth field is always 0.
- The last field shows whether the slave guard dog is activated in the Profibus configuration file.

Profibus-DP slave data

The window looks like this:



Two lists displaying the input/output addresses and symbols:

- the top list shows the input data relating to the selected device, with their associated symbol,
- the bottom list shows the output data relating to the selected device, with their associated symbol.

Viewing Profibus-DP master configuration

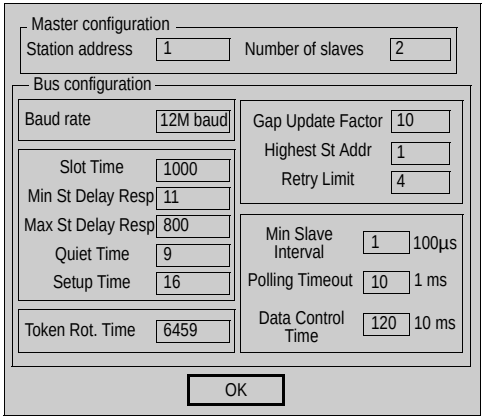
At a Glance

By pressing the **View** button, you are able to view the master and bus configuration parameters. This screen is enabled when you have selected a *.CNF text file.

If no *.CNF text file has been selected, a default file appears. It shows a master module with no slave.

Illustration

The screen is presented in the following format:



Note: the bus parameters are calculated automatically by the SyCon configuration tool. A manual adaptation may be necessary for the pathways deliverd without using the GSD file and which are not entered in the Profibus configuration file. The documentation handling the pathways provides information on the potential adaptations.

Note: for further information, please refer to the SyCon software documentation and theModule configuration file (see *Illustration, p. 56*).

General module configuration

At a Glance

Module configuration is split into two parts:

- Configuring the general parameters.
- Configuring the TSX PBY 100 module.

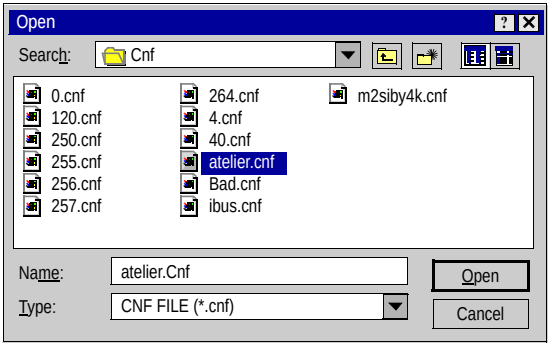
How to configure general parameters

The following procedure is used to configure the general parameters.

Step	Action
1	Select the type of task that will drive the bus.
2	Select the number of words used for the inputs/outputs.
3	Select the action of PMS services upon the application stopping.
4	Select the action of output upon the application stopping.

How to configure the PBY module

The following procedure is used to configure the TSX PBY 100 module with SyCon.

Step	Action
1	Click on the **Hilscher** button. **Result:** SyCon software is activated.
2	Under SyCon, configure: ● the bus topology, ● memory allocation: addressing for each image module in the %IW and %QW registers, ● group settings, ● special functions.
3	Export this configuration into the *.CNF text file.
4	Click on the **Load CNF** button. **Result:** the following window appears. 
5	Find and select the *.CNF text file which describes the configuration being used.
6	Confirm your selection using the **Open** button. The file is rejected if: ● the file format is incorrect, ● there are over 125 devices.
7	Confirm the configuration.

Module configuration file

At a Glance A file describing the application configuration for the TSXPBY100 module is available in the PL7 documentation editor.

Illustration It is presented in the following format:

TSX PBY 100 [RACK 0 POSITION 4]			
Module identification			
Ref. Commercial :	TSX PBY 100	**Designation:**	Profibus-DP module
Address:	004	**Symbol:**	
Channel parameters: 0			
Profibus-DP general configuration:			
Task:	MAST	Outputs:	Reset
No. of IW/QW:	128 words	Diagnostics length:	32 bytes
Profibus-DP configuration file:			
Profibus-DP master configuration:			
Station address:	1	No. of slaves:	0
Baud rate:	1.5M baud		
Slot Time:	2000 tBit	Quiet Time:	6 tBit
Min St Delay Resp	11 tBit	Max St Delay Resp:	55 tBit
Setup Time	1 tBit	Token Rot. Time	50000 tBit
Gap Update Factor	1	Retry Limit:	3
Highest St Addr:	126	Min Slave Interval:	1 * 100 microseconds
Polling Timeout	500 ms	Data Control Time:	100 * 10ms
Profibus-DP slave configuration			
Profibus-DP slave language objects			

Key:

Slot Time	Maximum waiting time before the master starts responding to a request
Min St Delay Resp.	Minimum waiting time before a slave is authorised to reply (transmission delay included)
Setup Time	Waiting time between the sending of the last bit by the slave and the master's acceptance of the response
Gap Update Factor	Specify the number of bus cycle the master uses to search for other masters on the network.
Highest St addr.	The master looks for the other masters on the network only as far as this address.
Quiet Time	Time needed for a signal to return to zero after sending a frame. During this time devices are only active on the bus.
Max St Delay Resp.	Maximum time during which the master waits for the slave to respond
Token Rot. Time	Maximum token rotation time
Retry Limit	When a slave does not respond, the master again asks the slave to transmit. It scans the next slave when the Retry Limit delay has been reached.
Min Slave Interval	Minimum time before a slave is rescanned.
Data Control Time	Maximum time for data exchange between the master and each slave.

Note: a manual configuration of the bus parameters may be necessary,see Viewing the Profibus-DP master configuration (see *Illustration, p. 53*).

