

PNOZmulti TCP/IP communication with SIMATIC PLCs in Step7 V5.5



Product

Type: PNOZmulti with Ethernet-Interface (TCP/IP)
Name: PNOZmulti series (complete list inside, please see Ch. 3.2, page 8)
Manufacturer: Pilz GmbH & Co. KG, Safe Automation

Document

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01	2012-08-23	Creation	all
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Validity of Application Note

This present Application Note is valid until a new version of the document is published.

This and other Application Notes can be downloaded in the latest version and for free from www.pilz.com.

For a simple search, use our [content document \(1002400\)](#) or the [direct search function](#) in the download area.

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June 2014

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Contents

1. Useful documentation	5
1.1. Documentation from Pilz GmbH & Co. KG.....	5
1.2. Documentation from other sources of information.....	5
2. Preface	6
3. Configuration	7
3.1. List of used hardware.....	7
3.2. List of supported Pilz hardware.....	8
3.3. List of used Software	8
3.4. List of used IP addresses.....	8
3.5. List of used S7 and PNOZ multi Programs according to PNOZ multi Hardware	9
4. Application Task	10
4.1. Setting IP address on PNOZmulti base unit.....	10
4.2. Setting IP address on Simatic PLC (ProfiNET).....	12
4.3. Settings with Open Communication Wizard	13
4.4. Complete and Download actual Step7-Project.....	19
4.5. Check successful communication via Monitoring	24
4.5.1. Monitoring on Simatic PLC	24
4.5.2. Monitoring on PNOZmulti base unit.....	28
5. Table of figures	30

1. Useful documentation

Reading the documentation listed below is necessary for understanding this application note. The availability of the indicated tools and safe handling are also presupposed with the user.

1.1. Documentation from Pilz GmbH & Co. KG

No.	Description	Item No.
1	Pilz international homepage, download section	www.pilz.com
2	PNOZmulti Communication Interfaces	1001154-EN-XX
3	PNOZmulti 2 Communication Interfaces	1002971-EN-XX
4	Application Note PNOZm Serial-2-Ethernet	1001958-EN-XX
5	Technical Catalogue PNOZmulti	1001153-EN-XX
6	Operating Manual PNOZ mm0.1p	1002101-EN-XX
7	Operating Manual PNOZ mm0.2p	1002235-EN-XX
8	Operating Manual PNOZ mmc1p	1002102-EN-XX
9	Operating Manual PNOZ m1p (ETH)	20878-EN-XX
10	Operating Manual PNOZ m B0	1002660-EN-XX
11	Operating Manual PNOZ m ES ETH	1002700-EN-XX

1.2. Documentation from other sources of information

No.	Description	Item No.
1	SIMATIC portal "Automation Systems" (international) Internet-Link to "www.automation.siemens.com"	
2	Document, Code and Step7-Project to topic "Wizard for creating connection data for open TCP/IP communication (Open Communication Wizard)." Internet-Link to "support.automation.siemens.com"	OC Wizard V2.3.3 Entrys-ID: 25209116

2. Preface

This document provides a Step by Step example how to communicate between Siemens S7-300 and PNOZ multi with TCP/IP connection.

Notice:

This Application Note describes a PNOZ m1p ETH, the PNOZ mmc1p is working in the same way. With a PNOZ m B0 ETH you have to take different Blocks (because of bigger Data Size) in the Simatic Example, it is also included in the Simatic Example.

The document is not intended as a technical documentation for general use of SIMATIC Manager Step 7. It may not be distributed to customers without a special note to its scope.

Notice: You need for this application these four projects

- ▶ PNOZmulti Configurator – provided Project
 - “PNOZmulti_S7-PLC_ETH-TCP-IP_v2”
 - “PNOZ_mmc1p_S7-PLC_ETH-TCP-IP_v1”
 - “PNOZ_m_ES_ETH_S7-PLC_ETH-TCP-IP_v1”
- ▶ Step7 – provided Project
 - “PNOZm_S7-PLC_ETH_v2”

This following Step7-Project is not provided. It is an example for your second target project.

- ▶ Step7 – Target Project Example “ETH_Multi_S7_ProfiNET_v2”

In addition to this manual the first **four projects**, which are described in the following, can be opened with a unzip program from the attached file

“AN_PNOZm_ETH_TCP-IP_with_S7_1002671_SW_02.zip”

by a double-click on this “Pin-Icon”:



Notice:

It is not possible to open or save a *.zip File from the attachments with Adobe Reader.

>> For open or save this file, please use PDF-XChange Viewer (www.tracker-software.com).

Alternatively the file can be obtained from Pilz Technical Support (<mailto:support@pilz.de>)

Subject: Application Note 1002671

3. Configuration

3.1. List of used hardware

This Application Note has been tested with the following hardware:

- ▶ Siemens Simatic PLC: CPU 318-3FL01-0AB0 V3.2
- ▶ Pilz Configurable Control System: PNOZ m1p ETH 773104 Version v2.1
- ▶ Pilz Configurable Control System: PNOZ m B0 772100 Version v1.1
- ▶ Pilz Configurable Control System: PNOZ m ES ETH 772103 Version v1.0

Configured Hardware

Module Name	Version	Equipment Identifier	Location Description	I	O
I/Os transmitted via the integrated interface	v1.0	a2		128	128
0 Base Unit PNOZ m1p ETH	v6.2	a1		20	6

Fig. 1: PNOZmulti Configurator - Hardware Configuration PNOZ m1p ETH

3.2. List of supported Pilz hardware

- ▶ PNOZmulti Mini Series
 - PNOZ mm0.1p 772001 with PNOZ mmc1p ETH 772030
 - PNOZ mm0.2p 772002 with PNOZ mmc1p ETH 772030

- ▶ PNOZmulti 1st Series with integrated Ethernet ports
 - PNOZ m1p ETH 773103
 - PNOZ m3p ETH 773126
 - PNOZ m0p ETH 773113
 - PNOZ m2p ETH 773123
 - PNOZ m1p ETH coated version 773104

- ▶ PNOZmulti 1st Series with external Ethernet ports

Notice: The description of different structure of data telegram of the following configurations is not part of this document. For more information please see Ch. 1.1-No. 2, page 5.

 - PNOZ m1p base unit 773100
 - PNOZ m1p base unit coated version 773105
 - PNOZ m2p base unit press function 773120
 - PNOZ m3p base unit burner function 773125

- ▶ PNOZmulti 2nd Series B0 with (external) Ethernet ports
 - PNOZ m B0 772100
 - PNOZ m ES ETH 772130

3.3. List of used Software

This Application Note has been tested with the following software:

- ▶ Pilz PNOZmulti Configurator, Version 9.2.0
- ▶ Siemens Simatic STEP7, Version 5.5 SP3
- ▶ Siemens Simatic Open Communication Wizard, Version 2.3

3.4. List of used IP addresses

The following IP addresses has been used in the example project:

- ▶ Computer: 169.254.060.099
- ▶ PNOZmulti ETH: 169.254.060.001
- ▶ PNOZ m ES ETH: 169.254.060.002
- ▶ Simatic S7 PLC: 169.254.060.151

Notice: For more information about setting IP address open in software "PNOZmulti Configurator" Help function "Contents and Index" and choose "Create or edit project".

3.5. List of used S7 and PNOZ multi Programs according to PNOZ multi Hardware

Base Module	PNOZ mxp ETH	PNOZ mm0.xp	PNOZ m Bx
Ethernet Module	(integrated Ethernet Ports)	PNOZ mmc1p (Ethernet Module)	PNOZ m ES ETH (Ethernet Module)
PNOZ multi program	PNOZmulti_S7-PLC_ETH-TCP-IP_v2	PNOZ_mmc1p_S7-PLC_ETH-TCP-IP_v1	PNOZ_m_ES_ETH_S7-PLC_ETH-TCP-IP_v1
Simatic Step7 program	PNOZm_S7-PLC_ETH_v2 Blocks: FC1, FC3, DB6, DB7, DB10, DB11, DB12, DB13, DB65, DB99 Variable list: CONTROL_PNOZ_m1p_ETH ETH_Multi_PNOZ_m1p_ETH	PNOZm_S7-PLC_ETH_v2 Blocks: FC2, FC4, DB8, DB9, DB20, DB21, DB22, DB23, DB66, DB100 Variable list: CONTROL_PNOZ_m_ES_ETH ETH_Multi_PNOZ_m_ES_ETH	
Documentation	PNOZmulti Communication Interfaces 1001154-EN-XX		PNOZmulti 2 Communication Interfaces 1002971-EN-XX

Fig. 2: List of used Programs

4. Application Task

Create a connection with TCP/IP and control communication between PNOZ m1p ETH / PNOZ m ES ETH and Siemens S7-300 PLC.

The initial S7-Hardware configuration is not part of this “Application Note”. One can get further details in the manuals about Siemens Simatic Step 7 (please see Ch. 1.2, page 5).

4.1. Setting IP address on PNOZmulti base unit

- ▶ Start the PNOZmulti Configurator and open “Scan Network”.



Fig. 3: PNOZmulti Configurator - Scan Network

- ▶ Choose your device and go online. For that click on the “Online”-button.

