VACON NX AC DRIVES

OPTCP

PROFINET OPTION BOARD

USER MANUAL



INDEX

Document code: DPD00895A Last edited: 27.01.2012

1.	I	ntroduction	3
2.	E	Ethernet board technical data	4
	2.1. 2.2. 2.3. 2.4.	Overview LED indications Ethernet Connections and wiring	4 5 6 7
3.	I	nstallation	8
	3.1. 3.2. 3.3. 3.4.	Installing the Ethernet Option Board in a Vacon NX Unit NCDrive IP Tool NCIPConfig Example with Siemens PLC	8 10 10 14
4.	(Commissioning	23
	4.1. 4.2. 4.3. 4.4.	Expander board menu (M7) Profinet parameters IP Address Start-up test	23 23 23 24
5.	F	Profinet IO	25
	5.1. 5.2. 5.3. 5.4. 5.5.	Vendor profile Bypass profile Profidrive profile Parameter channel Parameter data transfer examples	25 30 31 35 39
6.	ļ	APPENDIX	40

1. INTRODUCTION

Vacon NX frequency converters can be connected to Ethernet using an Ethernet fieldbus board OPTCP.

The OPTCP can be installed in board slots D or E.

Every appliance connected to an Ethernet network has two identifiers; a MAC address and an IP address. The MAC address (Address format: xx:xx:xx:xx:xx) is unique to the appliance and cannot be changed. The Ethernet board's MAC address can be found on the sticker attached to the board or by using the Vacon IP tool software NCIPConfig. You can find the software installation at www.vacon.com

In a local network, IP addresses can be defined by the user as long as all units connected to the network are given the same network portion of the address. For more information about IP addresses, contact your Network Administrator. Overlapping IP addresses cause conflicts between appliances. For more information about setting IP addresses, see Section 3, Installation.



Internal components and circuit boards are at high potential when the frequency converter is connected to the power source. This voltage is extremely dangerous and may cause death or severe injury if you come into contact with it.

2. ETHERNET BOARD TECHNICAL DATA

2.1. Overview

General	Board name	ОРТСР
Ethernet connec- tions	Interface	RJ-45 connector
Communications	Transfer cable	Shielded Twisted Pair (STP) CAT5e
	Speed	10 / 100 Mb
	Duplex	half / full
	Default IP-address	192.168.0.10
Protocol	Profinet I/O	
Environment	Ambient operating temperature	-10°C50°C
	Storing tempera- ture	-40°C70°C
	Humidity	<95%, no condensation allowed
	Altitude	Max. 1000 m
	Vibration	0.5 G at 9200 Hz
Safety		Fulfils EN50178 standard

Table 1. Ethernet board technical data

2.2. LED indications



Figure 1-2, LED indications on the OPTCP board

LED:	Meaning:			
H4	LED in ON when board is powered			
H1	Blinking 0.25s ON / 0.25s OFF when board firmware			
	is corrupted (chapter 3.2.1 NOTE).			
	OFF when board is operational.			
H2	Blinking 2.5s ON / 2.5s OFF when board is ready for			
	external communication.			
	OFF when board is not operational.			

Using the "Node Flashing Test" function you can determine to which device you are directly connected. For example in Siemens S7, by using the menu command "PLC > Diagnostics/Setting > Node Flashing Test..." you can identify the station connected directly to the PG/PC by the FORCE LED that flashes.

2.3. Ethernet

Common-use cases of Ethernet devices are 'human to machine' and 'machine to machine'. Basic features of these two cases are presented in the pictures below.

1. Human to machine (Graphical User interface, relatively slow communication)



Note! NCDrive can be used in NXS and NXP drives via Ethernet. In NXL drives this is not possible.



2. Machine to machine (Industrial environment, fast communication)

2.4. Connections and wiring

The Ethernet board supports 10/100Mb speeds in both Full- and Half-duplex modes. However, using Profinet requires the Full-duplex mode and the 100-megabit speed. The boards must be connected to the Ethernet network with a Shielded Twisted Pair (STP) CAT-5e cable. Use a so-called crossover cable if you want to connect the Ethernet option board directly to the master device.

Use only industrial standard components in the network and avoid complex structures to minimize the length of response time and the amount of incorrect dispatches.

More information on Ethernet can be found at www.odva.org.



3. INSTALLATION

3.1. Installing the Ethernet Option Board in a Vacon NX Unit



Vacon NX frequency converter. Α Remove the cable cover. В Open the cover of the control unit. С



3.2. NCDrive

NCDrive software can be used with the Ethernet board in NXS and NXP drives.

NOTE! Does not work with NXL

NCDrive software is recommended to be used in LAN (Local Area Network) only.

NOTE! If OPTCI Ethernet Option board is used for NC Tools connection, like NCDrive, the OPTD3 board can not be used.

NOTE! NCLoad does not work via Ethernet. See NCDrive help for further information

3.3. IP Tool NCIPConfig

To begin using the Vacon Ethernet board, you need to set an IP address. The factory default IP address is 192.168.0.10. Before connecting the board to the network, its IP addresses must be set according to the network. For more information about IP addresses, contact your network administrator.

You need a PC with an Ethernet connection and the NCIPConfig tool installed to set the Ethernet board's IP addresses. To install the NCIPConfig tool, start the installation program from CD or download it from www.vacon.com website. After starting the installation program, follow the on-screen instructions.

Once the program is installed successfully, you can launch it by selecting it in the Windows Start menu. Follow these instructions to set the IP addresses. Select **Help** --> **Manual** if you want more information about the software features.

Step 1. Connect your PC to the Ethernet network with an Ethernet cable. You can also connect the PC directly to the device using a crossover cable. This option may be needed if your PC does not support Automatic crossover function.

Step 2. Scan network nodes. Select **Configuration --> Scan** and wait until the devices connected to the bus in the tree structure are displayed to the left of the screen.

NOTE!

Some switches block broadcast messages. In this case, each network node must be scanned separately.