4.3 Debugging

At a Glance

Subject of this Section

This section describes the debugging mode screen.

What's in this Section?

This section contains the following topics:

Topic	Page
Description of the debugging screen	59
Debugging parameters	61

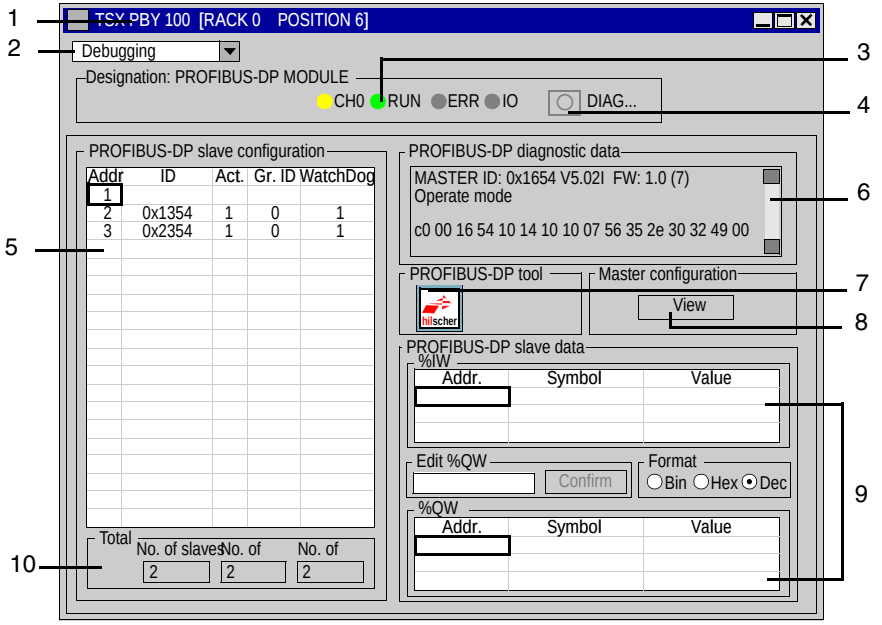
Description of the debugging screen

At a Glance

The Debugging function or the ability to double click on the TSX PBY 100 graphical module in the PL7 configuration is only available in online mode.

Illustration

This selection allows us to display the following screen:



Description

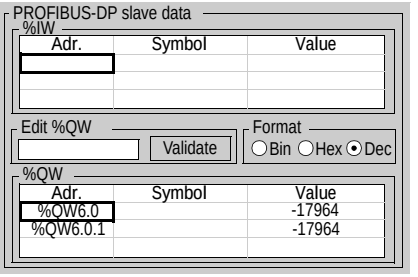
The table below shows the different zones of the debugging screen:

Number	Element	Function
1	Title bar	Indicates the product reference and the position of the module
2	Function selection	Debugging (available in online mode only) or Configuration
3	Lights	Indicate the state of the module: ● RUN lit: the module is in operation ● ERR lit: there is a fault in the module
4	**DIAG** button	When a module fault is detected, this button allows access to status information for this module (this button is disabled or enabled according to the value of the %Ixy.MOD.ERR bit)
5	Profibus-DP Configuration	This drop-down list shows the configuration of the Profibus-DP field bus. When a device has a fault: ● the cursor places itself over that device, ● the corresponding line appears in red
6	Profibus-DP diagnostic data	This window is used to carry out diagnostics on the Profibus-DP bus. See *Profibus-DP diagnostics, p. 64*
7	**Hilscher** button	Icon for starting the software.
8	**View** button	Button for starting the file converter. *Viewing Profibus-DP master configuration, p. 53*
9	Profibus-DP slave data	Used to display addresses and symbols associated to input and output data for a device on the list. See *Slave data, p. 61*
10		The three fields show: ● No. of slaves total number of slaves. ● No. %IW: total number of input words. ● No. %QW: total number of output words.

Debugging parameters

Slave data

To display I/O data values for a device, select **Profibus-DP slave configuration** from the drop-down list.



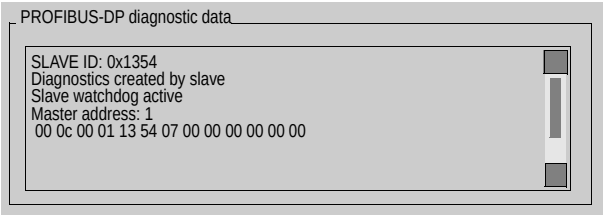
Two pull down lists show the input/output data values:

- The %IW zone field displays the input data list for the device selected, with the symbol and the associated value for each data item.
- The %QW zone field displays the output data list for the device selected, with the symbol and the associated value for each data item.
- The Edit %QW zone field is used to enter the value of a %QW data item, and indicate for each data item the type of display:
  - hexadecimal,
  - decimal,
  - ASCII.

Note: forcing is not authorized for %IW and %QW language objects.
The PLC switching to STOP mode makes the module's fallback values appear in red.

Diagnostics window

This window shows all the diagnostics information for a device. By selecting a device from the **Profibus-DP slave configuration** list, its diagnostics appear in the **Profibus-DP diagnostics data** window.



The data displayed corresponds to a new diagnostics. When a device is selected from the list, the addressed module automatically undergoes diagnostics.

In all cases of diagnostics, the first six bytes are standardized and displayed. If a slave requires more than six bytes of diagnostics, the data is displayed in the window and can be accessed using the scroll bars.

4.4 Programming

At a Glance

Subject of this Section

This section describes the programming principles.

What's in this Section?

