FAQ Communication over PROFIBUS

Service & SUPPORT

FDL connection over PROFIBUS between PC station and SIMATIC S7



FAQ



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Question

How do I configure a FDL connection to a SIMATIC S7 over PROFIBUS for the SIMATIC NET OPC Server with the SIMATIC NET PC Software?

Answer

The instructions and notes listed in this document provide a detailed answer to this question.

1 Assignment of tasks

In this example a CP5611 is used, that implements FDL communication over the OPC Server with a S7 station on PROFIBUS.

NOTE The method described in these instructions also applies to the communications processors CP5613/14 (A2), CP5621, CP5511 and CP5512.

1.1 Condition

It is assumed that one of the two following configuration tools is installed:

• NCM PC

NCM PC is supplied with the SIMATIC NET CD and allows you to create PC projects and open STEP 7 projects. It is, however, not possible to edit S7 blocks in the STEP 7 project with this software.

 STEP 7 STEP 7 is a separate software package with which you can create S7-400, S7-300 and PC projects. S7 blocks can be edited with this software.

Only one of these tools can be installed.

In chapter 2 "Configuration of the PC station" is described the configuration of PC station so that you can use the FDL communication over PROFIBUS to exchange data between PC station and S7 station.

2 Configuration of the PC station

After successful completion of the hardware and software installation of the SIMATIC NET CD and the configuration tool and after restarting your computer, you start NCM PC or STEP 7 with "Start \rightarrow (in Windows XP: All Programs \rightarrow) SIMATIC \rightarrow SIMATIC Manager or SIMATIC NCM PC Manager or using the desktop icon of the same name.

Create a new project with "File \rightarrow New".

Example F:\Program Files\SIEMENS\SIM	ATIC.NCM\S7p	roj\Exampl
د [>
ame:	Type:	
am_e: C_Station	Lype: Project	
ame: C_Station	Lype: Project □ E Libra	<u>r</u> y

Figure 2-1 giving the project a name

Confirm the project name you have entered (in the example: "PC_Station") with OK. An empty STEP 7 or NCM PC project is then created.



Figure 2-2 inserting the PC station	
Ele Edit Insert PLC View Options Window Help D 2 22 22 22 22 22 22 22 22 22 22 22 22	
PC_Station C:\Program Files\SIEMENS\SIMATIC.NCM\S7proj\PC_Stati	
Press F1 to get Help. CP5611(MPI)	1.

With the menu command "Insert \rightarrow Station \rightarrow SIMATIC PC Station", you insert the PC station.

Figure 2-3 changing the name of the PC station





Give the PC station you have just inserted the same name as your computer (in the example: "PC_Station").

Now open the hardware configuration of the PC station by selecting the PC station, then pressing the right mouse button and selecting "Open Project" (STEP 7: "Open Object").

Figure 2-4 hardware configuration of the PC station



You will see an empty rack. If you cannot see the hardware catalog, click on the button marked in red.

Now place your PC modules in this rack (for example by dragging them from the hardware catalog).

If you use a CP5613/14 (A2) (or CP5511 or CP5512) you will select the CP5613/14 (A2) (or CP5511 or CP5512) from the STEP7 hardware catalog.

If you use a CP5611 A2 or CP5621 you will configure these modules as CP5611.

The following dialog appears automatically after you insert the module in the PC station.



Figure 2-5 address assignment dialog

Properties -	PROFIBU	S interface	CP 5611 (R0/S5)		
General I	Parameters				
<u>A</u> ddress: Highest add	dress: 126	2	If a subnet is se the next availab	ected, de address is s	uggested.
Transmission	n rate: 1.5 M	bps			
not ne	tworked		1.5 Mbox		<u>N</u> ew
	2(1)		т.э төрэ	Pro	operties
					Dejete
OK]			Cancel	Help

In this dialog you set the PROFIBUS address of the CP5611. Following you select the existing PROFIBUS subnet and close the dialog with "OK". So you assign the CP5611 to an existing network.

If there isn't an existing PROFIBUS subnet you will click the button "New" to create a new PROFIBUS subnet which you assign to the CP5611.

The configuration and networking of the CP5611 is finished now.

Following you select the OPC server in the hardware catalog and then drag it to any slot.



