



Application note

AH EN S7 - AXL E PN PRO

Startup of Axioline E PROFINET devices on
a SIMATIC® S7 controller
(for experienced S7 users)

Application note

Startup of Axioline E PROFINET devices on a SIMATIC® S7 controller

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This application note is valid for Axioline E PROFINET devices.

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Please observe the following notes

User group of this manual

The use of products described in this manual is oriented exclusively to:

- Qualified electricians or persons instructed by them, who are familiar with applicable standards and other regulations regarding electrical engineering and, in particular, the relevant safety concepts.
- Qualified application programmers and software engineers, who are familiar with the safety concepts of automation technology and applicable standards.

Explanation of symbols used and signal words



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

There are three different categories of personal injury that are indicated with a signal word.

DANGER This indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING This indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



This symbol together with the signal word **NOTE** and the accompanying text alert the reader to a situation which may cause damage or malfunction to the device, hardware/software, or surrounding property.



This symbol and the accompanying text provide the reader with additional information or refer to detailed sources of information.

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1 Basics and example project

1.1 Information about this document

This document describes specific features associated with the startup of Axioline E PROFINET devices on an S7 controller.

The document is aimed at experienced S7 users. It does not cover a complete project, just specific features associated with the use of Axioline E devices.

It is assumed the user has knowledge of and experience in the operation of PCs and Windows operating systems, and knowledge of the Siemens SIMATIC software and Ethernet basics.

1.2 System requirements

1.2.1 Software requirements

You are working with Axioline E and STEP 7 Version 5.5, Service Pack 3 (Version K5.5.3.0).

1.2.2 Hardware requirements for the Siemens SIMATIC software

Please refer to the S7 documentation for the hardware requirements.

1.3 Axioline E PROFINET devices

The document is valid for the following Axioline E PROFINET devices:

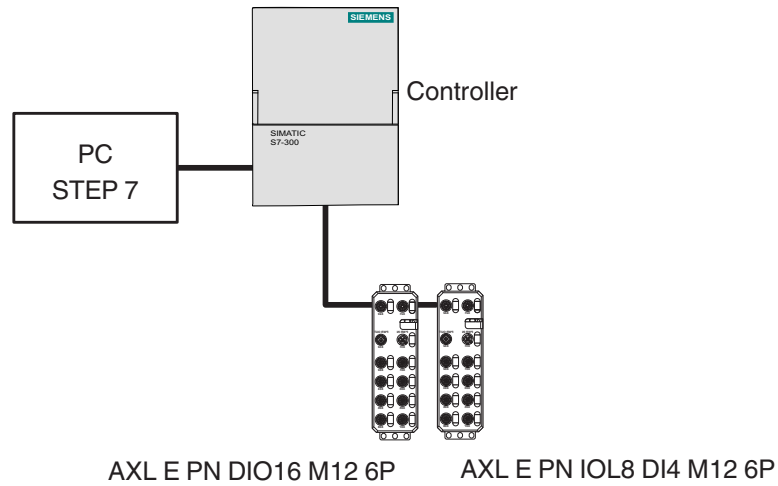
Designation	Order No.	Device No.	Module ID No.
AXL E PN DI8 DO8 M12 6M	2701515	0x0104	0x310000
AXL E PN DI16 M12 6M	2701516	0x0104	0x210000
AXL E PN DIO16 M12 6M	2701517	0x0104	0x110000
AXL E PN DI8 DO4 2A M12 6M	2701518	0x0104	0x410000
AXL E PN IOL8 DI4 M12 6M	2701519	0x0104	0x510000
AXL E PN DI8 DO8 M12 6P	2701509	0x0104	0x300000
AXL E PN DI16 M12 6P	2701510	0x0104	0x200000
AXL E PN DIO16 M12 6P	2701511	0x0104	0x100000
AXL E PN DI8 DO4 2A M12 6P	2701512	0x0104	0x400000
AXL E PN IOL8 DI4 M12 6P	2701513	0x0104	0x500000



The information refers to firmware Version 1.10.

1.4 Example for a project with Axioline E PROFINET devices

This example project consists of an S7 controller and devices. The example system is shown in Figure 1-1.



8680001

Figure 1-1 Example system

AXL E PN DIO16 M12 6P	Digital Axioline E device
AXL E PN IOL8 DI4 M12 6P	IO-Link Axioline E device

2 Integrating Axioline E PROFINET devices into the S7 controller (STEP 7)

To integrate the Axioline E devices into the network, proceed as described in the manufacturer's documentation for your controller. This section only explains fundamental steps that are relevant to the Axioline E system.

2.1 Creating/opening a project

- In the Siemens SIMATIC Manager, create a new project or open an existing project.

2.2 Installing GSDML files



Make sure you use the latest GSDML file. It is available on the Internet at www.phoenixcontact.net/catalog.

Make sure that the name of the downloaded GSDML file is the same as the name displayed in the Download area. If the file name differs following download (e.g., after downloading with Mozilla Firefox), rename the file. Otherwise the file will not be recognized by STEP 7.

