

# **NDI series displays**

## **PARAMETRIZATION OF PROFIBUS-DP COMMUNICATION INTERFACE**

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## 1. Introduction

This manual is aimed for programmers of SIEMENS, SIMATIC S7 control systems. In addition to this manual there is also a sample Step7 project „ELEN\_NDI“, compiled in STEP7 ver. 5.4 programming environment, which is a development environment for SIMATIC S7-300 and S7-400 control system. Sample Step7 project contains a simple configuration of SIMATIC S7-300 control system, consisting of CPU 315-2DP and display NDI 100 with PROFIBUS-DP interface.

## 2. GSD file installation

If we want to add display NDI into existing Step7 project, as a first step it is necessary to download the .GSD file and then add display NDI into HW catalog of STEP7. To do this open HW config editor in Step7 environment and in menu “Options – Install GSD file...” using function “Browse” open folder in which is located file NdiW08DB.GSD, see figure 1 – Installing GSD file. Next, using the Install button, install GSD file into HW catalog of Step7 development environment. File NdiW08DB.GSD is available for download from ELEN company web site ([www.elen.sk](http://www.elen.sk)).

If you work with display NDI for the first time, we recommend to study the sample Step7 project „ELEN\_NDI“, or make a test workspace, that means: CPU with Profibus DP interface and display NDI, download sample Step7 project into CPU and test display functions. There are two participants on the Profibus DP network. As the PROFIBUS-DP Master is used CPU 315-2DP, profibus address 2. To Master is connected PROFIBUS-DP Slave display NDI 100 with factory predefined Profibus address 25 (in this case).