HW Konfig	g - PC_Station					_ 0
ation Bear	beiten Einfügen Zie	lsystem <u>A</u> nsicht E <u>x</u> tras <u>F</u> e	nster Hilfe		<u>1120 (3)</u>	
) 🖻 🔓			₩ №			
PC_Stati	ion (Konfiguration) -	- FAQprojekt_IE_SR			Suchen:	mt.
(0) PC					Profil:	Standard
2	OPC Server				+ # F	PROFIBUS-DP
						PROFIBUS-PA
					1 문 짦 [PROFINET IO
2						SIMATIC 300
7						SIMATIC PC Based Control 300/
3						SIMATIC PC Station
3 📲	CP 5611				ē-(Benutzer Applikation
10						 Applikation
1						E- CPC Server
É.						SW V6.0 SP4
						SW V6.0 SP5
← ⇒ 1	(0) PC					
[[1 Paulallauran	1 c	I NOLAHA		Controller
Index 1	Baugruppe	Besteinummer	Firmware	MPT-Adres:	Đ-(CP-Industrial Ethernet
2	OPC Server		V6.2.1		P	
3	0.000.00					
4					4	•
5					OPC Ser	ver
6					OPC Ser	ver für die Protokolle DP,
/ 					ISO/TCF	5, 57(subnetzubergreifend), — P, SNMP, DP Master Klasse — I
<u> </u>					Constanting of the	

Figure 2-6 finished hardware configuration of the PC Station

Now open the NetPro program. Use the button marked red in the toolbar in Figure 2-7 button "NetPro.

Figure 2-7 button "NetPro"



In NetPro you configure a FDL connection to exchange data between the OPC server and the S7 station.







Select the OPC server and choose the menu command "Insert \rightarrow New Connection" to create a new connection for the OPC server or right-click the OPC server \rightarrow "Insert \rightarrow New connection".



ert New Co	onnection	2
Connection	Partner	
- <mark> </mark>	the current project) FAQprojekt_PB_FDL SIMATIC 300(1) CPU 314 (Unspecified)	
- Bala	All broadcast stations All multicast stations	
		E.
Project:	FAQprojekt_PB_FDL	₹ <u></u>
Project: Station:	FAQprojekt_PB_FDL SIMATIC 300(1)	₹ <u></u>
Project: Station: Module:	FAQprojekt_PB_FDL SIMATIC 300(1) CPU 314	₹ <u></u>
Project: Station: Module: Connection	FAQprojekt_PB_FDL SIMATIC 300(1) CPU 314	₹
Project: Station: Module: Connection Type:	FAQprojekt_PB_FDL SIMATIC 300(1) CPU 314 FDL connection	
Project: Station: Module: Connection Type:	FAQprojekt_PB_FDL SIMATIC 300(1) CPU 314 FDL connection	₹ <u>≺</u>

Figure 2-9 insert a new connection in NetPro

If the communication partner is configured in the same STEP 7 project like the PC station you can select the relevant communication partner directly. In this case the communication partner is a S7 station with PLC 314. Select the connection type "FDL connection". The FDL connection is created automatically.

Close the dialog "Insert New Connection"with "OK".

If the communication partner isn't configured in the same STEP 7 project like the PC station you will configure an unspecified connection. Select "unspecified" in the dialog box "communication partner".

If you select the OPC server in the PC station you will see the FDL connection you have just created in the connection table.





Figure 2-10 connection table with created FDL connection

Now the configuration of the of the FDL connection is finished.

Check the PROFIBUS network settings to know if you have to change declarations concerning the transmission rate and the bus profile. Therefore right-click the PROFIBUS subnet which is assigned to the PC station and S7 station and open the object properties of the PROIBUS subnet.





In the object properties of the PEOFIBUS subnet you have to change to the register "Network Settings". Adapt the transmission rate and the bus profile. The parameters have to be identically for all members of the PROFIBUS subnet.

NOTICE For FDL communication over PROFIBUS you have to use the bus profile "Standard".



5 11 5				
Properties - PROFIBUS				
General Network Settings				
Highest PROFIBUS Address:	126 💌	└ <u>C</u> hange	Option	s
Iransmission Rate:	45.45 (31.25) Kbps 93.75 Kbps 187.5 Kbps 500 Kbps 1.5 Mbps			
<u>P</u> rofile:	DP Standard Universal (DP/FMS) User-Defined		<u>B</u> us Param	neters
ОК			Cancel	Help

Figure 2-12 property view of the PROFIBUS subnet

Close the property view of the PROFIBUS subnet with "OK".

Save and compile the S7 project. Therefore select the PC station in NetPro and click the button "Save and Compile" in the toolbar. This updates the information in the S7 project.