NCIPConfig - Untitled - Plant							
File Edit Configuration Software View Help							
Configure							
Ping Targets	Node	Mac					

Step 3. Set names. Select the cell in column 'Node' and enter the name of the node.

Step 4. Set IP addresses. Change the node's IP settings according to the network IP settings. The program will report conflicts with a red color in a table cell.

NCIPConfig - Untitled - Plant					
File Edit Configuration Software View Help					
□ ☞ 🖬 😻 🗟 🕾 📲 🕌 🤶	\frown				_
B 🔁 Plant	Node	Mac	IP	Subnet Mask	Gateway
ia → Bondard Control	OPTIONCARD	00-50-C2-3E-5A-7A	192.168.0.10	255.255.255.0	192.168.0.1
B Protocol settings					
Software: OPTCP_10530V001_TEST1.v	l				
Expander board S.NO: 369B8060033					
Drive S.NO: 1234567P					

Step 5. Send configuration to boards. In the table view, check the boxes for boards whose configuration you want to send and select Configuration, then Configure. Your changes are sent to the network and will be valid immediately.

NOTE! Only **A-Z, a-z and 0-9** symbols can be used in the drive name, **no** special characters, or Scandinavian letters (ä, ö, etc.)! The drive name can be freely formed using the allowed characters.

NCIPConfig - Untitled - Plant					
File Edit Configuration Software View Help					
Configure					
B Pk Ping Targets	Net	Мас	IP	Subnet Mask	Gateway
	OPTIONCARD	0-50-C2-3E-5A-7A	192.168.0.10	255.255.255.0	192.168.0.1
i∎ — 🧰 Ethernet settings					
i∎ ⊡ Protocol settings					
Software: OPTCP_10530V001_TEST1.v					
Expander board S.NO: 369B8060033 Drive S.NO: 1234567P					

3.3.1. Update OPTCP Option Board program with the NCIPConfig Tool

In some cases it may be necessary to update the option board's firmware. Differing from other Vacon option boards, the Ethernet option board's firmware is updated with the NCIPConfig tool.

To start the firmware update, scan the nodes in the network according to the instructions in section 3.2. Once you can see all nodes in the view, you can update the new firmware by clicking the **VCN packet** field in NCIPCONFIG 's table view on the right.

NOTE! The PC's IP address must be chosen in the same IP address space as the Ethernet board's.

NCIPConfig - Untitled - Plant										
File Edit Configuration Software View Help										
□ ☞ 🖬 😻 🗟 🕾 🗗 🕌 🤶										\frown
B 🔁 Plant	Node	Mac	IP	Subnet Mask	Gateway	Expander b	Drive S	Software	Drive Status	VCN packet
e 🚣 Optioncard	OPTIONCARD	00-50-C2-3E-5A-7A	192.168.0.10	255.255.255.0	192.168.0.1	369B8060033	1234567P	OPTCP_10	stop	
Ethernet settings										
Protocol settings Software: OPTCP 10520/001 TEST1 v										
Expander board S NO: 36988060033								Click		
Drive S.NO: 1234567P										

After clicking the **VCN packet** field, a file open window where you can choose a new firmware packet is displayed.

Open	? 🛛
Look in: 🔁 von	- 🗈 📸 🖅
OPTCP_10530V001.vcn	
File name:	Open
Files of type: VCN-files(*.vcn)	Cancel

Select the desired packet and click Open.

NCIPConfig - Untitled - Plant								
File Edit Configuration Software View Help								
B Plant	Node	Mac	IP	Subnet Mask	Gateway	Expander b	Drive S	Software
🗄 📥 OPTIONCARD 🛛 🔰	OPTIONCARD	00 50-C2-3E-5A-7A	192.168.0.10	255.255.255.0	192.168.0.1	369B8060033	1234567P	OPTCP_10
Ethernet settings								
Protocol settings		1						
Software: UPTCP_10530V001_TEST1.v								
Expander Doard S.NU: 36568060033								
DIVE 5.NO: 1234367P								

NOTE!

Do not do a power up cycle after downloading the option board software or installing a new option board to the drive within 1 minute. This may cause the option board to go to "Safe Mode". This situation can only be solved by re-downloading the software. The Safe Mode triggers a fault code (F54). The Board slot error F54 may also appear due to a faulty board, a temporary malfunction of the board or disturbance in the environment.

3.3.2. Configure Option board parameters

These features are available from NCIPConfig tool version 1.6.

In the tree-view, expand the folders until you reach the board parameters. Slowly double-click the parameter (*Comm. Time-out* in figure below) and enter new value. New parameter values are automatically sent to the option board after the modification is complete.

NCIPConfig - Untitled - Plant					
File Edit Configuration Software View Help					
D 🛎 🖬 🔯 🗟 🕾 🕬 🕌 🤶					
B 🔁 Plant	Node	Мас	IP	Subnet Mask	Gateway
	OPTIONCARD	00-50-C2-3E-5A-7A	192.168.0.10	255.255.255.0	192.168.0.1
Ethernet settings					
B Protocol settings					
Expander board S.NO: 369B8060033					
Drive S.NO: 1234567P					
Drive S.NO: 1234567P					

NOTE! If the fieldbus cable is broken at the Ethernet board end or removed, a fieldbus error is immediately generated.