This section contains the following topics:

Topic	Page
Profibus-DP diagnostics	64
Diagnostic command	65
Examples of diagnostics command	68
Communication/operation report	70

Profibus-DP diagnostics

General

Profibus-DP diagnostic functions are used to quickly find and identify faults on devices connected to the bus. Diagnostics messages are exchanged on Profibus DP via the TSX PBY 100 master module.

There are four types of diagnostics:

- **Master diag**: complete diagnostics on the TSX PBY 100 master module.
- **Slave diag**: complete diagnostics on a single slave.
- **Compressed diag**: compressed diagnostics on all slaves.
- List of diagnostics available for each slave.

Each of these diagnostics can be read by the PL7 software or by any other debugging PC.

Diagnostic command

At a Glance

A diagnostics command is sent by the SEND_REQ function block.

The SEND_REQ function must be used for reading or resetting the various diagnostics counters.

In order to handle current problems, the TSX PBY 100 module provides four diagnostics counters per slave. These counters can be accessed via the SEND_REQ function and are presented in the form of a byte table. See *General information on a slave, p. 82*

Syntax

The communication function syntax is presented in the following format:

```
SEND_REQ (ADR#rm.v, 16#0031, %MWi:3, %MWj:L, % MWk:4)
```

The following table describes the various parameters of the function:

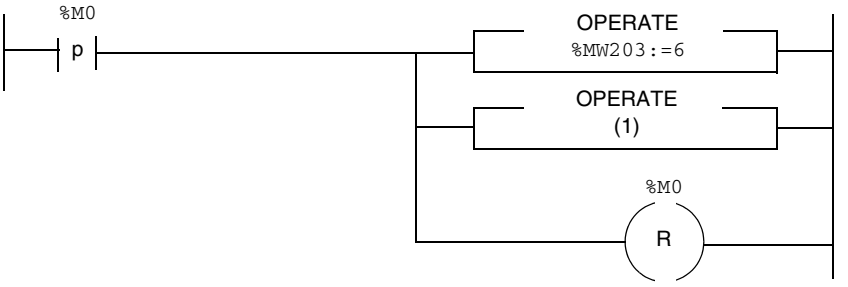
Parameter	Description		
ADR#rm.v	**r**	Rack number	
	m	Module number	
	v	Channel number (0 for Profibus-DP)	
16#0031	Request code		
%MWi:3	Request parameters		
	%MWi	Type of diagnostics	
	%MWi:x0...x8	0...125 126 127 128 129 130 131 132	Diagnostics on slave x List of diagnostics available Compressed diagnostics on all slaves Diagnostics on master module Total diagnostics counters Faulty exchange counters Downtime counters Invalid response counters
	%MWi:x9	Reserved	
	%MWi:x10	Reserved	
	%MWi:x11	Reserved	
	%MWi:x12	If activated, reading of configuration data for slave selected by %MWi.x0..x8 (= 0 to 124)	
	%MWi:x13	If activated, reading of information for slave selected by %MWi.x0..x8 = 0 to 124	
	%MWi:x14	If activated, resetting the list of available diagnostics or the counters specified by %MWi.x0...x8 = 126, 129 to 132	
	%MWi:x15	If activated, reading of the list of available diagnostics or the counters specified by %MWi.x0...x8 = 126, 129 to 132	
	%MWi+1	Start address in the diagnostics table (default value is 0). To access part of the diagnostics table, it is possible to specify a start word in the table (Offset start)	
	%MWi+2	Length of diagnostics to be read	
%MWj:L	PL7 control words where responses are stored		
	j	Number of first word	
	L	Number of words	

Parameter	Description	
%MWk:4	Four words identifying the address of PL7 data used to control the function	
	k	Exchange status

Examples of diagnostics command

Reading diagnostics words from a slave

Diagnostics carried out on slave 2.



(1) `SEND_REQ(ADR#6.0,16#0031,%MW100:3,%MW104:32,%MW200:4)`

The table below describes the parameters:

Parameters	Variables	Values
Address	-	ADR#6.0
Request code	-	16#0031
Data to be sent	%MW100:3	2 (slave address in decimal) 0 (diagnostics table address in decimal) 32 (length of diagnostics table in decimal)
Reception Zone	%MW104:32	-
Report	%MW200:4	-

Diagnostics on a master

SEND_REQ(ADR#6.0,16#0031,%MW100:3,%MW104:32,%MW200:4)

Parameters	Variables	Values
Address	-	ADR#6.0
Request code	-	16#0031
Data to be sent	%MW100:3	126 (master code in decimal) 0 (diagnostics table address in decimal) 32 (length of diagnostics table in decimal)
Reception Zone	%MW104:32	-
Report	%MW200:4	-

Resetting the diagnostics counter

SEND_REQ(ADR#6.0,16#0031,%MW100:3,%MW104:32,%MW200:4)

Parameters	Variables	Values
Address	-	ADR#6.0
Request code	-	16#0031
Data to be sent	%MW100:3	16#4081 (initialization of the total diagnostics counter in hexadecimal) 0 (diagnostics table address in decimal) 32 (length of diagnostics table in decimal)
Reception Zone	%MW104:32	-
Report	%MW200:4	-

Communication/operation report

Description

These messages are common to all types of requests.