Figure 2-13 Save and compile

Compile and check everything
Compile changes <u>o</u> nly

Note Warning indications can be displayed while proceeding with the "Save and Compile" of a S7 project. Warnings serve as piece of information and have no functional effect. In case error warnings occur, search for possible divergences in the previous steps of the instructions.

3 Download the configuration into PC station

Open the "Station Configuration Editor" in the Windows START Menu \rightarrow "Station Configuration Editor" or with the following button in the Windows task bar.

Figure 3-1 button "Station Configuration Editor"



Figure 3-2 Station	Configuration Editor
--------------------	----------------------

				prov	-•** //		
Index	Name	Туре	Ring	Status	Run/Stop	Conn	
1							
2							1
3							
4							
5				_			4
6							
7							-
8			_	-	-		1
9				_			-
10	-						4
11							
12							+
13				-	-		+
14				-	-		+
10							
10							
New dia	gnostic entry arrive	edl					
	Add	Edit	1 0)elete	1	Ring ON	
Sta	ion Name	Import Station	5		Dis	able Stati	on

Click the button "Import Station...". A message about restarting the PC station will open.



Figure 3-3 r	nessage about restarting the PC station	
Station Co	nfiguration Editor	×
<u>.</u>	 The station will be restarted. Make sure that no communication is active over the components involved. Do you want to import the station? 	
Yes		

Confirm the message about restarting the PC station with "Yes". The following dialog to select the XDB file, which should be import, opens.

Figure 3-4 selecting the XDB file



In this dialog you enter the path of the XDB file. The XDB file is always created in the project by NCM PC / STEP 7 (see Figure 2-1 giving the project a name). With the combo box "Search in: "you navigate in the path of the XDB file.



1	ridino	Туре	Status	Error	-
2	OPC Server	OPC Server			
3					
4					
5					
6					
7					1
8					
9	IF CP 5611	CP 5611			
10					
11					
12					
13					
14					
15					
16					1

Figure 3-5 information from the XDB file

As information, you can see once again which modules and applications are configured in the XDB file.



tation:	PC_Station		Mode:	RUN	LP	
Index	News	Ture	Dine	Chalter	-	Court
Index	Name	Туре	Fing	Status	Run/Stop	Conn
2	DPC Server	OPC Server		চর		
3		01 C 361461			· ·	
4						
5						
6						
7						
8					-	
9	CP 5611	CP 5611		1	0	\$
10					· · · ·	
11						
12						
13						
14						
15						
16						
17						
ew dia	gnostic entry arrived!					
	<u>A</u> dd	<u>E</u> dit		<u>D</u> elete		Ring <u>O</u> N
Stal	ion Name	Import Station	1		Dis	able Station

. . . .

Now the import of the XDB file is finished and the configuration is downloaded.

In the column connection, which is marked red, you see that the connection is also been downloaded.

So the configuration of the PC station is finished.

NOTE After downloading the configuration into PC station you have to download the configuration of the FDL connection to the S7 station.

> You have to download the configuration of the FDL connection into PC station and to S7 station.

4 Description of the S7 program

In the S7 program you have to call the communication blocks FC5/50 "AG_SEND/AG_LSEND" and FC6/60 "AG_RCV/AG_LRCV". You can find the communication blocks in the SMATIC_NET_CP library under CP 300→Blocks and CP 400→Blocks respectively.

In this example is used a S7-300 station. For this reason the communication blocks FC5 "AG_SEND" and FC6 "AG_RCV" are used.

There are the communication blocks FC50 "AG_LSEND" und FC60 "AG_LRCV" for the S7-400 station.

Open the STEP 7 project.

Open the SIMATIC_NET_CP libary in the SIMATIC Manager with the menu command "File \rightarrow Open \rightarrow Libaries".

Figure 4-1 opening the SIMATIC_NET_CP libary

Name	Storage path
Redundant IO (V1)	C:\Siemens\Step7\S7libs\RED_I0_0
SIMATIC_NET_CP	C:\Siemens\Step7\S7libs\simation
Standard Library	C:\Siemens\Step7\S7libs\StdLib30
stdlibs (V2)	C:\Siemens\Step7\S7libs\STDLIBS
	Gelected
ser Projects:	Selected
ser Projects: [braries: [Selected
ser Projects: [braries: [ample Projects: [Selected

You can find the communication blocks FC5 "AG_SEND" und FC6 "AG_RCV" in the SIMATIC_NET_CP library under CP 300 \rightarrow Blocks.