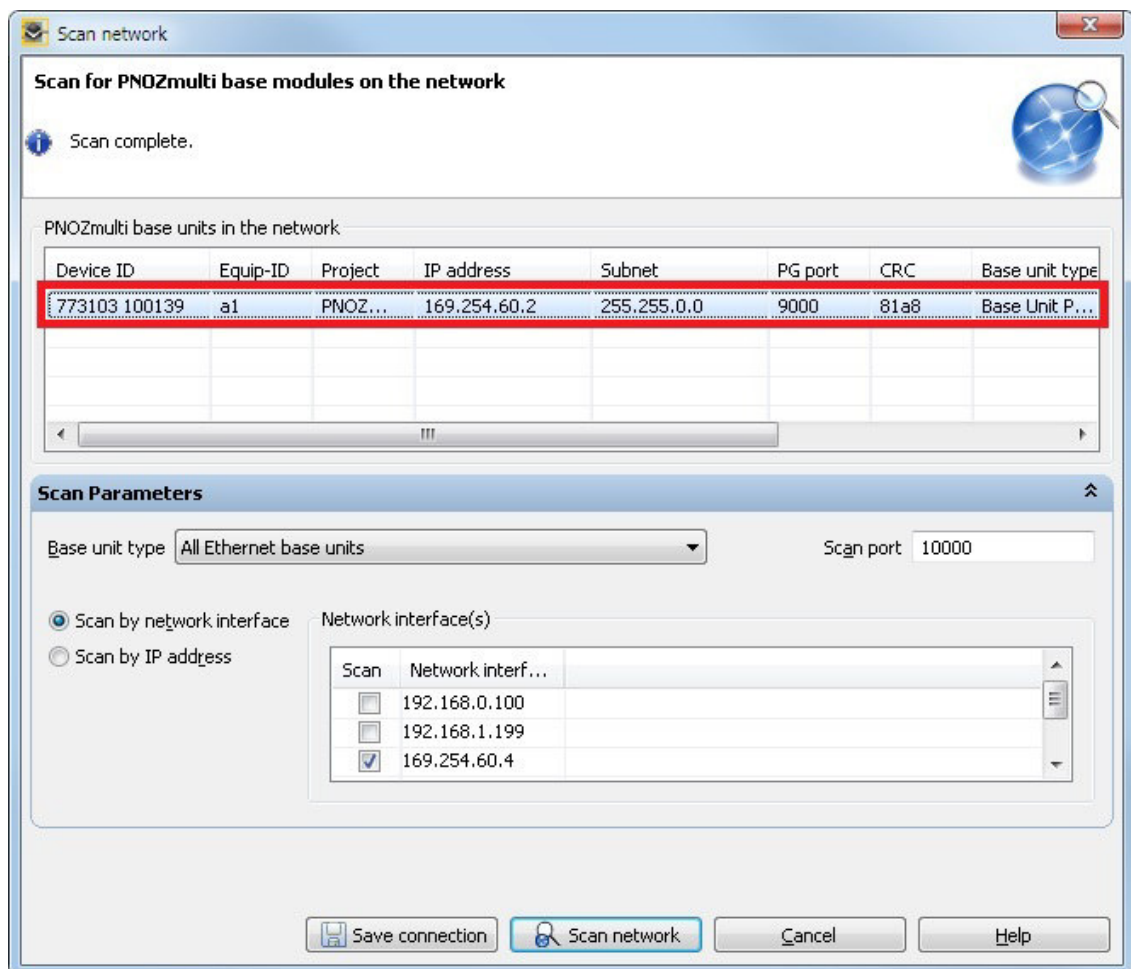


Fig. 4: PNOZmulti Configurator - Choose of the used device



Fig. 5: PNOZmulti Configurator - Go online with the device

If necessary adjust the IP address of your PNOZmulti.

- ▶ Continue with function "Configure Device Ethernet Connection".



Fig. 6: PNOZmulti Configurator - Configure device Ethernet connection

- ▶ Change the IP address of your device und confirm with "OK".

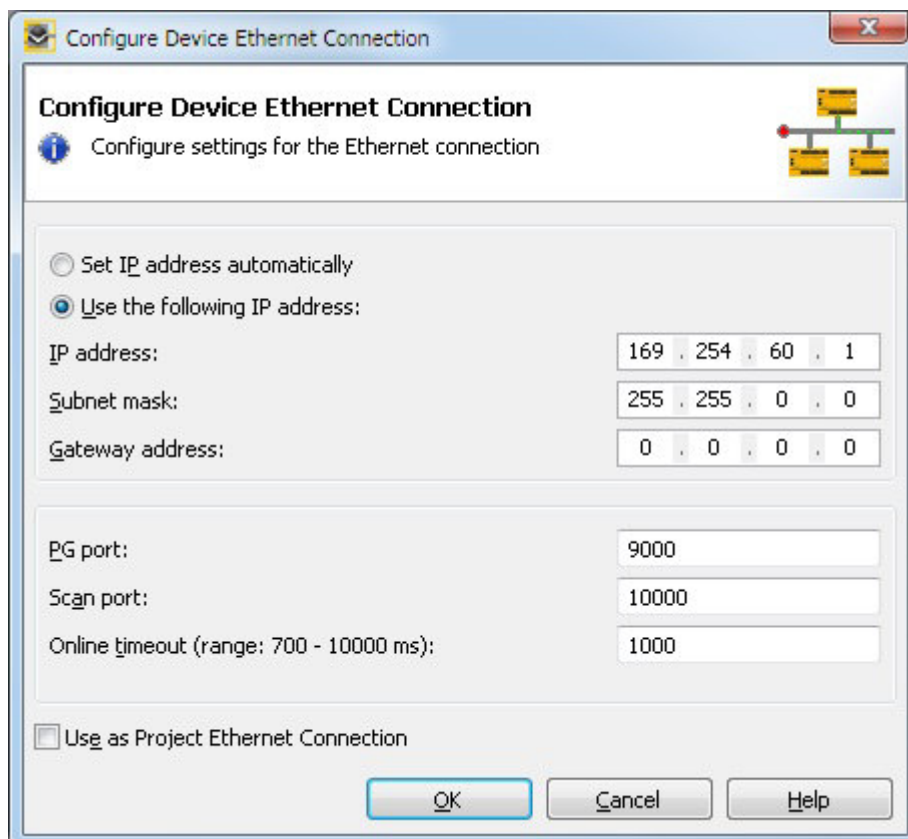


Fig. 7: PNOZmulti Configurator - Adapt the IP address on base unit

The defined IP address is now set to PNOZmulti. The device will response to that IP address.

4.2. Setting IP address on Simatic PLC (ProfiNET)

- ▶ Open the provided Step7-Project “PNOZmulti_S7-PLC_ETH_v2” in the Simatic Manager.
- ▶ Copy the blocks this 1st project to your actual project (here as example “ETH_Multi_S7_ProfiNET_v2”) and click twice at “Hardware”.
- ▶ Click twice on PN-IO (X2). The window "Properties - PN-IO" open.
If necessary improve the device name to "PN-IO" [1].

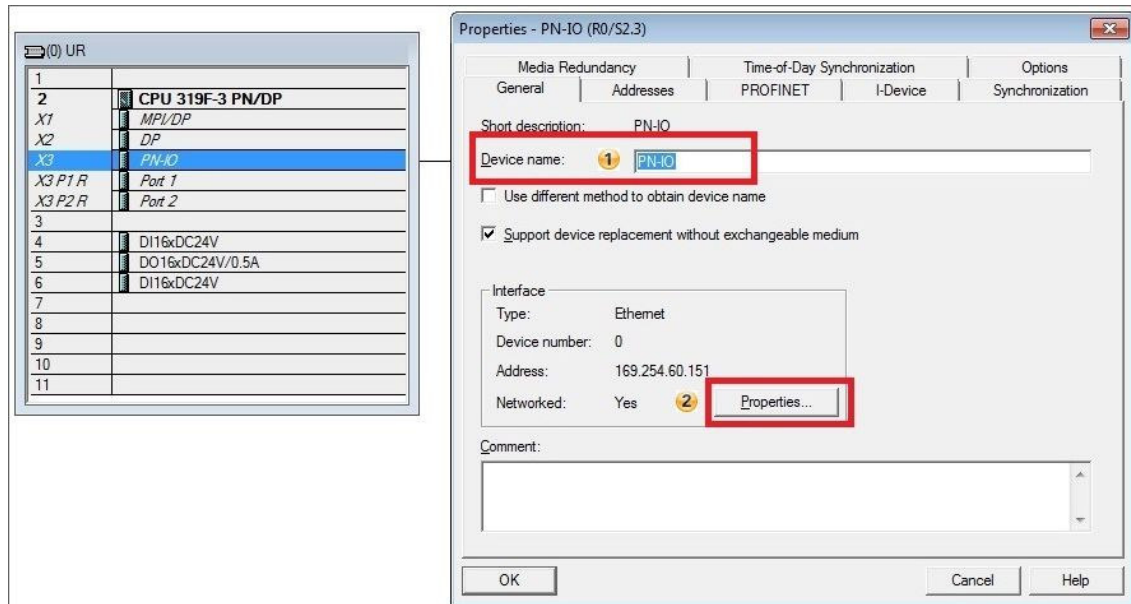


Fig. 8: Simatic HW Config - Setting device name

- ▶ Click on the Button "Properties..." if you have to change the IP address [2].

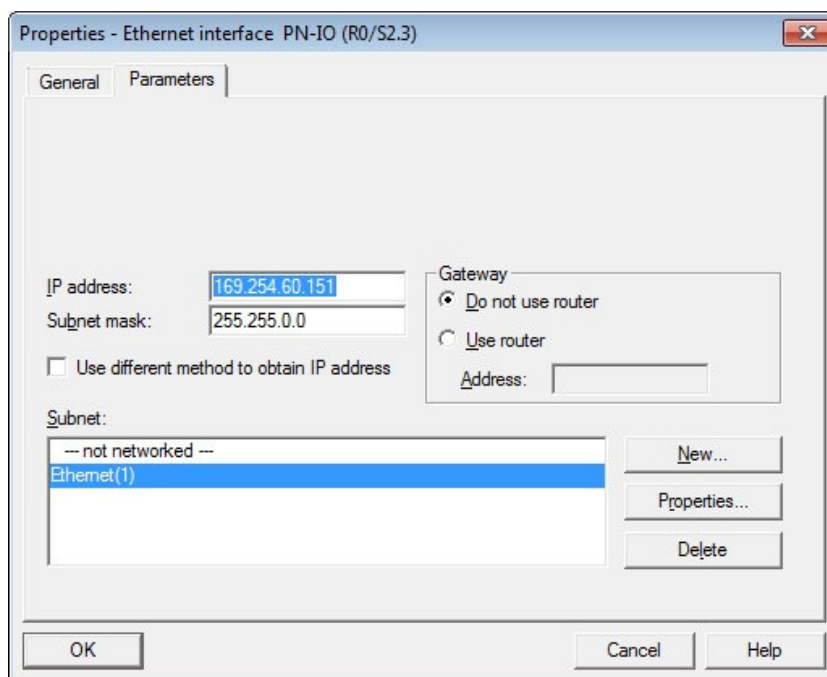


Fig. 9: Simatic HW Config - Change the IP-address

4.3. Settings with Open Communication Wizard

- ▶ Start the "Open Communication Wizard" and click at "Next".