- Open the “Install GSD Files” menu in “HW Config Options”. The following dialog box appears:

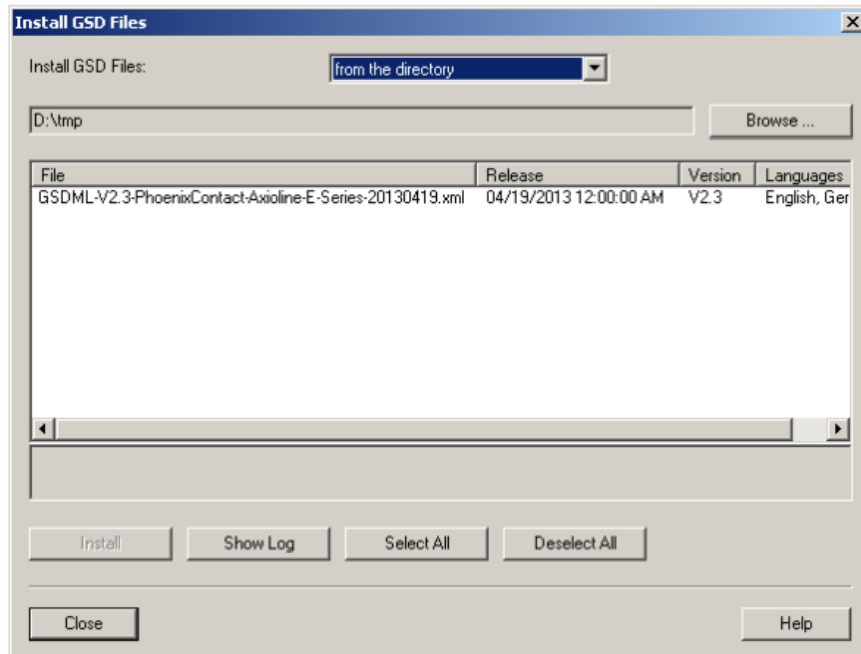


Figure 2-1 Dialog box: Install GSD Files

- Under “Install GSD Files”, select “from the directory”.
- Switch to the folder where the GSDML file is located.
- Select the required GSDML file and then click “Install”.
- Click “Yes” to acknowledge the “Confirm GSD File” dialog box.
- Click “Close” to exit the “Install GSD Files” dialog box.

The Axioline E devices now appear in the hardware catalog under:
PROFINET IO > Additional Field Devices > I/O > AXL E.

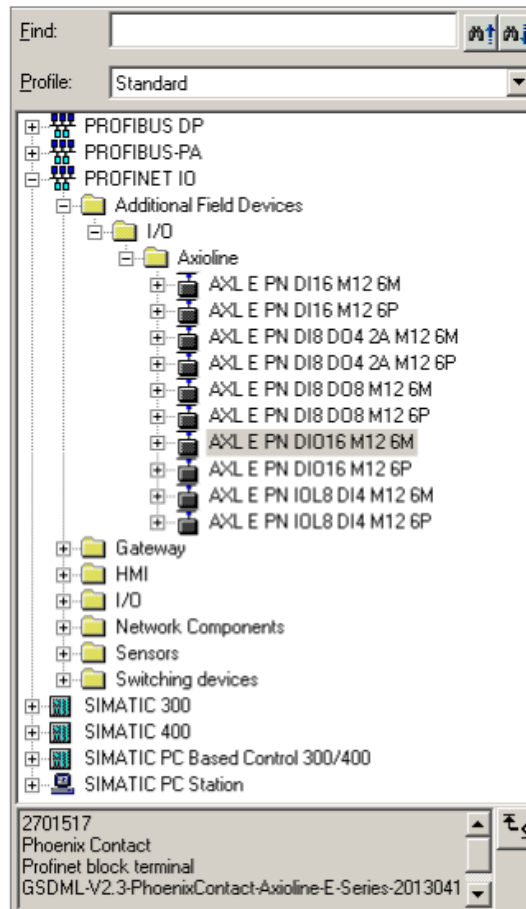


Figure 2-2 Hardware catalog

2.3 Inserting I/O devices in the hardware configurator

- Select the Axioline E PROFINET device in the hardware catalog and move it to the PROFINET network using drag & drop.

The devices all have modules with the same structure in slot zero. This is where the communication submodules are located.

2.4 Digital devices

Digital devices have a virtual diagnostics module in slot 1. This provides a cyclic overview of current diagnostics. The table below shows how the individual bits are represented.

Byte #	Bit #	Meaning
0	0	Output short circuit
0	1	Output overload
0	2	Actuator short circuit
0	3	Actuator undervoltage
0	4	Sensor/bus supply overload
0	5	Sensor/bus supply undervoltage
0	6 ... 7	Reserved
1 ... 3	0 ... 7	Reserved

The I/O module is located in slot 2 of the digital devices. Depending on the hardware version, 1 byte to 2 bytes of inputs and 0 bytes to 2 bytes of outputs can be addressed.

For easy access to the I/O data, the addresses should be located in the cyclic I/O map: normally addresses 0 to 255.

If the I/O data is in the I/O area, the corresponding I/O download/transfer commands (e.g., L PAB 256; T PAB 256) or SFCs 14/15 should be used.