3.4. Example with Siemens PLC

1. Create project

New Project							
User projects Libraries Multiprojects							
Name	Storage path						
<							
Add to current multiproject							
Name:	Туре:						
Example	Project 💌						
Starage leasting	F Library						
C:\Program Files\Siemens\Step7\s7p	roj Browse						
, <u>,</u>							
ОК	Cancel Help						

2. Insert station

🛃 Exampl	e C:\Program Fil	les\Siemens\S	itep7\s7proj\Example
🔁 Exar	Cut	Ctrl+X	Symbolic name
	Copy Paste	Ctrl+C Ctrl+V	
	Delete	Del	
	Insert New Object		SIMATIC 400 Station
	PLC	•	SIMATIC 300 Station
	Rename Object Properties	F2 Alt+Return	SIMATIC H Station り SIMATIC PC Station Other Station
			SIMATIC 55 PG/PC
			MPI PROFIBUS
			PTP
			S7 Program M7 Program

3. Double-click hardware to open HW config window.

Example C:\Program Files\Siemens\Step7\s7proj\Example								
Example	Object name	Symbolic name	Туре					
SIMATIC 300(1)	🕮 Hardware		Station configuration					
	KS SIMATIC Statio	n						

4. Insert rail

🖳 HW Config - [SIMATIC 300(1) (Configuration) Example]			
🕅 Station Edit Insert PLC View Options Window Help			_ 8 ×
D 😅 🖫 🖳 🚳 🖻 🛍 🏙 🏜 🖺 🗖 🎇 💦			
	<u>F</u> ind:		M‡ M‡
	<u>P</u> rofile:	Standard	•
		10FIBUS DP 10FIBUS-PA 10FINET IO MATIC 300 C7 CP-300 CPU-300 FM-300 Gateway IM-300 M7-EXTENSION	*
SIMATIC 300(1)		PS-300 RACK-300 Rail SM-300	
Slot Designation	€ES7 390- Available in	MATIC 400 1???0-0AA0 h various lengths	<u>₹</u>
Press F1 to get Help.	U.		



5. Insert power supply

B HW Config - [SIMATIC 300(1) (Configuration) Exam	iple]						
DO Station Edit Insert PLC Vie	w Options Window Help							_ 8 ×
D 🚅 🔓 🗳 🗳 🖬	C. 🟜 🏜 📳 🗖 器	N ?						
					~			
📼 (0) UB					=	<u>F</u> ind:		mt mi
						<u>P</u> rofile:	Standard	•
$\frac{2}{3}$						E RR PF	OFIBUS DP OFIBUS-PA	~
<u>5</u> <u>6</u>						I III III III III III IIII IIII IIII	MATIC 300 C7	
						±	CP-300 CPU-300	
						÷	FM-300 Gateway	
					~	.	IM-300	
<					>		PS-300	
(0) UR							PS 307 10A	
Slot 🚺 Module	Order number	Firmware	MPI ad	I Q	C	 	- PS 307 54 RACK-300	~
1 2					-	6ES7 307-	1EA00-0AA0	
3 4						/5A	y foldge 1207 200 97	0.24 700
l Selecting the hardware					Γ	1		Cha

6. Insert CPU

🙀 HW Config - [SIMATIC 300(1) (Configuration) Example]		
💵 Station Edit Insert PLC View Options Window Help		_ @ ×
D 😅 🖫 🖉 🐘 🎒 🖹 🛍 🛍 👔 🗊 🗔 🞇 💦		
	^	
		Eind: Mt Mi
1 PS 307 5A		Profile: Standard
	~	CPU 314 IFM CPU 314 C2 DP CPU 314C2 DP CPU 314C2 PP CPU 315-2 DP CPU 315-2 DP CPU 315-2 PN/DP CPU 315-2 PN/DP CPU 315-2 PN/DP GES7 315-2FH10-0AB0 GES7 31
(0) UR	c l	□ 0 V26 ⊕-□ CPU 316 ⊕-□ CPU 316-2 DP
1 SS 07 54 6ES7 307-1EA00-0AA0	~	
2		256 KB work memory; 0.1 ms/1000
3	-~	instructions; PROFINET connection; S7
Press F1 to get Help.		Chg /

7. Change IP address and select subnet by clicking **New**.

🖳 HW Config - [SIMATIC 300(1) (Configuration) Example]		
에 Station Edit Insert PLC View Options Window Help		_ 8 ×
Properties - Ethernet interface PN-IO (R0/S2.2) 🔀	
General Parameters	[<u>n</u> †ni
1 PS 307 5A 2 3 3 4 5 5 6 7	If a subnet is selected, the next available addresses are suggested. Gateway • Do not use router	
Subnet mask: 255.255.255.0	C Use router Address: 192.168.0.1	315F-2 DP 315F-2 PN/DP 5ES7 315-2FH10-0AB0 5ES7 315-2FH13-0AB0
Stotree. Image: Constraint of the store of the sto	New Properties Delete	V2.3 V2.5 V2.6 316 316-2 DP 1317-2 ₩
Insertion possible	Cancel Help	y; 0.1 ms/1000 = IET connection; S7 Jable FBs/FCs); • Chg

8. Click OK

🖳 HW Config - [SIMATIC 30	00(1) (Configuration) Example]	
🕅 Station Edit Insert PLC	View Options Window	v Help	_ 8 ×
🗅 🚘 💁 🖬 🖳 🚑 🗍	e. 🗅 II 🚲 🚓 Tre		
	Properties - Ethern	et interface PN-10 (R0/S2.2) 🛛 🗙	
(0) UB	Properties - New s	subnet Industrial Ethernet 🛛 🔀	nt ni
1 PS 307 5A	General		•
2 3 4 5 6 7 - - (0) UR Slot Module 1 PS 307 5A 2 3 4	Name: S7 subnet ID: Project path: Storage location of the project: Author: Date created: Last modified: Comment:	Ethernet(1) 0098 · 0004 C:\Program Files\Siemens\Step7\s7proj\Example 10/22/2009 12:12:48 PM 10/22/2009 12:12:48 PM	314 IFM 314C-2 DP 314C-2 PtP 315 315-2 DP 315-2 PN/DP 315F-2 DP 315F-2 PN/DP 57 315-2FH10-0AB0 57 315-2FH10-0AB0 57 315-2FH13-0AB0 V2.3 V2.5 V2.6 316 316-2 DP 317-2 10 0.1 ms/1000 17 connection; S7 ble FBs/FCs); ♥
Insertion possible	N		Chg //