<table>
<tr><td colspan="3">Communication report (least significant byte)</td></tr>
<tr><td>Value</td><td colspan="2">Meaning</td></tr>
<tr><td>16#00</td><td colspan="2">Correct exchange</td></tr>
<tr><td rowspan="3"></td><td colspan="2">Operation report (most significant byte)</td></tr>
<tr><td>Value / error code</td><td>Meaning</td></tr>
<tr><td>Send request code in increments of 16#30
16#01
16#02
16#03</td><td>
Positive result
Request not processed
Incorrect response
Reserved</td></tr>
<tr><td>16#01</td><td colspan="2">Exchange stopped on timeout</td></tr>
<tr><td>16#02</td><td colspan="2">Exchange stopped on user request (CANCEL)</td></tr>
<tr><td>16#03</td><td colspan="2">Incorrect address format</td></tr>
<tr><td>16#04</td><td colspan="2">Incorrect target address</td></tr>
<tr><td>16#05</td><td colspan="2">Incorrect management parameter format</td></tr>
<tr><td>16#06</td><td colspan="2">Incorrect specific parameters</td></tr>
<tr><td>16#07</td><td colspan="2">Problem with sending to destination device</td></tr>
<tr><td>16#08</td><td colspan="2">Reserved</td></tr>
<tr><td>16#09</td><td colspan="2">Size of receive buffer is insufficient</td></tr>
<tr><td>16#0A</td><td colspan="2">Size of send buffer is insufficient</td></tr>
<tr><td>16#0B</td><td colspan="2">No processor system resources</td></tr>
<tr><td>16#0C</td><td colspan="2">Incorrect exchange number</td></tr>
<tr><td>16#0D</td><td colspan="2">No telegram received</td></tr>
<tr><td>16#0E</td><td colspan="2">Incorrect length</td></tr>
<tr><td>16#0F</td><td colspan="2">Telegram service not configured</td></tr>
<tr><td>16#10</td><td colspan="2">Network module missing</td></tr>
</table>

16#FF	Message refused	
	Operation report (most significant byte)	
	Value / error code	**Meaning**
	16#01 16#02 16#03 16#04 16#05 16#06 16#07 16#08 16#0B 16#0D 16#0F 16#11 16#12 16#FD	Lack of resources communicating with the processor Lack of line resources Device missing Line error Length error Communication channel fault Addressing error Application fault No system resources Destination missing Intra-station routing problem or channel not configured Address format not handled Lack of destination resources Invalid parameter

4.5 Diagnostics

At a Glance

Subject of this Section

This section describes the different diagnostics functions.

What's in this Section?

This section contains the following topics:

Topic	Page
Diagnostics of the module’s status from the LEDs	73
Downgraded application modes	74
Lists of diagnostics variables	76
List of available diagnostics	79
Compressed diagnostics on all slaves	80
Slave diagnostics	81
General information on a slave	82
Slave configuration data	83
Typical errors	84

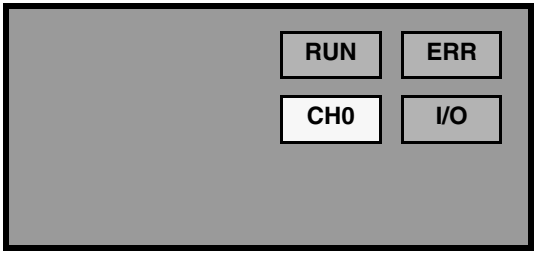
Diagnostics of the module's status from the LEDs

At a Glance

LEDs on the card are used to display the state of the module and the Profibus DP network. The signaling complies with Premium and Profibus DP standards.

Illustration

The diagnostic LEDs are as follows:



Diagnostics

Depending on the state of the LEDs, the diagnostics are as follows:

LEDs	On	Flashing	Off
RUN (green)	TSX PBY 100 module ready - self-diagnostic tests successful - Profibus DP ready	-	Module has not been initialized (awaiting configuration)
ERR (red)	Bus fault or Configuration fault or TSX PBY 100 module fault	Module awaiting configuration or Currently loading (if RUN is off) or Communication fault with the PLC (if RUN is on)	No fault indicated
I/O (red)	Fault on one or several of the slave peripherals	-	No fault indicated (all slaves are active)
CHO (yellow)	Input/output data exchange	-	No input/output data exchange

Downgraded application modes

Transmission media fault

- Communication fault on starting Profibus-DP
  This fault can be caused by poor configuration or damage to the cable. In this case, the bus remains in a non-operational state and the slaves remain in failed start state.

  An error code is generated by the TSX PBY 100 master module in the form of diagnostics. All the diagnostics bits of the slaves remain in their fault state. The ERR LED is on and the other LEDs are off.
- Communication fault during operation
  If a fault occurs while exchanges are in progress, an error code is generated by the TSX PBY 100 master module in the form of diagnostics. In this case, the slaves switch to their pre-configured default state after the watchdog period is exceeded.

  The diagnostic bits of the slaves are enabled to indicate that the slaves are not available and that inputs are reset to zero. The TSX PBY 100 module saves the diagnostics and informs the CPU of their availability using the language object %IWm.0.129:x10..x12.

TSX PBY 100 master module faults

When a fault appears, data exchanges, commands and diagnostics are interrupted. After the watchdog period is exceeded, an error code is generated in the form of diagnostics.

If exchanges are interrupted, the diagnostics bits of the slaves are enabled to indicate that the slaves are not available and that inputs are reset to zero. The ERR LED is on and the other LEDs are off.

Slave faults

When exchanges are in progress, a slave fault is indicated by a new diagnostic. If communication is still established, the slave generates the diagnostics, if not, the diagnostics are generated by the TSX PBY 100 master module.

The diagnostics bits of the slave are enabled to indicate that the slave is not available and that its inputs are reset to zero. The TSX PBY 100 module saves the diagnostics and informs the CPU of their availability using the language object %IWm.0.129:x10..x12.

Note: if one or several slaves are faulty, the bus cycle slows down. Several PLC cycles may be necessary for diagnostics to be recognized and inputs to be reset to zero.