The figure below shows an example configuration for the AXL E PN DIO16 M12 6P device:

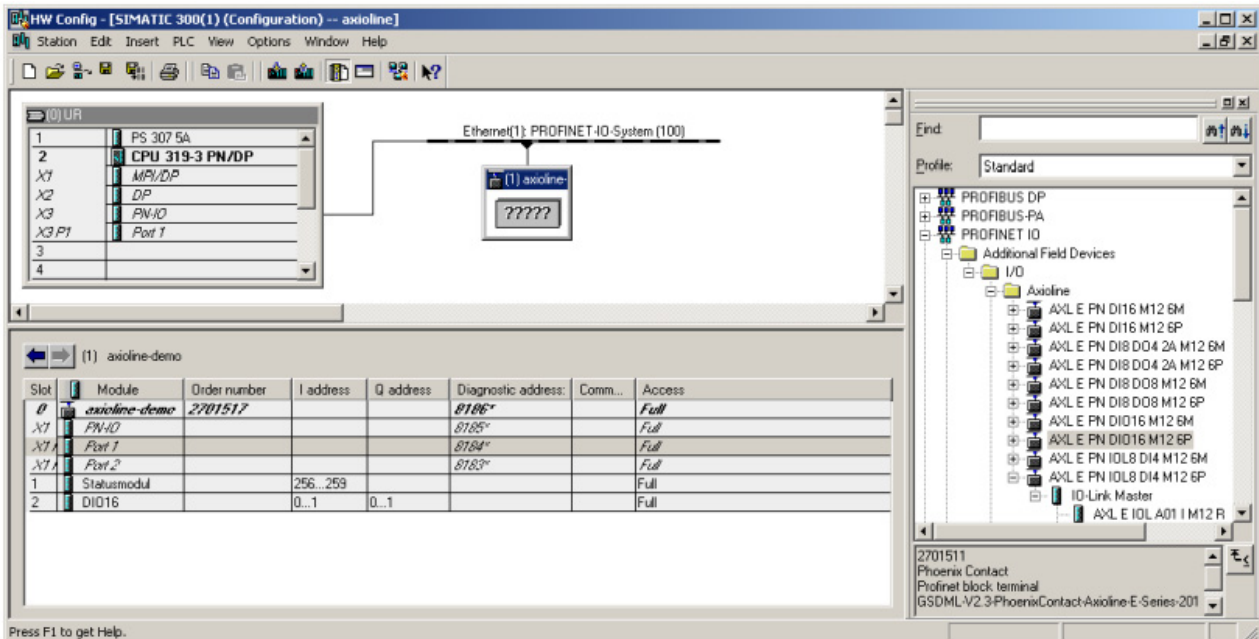


Figure 2-3 Hardware configuration of the AXL E PN DIO16 M12 6P

2.5 IO-Link devices

The IO-Link devices have a module in slot 1 in which nine slots are configured. Subslot 1 contains the Status/Control Module, which has 4 bytes of input data and 4 bytes of output data. These are shown in the IOLM_Status table (input) and IOLM_Control table (output).

Table: IOLM_Status

Byte	Byte 0								Byte 1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Port	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
Meaning	COM States								PD Valid States							
Byte	Byte 2								Byte 3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Port	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
Meaning	Digital Input States of C/Q								UA States (Pin 2)				Digital Input States of DI (Pin 2)			

Table: IOLM_Control

Byte	Byte 0								Byte 1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Port	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
Meaning	ComCntrl								reserved							
Byte	Byte 2								Byte 3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Port	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
Meaning	Digital Output Control of C/Q								reserved							

The corresponding submodules (analog converters, digital inputs/outputs, IO-Link sensors) can be configured in subslots 2 to 9 using drag & drop.

The figure below shows an example configuration for the AXL E PN IOL8 DI4 M12 6P.

The screenshot shows the HW Config software interface for a SIMATIC 300(1) system. The rack configuration is as follows:

Slot	Module
1	PS 307 5A
2	CPU 319-3 PN/DP
X1	MPI/DP
X2	DP
X3	PN-IO
X3 P1	Port 1
3	
4	

The rack is connected to an Ethernet(1) PROFINET-IO-System (100). A DP-NORM module is also shown connected to the system.

The detailed view of the IO-Link Master module (Slot 1) is shown below:

Slot	Module	Order number	I address	Q address	Diagnostic address	Comment	Access
0	Axoline-E-Series-PN-IOL	2701513			8182*		Full
X1	PN-IO				8181*		Full
X1 P1 R	Port 1				8180*		Full
X1 P2 R	Port 2				8179*		Full
1	IO-Link Master				2*		Full
1.1	Status/Control Module		2..5	2..5			Full
1.2	AXL E IOL A01 I M12 R			256..259			Full
1.3	AXL E IOL A01 U M12 R		256..257	260..261			Full
1.4	AXL E IOL RTD1 M12 S		258..259	262..263			Full
1.5	IO-Link 32/32 Byte I/O ~		260..291	264..295			Full
1.6	IO-Link 1 Byte Output			296			Full
1.7	IO-Link 1 Byte Output			297			Full
1.8	Digital Output				8196*		Full
1.9	Digital Output				8195*		Full

The right-hand pane shows the IO-Link Master configuration tree with various digital input and output options, including digital input with IO-Link and digital output with IO-Link.

Figure 2-4 Hardware configuration of the AXL E PN IOL8 DI4 M12 6P device

2.6 Assigning device names

PROFINET uses names to address the devices.



Make sure that the device name only occurs once in the PROFINET system. Observe the naming conventions listed below when assigning the device name.

Naming conventions for PROFINET device names:

- Limited to 127 characters (letters, numbers, dash, dot).
- A name component within the device name, i.e., a character string between two points, may be a maximum of 63 characters long.
- No special characters such as umlauts, brackets, underscore, slash, space, etc. A dash is the only special character permitted.
- The device name must not start or end with “.” or “.” characters.
- The device name must not start with numbers.
- The device name must not start with the character string “port-xyz-” (x, y, z = 0 ... 9).
- The device name must not take the form n.n.n.n (n = 0 ... 999).