9. Click OK

🖳 HW Config - [SIMATIC 300(1) (Configuration) Example]		_ \
💵 Station Edit Insert PLC View Options Window Help		_ 8 ×
Properties - Ethernet interface PN-IO ((R0/S2.2) 🛛 🔀	
General Parameters		<u>n</u> † ni
1 PS 307 5A 2 3 4 5 5 5	If a subnet is selected, the next available addresses are suggested.	314 IFM 314C-2 DP 314C-2 PtP 315
7 IP address: 192.168.0.1 2 Subnet mask: 255.255.255.0	Do not use router Use router Address: 192.168.0.1	315-2 DP 315-2 PN/DP 315F-2 DP 315F-2 PN/DP 315F-2 PN/DP SES7 315-2FH10-0AB0
Subnet: Image: Constraint of the state of the stat	New Properties Delete	6ES7 315-2FH13-0AB0 V2.3 V2.5 V2.6 1316 1316-2 DP 1317-2
Insertion possible	Cancel Help	y; 0.1 ms/1000 IET connection; S7 table FBs/FCs);

10. Now configuration should look like this

🖳 HW Config - [SIMATIC 300(1) (Configuration) Example]	
🕅 Station Edit Insert PLC View Options Window Help	_ 8 ×
D 😅 💱 🖳 🛼 🎒 🗈 🗈 🖬 🏜 🕼 📳 🖽 松	
<u>^</u>	
🗩 (0) UR	Eind:
	Profile: Standard
	🕒 🔁 CPU 314 IFM 📃 🔼
2 PN-/D Ethemet(1): PROFINET-IO-System (100)	⊕
X2 P1 Port 1	
	🕀 🧰 CPU 315-2 DP
	🕀 💼 CPU 315-2 PN/DP 👘
	⊕ 💼 CPU 315F-2 DP
	□ □ CPU 315F-2 PN/DP
<u>×</u>	E-13-0460
	V2.5
	V2.6
Ethernet(1): PROFINET-IO-System (100)	🕀 🧰 CPU 316
Device Number III IP addres Device Name Order number Firmware Diagnostic IC	🕀 🧰 CPU 316-2 DP
	E
	6ES7 315-2FH13-0AB0
	instructions; PROFINET connection; S7
	Communication (loadable FBs/FCs);
Press F1 to get Help.	Chg

11. Drag and drop OPTCP to Profinet IO system

HW Config - [SIMATIC 300(1) (Configuration) Example] Station Edit Insert PLC View Options Window Help		
Image: Description of the second s	<u>n (100)</u>	Eind: Profile: Standard PROFIBUS DP PROFIBUS PA PROFIBUS-PA PROFINET IO Additional Field Devices Vacon Drives PROFINER
	>	
(0) UR		
Slot Module O Fi M I Q Comment		Ensors Sensors SIMATIC 300 SIMATIC 300
1 PS 307 5A 6ES7 2 1 CPU 315F-2 PN/DP 6ES7V2.6 2 X7 1 MFV/DF 2 2047 X2 FW/I7 3746 3746		GES7 195-3BC00-0YA0 VACON OPTCP PROFINET IO Option Board GSDML-V2.1-VACON-OPTIONCARD-2009082
Selecting the hardware		

12. Select communication profile

HW Config - [SIMATIC 300(1) (Conf	iguration) Exampl	e]						
Lawy Station Edit Insert PLC view Option	ns window Help							*
D 😅 🐂 📕 🖏 🚭 🖻 🖻 🏙	u 🛍 🚯 🗖 💥 I	\?						
					^			
						<u>F</u> ind:		m† mi
2 CPU 315F-2 PN/L						Profile:	Standard	•
X1 MPI/DP X2 PN-10 -	Etherne	(1): PROFIN	ET-10-9	iystem	(100		ė- 🔂 opto	
3		🚡 (1) OPTIO	NCARI)				BYPASS PP03
								BYPASS PP04 BYPASS PP06
		VAG	ON				📮 💼 P	ROFIDRIVE
		DR	IVEN BY D	RIVES				Standard telegram 1
								Standard telegram 1451 PD Standard telegram 1 + 2 PD
				_				Standard telegram 1 + 3 PD
					2			Standard telegram 1 + 4 PD
								Standard telegram 1 + 5 PD
								Standard telegram 1 + 6 PD
Slot 🚺 Module Order N	umber	I Address	Q	D	C		···· [Standard telegram 1 + 7 PD
0 🖬 OFTIONCARD OFTOP				2043			· · · · · · · · · · · · · · · · · · ·	Standard telegram 1 + 8 PD 🞽
1			1					
						Profidrive : GSDML-V	standard telegi 2.1-VACON-01	ram 1 PTIONCARD-20090828.xml
Press F1 to get Help.								Chg

13. Change Optioncard properties

Properties - OPTIONC	ARD	
General IO Cycle		
Short description:	OPTIONCARD OPTCP PROFINET IO Option Board	
Order no.:	OPTCP	
Family:	Vacon Drives	
Device name	OPTIONCARD	
GSD file:	GSDML-V2.1-VACON-OPTIONCARD-20090828.xml Change Release Number	
- Node / PN IO system-		
Device number:	1 PROFINET-IO-System (100)	
IP address:	192.168.0.10 Ethernet	
Assign IP address	via ID controller	
Comment:		
		~
ОК	Cancel	Help