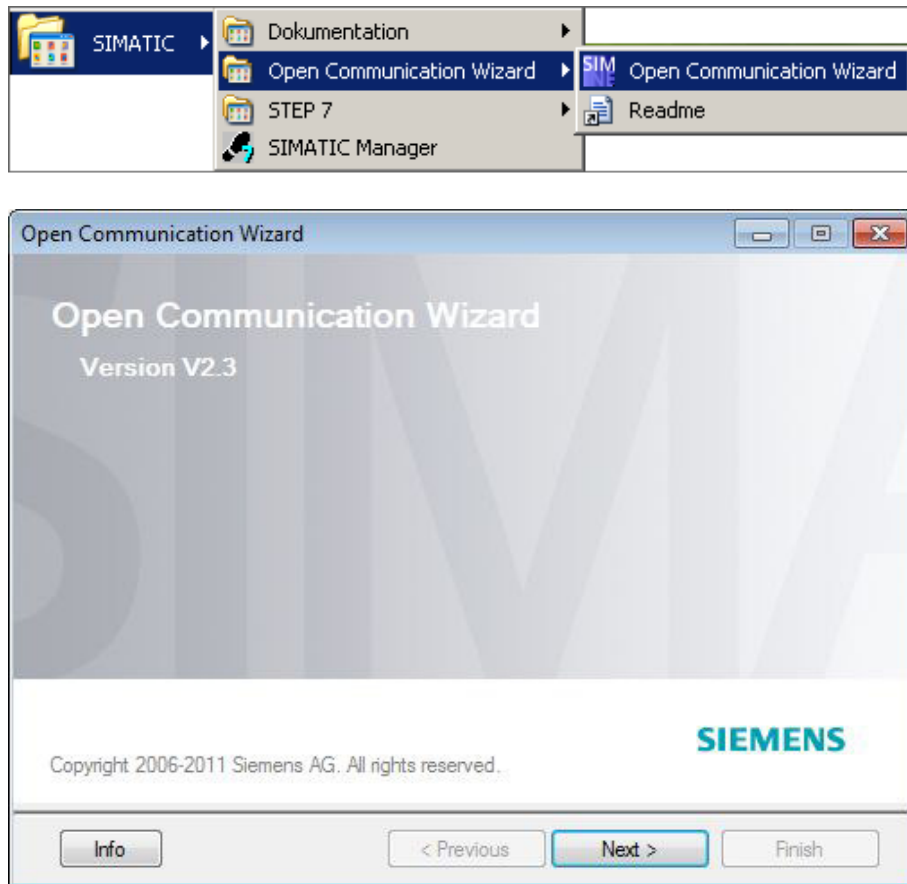


Fig. 10: OC Wizard - Start Open Communication Wizard

- ▶ Choose your S7 project and your block folder and confirm with "Open".
- ▶ Click "Next" to continue.

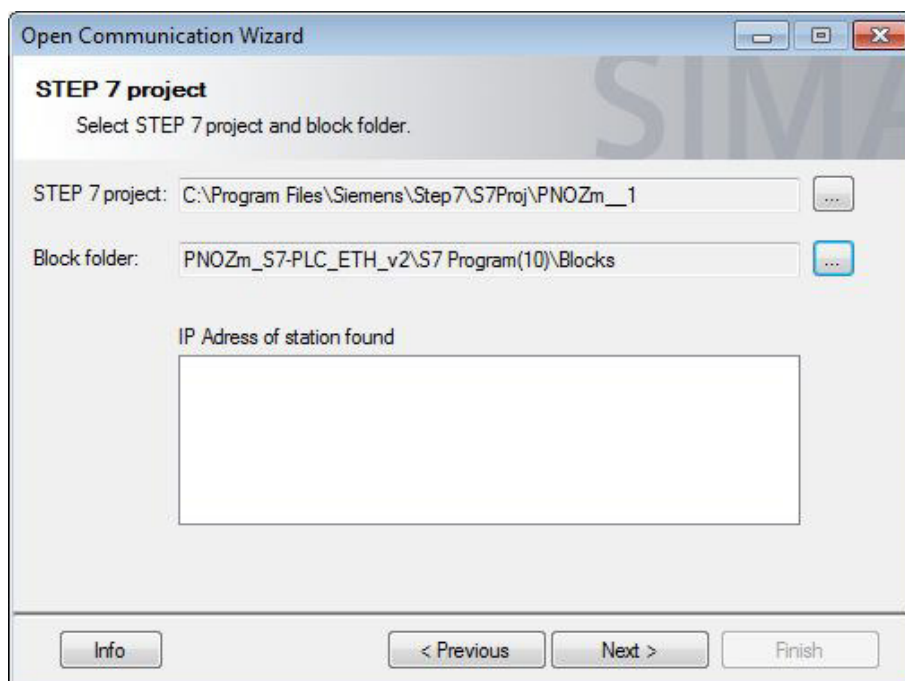


Fig. 11: OC Wizard - Choose the Step 7 project and block folder

- ▶ Click "Next" to continue.

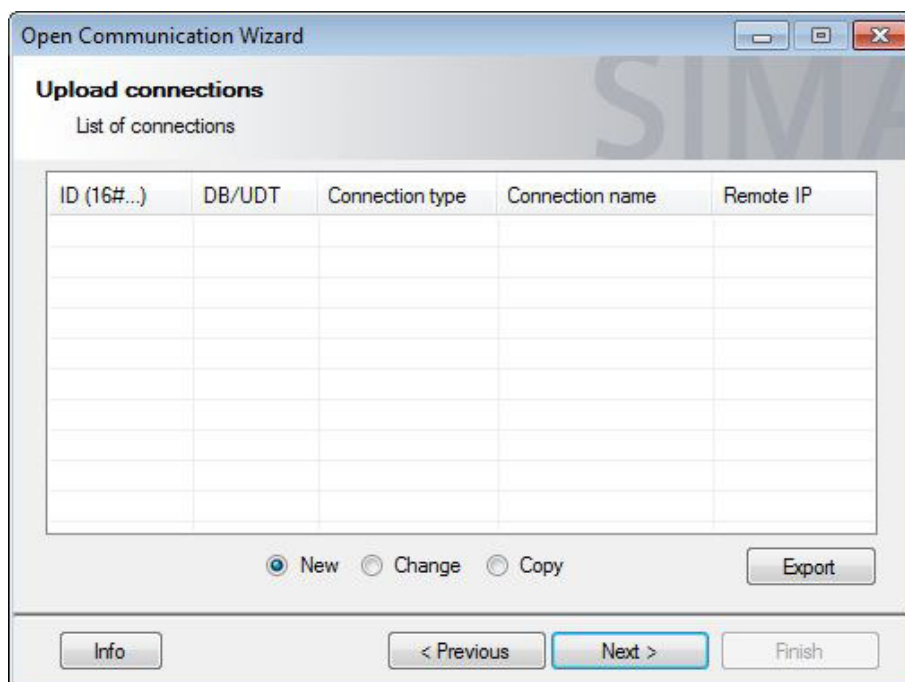


Fig. 12: OC Wizard – Check connection

- ▶ Choose "TCP native" and go on with "Next".



Fig. 13: OC Wizard – Choose connection type “TCP native”

- ▶ The “Communication partner B (here: PNOZmulti base unit) is not a S7-CPU”, so activate the right check box and continue with "Next".

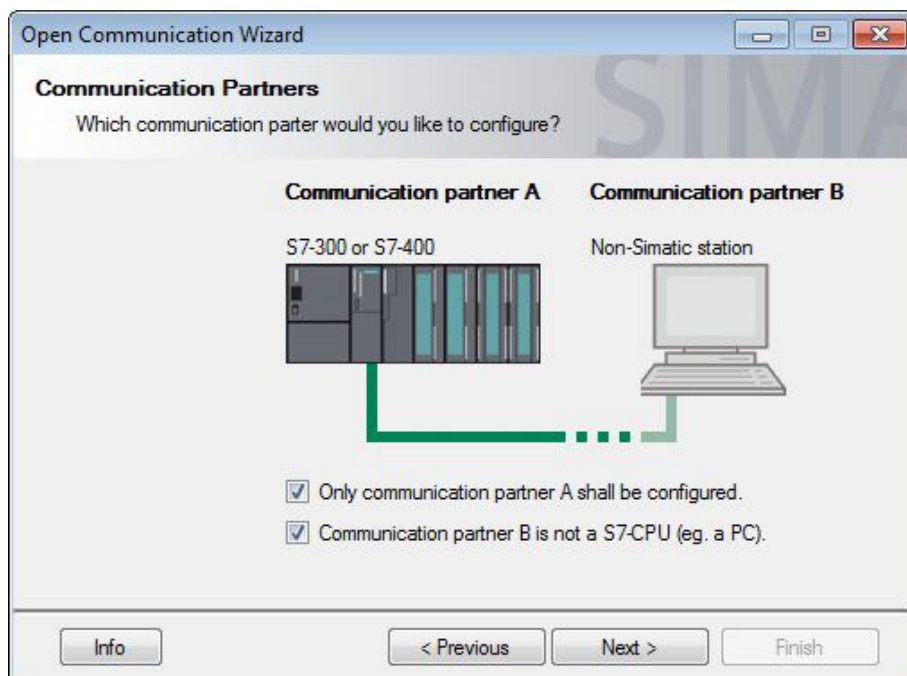


Fig. 14: OC Wizard – Set properties of “Communication partner B”

- ▶ Assign the connection name and the IP address and choose the "Used interface" and continue with "Next".

Open Communication Wizard

Communication Partners
Enter the properties of the communications partners.

	Communication partner A	Communication partner B
Connection ID:	W#16# 0001	W#16# 0001
Connection name:	PNOZ multi ETH	
Connection establishment:	<input checked="" type="radio"/> Active <input type="radio"/> Passive	<input type="radio"/> Active <input checked="" type="radio"/> Passive
Connection	<input type="checkbox"/> Unspecified connection partner	<input type="checkbox"/> Unspecified connection partner
IP address:	000.000.000.000	169.254.060.001
Used interface:	<input type="checkbox"/> <input type="text" value="CPU 319"/>	
Rack / Slot of the CPU:	0 / 2	0 / 0
Rack / Slot of the CP:	0 / 3	0 / 0

Info < Previous Next > Finish

Fig. 15: OC Wizard – Set properties of “Communication partner A”

Normally the port of the PNOZ multi Ethernet modul is the port "9000".

- ▶ If the port is changed, please correct this parameter and go on with "Next".

Open Communication Wizard

Connection parameters
Enter the parameters for the connection.

	Communication partner A	Communication partner B
Local port no:	<input checked="" type="checkbox"/> Specify port	<input checked="" type="checkbox"/> Specify port
	<input checked="" type="radio"/> ASCII	9000
	<input type="radio"/> HEX	2328

Info < Previous Next > Finish

Fig. 16: OC Wizard – Set “Connections parameters” of “Communication partner B”

- ▶ Declare any UDT. In this example "UDT 65" and continue with "Next".