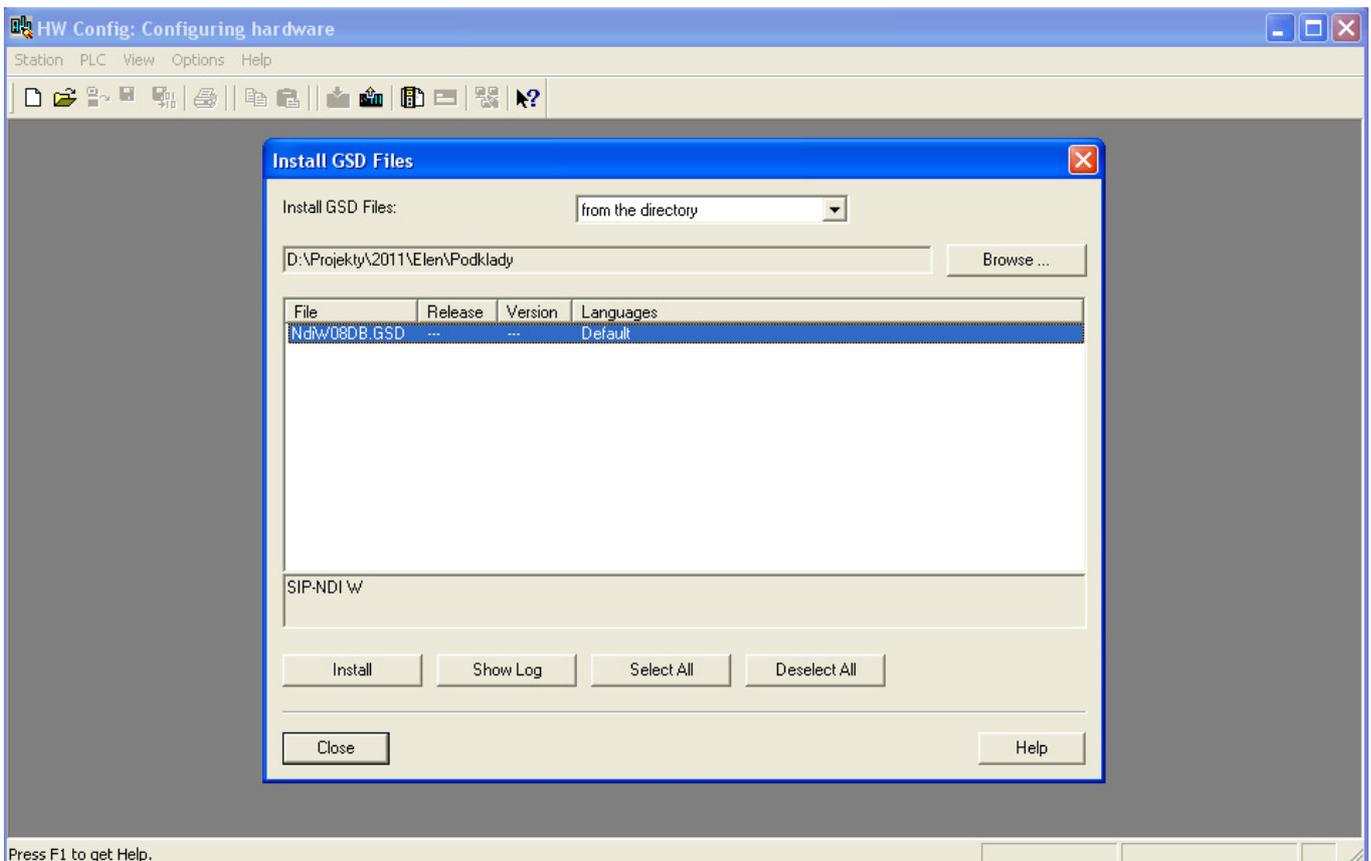


Figure 1 - Installing GSD file

After successfully adding GSD file there will be a new Profibus slave device “SIP-NDI W” added into HW catalog, see figure 2 – HW catalog. In its virtual slots there are two output blocks:

1. DATA – DATA 5xDisplay & DP
2. STATUS – STATUS – NET, kg, Flash, Bright

These output blocks serve for writing 5-position string to main 7-segment display (DATA) and to control other display functions (STATUS).