14. Verify Device Name.

🖳 HW Config - [SIMAT	IC 300(1) (Configuration) Exar	nple]				
C Station Edit Insert	PLC View Options Window Help					- 8 ×
] 🗅 🚅 ≌∽ 🖬 🗣 ∉	Download Upload	Ctrl+L				
(0) UR	Download Module Identification Upload Module Identification to PG			Eind:		×
2 CPU :	Faulty Modules			Profile:	Standard	-
$\begin{array}{c cccc} \lambda 7 & MPLD \\ \lambda 2 & PN-IO \\ \hline \lambda 2 PT & Port 1 \\ \hline 3 & \hline 4 & \hline r & \hline \end{array}$	Module Information Operating Mode Clear/Reset Set Time of Day Monitor/Modify	Ctrl+D Ctrl+I)FINET-IO-System (100 TIONCARD		CPU 314C-2 PtP CPU 315 CPU 315-2 DP CPU 315-2 PN/DP CPU 315-2 PN/DP	~
	Update Firmware				CPU 315F-2 PN/DP	
	Save Device Name to Memory Card			÷	CPU 316-2 DP	
<	Ethernet	•	Edit Ethernet Node		CPU 317-2 PN/DP	=
Ethernet(1): PR	PROFIBUS Save Service Data	•	Verify Device Name Assign Device Name	2		
Device Number	IP addres Device Name Order 92.168.0.1(OPTIONCARD OPTC	number D	Firmware D C 2043		V2.5 V2.6	~
Supplies information on the cu	I I I I I I I I I I I I I I I I I I I	names.		6ES7 317-2E 1024 KB wor instructions; Communicati	EK13-0AB0 rk memory: 0.05ms/1000 PROFINET connection; S7 ion (loadable FBs/FCs); PROFINET	► E<

15. Close window.

Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station Edit Insert PLC View Options Window Help _ 0 : Image: Station E
□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ Verify Device Name □ □ □ □ □
Verify Device Name
Available Devices:
2 CPU 31 Device name S IP address MAC address Device type
X2 0PTIONCARD V 192.168.0.10 00-50-C2-3E-5A-7A Vacon Drives
X2 P1 Port 1
N/DP
P P
N/DP
7-2EJ10-0AB0
Ethernet(1): PR0 Show only missing and incorrectly configured devices
Device Number
1024 KB work memory: 0.05ms/1000
instructions; PROFINET connection; S7
Press E1 to get Help

16. Change IO cycle to 16 ms (minimum) or greater.

	X
16.000 ▼ ms	
3 🗸	
48.000 ms	
	16.000 ▼ ms 3 ▼ 48.000 ms

4. COMMISSIONING

The Vacon Ethernet board is commissioned with the control keypad by giving values to appropriate parameters in menu M7 (or with NCIPConfig tool, read chapter IP Tool NCIPConfig). Keypad commissioning is only possible with NXS and NXP series AC drives. AC drives of the NXL series can only be commissioned with the NCIPConfig tool.

4.1. Expander board menu (M7)

The *Expander board menu* makes it possible for the user to see which expander boards are connected to the control board and to reach and edit the parameters associated with the expander board.

Enter the following menu level (G#) with the *Menu button right*. At this level, you can browse trough slots A to E with the *Browser buttons* to see what expander boards are connected. On the lowermost line of the display you see the number of parameter groups associated with the board. If you still press the *Menu button right* once you will reach the parameter group level where there are one group in the Ethernet board case: Parameters. A further press on the *Menu button right* takes you to Parameter group.

Name	Default	Range	Description
Comm. Timeout	10	0255 s	
IP Part 1	192	1223	IP Address Part 1
IP Part 2	168	0255	IP Address Part 2
IP Part 3	0	0255	IP Address Part 3
IP Part 4	10	0255	IP Address Part 4
SubNet Part 1	255	0255	Subnet Mask Part 1
SubNet Part 2	255	0255	Subnet Mask Part 2
SubNet Part 3	0	0255	Subnet Mask Part 3
SubNet Part 4	0	0255	Subnet Mask Part 4
DefGW Part 1	192	0255	Default Gateway Part 1
DefGW Part 2	168	0255	Default Gateway Part 2
DefGW Part 3	0	0255	Default Gateway Part 3
DefGW Part 4	1	0255	Default Gateway Part 4
InputAssembly	-	-	NOT USED in Profinet
OutputAssembly	-	-	NOT USED in Profinet
	Name Comm. Timeout IP Part 1 IP Part 2 IP Part 3 IP Part 4 SubNet Part 1 SubNet Part 2 SubNet Part 3 SubNet Part 3 DefGW Part 1 DefGW Part 2 DefGW Part 2 DefGW Part 3 DefGW Part 4 <i>InputAssembly</i> <i>OutputAssembly</i>	NameDefaultComm. Timeout10IP Part 1192IP Part 2168IP Part 30IP Part 410SubNet Part 1255SubNet Part 2255SubNet Part 30SubNet Part 40DefGW Part 1192DefGW Part 2168DefGW Part 30DefGW Part 41InputAssembly-OutputAssembly-	NameDefaultRangeComm. Timeout100255 sIP Part 11921223IP Part 21680255IP Part 300255IP Part 4100255SubNet Part 12550255SubNet Part 22550255SubNet Part 300255SubNet Part 400255SubNet Part 400255DefGW Part 11920255DefGW Part 21680255DefGW Part 300255DefGW Part 410255DefGW Pa

4.2. Profinet parameters

Table 2. Ethernet parameters

4.3. IP Address

IP is divided into 4 parts. (Part = Octet) Default IP Address is 192.168.0.10.

Communication timeout

Defines how much time can pass from the last received message from the Master Device before fieldbus fault is generated. Communication timeout is disabled when given the value **0**. The communication timeout value can be changed from the keypad or with NCIPConfig tool (see chapter IP Tool NCIPConfig).

NOTE!

If the fieldbus cable is broken at the Ethernet board end or removed a fieldbus error is immediately generated.

All Ethernet parameters are saved to the Ethernet board (not to the control board). If the Ethernet board is replaced by a new one you must re-configure the new Ethernet board. Option board parameters can also be saved to the keypad using the NCIPConfig tool or the NCDrive.

4.4. Start-up test

In the AC drive application:

Choose Fieldbus (Bus/Comm) as the active control place (see Vacon NX User's Manual, Chapter 7.3.3).

In the Master software:

- 1. Set Control Word value to Ohex.
- 2. Set Control Word value to 47Ehex.
- 3. Set Control Word value to 47Fhex.
- 4. Frequency converter status is RUN.
- 5. Set Reference value to 5000 (=50.00%).
- 6. The Actual value is 5000 and the frequency converter output frequency is 25.00 Hz.
- 7. Set Control Word value to 477hex.
- 8. Frequency converter status is STOP.