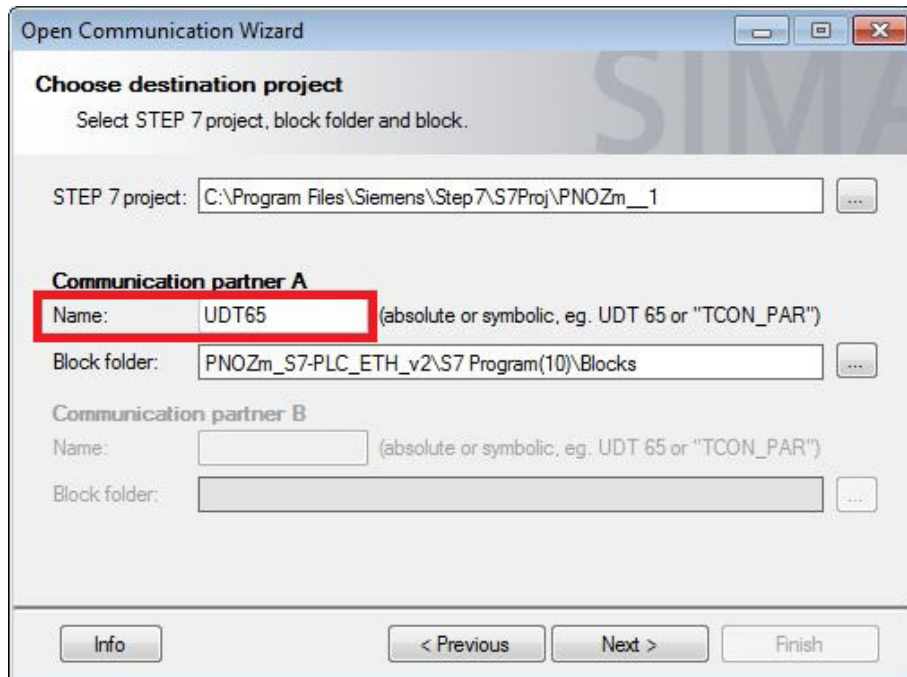


Fig. 17: OC Wizard – Choose destination project, block folder and block "UDT65"

- ▶ Control all properties of new connection and continue with "Next".

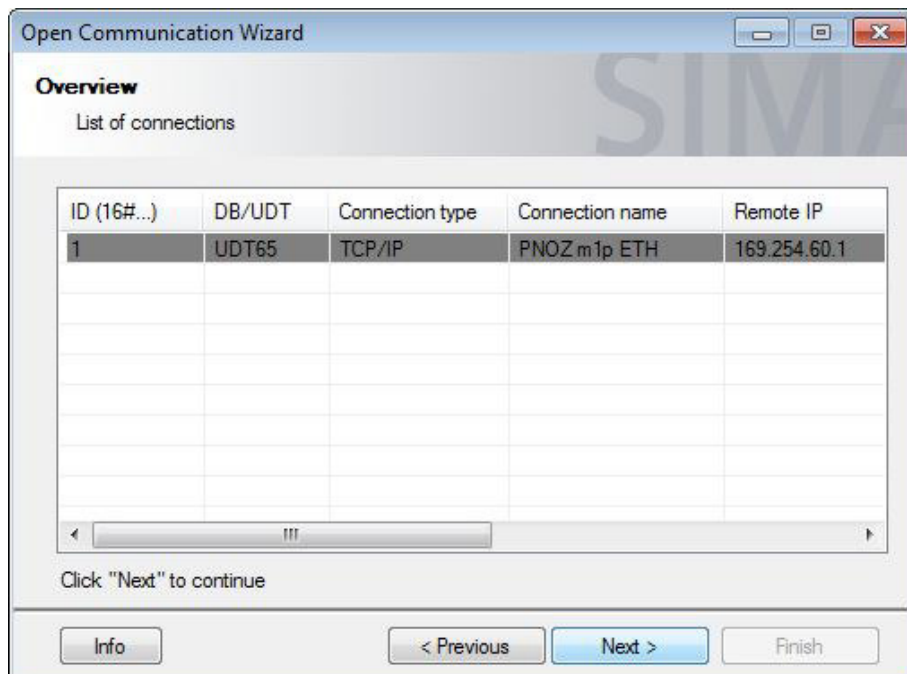


Fig. 18: OC Wizard – Overview with "List of Connections" for "UDT65"

In the S7 project will be set “UDT 65”:

DB99	PNOZ_m1p_ETH	DB
DB100	PNOZ_m_ES_ETH	DB
UDT65	PNOZ_m1p_ETH	AwL
UDT66	PNOZ_m_ES_ETH	AwL
CONTROL_PNOZ_m1p_ETH	CONTROL_PNOZ_m1p_E...	
CONTROL_PNOZ_m_ES_ETH	CONTROL_PNOZ_m_ES_...	
ETH_Multi_PNOZ_m1p_ETH	ETH_Multi_PNOZ_m1p_E...	

Fig. 19: Simatic Manager – Step7-Project with List of blocks (“UDT65”)

- Confirm with “Finish” and close the “Open Communication Wizard”.

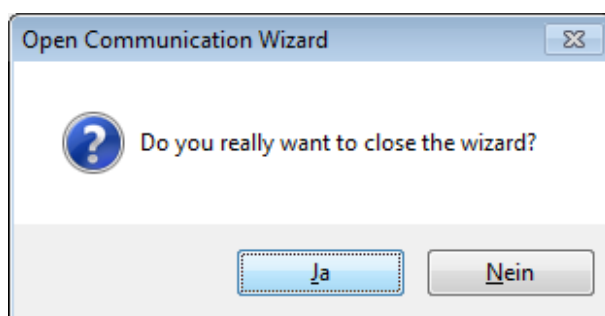
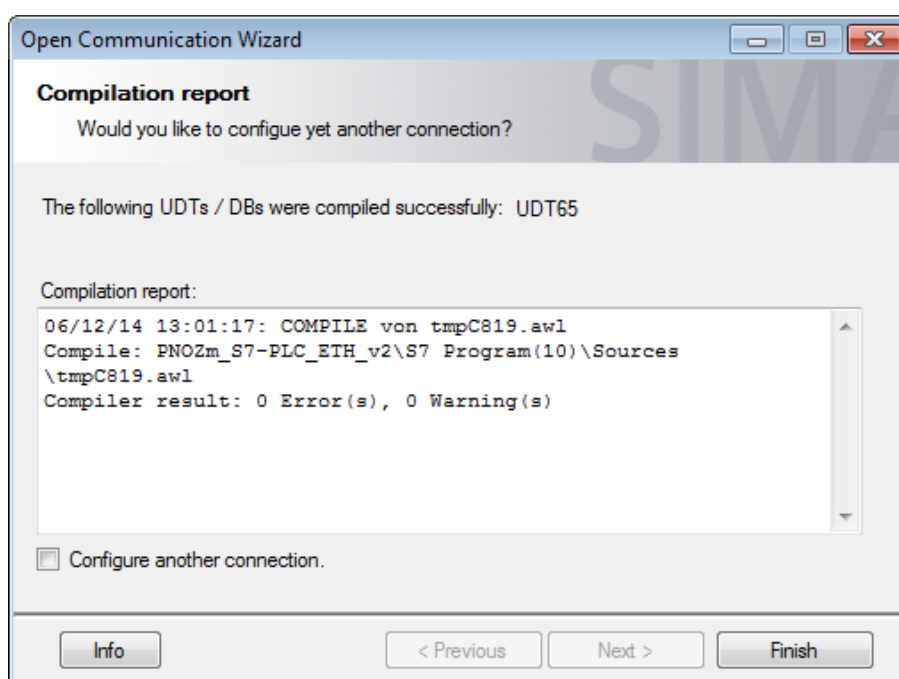


Fig. 20: OC Wizard – Compilation Report and Confirm finished of setup

4.4. Complete and Download actual Step7-Project

- ▶ Open your actual Step7-Project (here as example “ETH_Multi_S7_ProfiNET_v2”) in the Simatic Manager.
- ▶ Now you have to insert a new data block.
 - For this step click with the right mouse button at “Blocks” (German: “Bausteine”), choose “Insert New Object” and click at “Data Block”.
 - For properties set name “DB65”, “DB of type” of the data block and “UDT 65”.