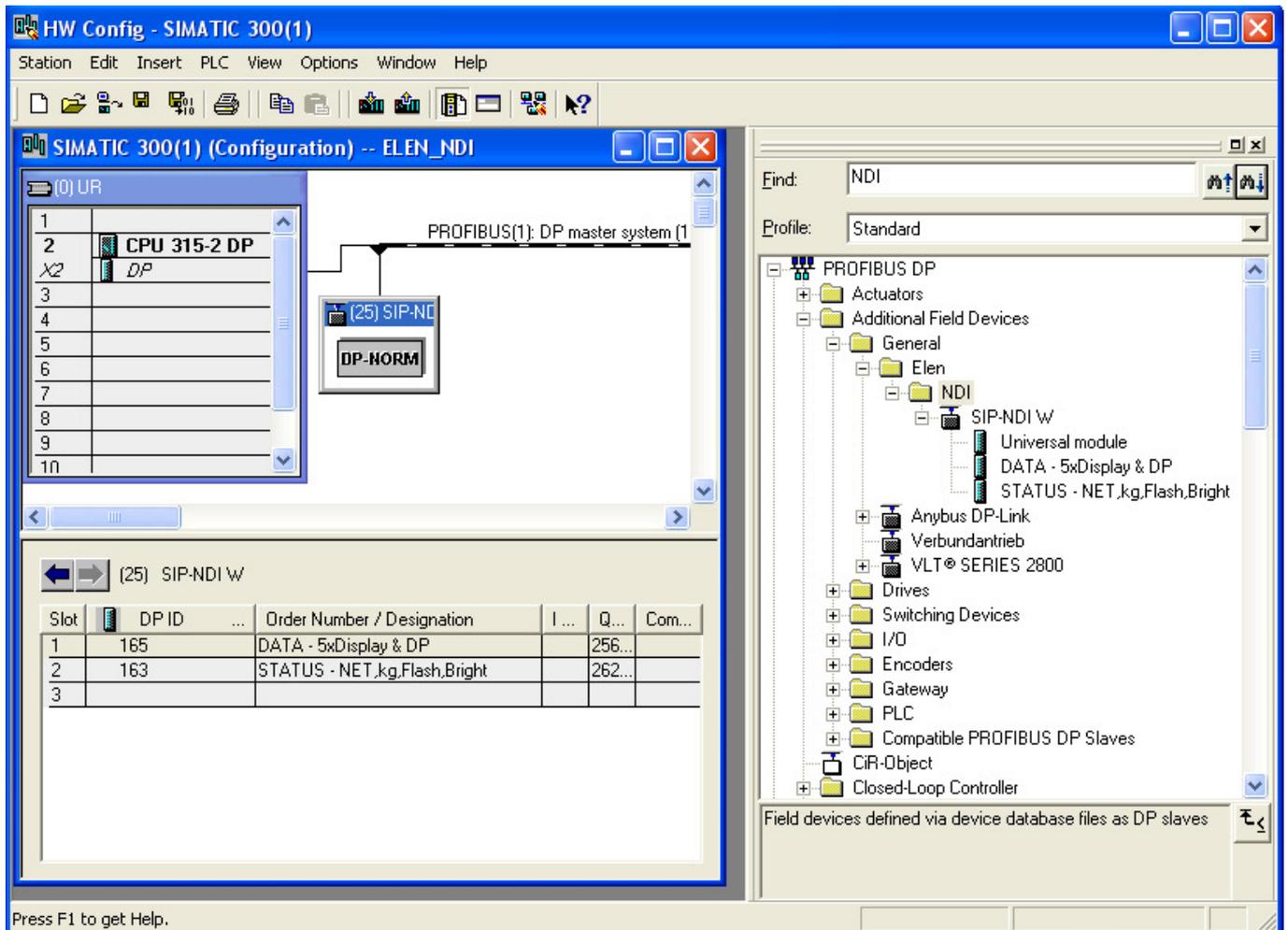


Figure 2 - HW catalog

### 3. Sample project ELEN\_NDI

After installing GSD file into HW catalog of Step7 environment we can insert new DP slave „SIP-NDI W“ into HW configuration of existing Step7 project, or we can open sample Step7 project with name ELEN\_NDI. In this sample Step7 project there is FB1 in programming folder “Blocks”, which converts input variable “VALUE” of DINT type in range -9999 to +99999 to string (for conversion of number DINT to string is used standard block FC5 /DI\_STRING/ from Standard Library), FB1 writes this string via interface PROFIBUS-DP on display. Writing is realized by calling of system function SFC15 /DPWR\_DAT/. Calling FB1 with corresponding instant data block DB1 is in the main programming cycle OB1. In OB1 is also realized incrementation of input variable “VALUE” for demonstration of displaying the entire numerical range -9999 to +99999. Other functions of display, that is displaying symbols before and after the main numerical information, displaying decimal point, controlling flashing and changing display’s brightness are also contained in FB1 interface. A list of all blocks in sample project is in Figure 3 – Step7 project ELEN\_NDI.