General PLC CPU faults

In the event of a communication fault between the CPU and the TSX PBY 100 module, all outputs are set to their default state (maintained or Reset) and inputs are reset to zero. The ERR LED flashes to indicate the communication fault between the PLC CPU and the TSX PBY 100 module.

The transfer of diagnostics data between the master and the slave are not affected.

Resetting outputs after loading an application

For a low baud rate (less than 500 Kbit/s) and a large watchdog value, the slaves maintain their output states for the whole of the watchdog period.

For a low baud rate (less than 500 Kbit/s) and a disabled watchdog, the slave output states are maintained until the application loading has finished.

Lists of diagnostics variables

Master diagnostics

The following table indicates the diagnostics data for the TSX PBY 100 module.

Bytes	Structure	Description
0/1	OPERATING_MODE	Master operating mode (byte 0: least significant byte; byte 1: most significant byte) Hexadecimal values: 16#00 : inoperative (initialization) 16#40 : stop (ready to receive configuration) 16#80 : output fallback (depending on the configuration) 16#C0: operating
2/3	PNO_IDENTIFIER	Master identification code depending on the Profibus DPcode (byte 2 : least significant byte; byte 3: most significant byte) Hexadecimal values: 16#1654 : for the TSX PBY 100 module
4	PC card hardware version	Hardware version of the PCMCIA card depending on the Profibus DPcode Hexadecimal values: 16#10 : version V1.0 16#XY: version VX.Y 16#FF: no card or card invalid
5	PC card firmware version	Software version of the PCMCIA card depending on the Profibus DPcode Hexadecimal values: 16#14 : version V5.02I 16#16 : version V5.02K 16#XY: version V5.XY 16#FF: no card or card invalid
6	PBY hardware version	Hardware version of the TSX PBY 100 module Hexadecimal values: 16#10 : version V1.0 16#XY: version VX.Y
7	PBY firmware version	Software version of the TSX PBY 100 module Hexadecimal values: 16#10 : version V1.0 16#XY: version VX.Y

Bytes	Structure	Description
8	PBY IE version	Index of software version for the TSX PBY 100 module Hexadecimal values: 16#04 : version IE04 16#XY: version IEXY
9...15	PC card firmware version (ASCII)	Software version of the PCMCIA card in ASCII mode

Master Class 2 diagnostics

For Profibus DP, a Master Class 2 device has the following standard TSX PBY 100 module diagnostics data:

Bytes	Structure	Description
0	OPERATING_MODE	Master operating mode Hexadecimal values: 16#00 : inoperative (initialization) 16#40 : stop (ready to receive configuration) 16#80 : output fallback (depending on the configuration) 16#C0: operating
1/2	PNO_IDENTIFIER	Master ID code depending on the Profibus DPcode (byte 1 : least significant byte; byte 2: least significant byte) Hexadecimal values: 16#1654 : for the TSX PBY 100 module
3	PC card hardware version	Hardware version of the PCMCIA card depending on the Profibus DPcode Hexadecimal values: 16#10 : version V1.0 16#XY: version VX.Y 16#FF: no card or card invalid
4	PC card firmware version	Software version of the PCMCIA card depending on the Profibus DPcode Hexadecimal values: 16#14 : version V5.02I 16#16 : version V5.02K 16#XY: version V5.XY 16#FF: no card or card invalid
5	PBY hardware version	Hardware version of the TSX PBY 100 module Hexadecimal values: 16#10 : version V1.0 16#XY: version VX.Y

Bytes	Structure	Description
6	PBY firmware version	Hardware version of the TSX PBY 100 module Hexadecimal values: 16#10 : version V1.0 16#XY: version VX.Y

Note: the most and least significant diagnostics bytes of the **PNO_IDENTIFIER** are transposed in relation to the standard diagnostics on Profibus DP.

List of available diagnostics

At a Glance

This table provides the activity bits. With one bit per slave, they provide information on the availability of new diagnostics coming from slaves.

Words	Structure	Description
0	x0...x15	New diagnostics for slaves 0 to 15
1	x0...x15	New diagnostics for slaves 16 to 31
2	x0...x15	New diagnostics for slaves 32 to 47
3	x0...x15	New diagnostics for slaves 48 to 63
4	x0...x15	New diagnostics for slaves 64 to 79
5	x0...x15	New diagnostics for slaves 80 to 95
6	x0...x15	New diagnostics for slaves 96 to 111
7	x0...x13 x14,x15	New diagnostics for slaves 112 to 124 Not used

The bit is reset when the slave has been diagnosed by the SEND_REQ communication function.

All the bits can only be reset once by the SEND_REQ command, the parameter identifying this table and the parameter identifying the reset.

Compressed diagnostics on all slaves

At a Glance

The diagnostics table groups together the main diagnostics for each slave. It always has a size of 125 bytes.

Each byte corresponds to a slave address, byte 0 corresponding to slave 1 and byte 124 corresponding to slave 125.

Each byte shows the same diagnostics information.

The following table describes the diagnostics information contained in each byte.

Words	Structure	Description
0...124	0: NOT_REACHABLE	x0=1 if slave x is not connected or switched off
	x1: NOT_READY	x1=1 if slave x is not ready for data exchanges
	x2: CONFIG_FAULT	x2=1 if there is a configuration error on slave x when test requested
		x3=1 if slave x has to be reconfigured and re-parameterized
	x3: PRM_REQUIRED	x4=1 if slave x is inactive (excluded from processing)
	x4: INACTIVE	x5=1 if there is an error in the last response from slave x
	x5: INVALID_RSP	x6=1 if there is an error in the last parametering message from slave x
	x6: PARAM_FAULT	x7=1 if slave x has already been parameterized by another master module
	x7: MASTER_LOCK	

Slave diagnostics

At a Glance

Only the first six diagnostics bytes are standardized and mandatory.