First, the device is assigned a name in the configuration.

- Right-click on the device and select “Object Properties”.
- In the dialog box that appears, enter a name for the device under “Device name”.

In the figure below, “axioline demo” is used.

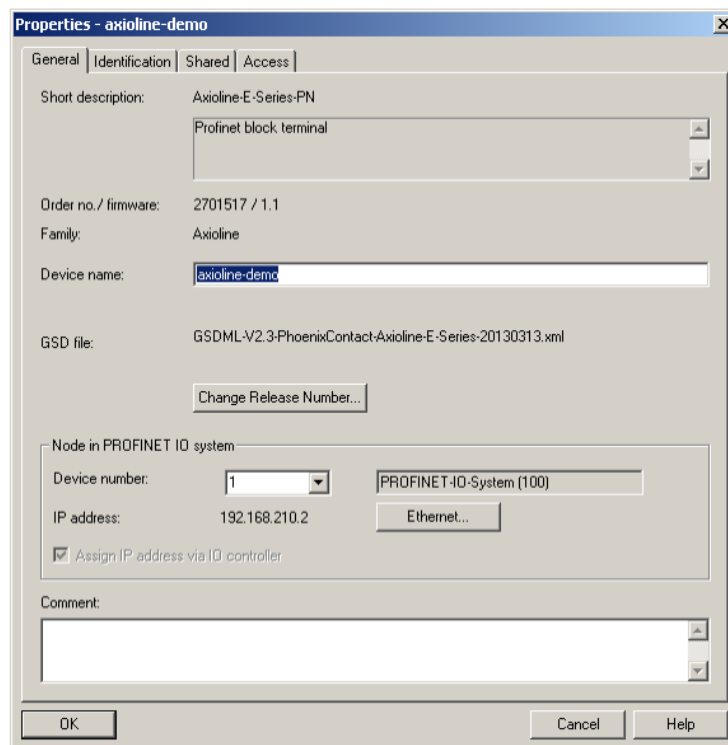


Figure 2-5 Dialog box: Properties; General tab

Next, assign the same name that was used in the hardware configuration to the device. The device should be connected when doing this.

The following steps must be carried out:

- In the “HW Config”, select the “Target system, Ethernet, Assign device name” menu.
- In the “Assign device name” dialog box shown below, there should be an entry with the device MAC address. Select it and assign the desired configured name to it via “Assign name” under “Device name”.
- Click “Close” to exit the dialog box.

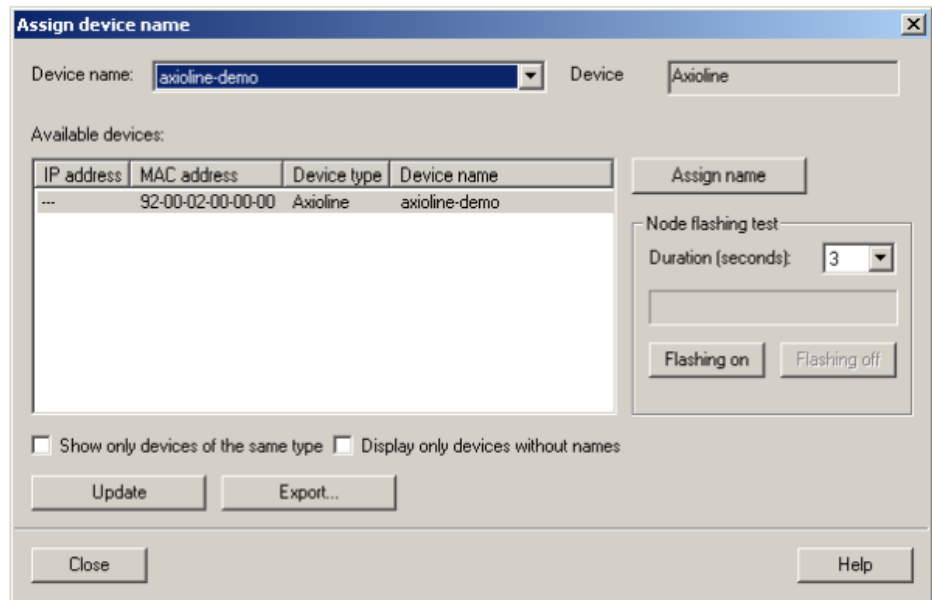


Figure 2-6 Dialog box: Assign device name

2.7 Fast startup

In order to use the “fast startup” function, prioritized startup must be activated in the PROFINET IO device interface submodule (PN-IO).

The following steps must be carried out:

- Right-click on “PN-IO”, then select “Object Properties”. The “Properties - PN-IO (X1)” dialog box opens, see Figure 2-7.
- In the “General” tab, activate the “Prioritized startup” checkbox.
- Acknowledge the dialog box with “OK”.