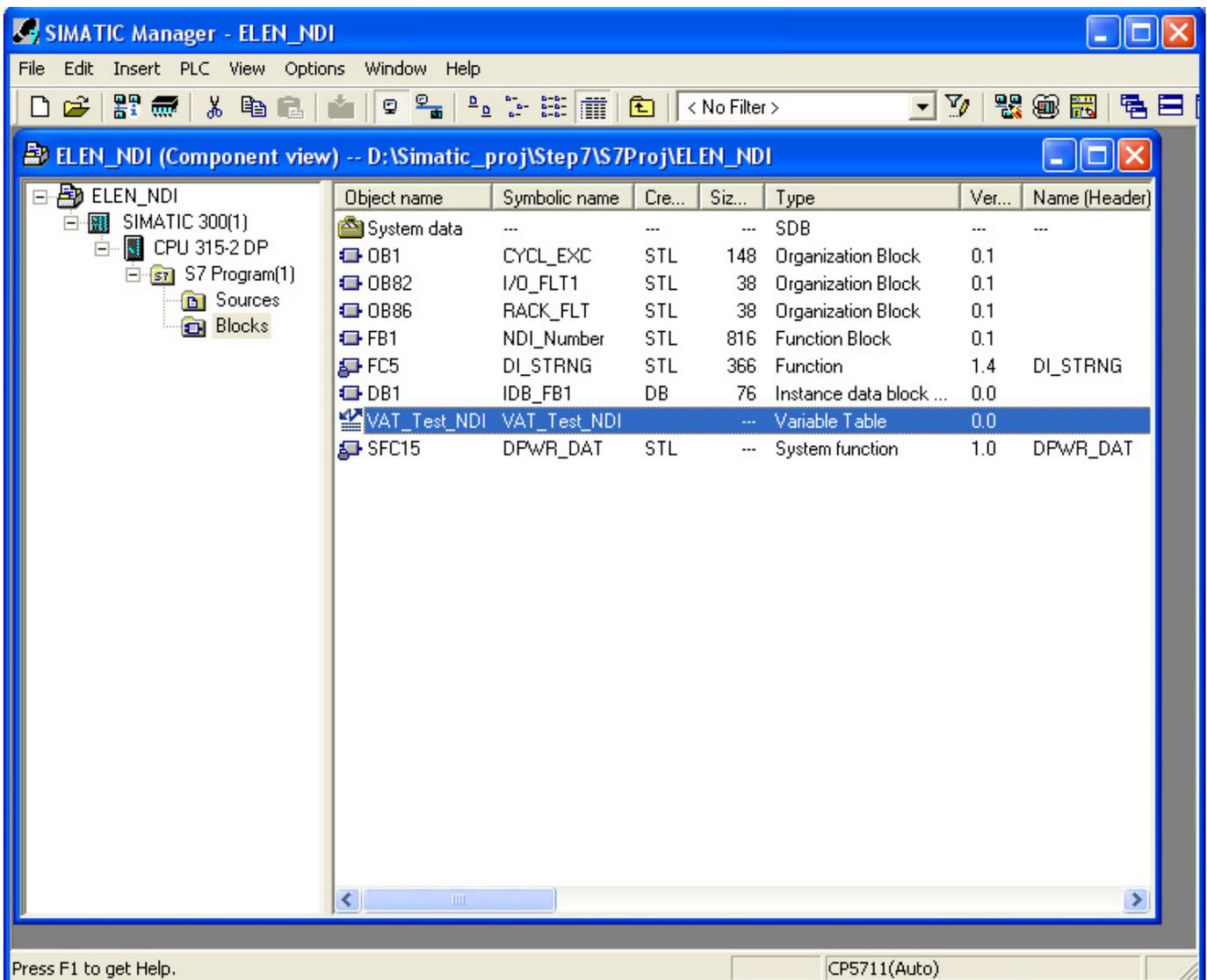


Figure 3 - Step7 project ELEN\_NDI

## 4. Parameters FB1

### 4.1. DATA

First input parameter is PerAdr, it serves for setting the beginning peripheral display address. It is actually Q address in slot 1 (DATA) of HW configuration.

Input parameter DisVal is variable of DINT type, which will be displayed on 5 positions of 7-segment display. This parameter is transferred in first part of telegram, that is in 1<sup>st</sup> slot of "DATA" at address QB256 through QB260 in our HW configuration. As was already mentioned, conversion of variable DisVal from DINT to string is made in FB1. Besides numbers, NDI display can also show other characters:

Letters: 'A','b','C','d','E','F','G','H','I','J','L','n','O','P','r','S','t','U','Y'.