Figure 4-2 copy FC5 and FC6			
SIMATIC Manager - [SIMATIC]	NET_CP C:\S	iemens\Step7\S7	libs\simaticn]
🔏 File Edit Insert PLC View	Options Window	Help	
			No Filter >
□- 11 SIMATIC_NET_CP	FB2	🕞 FB3	🕞 FB4
🖻 🗊 CP 300	5 FB12	🚛 FB13	🔂 FB14
Bausteine	FC4	FC5	FC6
	50 FC42	🚛 FC43	🕞 FC44
	SFC1	SFC20	SFC24
	Г	-	-

Copy the communication blocks FC5 and FC6 in the folder "Blocks" of your S7 program.

You cyclical call the FC5 "AG_SEND" in the OB1.

Figure 4-3 calling the FC5 "AG_SEND"

Netwo	rk 1: Title:
Conne	nt:
	CALL "AG_SEND" ACT := ID := LADDR := SEND := LEN := DONE := ERROR := STATUS :=

The "ID" and "LADDR" function parameters were already specified by the connection set up in NetPro.

You can enter these parameters automatically with the right mouse button and "Connections".



U		0.			U
	CALL "	AG_SE	ND"		
	ID LADDR	;=	Paste	Ctrl+V	
	SEND LEN	20 20	Delete	Del	
	DONE ERROR	;= ;= :=	Insert Network Insert Symbol	Ctrl+R Ctrl+J	
	SIATUS		Go To Edit Symbols	► Alt+Return	
			Connections		

Figure 4-4 setting parameters ID and LADDR eintragen

In the next dialog you select the FDL connection which you have configured in NetPro for the S7 station.

Confirm the dialog with "OK".

Figure 4-5 selecting FDL connection

allable connections.	<u>.</u>	7	Lorun	TILCLIN	L - MOG
Connection Type	Local ID	Partner Station / M	odule	Local	R
DL connection	0001 A000	SIMATIC PC-Statio	n/0	CP 34	0/4
Block parameters for	FC5 (AG_SEN	ID)		Propert	ies
Block parameters for 1 W#16#0100	FC5 (AG_SEN	ID)		Propert New Conn	ies

It's also possible to find out the values of the parameters in the property view of the FDL connection which is configured for the S7 station.



ion
>

Call the FC6 "AG_RCV" and parameterize this function block in the same way like the FC5 "AG-SEND".

A sample program for calling FC5 / FC6 might look as shown below.



Figure 4-7 sample program FC5/6

		м	100.0		
	s	M	0.0		
	~		0.0		
	CALL	"AG_S	SEND"		//AG_SEND block call
	ACT	:=M0	0.0		//Job triggered by memory bit
	ID	:=1			//Connection ID from NETPro
	LADDI	R :=₩#	#16#100		//Load address from NETPro
	SEND	:=P#	ØDB10.DBX0.0	BYTE 50	//Buffer with send data
	LEN	:=50	D		//Length info for send data
	DONE	:=MJ	10.0		<pre>//job ready without error</pre>
	ERROR	R :=M1	10.1		//job ready with error
	STATI	US:=MU	J11		//Status code
	0	м	10.0		
	õ	M	10.1		
	S	м	100.0		
	U	м	0.0		
	R	м	0.0		
	R	м	100.0		
	UN	м	10.1		
	SPB	noER			
	L	MU	11		
noER:	SET				
	CALL	"AG 1	ercv"		//AG RECV block call
	ID	:=1	201		//Connection ID from NETPro
	LADDI	R :=W#	#16#100		//Load address from NETPro
	RECV	:=P#	#DB10.DBX0.0	BYTE 50	//Buffer for receive data
	NDR	:=M2	20.0		//job ready without error
	ERROR	R :=M2	20.1		//job ready with error
	STATI	US:=MW	J21		//Status code
	LEN	:=M	J23		//really received mount of data

Save the program you have created and download the blocks to the S7 station.

5 Establish the connection with the OPC-Scout

Start the OPC Scout with "Start \rightarrow SIMATIC \rightarrow SIMATIC NET \rightarrow OPC Scout".

Double-click the "OPC.SimaticNet"for connection with the SIMATIC NET OPC server. In the dialog that appears, enter a suitable group name and confirm this with OK.