5. PROFINET IO

PROFINET is the Ethernet-based automation standard of PROFIBUS International for the implementation of an integrated and consistent automation solution based on Industrial Ethernet. PROFINET supports the integration of simple distributed field devices and time-critical applications in (switched) Ethernet communication, as well as the integration of component-based distributed automation systems for vertical and horizontal integration of networks.

5.1. Vendor profile

In vendor mode there are three PPO types; PPO3,PPO4,PPO6. These PPO types should have same functionality than Vacon NX Profibus. In PPO mode control word and status word goes though state machine.



Descriptions

- Byte CW Control Word
- SW Status Word
- REF Reference value
- ACT Actual value
- PD Process Data

5.1.1. Control word (Vendor profile)

The Control command for the state machine (see Figure 2) The state machine describes the device status and the possible control sequence of the frequency converter. The control word is composed of 16 bits that have the following meanings:

Bit	Description	
	Value = 0	Value = 1
0	STOP 1 (by ramp)	ON 1
1	STOP 2 (by coast)	ON 2
2	STOP 3 (by ramp)	ON 3
3	RUN DISABLE	ENABLE
4	No action	START
5	No action	START
6	No action	START
7	No action	FAULT RESET (0 ->1)
8	No action	No action
9	No action	No action
10	Disable fieldbus control	Enable fieldbus control
11	Fieldbus DIN1=0FF	Fieldbus DIN1=0N
12	Fieldbus DIN2=0FF	Fieldbus DIN2=0N
13	Fieldbus DIN3=0FF	Fieldbus DIN3=0N
14	Fieldbus DIN4=0FF	Fieldbus DIN4=0N
15	Fieldbus DIN5=0FF	Fieldbus DIN5=0N
	Table 3.	

5.1.2. Status word (Vendor profile)

Information about the status of the device and messages is indicated in the Status word. The Status word is composed of 16 bits that have the following meanings:

Bit	Description	
	Value = 0	Value = 1
0	Not Ready (initial)	READY 1 **
1	Not Ready	READY 2 **
2	DISABLE	ENABLE **
3	NO FAULT	FAULT ACTIVE *
4	STOP 2	NO STOP 2 **
5	STOP 3	NO STOP 3 **
6	START ENABLE	START DISABLE **
7	No Warning	Warning *
8	Reference ≠ Actual value	Reference = Actual value *
9	Fieldbus control OFF	Fieldbus control ON *
10	Not used	Not used
11	Not used	Not used
12	FC stopped	Running *
13	FC not ready	FC ready *
14	Not used	Not used
15	Not used	Not used

Table 4.

*Comes straight from the frequency converter

**Bits of the State Machine

5.1.3. State Machine

The state machine describes the device status and the possible control sequence of the frequency converter. The state transitions can be generated by using the "Control word". The "Status word" indicates the current status of the state machine. The modes INIT, STOP, RUN and FAULT correspond to the actual mode of the Frequency converter.



NOTE! Always set CW bit0 to 0 after fault reset before proceeding!

Figure 2.

5.1.4. Reference

CW	REF		PD1		PD2		PD3		PD4		PD5		PD6		PD7		PD8	

This is the reference 1 to the frequency converter. Used normally as Speed reference.

The allowed scaling is -10000...10000. In the application, the value is scaled in percentage of the frequency area between set minimum and maximum frequency.

-10000 = 100,00 % (Direction reverse) 0 = 0,00 % (Direction forward) 10000 = 100,00 % (Direction forward)

5.1.5. Actual value

SW	ACT	PD1	PD2	PD3	PD4	PD5	PD6	PD7	PD8	

This is the actual value from the frequency converter. Value between -10000...10000. In the application, the value is scaled in percentage of frequency area between set minimum and maximum frequency.

-10000 = 100,00 % (Direction reverse) 0 = 0,00 % (Direction forward) 10000 = 100,00 % (Direction forward)

5.1.6. Process data in

CW	REF	PD1	PD2	PD3	PD4	PD5	PD6	PD7	PD8	

ProcessData Master -> Slave

The Master can write max. 8 additional setting values to the device with the help of the Process Data. How these setting values are used is totally dependent on the application in use.

5.1.7. Process data out

SW	ACT	PD1	PD2	PD3	PD4	PD5	PD6	PD7	PD8	

ProcessData Slave -> Master

The master can read the frequency converter's actual values using the process data variables. Depending on the used application, the contents are either standard or can be selected with a parameter.

5.2. Bypass profile

In BYPASS mode there are three types.

	Proces	s Data Fi	eld							
	CW	REF	PD1	PD2	PD3	PD4	PD5	PD6	PD7	PD8
	SW	ACT	PD1	PD2	PD3	PD4	PD5	PD6	PD7	PD8
PP03										
PP04										
PP06										

Descriptions

	Byte
CW	Control Word
SW	Status Word
REF	Reference value
ACT	Actual value
PD	Process Data

5.2.1. Control Word (Bypass profile)

The meanings of the Control Word bits is application-dependent.

5.2.2. Status Word (Bypass profile)

The meanings of the Status Word bits are application-dependent.



5.3. Profidrive profile



The PROFIDRIVE profile has been jointly defined by drive manufacturers. The profile specifies aspects of drive parameterization and how the setpoints and actual values should be transmitted. This makes drives in a fieldbus vendor-independent and possible to be replaced by a drive from a different vendor. The profile contains specifications needed for speed control and positioning and it specifies the basic drive functions while leaving sufficient freedom for application-specific expansions and further developments.

5.3.1. Application class 1

The Profinet board supports Application Class 1 of the Profidrive profile (version 4.1). Application Class 1 defines Standard Telegram 1. The standard telegrams have the following structure:

I/O data num- ber	1	2
Setpoint	STW1	NSOLL_A
Actual value	ZSW1	NIST_A
T 1 1 F		

Table 5.