Characters: ',', '?', '@', '\_', '|', '°'

Input parameter DP is variable of type BYTE and serves for displaying decimal point. In binary representation 2#0000\_0000 corresponds to displaying number DisVal without decimal point. Value 2#0000\_0001 will display decimal point after first position from left, that is „1.2345“. Value 2#0001\_0000 will display decimal point after last that is fifth position from left, that is „12345.“ The remaining bits, that is 2#1110\_0000 have no significance. This parameter is transferred in the first part of telegram, that is in 1<sup>st</sup> slot "DATA" at address QB261 in our HW configuration.

OB1 : "Main Program Sweep (Cycle)"

Comment:

Network 1: Title:

Comment:

L	"VALUE"	MD100	-- Dint value for display
L	L#1		
+D			
T	"VALUE"	MD100	-- Dint value for display
L	L#99999		
>D			
JCN	www		
L	L#-9999		
T	"VALUE"	MD100	-- Dint value for display
www:	NOP 0		
CALL	"MDI_Number", "IDB_FB1"	FB1 / DB1	-- Display ELEM model NDI, inter
PerAdr	:=256		
DisVal	:= "VALUE"	MD100	-- Dint value for display
DP	:= "DP"	MB104	-- Decimal point position (bit0
Front	:= "Front"	MB105	-- Front part of display ( bit0=
Rear	:= "Rear"	MB106	-- Rear part of display ( 00=" "
Flashing	:= "Flashing"	MB107	-- Flashing display ( 00=no flas
Bright	:= "Bright"	MW108	-- Brightness of display 0-100 %

1: Error 2: Info 3: Cross-references 4: Address info. 5: Modify 6: Diagnostics 7: Comp

Press F1 to get Help. offline Abs < 5.2 Nw 1 Ln 12 Insert

Figure 4 – Calling FB1

DATA byte	0	1	2	3	4	5
Meaning	1 <sup>st</sup> character	2 <sup>nd</sup> character	3 <sup>rd</sup> character	4 <sup>th</sup> character	5 <sup>th</sup> character	Decimal point
Address in CPU S7	QB256	QB257	QB258	QB259	QB260	QB261
Example content	'1'	'2'	'3'	'4'	'5'	2#0000_0001

Example content DATA will display number 1.2345, that means decimal point is in position after first 7-segment field.

## 4.2. STATUS

Input parameter Front is variable of type BYTE, which controls displaying symbols in first part of display, that is before five 7-segment fields. In binary representation value 2#0000\_0000 corresponds to empty field of first displaying part, value 2#0000\_0001 activates displaying symbol "NET", value 2#0000\_0010 activates displaying symbol „-0-“ and value 2#0000\_0011 activates displaying both symbols “-0-“ and “NET“. Other bits of this byte have no significance. This parameter is transferred in second part of telegram, that is in 2<sup>nd</sup> slot "STATUS" at address QB262 in our HW configuration.

Input parameter Rear is variable of type BYTE, which controls displaying symbols in end part of display, that is after five fields of 7-segment display. In decimal representation value 0 corresponds to empty field of last display part, value 1 activates displaying symbol "g", value 2 activates displaying symbol "kg" and value 3 activates displaying symbol "t". Other decimal values of this byte have no significance. This parameter is transferred in second part of telegram, that is in 2<sup>nd</sup> slot "STATUS" at address QB263 in our HW configuration.

Input parameter Flashing is variable of type BYTE, which controls flashing of display. In binary representation value 2#0000\_0000 corresponds to turning off display's flashing, value 2#0000\_0001 activates flashing of the main information on 5 fields of 7-segment display, value 2#0000\_0010 activates flashing of symbol "NET" in 1<sup>st</sup> part of display, value 2#0000\_0100 activates flashing symbol “-0-“ in first part of display and value 2#0000\_1000 activates flashing of symbols “g“, “kg“ and “t“ in last part of display. Other bits of this byte have no significance. This parameter is transferred in the second part of telegram, that is in 2<sup>nd</sup> slot "STATUS" at address QB264 in our HW configuration.