One slave can provide up to 244 diagnostics bytes. If there is an extended diagnostics (byte 7 is worth ff in hexadecimal), bit x3 of byte 0 indicates this by being at value 1 (x3=1).

Bytes	Structure	Description
0	x0: NOT_REACHABLE	x0=1 if slave is not connected or switched off
	x1: NOT_READY	x1=1 if slave is not ready for data exchanges
	x2: CONFIG_FAULT	x2=1 if there is a slave configuration error when test requested
		x3=1 if there are extended diagnostics (byte 7 at FFh in hexadecimal)
	x3: EXT_DIAG	x4=1 if the function is not supported by the slave
	x4: NOT_SUPPORTED	x5=1 if there is an error in the last response from the slave
	x5: INVALID_RSP	x6=1 if there is an error in the last parametering message from the slave
	x6: PARAM_FAULT	x7=1 if slave has already been parameterized by another master module
	x7: MASTER_LOCK	
1	x0: PRM_REQUIRED	x0=1 if slave has to be reconfigured and re-parameterized
	x1: DIAG_DATA_RDY	x1=1 if the slave has generated a diagnostics to be processed by the master
	x2: IS_SLAVE_DIAG	x2=0 if the diagnostics has been created by the master
		x2=1 if the diagnostics has been created by the slave
	x3: WDT_ACTIVE	x3=1 if the slave watchdog is active
	x4: FREEZE_MODE	x4=1 if the slave inputs selected are frozen
	x5: SYNC_MODE	x5=1 if the slave outputs selected are frozen
	x6	not used
	x7: INACTIVE	x7=1 if slave is inactive (excluded from processing)
2	x0...x6	Not used
	x7: DIAG_OVERFLOW	x7=1 if the number of diagnostics exceeds the size of the receive words
3	MASTER_ADDRESS	Address of the master module that sets the parameters for the slave
4/5	PNO_IDENTIFIER	Identification code for the slave
6...244	SPECIFIC_DIAG	Optional specific diagnostics data

General information on a slave

At a Glance

For each slave, the following general information can be read by the TSX PBY 100 module using the SEND_REQ function.

Designation	Size	Description
Configured	byte	the slave has been configured according to Profibus DPconfiguration
Operating	byte	the slave has been initialized and is running correctly
Number of %IW	word	total size of input data in the %IW zone
Number of %QW	word	total size of output data in the %QW zone
Size of input data	byte	total size of input data on Profibus
Size of output data	byte	total size of output data on Profibus
Size of diagnostics data	byte	total size of the last received diagnostics
Compressed diagnostics	byte	compressed diagnostics data for this slave
Diagnostics counter	Byte table	total number of diagnostics messages received from the slaves, one byte per slave (the size is always 126 bytes, byte n corresponds to slave address n)
Exchange counter	Byte table	total number of communication faults between the master and his slaves, one byte per slave (the size is always 126 bytes. Byte n corresponds to slave address n)
Downtime counter	Byte table	number of times when this slave is present but unavailable (the size is always 125 bytes, byte 0 corresponds to device 1 and byte 124 to device 125)
Invalid response counter	Byte table	number of invalid responses for this slave (the size is always 125 bytes, byte 0 corresponds to device 1 and byte 124 to device 125)

Slave configuration data

At a Glance

The TSX PBY 100 module can read the configuration data from each slave with the aid of the SEND_REQ function.

Designation	Size	Description
Total length	word	total length of configuration information
%IW number	byte	total input data size in the %IW zone
%QW number	byte	total output data size in the %QW zone
Offset %IW	word	input data blocks offset in the %IW zone
Offset %QW	word	input data blocks offset in the %QW zone
Station Status	byte	refer to the Profibus DP standard
Watchdog Factor 1	byte	
Watchdog Factor 2	byte	
Min TSDR	byte	
PNO_IDENTIFIER	word	
Group Flags	byte	
ID Address	byte	slave address on the bus
Modular slave	byte	value = 1 if the slave is a modular device value = 0 if the slave is a compact device
Slave active	byte	value = 1 if slave is active on the bus value = 0 if slave is inactive on the bus
Size of parameters	word	parameter data block size for this slave
Configuration data size	word	configuration data block size for this slave
Size of data used	word	data used block size for this slave
Parameters	x bytes	parameter data block for this slave
Configuration data	x bytes	configuration data block for this slave
Data used	x bytes	block of data used for this slave

Typical errors

Case 1 ERR flashing

Results	
After loading the application, the TSX PBY 100 module's ERR LED flashes	
Causes	**Actions**
The PBY 100 module is not recognized by the processor and has no configuration data	• Test whether the PL7 configuration corresponds to the actual configuration • Test whether the processor, PL7 and TSX PBY 100 software versions are compatible

Case 2 ERR lit

Results	
After loading the application, the PBY 100 module's ERR LED is permanently lit	
Causes	**Actions**
Profibus cabling problem	• Disconnect the TSX PBY 100 module from the TAP and reinitialize the processor • If the module starts correctly following this action, there is a short circuit or a wire inversion in the cabling
Physical problem resulting from the TAP or PCMCIA card	• If the module does not start correctly, cut the power supply to the PLC and change the TAP and if necessary the PCMCIA card (the TAP and the card must be changed when the module is switched off)
PCMCIA card software problem	• Test the software version of the card, it must be V5.02I or above
Problem with the loaded configuration	• Test the master module error codes and the input/output error codes • Test the error codes via the diagnostics function