5.3.1.1. <u>STW1</u>

STW1 is the Profidrive profile's control word. The control word is for controlling the drive from a fieldbus. It is sent by the fieldbus master to the drive. The drive switches between its states according to the bit-coded instructions on the control word. Because the STW1 and the drive's own control words are different the STW1 has to be written to Drive Interface through state machine. Some of the STW1 bits go straight to Drive Interface.

The STW1 is composed of 16 bits that have the following meanings:

Bits	Description								
	Value = 0	Value = 1							
0	OFF	ON							
1	Coast stop (No OFF2 / OFF2)	No coast stop							
2	Quick stop (No OFF3 / OFF3)	No quick stop							
3	Disable operation	Enable operation							
4	Reset ramp generator ^b	Enable ramp generator⁵							
5	Freeze ramp generator ^b	Unfreeze ramp generator ^b							
6	Disable setpoint	Enable setpoint							
7		Fault acknowledgement (0->1)							
8	Jog 1 OFF ^a	Jog 1 ON ^a							
9	Jog 2 OFF ^a	Jog 2 ONª							
10	No control by PLC	Control by PLC							
11	Device-	specific							
12-15	Device-	specific							
^a Optional; depends on application									
^b Depends	on application								

5.3.1.2. <u>ZSW1</u>

ZSW1 is the Profidrive profile's status word. Status word indicates information about the status of the device. Also messages are indicated in the Status word. The ZSW1 Status word is composed of 16 bits that have the following meanings:

Bits	Description					
	Value = 0	Value = 1				
0	Not ready to switch on	Ready to swich on				
1	Not ready to operate	Ready to operate				
2	Operation disabled	Operation enabled (drive follows set-				
		point)				
3	No fault	Fault present				
4	Coast stop activated (No OFF2 / OFF2)	Coast stop not activated				
5	Quick stop activated (No OFF3 / OFF3)	Quick stop not activated				
6	Switching on not inhibited	Switching on inhibited				
7	No warning	Warning present				
8	Speed error out of tolerance range	Speed error within tolerance range				
9	No control requested	Control requested				
10	f or n not reached	f or n reached or exceeded				
11	Device-specific					
12	Device-	specific				
13	Device-	specific				
14-15	Device-	specific				

5.3.1.3. <u>NSOLL_A</u>

NSOLL_A is the reference to the drive. It is used normally as Speed reference. Reference is a 16-bit word containing a sign bit and a 15-bit integer. A negative reference (indicating reversed direction of rotation) is formed by calculating the two's complement from the corresponding positive reference. The allowed scaling is –10000...10000. In the drive application, the value is scaled in percentage of the frequency area between set minimum and maximum frequency.

-10000 = 100,00 %	(Direction reverse)
0 = 0, 00 %	(Direction forward)
10000 = 100,00 %	(Direction forward)

5.3.1.4. <u>NIST_A</u>

NIST_A is the actual value from the frequency converter. It contains values between -10000...10000. In the application, the value is scaled in percentage of frequency area between set minimum and maximum frequency.

-10000 = 100,00 %	(Direction reverse)
0 = 0, 00 %	(Direction forward)
10000 = 100,00 %	(Direction forward)

5.3.1.5. State Machine

The state machine describes the device status and the possible control sequence of the frequency converter. The state transitions can be generated by using the "Control word". The "Status word" indicates the current status of the state machine. The modes INIT, STOP, RUN and FAULT correspond to the actual mode of the Frequency converter



Figure 3.

5.3.1.6. Additional Process data in

ProcessData Master -> Slave

The Master can write max. 8 additional setting values to the device with the help of the Process Data. How these setting values are used is totally dependent on the application in use.

5.3.1.7. Additional Process data out

ProcessData Slave -> Master

The master can read the frequency converter's actual values using the process data variables. Depending on the used application, the contents are either standard or can be selected with a parameter.



5.4. Parameter channel

The Parameter channel can be used to access the Drive's parameters and the PROFIDRIVE's parameters.



Figure 4. Data flow for Base Mode Parameter Access

Parameters are read/written with function blocks in Siemens PLC. Function block SFB 52 "RDREC" is for reading and SFB53 "WRREC" for writing. See more detailed information in document *Communication Function Blocks for PROFIBUS and PROFINET* on www.profibus.com .



Parameter Access Service	Index
Base Mode Parameter – Global	0xB02F

Global Parameters

Global parameters are related to the complete device.

Supported parameter accesses:

- Request parameter value, single
- Change parameter value, single
- Request parameter value, multi-parameter
- Change parameter value, multi-parameter
- Request parameter value, several array elements
- Change parameter value, several array elements
- Change parameter value, several array elements, Format Byte

It is possible to read and write parameters from and to the drive. In order to process them through the Base Mode Parameter Access mechanism, you should:

- o set requested PNU to 10001 (0x2711)
- o set requested subindex with the drive parameter ID

NOTE:

Parameters which are read from the drive have always the format set to "Word" – 0x42.

Error Value	Meaning
0x00	Impermissible PNU
0x01	Cannot change value
0x02	Low or high limit exceeded
0x03	Faulty subindex
0x04	No array
0x05	Incorrect data type
0x06	Setting not permitted
0x07	Cannot change description
0x09	No description
0x0B	No operation priority
0x0F	No text array available
0x11	Cannot execute the request. Rea-
	son not specified
0x14	Value impermissible
0x15	Response too long
0x16	Parameter address impermissi- ble
0x17	Illegal format
0x18	Number of values inconsistent
0x19	Axis/D0 nonexistent
0x20	Cannot change text
0x65	Invalid Request Reference
0x66	Invalid Request ID
0x67	Invalid Axis number / DO-ID
0x68	Invalid number of parameters
0x69	Invalid attribute
0x6B	Request too short

Table 6 PROFIDRIVE parameter request error codes

PNU	Signification	Datatype
922	Telegram Selection	
930	Operating Mode	
944	Fault Message Counter	
947	Fault Number	
950	Scaling of the Fault Buffer	
964	Drive Unit Identification	
965	Profile Identification Number	
975	DO Identification	
980		
to 989	Number List of Defined Parameter	