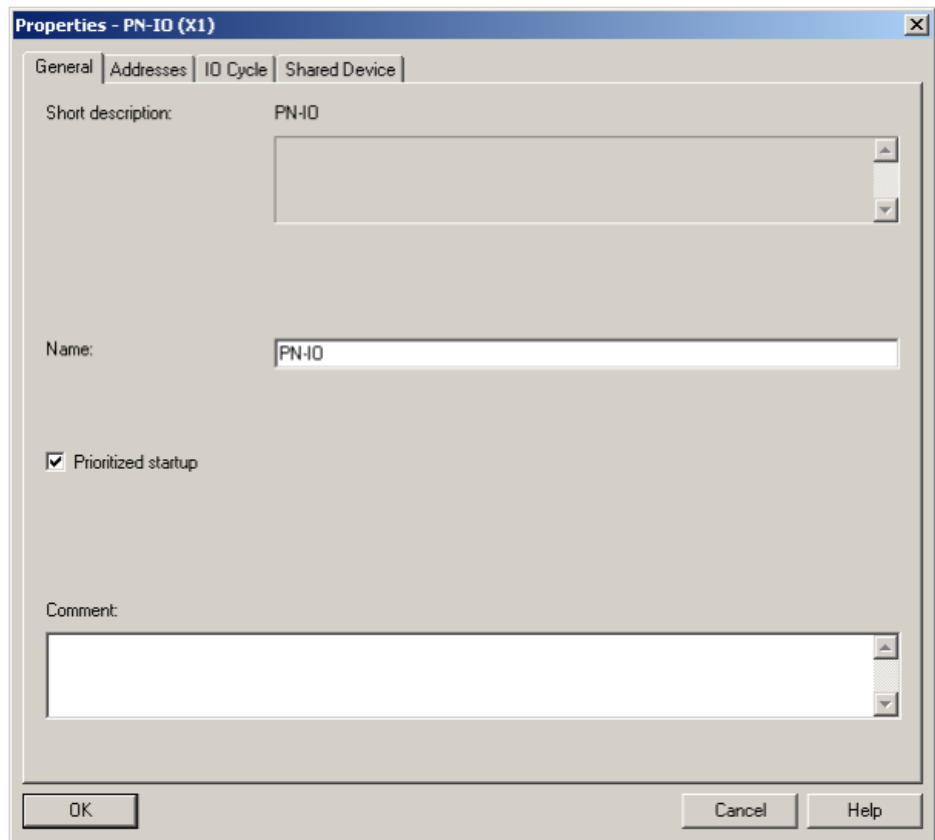


Figure 2-7 Dialog box: Properties- PN-IO (X1); General tab

Furthermore, both ports should be set to fixed values. This saves time on startup that would otherwise be taken up arranging the port configuration.

The following steps must be carried out both for the device and the controller:

- Right-click on the ports, then select “Object Properties”.
The “Properties - PN-IO - Port 1 (X1 P1 R)” dialog box opens, see Figure 2-8.
- In the “Options” tab, select the value “TP 100 Mbps full duplex” under “Transmission medium / duplex”.
- Activate the “Disable autonegotiation” checkbox.
- Close the dialog box with “OK”.

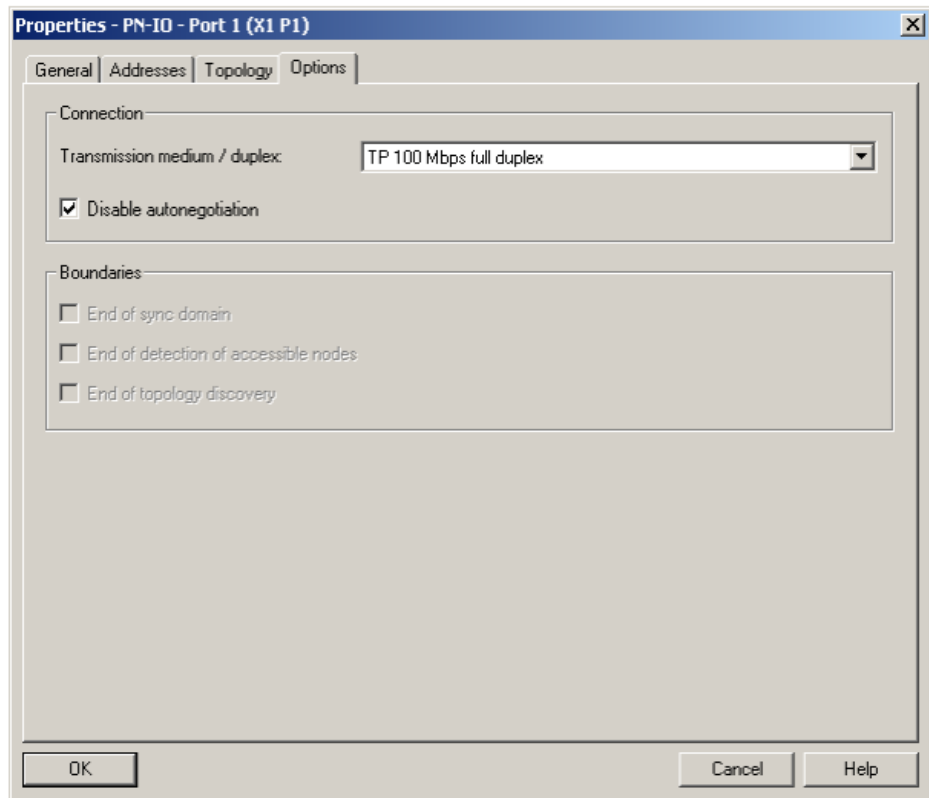


Figure 2-8 Dialog box: Properties - PN-IO - Port 1 (X1 P1 R); Options tab

2.8 Media Redundancy Protocol

In order to configure the Media Redundancy Protocol (MRP), the ring must be set for the corresponding dialog boxes of the PROFINET interfaces.

The following steps must be carried out:

- Right-click on “Profinet IO Interface (PN-IO)”, then select “Object Properties”.
- In the “Media Redundancy” tab, select the value “Client” under “Role”, see Figure 2-9.
- Close the dialog box with “OK”.