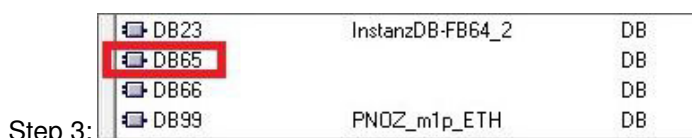
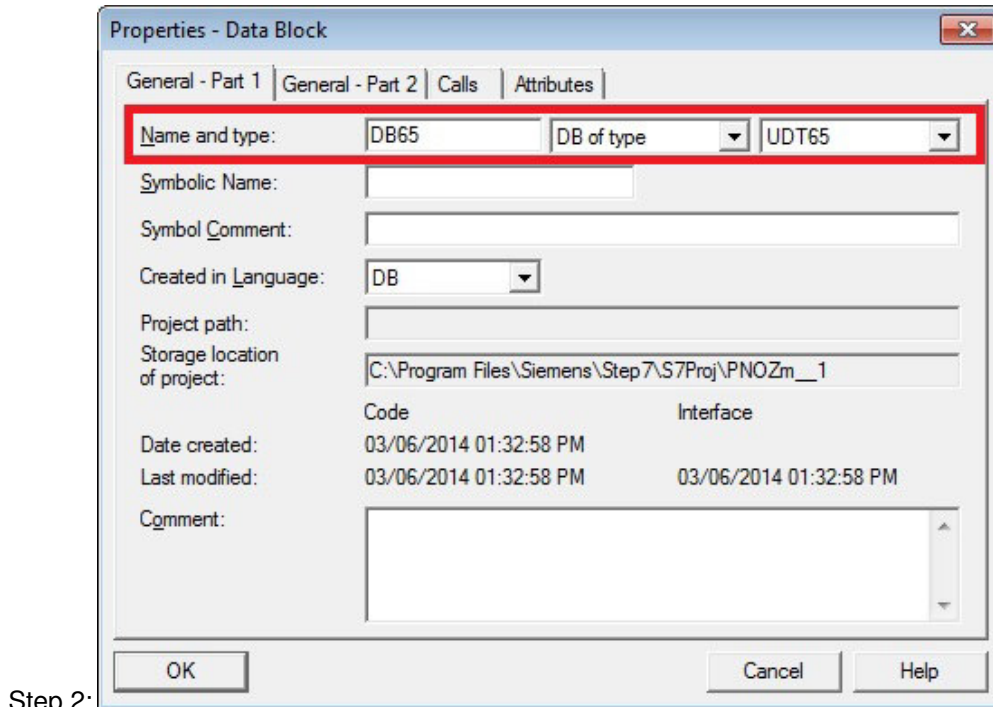
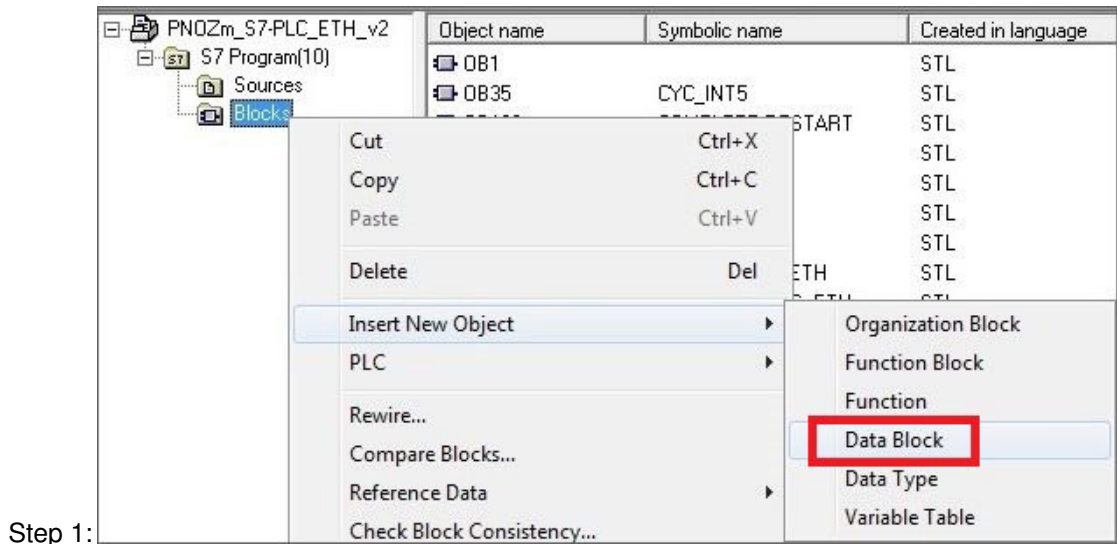


Fig. 21: Simatic Manager – Create and set properties of Data Block “DB65” of “UDT65”

- ▶ Open Function Block "FC3" for PNOZ m1p ETH, PNOZ mmc1p / "FC4" for PNOZ m ES ETH and change the ID in all network parts.

```
// ==== CONNECT =====
CALL "TCON" , "InstanzDB-FB65"      FB65 / DB10      -- Connect
REQ  :=M10.0
ID   :=W#16#1
DONE :=M10.1
BUSY :=M10.2
ERROR :=M10.3
STATUS :=MW11
CONNECT:=P#DB65.DBX0.0 BYTE 64
```

Fig. 22: AWL-Editor – Change ID in Function Block "FC3", section "CONNECT"

```
// ==== SEND =====
CALL "TSEND" , "InstanzDB-FB63"      FB63 / DB11      -- Send Data
REQ  :=M20.0
ID   :=W#16#1
LEN  :=30
DONE :=M20.1
BUSY :=M20.2
ERROR :=M20.3
STATUS:=MW21
DATA := "PNOZ m1p ETH SEND-DATA".DB_VAR      P#DB6.DBX0.0
```

Fig. 23: AWL-Editor – Change ID in Function Block "FC3", section "SEND"

```
// ==== RECEIVE =====
CALL "TRCV" , "InstanzDB-FB64"      FB64 / DB13      -- Receive Data
EN R :=M40.0
ID   :=W#16#1
LEN  :=30
NDR  :=M40.1
BUSY :=M40.2
ERROR :=M40.3
STATUS :=MW41
RCVD_LEN:=MW43
DATA := "PNOZ m1p ETH RCV-DATA".DB_VAR      P#DB7.DBX0.0
```

Fig. 24: AWL-Editor – Change ID in Function Block "FC3", section "RECEIVE"

```
// ==== DISCONNECT =====
CALL "TDISCON" , "InstanzDB-FB66"    FB66 / DB12      -- Disconnect
REQ  :=M30.0
ID   :=W#16#1
DONE :=M30.1
BUSY :=M30.2
ERROR :=M30.3
STATUS:=MW31
```

Fig. 25: AWL-Editor – Change ID in Function Block "FC3", section "DISCONNECT"

- ▶ Save modified Function Block "FC3" and download complete Step7-Project to Simatic PLC:

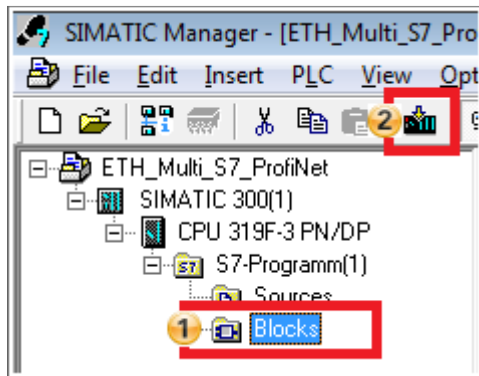


Fig. 26: Simatic Manager – Start complete download of Step7-Project

- ▶ For next message box choose “All”:

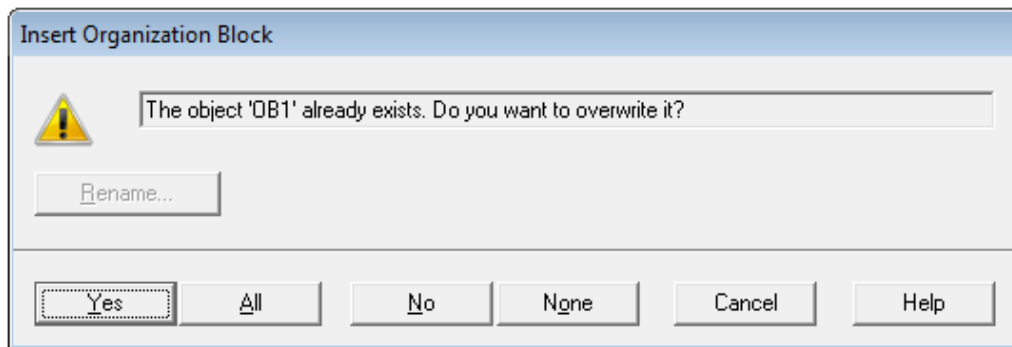


Fig. 27: Simatic Manager – Download, Message box “Insert Organization Block”

- ▶ For next four message boxes choose “Yes” or “OK”:

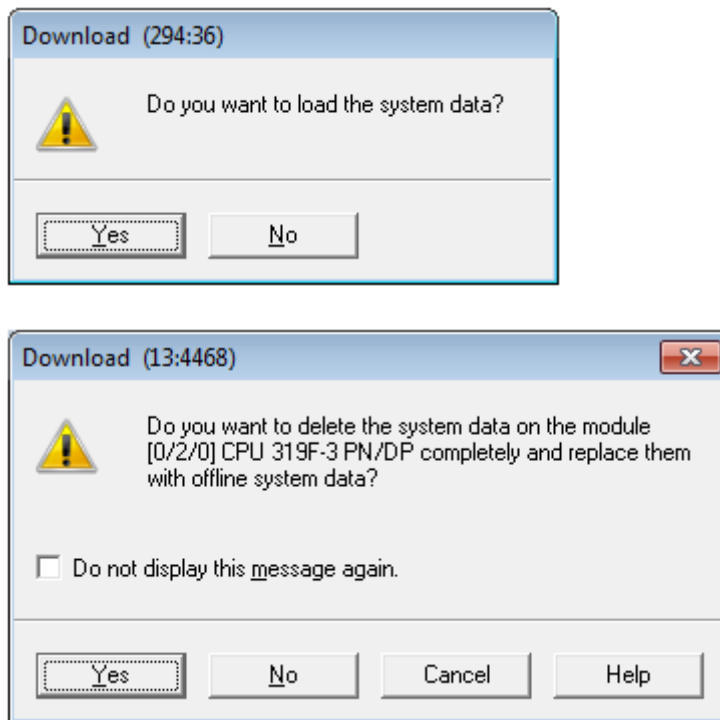


Fig. 28: Simatic Manager – Download, Message boxes “Download”

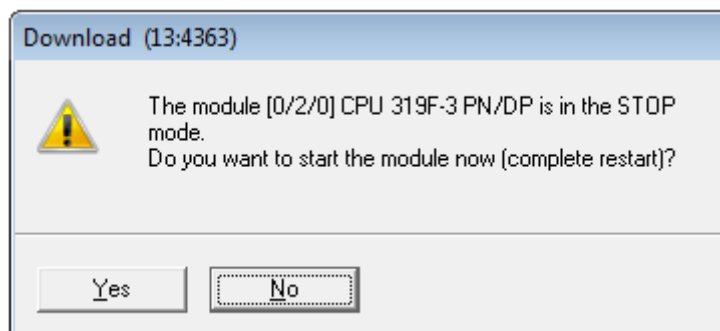
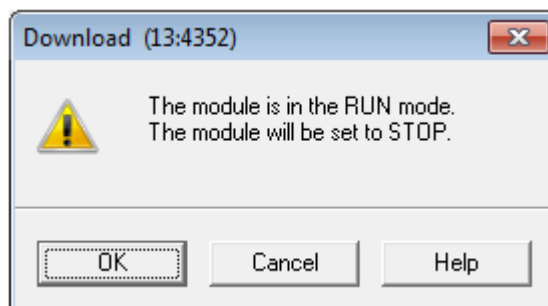
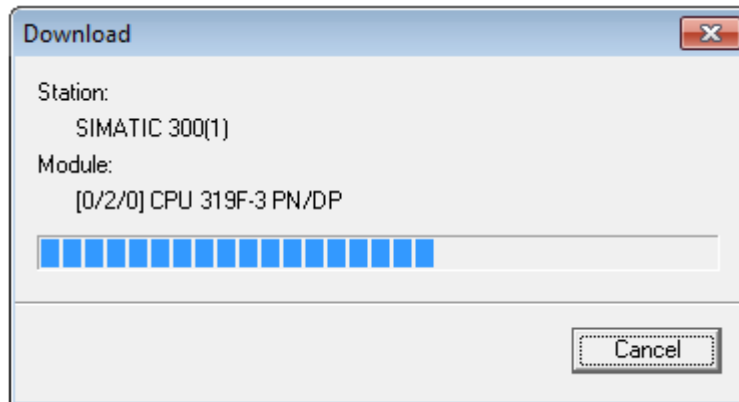


Fig. 29: Simatic Manager – Download, Message boxes “Download”

4.5. Check successful communication via Monitoring

4.5.1. Monitoring on Simatic PLC

- ▶ Open both variable tables “CONTROL_PNOZ_m1p_ETH” and “ETH_Multi_PNOZ_m1p_ETH” and Activate for each variable table function “Monitor variable”.