Case 3 Line fault

Results	
After loading an application, some bus slaves start and become faulty	
Causes	**Actions**
A line termination is detected but it is not at the end of the bus	• Test all the Profibus connectors and place the bus termination at the end of the line

Case 4 Faulty slave

Results	
A bus slave is faulty but has not caused a bus error	
Causes	**Actions**
The slave has some input/output errors or configuration error or the watchdog is inactive	• Test the slave diagnostics data via the debugging screen

Case 5 Delay in starting up the slave

Results	
Bus slaves do not react immediately to start-up without causing a bus error. After a while, the slave starts	
Causes	**Actions**
Some slaves require a control command before being activated. These slaves have been too slow to react to the first command sent	• Modify the bus parameters to delay the sending of the first command • Add 5 time units to the Timeout

Case 6 Slaves faulty intermittently

Results	
Some slaves are intermittently faulty	
Causes	**Actions**
Slaves are subject to cabling faults or errors in electromagnetic compatibility but the PBY 100 module tries to reactivate them	• Reset all the diagnostics counters using the SEND_REQ function • Test if the TSX PBY 100 module has received the new diagnostics

Case 7 Bus hardware fault

Results	
The %IWxy.0.243:x7 bit is activated, indicating one or more bus hardware faults and all the devices transmit their diagnostics data	
Causes	**Actions**

The bus is subject to cabling faults, connection faults, line termination faults or TAP faults. Because of this the slaves transmit their diagnostics and fill the receive zone with diagnostics	• Check the cabling and line terminations, in particular the connectors whose terminations are activated but not located at the end of the bus
	• Reset %IWxy.0.243:x7 by:
	  • switching off and then switching on the PLC,
	  • reinitializing the PLC,
	  • disconnecting and reconnecting the TSX PBY 10 module while switched on,
	  • downloading a new application,
	  • resetting all the diagnostics counters using the SEND_REQ function.

4.6 Language objects associated with the TSX PBY 100 module

At a Glance

Subject of this Section

This section presents the different language objects specific to the TSX PBY 100 module.

What's in this Section?

This section contains the following topics:

Topic	Page
Language objects in implicit exchange	88
Language objects for explicit exchange	92
Explicit exchange management	93
Language objects associated with the configuration	94
Error code for module TSX PBY 100	95

Language objects in implicit exchange

At a Glance

All the language objects for implicit exchange (See: PL7 Micro, Junior, Pro; Communication applications Volume 1) for Profibus-DP communication with the TSX PBY 100 module can be displayed or modified by the application program.

Bit objects

The table below shows the different bit objects for implicit exchange.

Object (1)	Function	Meaning
%Ixy.MOD.ERR	Module error	Bit set to 1 indicates a module error (at least one of the channels has an error, ...)
%Ixy.0.ERR	Channel error	Bit set at 1 indicates a channel error
Key		
(1)	xy address • x: corresponds to the rack number • y: corresponds to the module number	

Input word objects

The table below shows the different input word objects for implicit exchange.

Object (1)	Function	Meaning
%IWxy.0.0 to %IWxy.0.241	DP inputs	242 DP input words
%IWxy.0.242	PBY status	• x0 = 1: if x8 = 1 or x9 = 1 or x10 = 1, channel error • x8 = 1 Master module operating error (DP_ERROR) • x9 = 1 PCMCIA card operating error The 9 bit is at state 1 when an error is detected at the 253 word (IOM_error), see at the end of this table • x10 = 1 Master module configuration error The 10 bit is at state 1 when an error is detected at the 252 word (CM_error), see at the end of this table • x13 = 1 Configuration error • x14 = 1 Communication error: no communication with the programmable controller
%IWxy.0.243	PBY status	• x0..x6: Address of the last diagnosed slave • x7 = 1: Hardware fault on the bus (line termination, cabling, connectors, TAP, etc) • x8 = 1: Master module operating • x9 = 1: Inputs/outputs error (one or more slaves faulty) • x10 = 1: New diagnostics available for the master module • x11 = 1: New diagnostics available for a slave (address given via x0..x6) • x12 = 1: New diagnostics received for several slaves • x13..x15: Code of last management event (bus inoperative, communication error between master devices, etc.)
%IWxy.0.244	Diagnostics bitmap	• x0..x15: Status bits for slaves 0 to 15
%IWxy.0.245	Diagnostics bitmap	• x0..x15: Status bits for slaves 16 to 31
%IWxy.0.246	Diagnostics bitmap	• x0..x15: Status bits for slaves 32 to 47
%IWxy.0.247	Diagnostics bitmap	• x0..x15: Status bits for slaves 48 to 63
%IWxy.0.248	Diagnostics bitmap	• x0..x15: Status bits for slaves 64 to 79
%IWxy.0.249	Diagnostics bitmap	• x0..x15: Status bits for slaves 80 to 95
%IWxy.0.250	Diagnostics bitmap	• x0..x15: Status bits for slaves 96 to 111

Object (1)	Function	Meaning
%IWxy.0.251	Diagnostics bitmap	• x0..x12: Status bits for slaves 112 to 124 • x14: Transfer of inputs from the module to the PLC processor • x15: Transfer of outputs from the PLC processor to the module
%IWxy.0.252	CM_ERROR code	Master module error code (see *Error code for module* TSX PBY 100*, p. 95*)
%IWxy.0.253	IOM_ERROR code	Inputs/outputs error code (see *Error code for module* TSX PBY 100*, p. 95*)
Key		
(1)	xy address • x: corresponds to the rack number • y: corresponds to the module number	

Output word objects

The table below shows the different output word objects for implicit exchange.