Figure 5-1 connecting with the OPC server and enter a group name

🖻 🖬 🛃 🚂 🗐	
Servers and groups	Items incl. status information
⊡ 💑 Server(s)	ltem I
E- 📕 Local Server(s)	1
OPC.SimaticNET	
Add Group	
Group Properties: Enter a ' <u>G</u> roup Name':	
Group Properties: Enter a ' <u>G</u> roup Name': FDL Create <u>n</u> ew group active	
Group Properties: Enter a ' <u>G</u> roup Name': FDL Create <u>n</u> ew group active	<u>N</u>
Group Properties: Enter a ' <u>G</u> roup Name': FDL Create <u>n</u> ew group active Requested <u>update</u> rate in ms	

Double-click the OPC group which you have created. The "OPC-Navigator" opens. You will now see your protocols in the OPC-Navigator. Double-click on "FDL". The connection name you have configured in NetPro appears.



Figure	5-2	OPC-Navigator
riguie	0-z	Of O-Mavigator

Nodes	Leaves	Item Nam Bas
Connections		
🕀 🍻 DX		
🖻 🏘 \DP2:		
🕀 🊧 NDP:		
🖻 🔁 VFDL:		
Generation1		
⊡ go \FMS:		
⊡ ∰a VPNIO:		
⊡-@100, \S7:		
ternen and some:		
⊞~ (R \SR:		

Double-click the configured connection to define new items for the communication and to insert existing items respectively.

If you select "send" ", an item appears in the middle section. Move this "send" item to the right-hand window with the button " \rightarrow ". Double-click the item in the right-hand window.

Figure 5-3 insert "send" item

🙀 OPC-Navigator			1
Nodes ⊕ ∰ Connections ⊕ ∰ DX ⊕ ∰ NDP2. ⊕ ∰ NDP:	Leaves Item Nam Basis OrgName	he listed Item(s) will be add DL:[FDL Connection1]sen	d
EDL Connection1 ⊕ Galaria send ⊕ Galaria send ⊕ Galaria send ⊕ Galaria sens ⊕ Galaria Se	Enter an item with the following Syntax: [Devicename]Itemname [FDL:[FDL Connection1]send Modify Item Cancel		
⊕ 44 , \SNMP: ⊛ 44 , \SR:	Enter an Item	Eilter <u>O</u> K	Cancel
send is selected		1/26/2004	8:20 AM

Change the name of the item (see Figure 5-4 changing the name of "send" item) and click on the button "Modify Item" to apply the entry.



Figure 5-4 changing the name of "send" item

🚰 Modify an Item		
Enter an item with [Devicename]Iter	h the following Syntax: mname	
FDL:[FDL-Verbir	ndung-1]send 50, 80, 50	
	Modify Item	Cancel
Enter an Item		

Select "receive" in the OPC-Navigator and add the existing "receive" item, which is shown in the middle section, with the button " \rightarrow " to the item list in the right-hand window.

Close the dialog with "OK".

Figure 5-5 insert "receive" item

Nodes	Leaves	The listed Item(s)	will be added to
	n e s	FDL:[FDL-Verbind	ung-1]receive ung-1]send 50, B0
()		<u>≤</u> <u>Eilter</u> <u>D</u> K	Cancel

NOTE The send job is triggered by setting the memory bit 100.0 on the S7 station once manually. This starts communication between the S7 station and the PC station.

The items are adopted in the OPC Scout. If the quality of the first item is good, the connection is established. So it's possible read and write the items.



Figure 5-6 OPC-Scout



Double-click on the box "value" of the "send" item to write values into the PLC of the S7 station.

Figure 5-7 writing values

Write Value(s) to the	: Item(s)		2
Value			
{1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	01	0 0 0 0 0 0 0 0 0 0 0	10
-Formatconversion	• Sunc write		
①riginal	C Async wri	te	
С <u>H</u> ex			
C Binary	<u>0</u> K	Cancel	Apply



The default structure of the value input $\{0|0\}$ must not be modified. Only the values themselves may be modified $\{1|1\}$.

Figure 5-8 successful sending of values

Item Names	Value	Quality	Vrite Resul	Error
FDL:[FDL-Verbindung-1]receive	{0 0 0 0	good		
FDL:[FDL-Verbindung-1]send 50, 80,50	{0]0]0[0]}	good	OK	The operation completed successfully

Successful sending of values to the S7 station is displayed in the "Write Result" and "Error" columns of the OPC Scout. The "Write Result" and "Error" columns can be made visible in the "View \rightarrow Options" menu.

6 History

Version	Datum	Änderung
V 1.0	01.04.2008	Erste Ausgabe