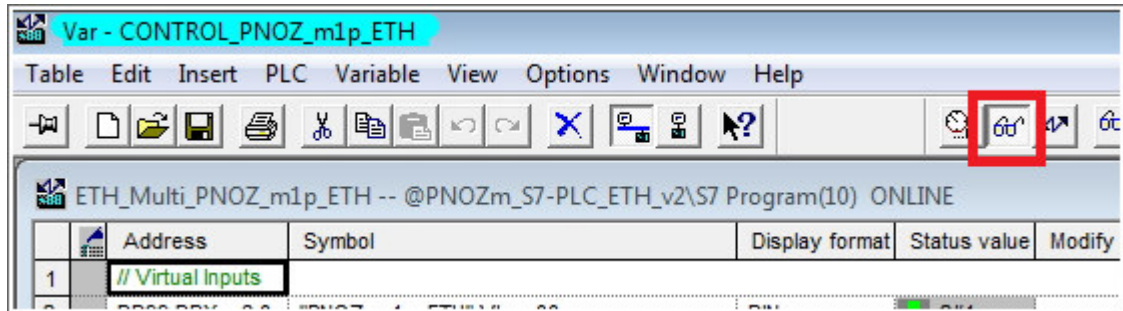


Fig. 30: Var Table – Activate monitoring of variables

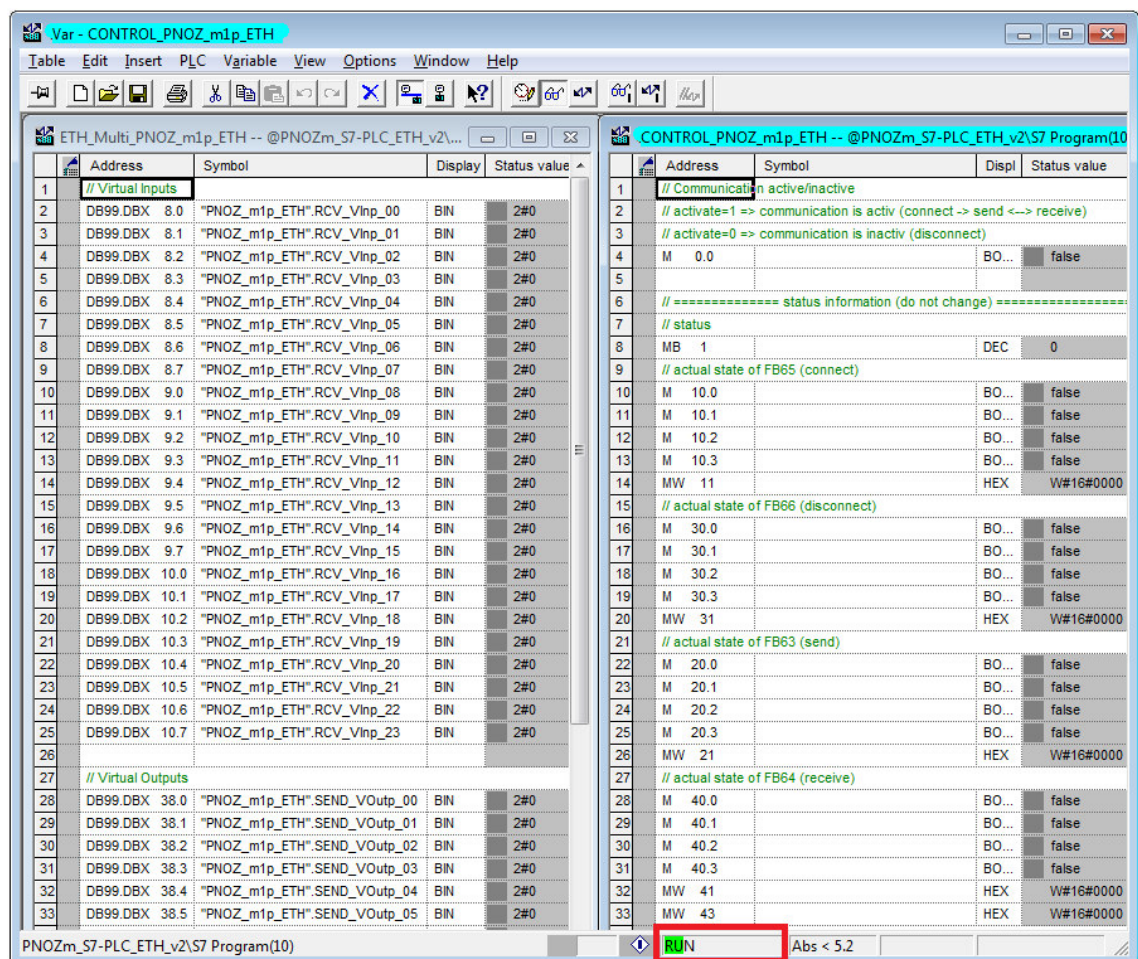


Fig. 31: Var Table – Monitoring of variables is active

- ▶ Activate the “CONTROL_PNOZ_m1p_ETH” window, click with your right mouse button at address “M0.0” on Symbol “activate” and set it to ”Modify Address to 1”.

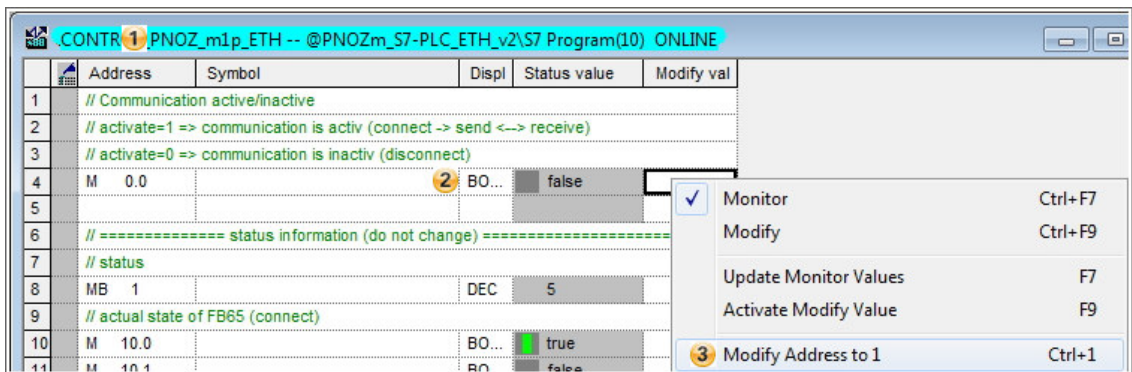


Fig. 32: Var Table – Modify Address “M0.0” to =1

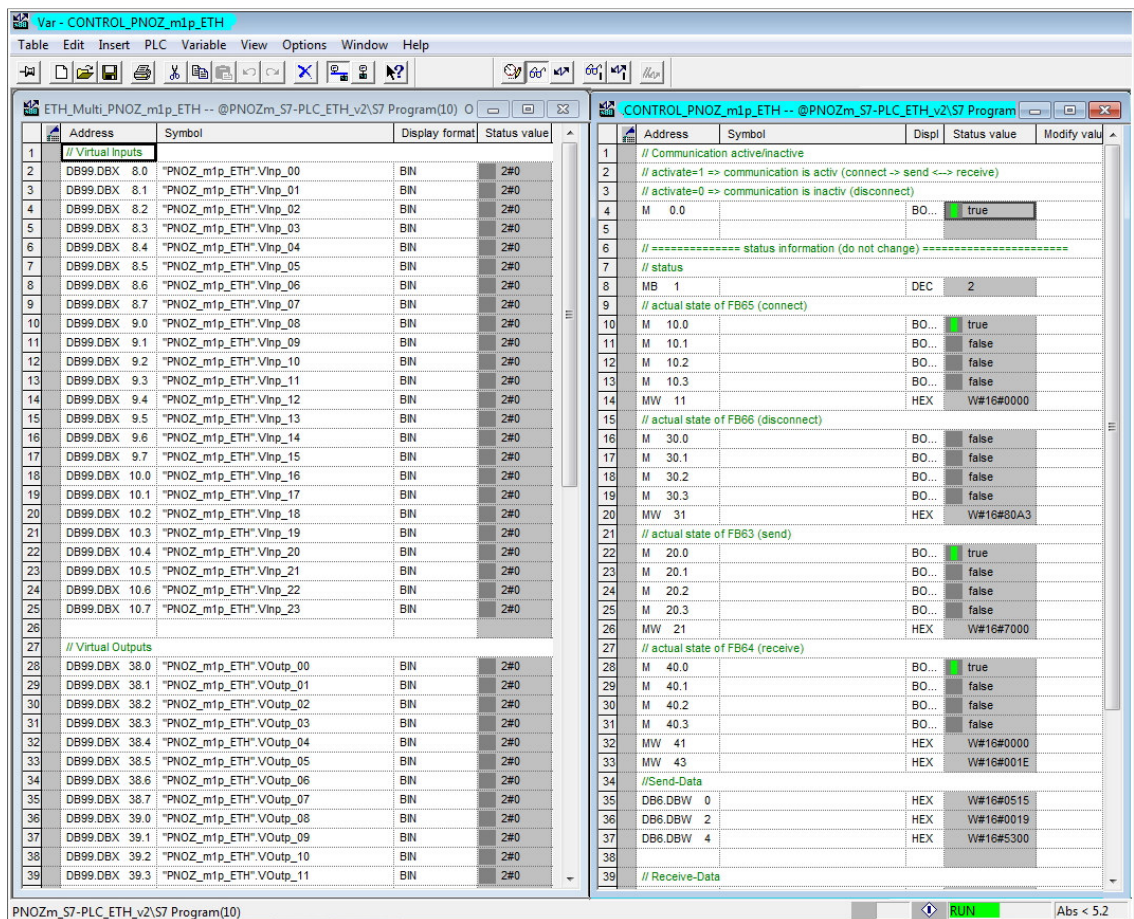


Fig. 33: Var Table – Monitoring of variables is active

- ▶ Activate the “ETH_Multi_PNOZ_m1p_ETH” window, select the Virtual Output 00, 08 and 16 and write in the “Modify value” 2#1.