PROFIDRIVE's profile-specific parameters

Request Header, Meaning of the fields

Field	Meaning	Range
Request Reference	Master sets unique identification for every query.	1255
Request ID	Defines the type of the message.	0x01 = Request Parame- ter 0x02 = Change Parameter
DO-ID	Set to "1".	0255
Number of Parameters	Specifies the number of parame- ters in request.	138
Attribute	Type of object being accessed.	0x10 = Value
Number of Elements	Number of array elements or length of string accessed.	1234
Parameter Number	Addresses of the accessed PROFI- drive parameter.	165535 (0x2711) Access to drive parameters
Subindex	Addresses of the first array ele- ment of the accessed parameter.	065535
Format	Format of the request.	0x00 = Reserved 0x01 - 0x36 = Data types 0x37 - 0x3F = Reserved 0x40 = Zero 0x41 = Byte 0x42 = Word 0x43 = Double word 0x44 = Error 0x45 - 0xFF = Reserved
Number of Values	Number of following values or number of following data type ele- ments.	0234
Error Number	See Table 6 on page 36.	

Field	Meaning	Range
Request Reference	Mirrored from request.	1255
Response ID	Slave's response.	0x01 = Request OK
		0x02 = Change OK
		0x81 = Request Failed
		0x82 = Change Failed
DO-ID	Mirrored from request.	-
Number of Parame-	Number of parameters in response.	138
ters		
Format	Data type of response value.	0x00 = Reserved
		0x01 – 0x36 = Data types
		0x37 - 0x3F = Reserved
		0x40 = Zero
		0x41 = Byte
		0x42 = Word
		0x43 = Double word
		0x44 = Error
		0x45 – 0xFF = Reserved
Number of Values	Number of values in response.	1234
Value	Value of request.	-

Response Header, Meaning of the fields

VACON • 39

65

00

5.5. Parameter data transfer examples

Reading parameter:

Request parameter value, single:

	F	Request Header					Parameter Address			
	05	01	01	01	10	01	27	11	00	
05 = Request Referen	ice									
01 = Request ID										
01 = DO-ID										
01 = No. of parameter	rs									
10 = Attribute										
01 = No. of elements										
2711 = Parameter nu	mber	(0x271	l1 Rec	juest [Drive F	aram	eters)		
0065 = Subindex (0x6	5 = ID	101 M	in Fre	quenc	:y)					

Response:

	F	Request	Heade	Parameter Addres				
	05	01	01	01	42	01	00	0
05 = Request Reference. Mi 01 = Request ID 01 = DO-ID. Mirrored 01 = No. of parameters. Mir 42 = Format (42 = word) 01 = No. of values 0000 = Value	rrore	d						

Request parameter value, single:

	Request Header					Parameter Address				
	06	01	01	01	20	01	27	11	00	65
06 = Request Referen	nce									

- 01 = Request ID
- 01 = D0 ID
- 01 = No. of parameters
- 20 = Attribute
- 01 = No. of elements
- 2711 = Parameter number (0x2711 Request Drive Parameters)
- 0065 = Subindex (0x65 = ID 101 Min Frequency)

Error Response:

-	Request Header			r	Parameter Address			
	06	81	01	01	44	01	00	09

- 06 = Request Reference. Mirrored
- 81 = Request ID (Bit7 = 1, Error Response)
- 01 = DO-ID. Mirrored
- 01 = No. of parameters. Mirrored
- 44 = Format (44 = word)
- 01 = No. of values
- 0009 = Error Value (9 = No Description data available)

6. APPENDIX

Process Data OUT (Slave → Master)

The fieldbus master can read the frequency converter's actual values using process data variables. *Basic, Standard, Local/Remote, Multi-Step, PID control and Pump and fan control* applications use process data as follows:

Data	Value	Unit	Scale
Process data OUT 1	Output Frequency	Hz	0,01 Hz
Process data OUT 2	Motor Speed	rpm	1 rpm
Process data OUT 3	Motor Current	А	0,1 A
Process data OUT 4	Motor Torque	%	0,1 %
Process data OUT 5	Motor Power	%	0,1 %
Process data OUT 6	Motor Voltage	V	0,1 V
Process data OUT 7	DC link voltage	V	1 V
Process data OUT 8	Active Fault Code	-	-

The *Multipurpose* application has a selector parameter for every Process Data. The monitoring values and drive parameters can be selected using the ID number (see NX All in One Application Manual, Tables for monitoring values and parameters). Default selections are as in the table above.

Process Data IN (Master -> Slave)

ControlWord, Reference and Process Data are used with All-in One applications as follows:

Basic, Standard, Local/Remote, Multi-Step applications

Data	Value	Unit	Scale
Reference	Speed Reference	%	0.01%
ControlWord	Start/Stop Com- mand Fault reset Com- mand	-	-
PD1 – PD8	Not used	-	-

Data	Value	Unit	Scale
Reference	Speed Reference	%	0.01%
ControlWord	Start/Stop Command		
	Fault reset Command		
Process Data IN1	Torque Reference	%	0.1%
Process Data IN2	Free Analogue INPUT	%	0.01%
Process Data IN3	Adjust Input	%	0.01%
PD3 – PD8	Not Used	-	-

Multipurpose control application

PID control and Pump and fan control applications

Data	Value	Unit	Scale
Reference	Speed Reference	%	0.01%
ControlWord	Start/Stop Command Fault reset Command	-	-
Process Data IN1	Reference for PID control- ler	%	0.01%
Process Data IN2	Actual Value 1 to PID con- troller	%	0.01%
Process Data IN3	Actual Value 2 to PID con- troller	%	0.01%
PD4-PD8	Not Used	-	-

License for LWIP

Copyright (c) 2001, 2002 Swedish Institute of Computer Science.

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

3. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.



Find your nearest Vacon office on the Internet at:

www.vacon.com

Manual authoring: documentation@vacon.com

Vacon Plc. Runsorintie 7 65380 Vaasa Finland

Subject to change without prior notice © 2012 Vacon Plc.



Rev. A