The corresponding settings must be made for the MRP manager.



If an S7 controller with two Ethernet ports is used and auto negotiation is also deactivated, the second port must be set exactly the same as the first port. A crossed patch cable must therefore be used to establish a connection from the second port of the controller to the second port of an Axioline E PROFINET device.

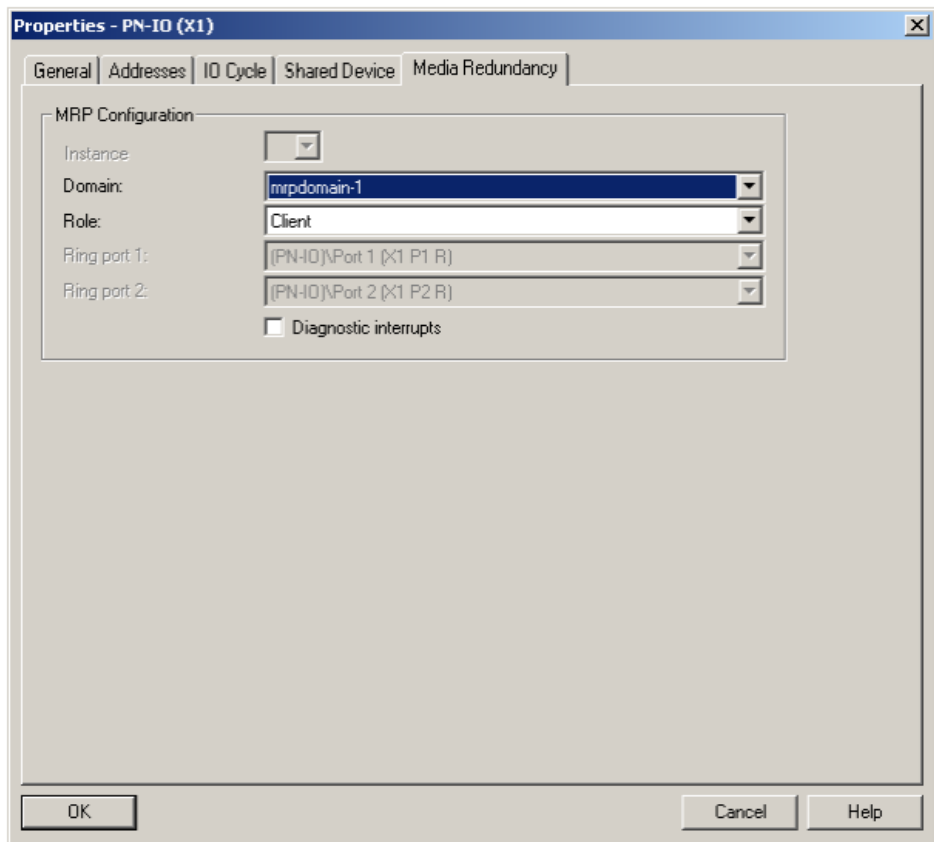


Figure 2-9 Dialog box: Properties - PN-IO (X1); Media Redundancy tab

In order to ensure that the watchdog is not triggered during the MRP failure detection time, this must be set to a larger value than the expected MRP failure detection time.

The following steps must be carried out:

- Right-click on “Profinet IO Interface (PN-IO)”, then select “Object Properties”.
- In the “IO Cycle” tab, set the value for “Number of accepted update cycles with missing IO data” under “Watchdog Time” so that the value under ”Watchdog time (ms)” is greater than 200, see Figure 2-10.
- Close the dialog box with “OK”.