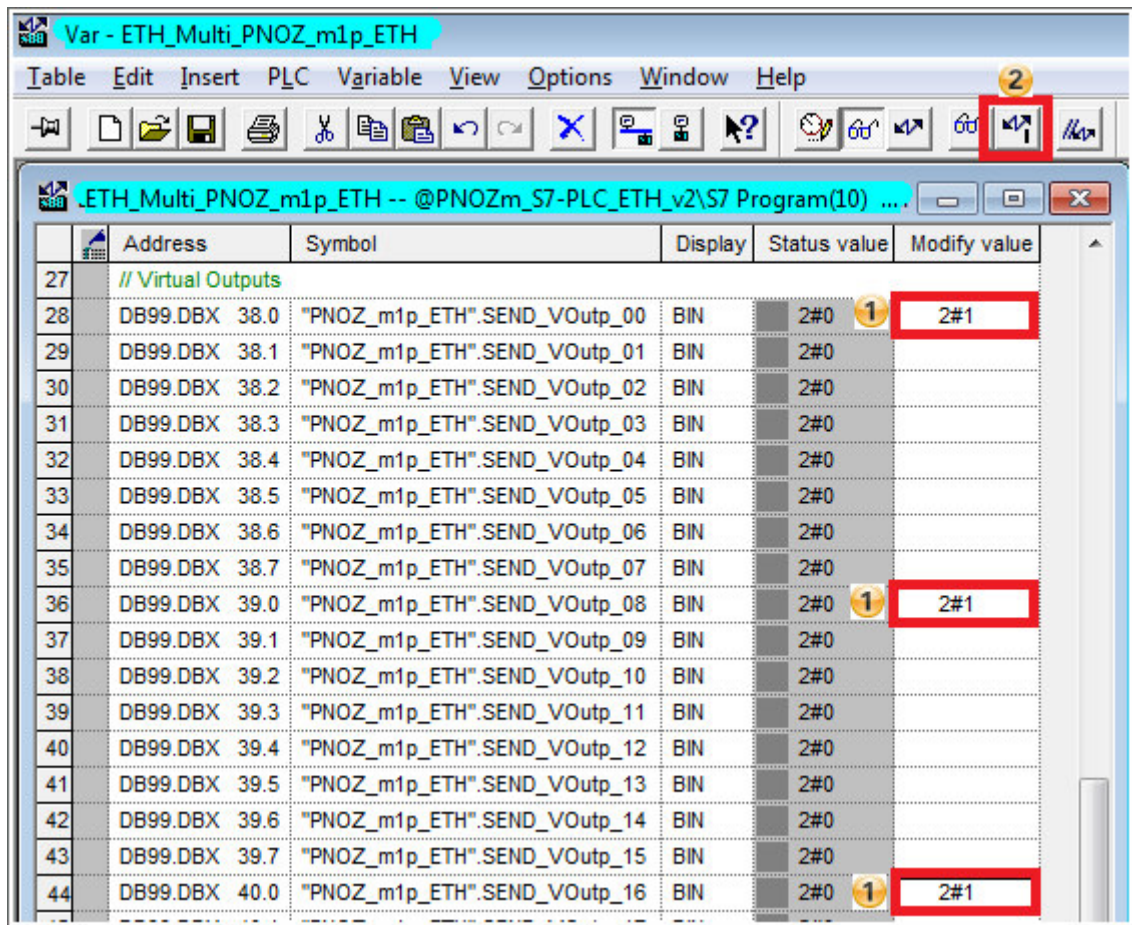


Fig. 34: Var Table – Modify Address Virtual Outputs to =1

The according bits will be set to the signal “=1”.

These tree bits are mirrored in the PNOZ multi application program. When a Virtual Output bit is set to “=1”, the Virtual Input bit is also “=1”.

27	// Virtual Outputs					
28	DB99.DBX	38.0	"PNOZ_m1p_ETH".SEND_VOutp_00	BIN	2#1	2#1
29	DB99.DBX	38.1	"PNOZ_m1p_ETH".SEND_VOutp_01	BIN	2#0	
30	DB99.DBX	38.2	"PNOZ_m1p_ETH".SEND_VOutp_02	BIN	2#0	
31	DB99.DBX	38.3	"PNOZ_m1p_ETH".SEND_VOutp_03	BIN	2#0	
32	DB99.DBX	38.4	"PNOZ_m1p_ETH".SEND_VOutp_04	BIN	2#0	
33	DB99.DBX	38.5	"PNOZ_m1p_ETH".SEND_VOutp_05	BIN	2#0	
34	DB99.DBX	38.6	"PNOZ_m1p_ETH".SEND_VOutp_06	BIN	2#0	
35	DB99.DBX	38.7	"PNOZ_m1p_ETH".SEND_VOutp_07	BIN	2#0	
36	DB99.DBX	39.0	"PNOZ_m1p_ETH".SEND_VOutp_08	BIN	2#1	2#1
37	DB99.DBX	39.1	"PNOZ_m1p_ETH".SEND_VOutp_09	BIN	2#0	
38	DB99.DBX	39.2	"PNOZ_m1p_ETH".SEND_VOutp_10	BIN	2#0	
39	DB99.DBX	39.3	"PNOZ_m1p_ETH".SEND_VOutp_11	BIN	2#0	
40	DB99.DBX	39.4	"PNOZ_m1p_ETH".SEND_VOutp_12	BIN	2#0	
41	DB99.DBX	39.5	"PNOZ_m1p_ETH".SEND_VOutp_13	BIN	2#0	
42	DB99.DBX	39.6	"PNOZ_m1p_ETH".SEND_VOutp_14	BIN	2#0	
43	DB99.DBX	39.7	"PNOZ_m1p_ETH".SEND_VOutp_15	BIN	2#0	
44	DB99.DBX	40.0	"PNOZ_m1p_ETH".SEND_VOutp_16	BIN	2#1	2#1
1	// Virtual Inputs					
2	DB99.DBX	8.0	"PNOZ_m1p_ETH".RCV_VInp_00	BIN	2#1	
3	DB99.DBX	8.1	"PNOZ_m1p_ETH".RCV_VInp_01	BIN	2#0	
4	DB99.DBX	8.2	"PNOZ_m1p_ETH".RCV_VInp_02	BIN	2#0	
5	DB99.DBX	8.3	"PNOZ_m1p_ETH".RCV_VInp_03	BIN	2#0	
6	DB99.DBX	8.4	"PNOZ_m1p_ETH".RCV_VInp_04	BIN	2#0	
7	DB99.DBX	8.5	"PNOZ_m1p_ETH".RCV_VInp_05	BIN	2#0	
8	DB99.DBX	8.6	"PNOZ_m1p_ETH".RCV_VInp_06	BIN	2#0	
9	DB99.DBX	8.7	"PNOZ_m1p_ETH".RCV_VInp_07	BIN	2#0	
10	DB99.DBX	9.0	"PNOZ_m1p_ETH".RCV_VInp_08	BIN	2#1	
11	DB99.DBX	9.1	"PNOZ_m1p_ETH".RCV_VInp_09	BIN	2#0	
12	DB99.DBX	9.2	"PNOZ_m1p_ETH".RCV_VInp_10	BIN	2#0	
13	DB99.DBX	9.3	"PNOZ_m1p_ETH".RCV_VInp_11	BIN	2#0	
14	DB99.DBX	9.4	"PNOZ_m1p_ETH".RCV_VInp_12	BIN	2#0	
15	DB99.DBX	9.5	"PNOZ_m1p_ETH".RCV_VInp_13	BIN	2#0	
16	DB99.DBX	9.6	"PNOZ_m1p_ETH".RCV_VInp_14	BIN	2#0	
17	DB99.DBX	9.7	"PNOZ_m1p_ETH".RCV_VInp_15	BIN	2#0	
18	DB99.DBX	10.0	"PNOZ_m1p_ETH".RCV_VInp_16	BIN	2#1	

Fig. 35: Var Table – Virtual In/Outputs

4.5.2. Monitoring on PNOZmulti base unit

- ▶ Open the provided PNOZmulti-Project (“PNOZmulti_S7-PLC_ETH-TCP-IP_v2”) with Software PNOZmulti Configurator; the password for “Level 1” is number “1”.

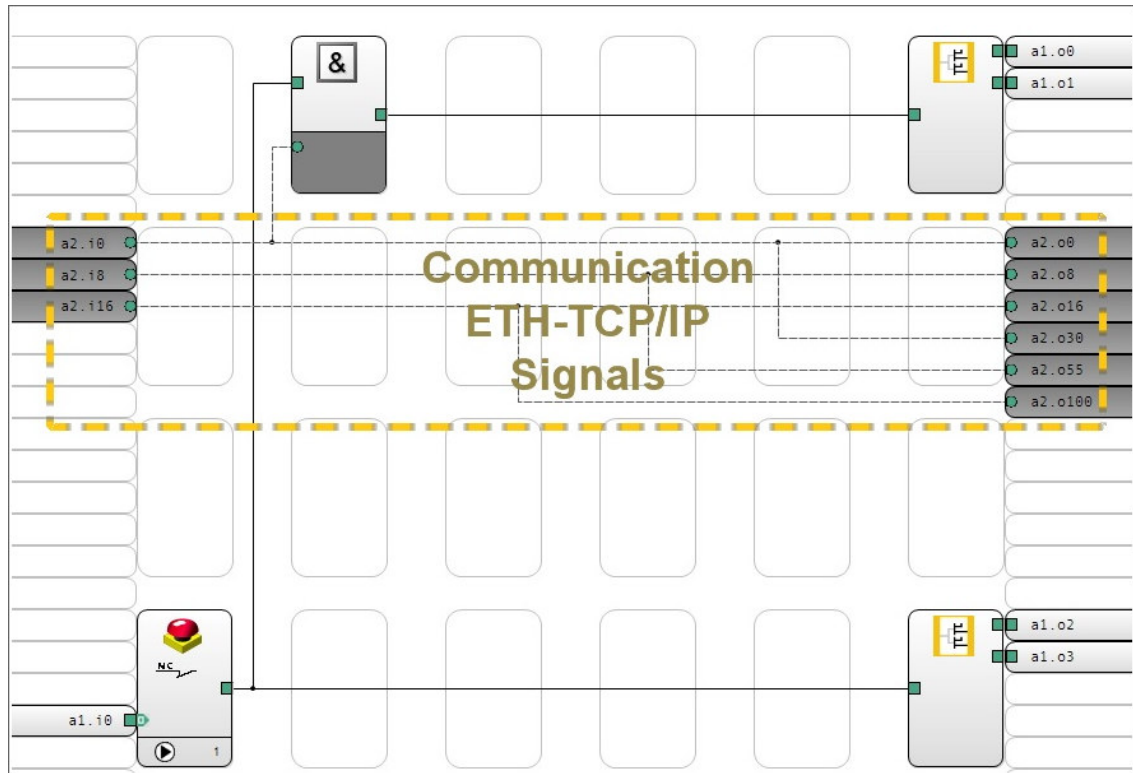


Fig. 36: PNOZmulti Configurator – Main Program “PNOZmulti_S7-PLC_ETH-TCP-IP_v2”

- ▶ Check the entered IP address (in example: 169.254.060.001), click at button “Online” and activate function “Dynamic Program Display”:



Fig. 37: PNOZmulti Configurator – Go “Online” and start “Dynamic Program Display”

If the lines of signals become green, than the Ethernet TCP/IP connection is online and the communication works.