Input parameter Bright is variable of type INT, which controls display's brightness. In decimal representation values 0 to 100 corresponds to brightness intensity 0-100%. Other decimal values have no significance. This INT variable is in FB1 converted to BYTE format. This parameter is transferred in second part of telegram, that is in 2<sup>nd</sup> slot "STATUS" at address QB265 in our HW configuration.

STATUS byte	0	1	2	3
Meaning	Symbols before data part	Symbols after data part	Flashing	Brightness
Address in CPU S7	QB262	QB263	QB264	QB265
Example content	2#0000_0001	2	2#0000_0010	100

Example of STATUS content will display "NET 1.2345 kg", while symbol "NET" will flash and display will have a maximum brightness level of 100%.

In case of communication loss, for example interruption of profibus communication link will cause display to show dashes "-----" in all five 7-segment field positions.

If communication link is OK and CPU is in STOP mode, the whole display will be turned OFF.

### 5. VAT table

On figure 5 - Vat\_Test\_NDI is a VAT table for rewriting variables, declared when calling FB1 in the main block OB1, it is suitable for testing all functions of NDI display.

	Address	Symbol	Symbol comment	Display format	Status value	Modify value
1						
2	MD 100	"VALUE"	Dint value for display	DEC	L#43227	L#0
3	MB 104	"DP"	Decimal point position (bit0=1.pos, from left ... bit4=5.pos)	BIN	2#0000_0000	2#0000_0000
4	MB 105	"Front"	Front part of display ( bit0=NET, bit1=-0- )	BIN	2#0000_0011	2#0000_0011
5	MB 106	"Rear"	Rear part of display ( 00=" ", 01="g", 02="kg", 03="t" )	BIN	2#0000_0010	2#0000_0010
6	MB 107	"Flashing"	Flashing display ( 00=no flash, 01=value, 02=NET, 04= -0-, 08=rear)	BIN	2#0000_0000	2#0000_0000
7	MW 108	"Bright"	Brightness of display 0-100 %	DEC	100	100
8	DB1.DBB 6	"IDB_FB1".DP	Decimal point position (bit0=1.pos, from left ... bit4=5.pos)	HEX	B#16#00	
9	DB1.DBB 7	"IDB_FB1".Front	Front part of display ( bit0=NET, bit1=-0- )	HEX	B#16#03	
10	DB1.DBB 8	"IDB_FB1".Rear	Rear part of display ( 00h=" ", 01h="g", 02h="kg", 03h="t" )	HEX	B#16#02	
11	DB1.DBB 9	"IDB_FB1".Flashing	Flashing display ( 00=no flash, 01=value, 02=NET, 04= -0-, 08=rear)	HEX	B#16#00	
12	DB1.DBW 10	"IDB_FB1".Bright	Brightness of display 0-100 %	DEC	100	
13						
14	DB1.DBB 12			HEX	B#16#10	
15	DB1.DBB 13			HEX	B#16#06	
16	DB1.DBB 14	"IDB_FB1".Str_conv[1]	String from conversion	CHARACTER	'4'	
17	DB1.DBB 15	"IDB_FB1".Str_conv[2]	String from conversion	CHARACTER	'4'	
18	DB1.DBB 16	"IDB_FB1".Str_conv[3]	String from conversion	CHARACTER	'3'	
19	DB1.DBB 17	"IDB_FB1".Str_conv[4]	String from conversion	CHARACTER	'2'	
20	DB1.DBB 18	"IDB_FB1".Str_conv[5]	String from conversion	CHARACTER	'2'	
21	DB1.DBB 19	"IDB_FB1".Str_conv[6]	String from conversion	CHARACTER	'7'	
22						
23						

ELEN\_NDI\SIMATIC 300(1)\...57 Program(1) RUN Abs < 5.2

Figure 5 - Vat\_Test\_NDI