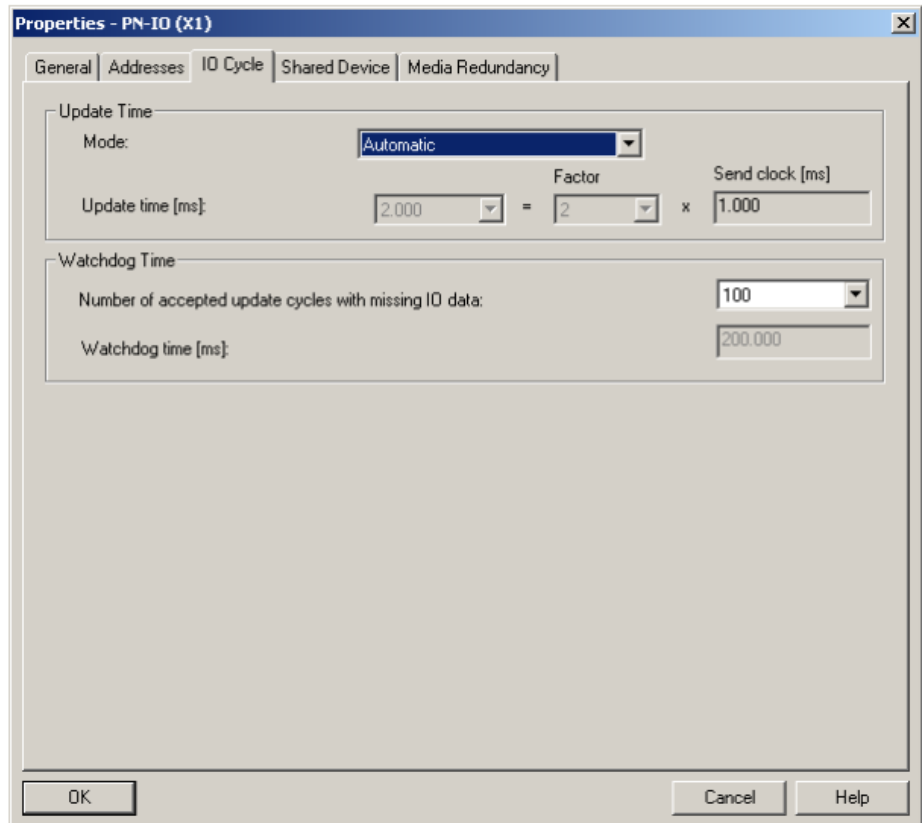


Figure 2-10 Dialog box: Properties - PN-IO (X1); IO Cycle tab

2.9 Identification and maintenance

The identification and maintenance (I&M) data records are split over several STEP 7 dialog boxes. An online connection to the device is required to display the I&M data records.

The following steps must be carried out:

- Switch the hardware manager to online view.
- Right-click on the module, then select “Module status”. In the “General” tab, the order number, designation, hardware version, and firmware version are listed in the “Version” area, see figure below.
- In the “Identification” tab, the module revision counter is listed in the “Module information” area and the vendor ID (manufacturer's description), serial number, profile, and profile details are listed in the “Manufacturer information” area, see Figure 2-12.

I&M data records 1 - 3 can be read and written using the “Download/Upload Module Identification” dialog boxes.

The following steps must be carried out (offline view):

- Select the device.
- Select “Target system, Download module identification”.
- In the dialog box (Figure 2-13), you can now adapt the I&M data records (1 - 3) and write them to the device with “OK”.