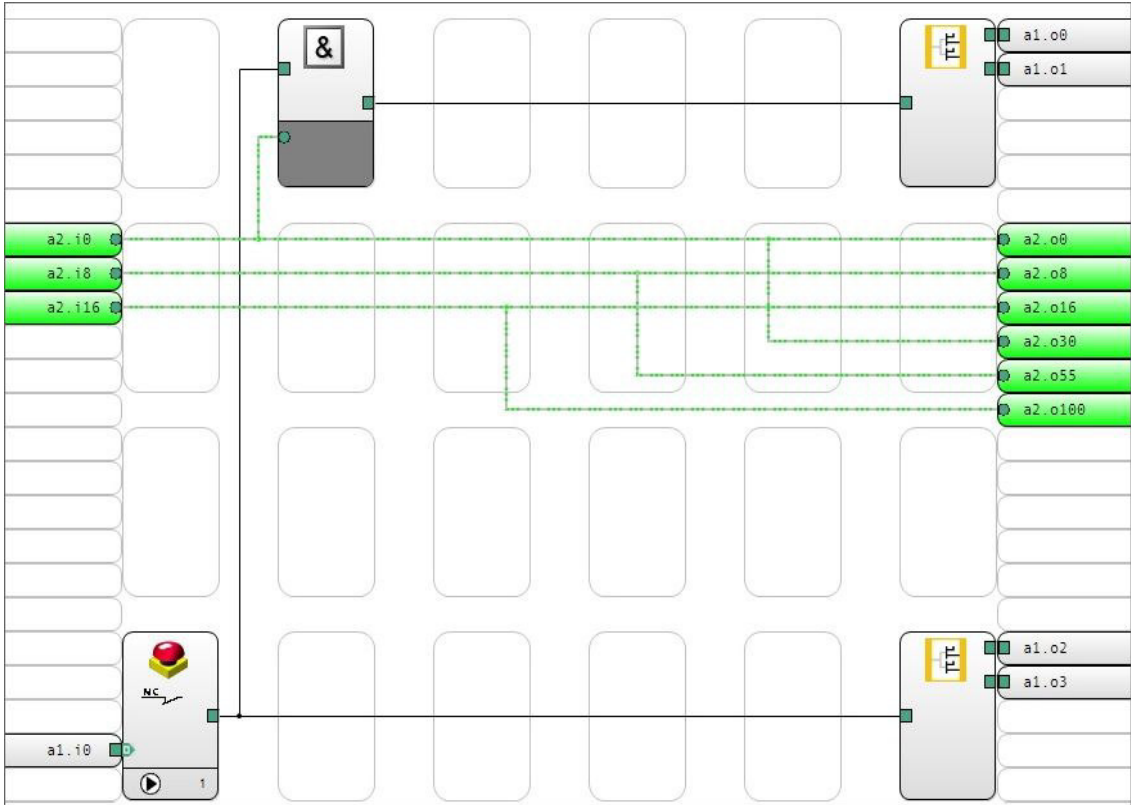


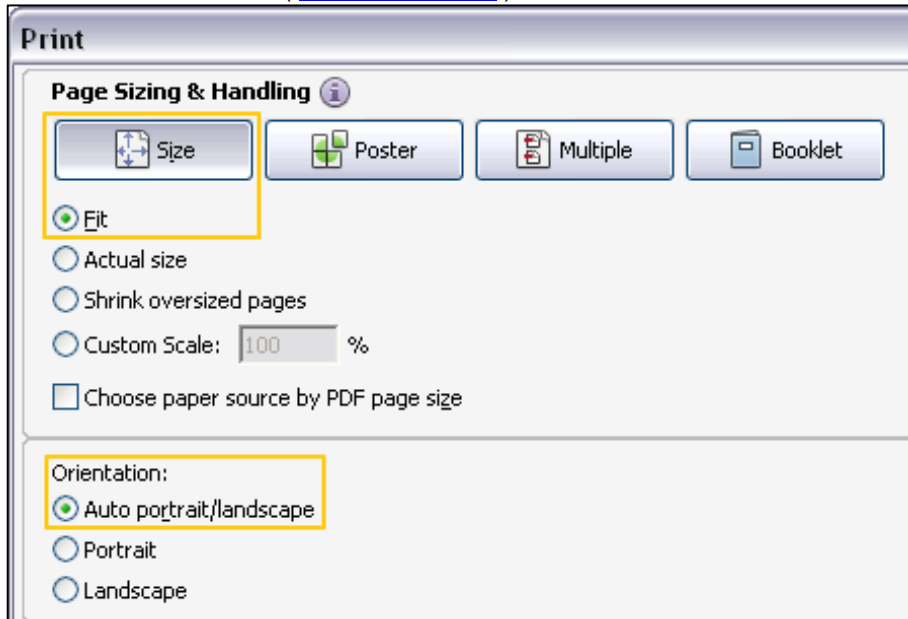
Fig. 38: PNOZmulti Configurator – Ethernet connection online and communication works

5. Table of figures

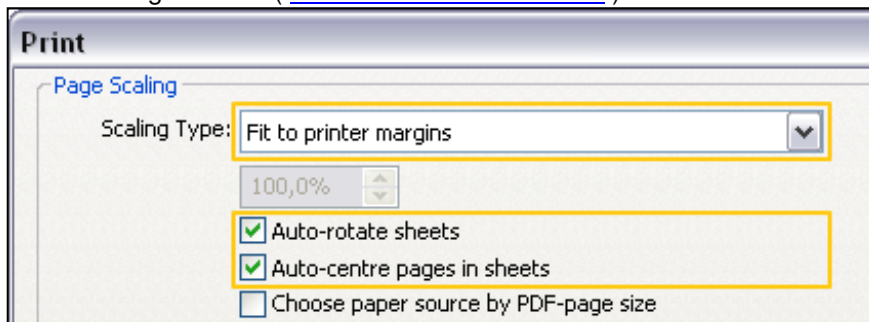
Fig. 1: PNOZmulti Configurator - Hardware Configuration PNOZ m1p ETH.....	7
Fig. 2: List of used Programs	9
Fig. 3: PNOZmulti Configurator - Scan Network.....	10
Fig. 4: PNOZmulti Configurator - Choose of the used device.....	10
Fig. 5: PNOZmulti Configurator - Go online with the device	11
Fig. 6: PNOZmulti Configurator - Configure device Ethernet connection	11
Fig. 7: PNOZmulti Configurator - Adapt the IP address on base unit.....	11
Fig. 8: Simatic HW Config - Setting device name	12
Fig. 9: Simatic HW Config - Change the IP-address	12
Fig. 10: OC Wizard - Start Open Communication Wizard	13
Fig. 11: OC Wizard - Choose the Step 7 project and block folder	14
Fig. 12: OC Wizard – Check connection.....	14
Fig. 13: OC Wizard – Choose connection type “TCP native”	15
Fig. 14: OC Wizard – Set properties of “Communication partner B”.....	15
Fig. 15: OC Wizard – Set properties of “Communication partner A”.....	16
Fig. 16: OC Wizard – Set “Connections parameters” of “Communication partner B”.....	16
Fig. 17: OC Wizard – Choose destination project, block folder and block “UDT65”	17
Fig. 18: OC Wizard – Overview with “List of Connections” for “UDT65”	17
Fig. 19: Simatic Manager – Step7-Project with List of blocks (“UDT65”)	18
Fig. 20: OC Wizard – Compilation Report and Confirm finished of setup	18
Fig. 21: Simatic Manager – Create and set properties of Data Block “DB65” of “UDT65”	19
Fig. 22: AWL-Editor – Change ID in Function Block “FC3”, section “CONNECT”	20
Fig. 23: AWL-Editor – Change ID in Function Block “FC3”, section “SEND”	20
Fig. 24: AWL-Editor – Change ID in Function Block “FC3”, section “RECEIVE”	20
Fig. 25: AWL-Editor – Change ID in Function Block “FC3”, section “DISCONNECT”.....	20
Fig. 26: Simatic Manager – Start complete download of Step7-Project	21
Fig. 27: Simatic Manager – Download, Message box “Insert Organization Block”.....	21
Fig. 28: Simatic Manager – Download, Message boxes “Download”	22
Fig. 29: Simatic Manager – Download, Message boxes “Download”	23
Fig. 30: Var Table – Activate monitoring of variables	24
Fig. 31: Var Table – Monitoring of variables is active	24
Fig. 32: Var Table – Modify Address “M0.0” to =1	25
Fig. 33: Var Table – Monitoring of variables is active	25
Fig. 34: Var Table – Modify Address Virtual Outputs to =1	26
Fig. 35: Var Table – Virtual In/Outputs.....	27
Fig. 36: PNOZmulti Configurator – Main Program “PNOZmulti_S7-PLC_ETH-TCP-IP_v2”	28
Fig. 37: PNOZmulti Configurator – Go “Online” and start “Dynamic Program Display”.....	28
Fig. 38: PNOZmulti Configurator – Ethernet connection online and communication works.....	29

Recommended printer settings

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PDF-XChange Viewer (www.tracker-software.com)





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