Object (1)	Function	Meaning
%QWxy.0.0 to %QWxy.0.241	DP outputs	242 DP output words
%QWxy.0.242	I/O exchange mode	%QWxy.0.242:X0=0: 'Byte consistency' mode %QWxy.0.242:X0=1: 'Byte consistency' mode
%QWxy.0.243 to %QWxy.0.253	Reserved	-
Key		
(1)	xy address ● x: corresponds to the rack number ● y: corresponds to the module number	

The I/O exchange mode is used with version V1.3IE14 (or higher) of the PBY software and requires version 5.8 (or higher) of PL7 CPU.

The application program can select either of these operating modes:

- 'Byte consistency' mode (Recommended for discrete I/Os):
  %QWxy.0.242:X0=0 == Data is coherent byte by byte with the Profibus frame, but it does not guarantee that the entire frame is transmitted in the PLC cycle. This mode ensures the best performance.
- 'Frame consistency' mode (Recommended for analog I/Os):
  %QWxy.0.242:X0=1 ==> This guarantees that the entire frame is transmitted in the same PLC cycle. In this case, the overall performance of the system may be reduced.

Language objects for explicit exchange

At a Glance

All the language objects for explicit exchange (See: PL7 Micro, Junior, Pro; Communication applications Volume 1) for Profibus-DP communication with the TSX PBY100 module can be displayed or modified by the application program.

Internal words

The following table describes the internal words:

Object (1)	Function	Meaning
%MWxy.MOD.2	Module status	• x0 = 1: defective module • x1 = 1: functional fault (Communication fault between the CPU and the module, command, adjustment or configuration value not accepted, etc.) • x5 = 1: error in hardware or software configuration (the module present is not that declared in the configuration, the sub-modules are not compatible) • x6 = 1: missing module
%MWxy.0.2	Reserved	-
Label		
(1)	xy Address • x: corresponds to the rack number • y: corresponds to the module number	

Explicit exchange management

At a Glance

This page describes all the language objects that manage explicit exchanges (See: PL7 Micro, Junior, Pro; Communication applications Volume 1).

Word objects

The table below shows the different word objects for managing explicit exchanges.

Object (1)	Function	Meaning
%MWxy.MOD.0	Exchange in progress	• x0 = 1: reading of status in progress
%MWxy.MOD.1	Reserved	-
%MWxy.0.0	Exchange in progress	• x15 = 0: reconfiguration in progress
%MWxy.0.1	Reserved	-
Key		
(1)	xy address • x: corresponds to the rack number • y: corresponds to the module number	

Language objects associated with the configuration

At a Glance

All the configuration language objects for Profibus-DP communication with the TSX PBY 100 module can be displayed or modified by the application program.

Internal constants

The following table describes the internal constants:

Object (1)	Function	Meaning
%KWxy.0.0	PBY function block	• x0...x15: PBY 100 function code
%KWxy.0.1	Size of %IW and %QW	Number of %IW and %QW updated (32, 64, 128, 242)
%KWxy.0.2	Configuration bits	• x0 = 1: outputs set to zero • x0 = 1: maintained outputs
Key		
(1)	xy address • x: corresponds to the rack number • y: corresponds to the module number	

Error code for module TSX PBY 100

Master module (%IWxy.0.252)

Managing the internal configuration of module TSX PBY 100

Symbol	Value	Description
E_CFG_DATA_SIZE	101	Size of configuration data block invalid
E_CFG_IO_IMAGE_SIZE	102	Size of I/O images invalid
E_CFG_N_SLAVES	103	Number of slaves invalid
E_CFG_MASTER_ADDRESS	104	Address of master module invalid
E_CFG_BAUD_RATE	105	Transmission speed invalid
E_CFG_BUS_PARAM	106	Bus parameters invalid
E_CFG_NODE_ID	107	Address invalid or already exists
E_CFG_SLAVE_IN_SIZE	108	Slave input data size invalid
E_CFG_SLAVE_OUT_SIZE	109	Slave output data size invalid
E_CFG_AAT_DATA	110	Size/offset combination of I/O data invalid
E_CFG_AAT_OVERLAP	111	I/O data overlap
E_CFG_CNF_TIMEOUT	112	Timeout on confirmation waiting time
E_CFG_INIT_FMB	113	Cannot initialize PCMCIA card
E_CFG_INIT_MASTER	114	Cannot initialize master module
E_CFG_LOAD_BUSPAR	115	Cannot load module bus parameters
E_CFG_SET_OPMODE	116	Cannot switch into operating mode
E_CFG_LOAD_SLAVE	117	Cannot load slave configuration
E_CFG_MASTER_DIAG	118	Cannot read master module diagnostics
E_CFG_DUP_ADDR	119	Bus address already exists
E_CFG_TAP_FAULT	120	Fault between the PCMCIA card and the TAP

Inputs/outputs (%IWxy.0.253)

Managing the TSX PBY 100 module inputs/outputs

Symbol	Value	Description
E_OK	0	No error
E_INIT	1	Initialization error
E_NO_CONFIG	2	No configuration data
E_INVALID_CONFIG	3	Invalid configuration data
E_INVALID_PARAM	4	Invalid parameters
E_INVALID_STATE	5	Slave state does not allow the request to be carried out
E_ACCESS	6	No exchange on BusX
E_NO_RESSOURCES	7	No resources available
E_SEND	8	Cannot send message to PCMCIA card
E_RECEIVE	9	Cannot receive message from PCMCIA card
E_STATE	10	Invalid state
E_SERVICE	11	Invalid service code (Uni-telway request and facility)

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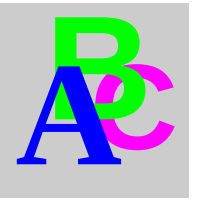

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