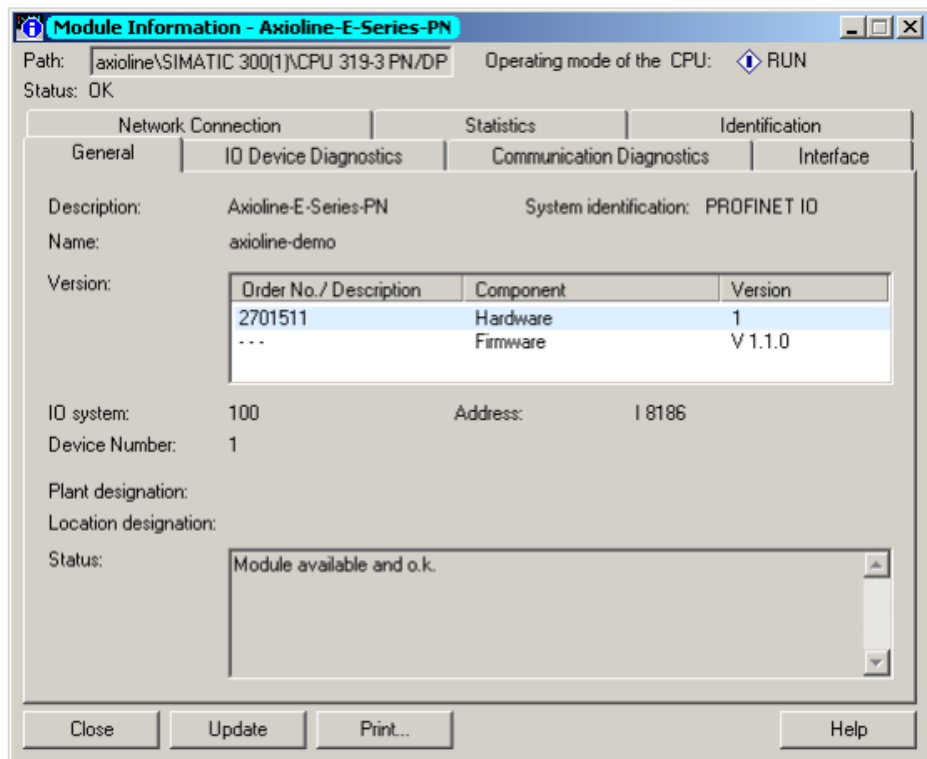


Figure 2-11 Dialog box: Module status; General tab

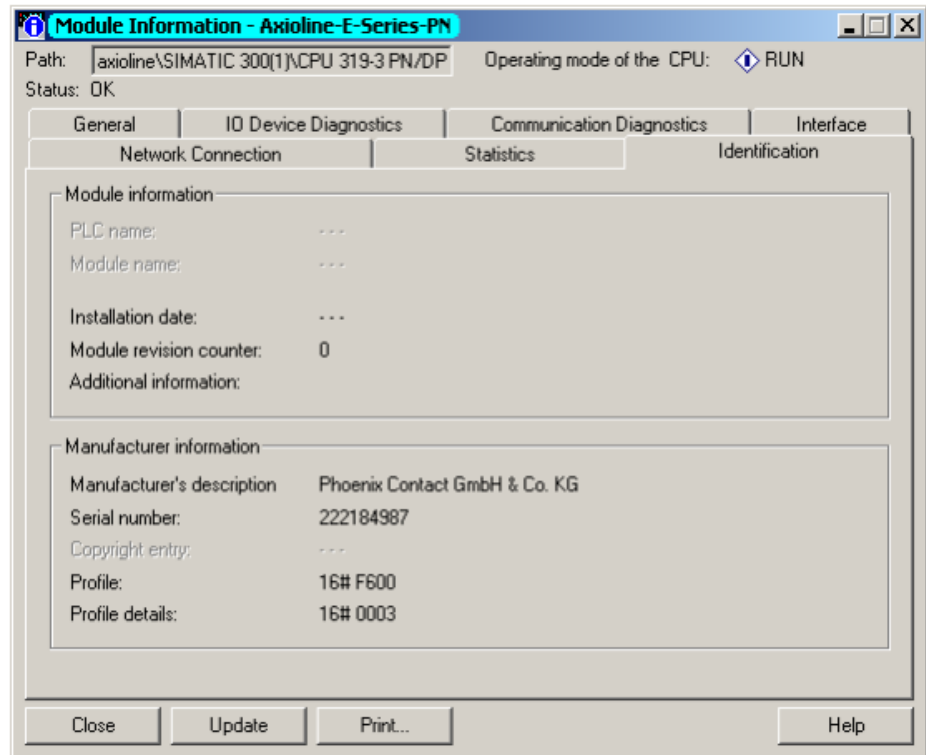


Figure 2-12 Dialog box: Module status; Identification tab

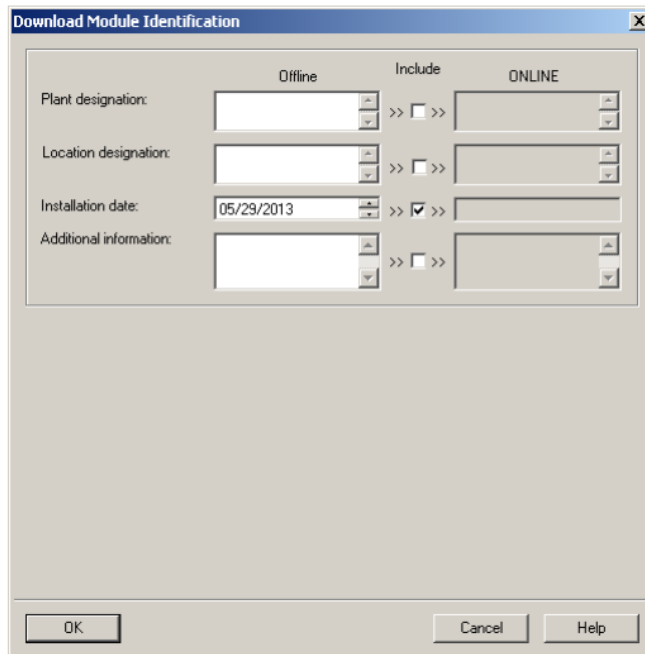


Figure 2-13 Dialog box: Download Module Identification

2.10 Diagnostic alarms

The devices support the following diagnostic alarms:

Alarm code	Module	Alarm text	Description
0x0002	0	Undervoltage	Undervoltage U_S
0x0003	0	Overvoltage	Surge voltage U_S
0x0004	0	Overload	Overload U_S
0x0005	0	Overtemperature	Overtemperature
0x0100	0	Actuator under voltage	Undervoltage U_A
0x0101	0	Actuator over voltage	Surge voltage U_A
0x0102	2	Shortcut bits 0..3	Short circuit X1/X2
0x0103	2	Shortcut bits 4..7	Short circuit X3/X4
0x0104	2	Shortcut bits 8..11	Short circuit X5/X6
0x0105	2	Shortcut bits 12..15	Short circuit X7/X8

These can be viewed in the “Module status” dialog box in STEP 7 in online view.

The following steps must be carried out:

- Switch the hardware manager to online view.
- Right-click on the module, then select “Module status”.
- In the “Module status” dialog box, select the “IO Device Diagnostics” tab to view the detailed text, see Figure 2-14..

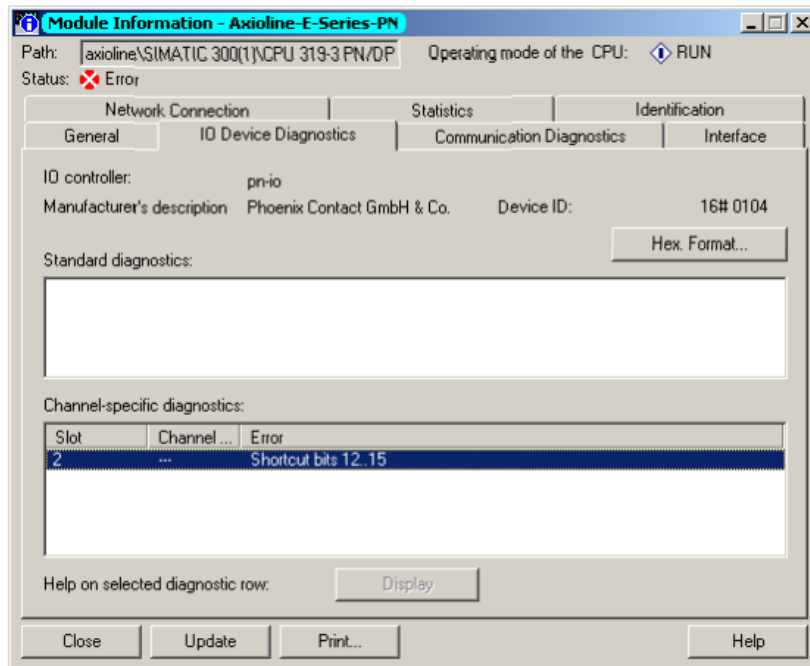


Figure 2-14 Dialog box: Module status; IO Device Diagnostics tab

