

service & SUPPORT

**S5-compatible communication via Industrial
Ethernet between PC station and SIMATIC S5**

SIEMENS

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Question

How do I configure the S5-compatible communication to the SIMATIC S5 for the SIMATIC NET OPC server via Industrial Ethernet 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 CP 1613 is used that implements the S5-compatible communication over the OPC server with an S5 controller on Industrial Ethernet.

NOTE The same procedure applies to the CP 1613 A2, CP 1612, CP 1512 communication processor and to normal Ethernet network cards.

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.

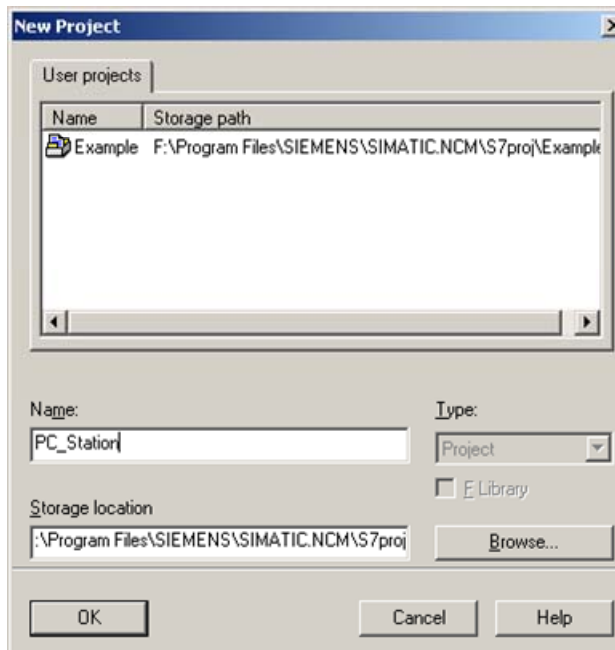
In chapter 2 “Configuration of the PC station” is described the configuration of PC station so that you can use the S5-compatible communication via Industrial Ethernet to exchange data between PC station und S5.

2 Configuration of the PC station

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

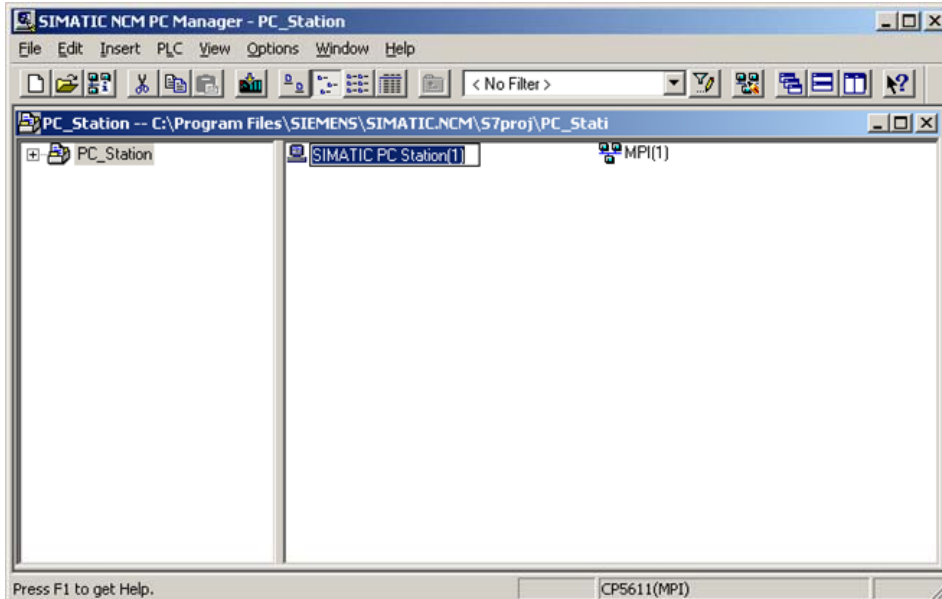
Create a new project with "File → New"

Figure 2-1 Giving the project a name



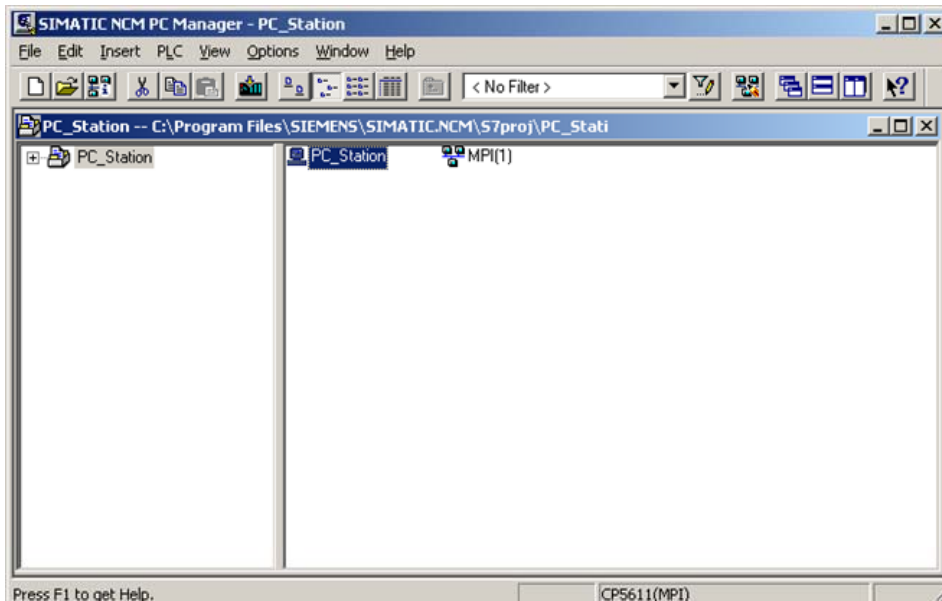
Confirm the project name you have entered (in the example: "PC_Station") with OK. An empty STEP 7 or NCM PC project is then created.

Figure 2-2 Inserting the PC station



With the menu command "Insert → Station → SIMATIC PC Station", insert the PC station.

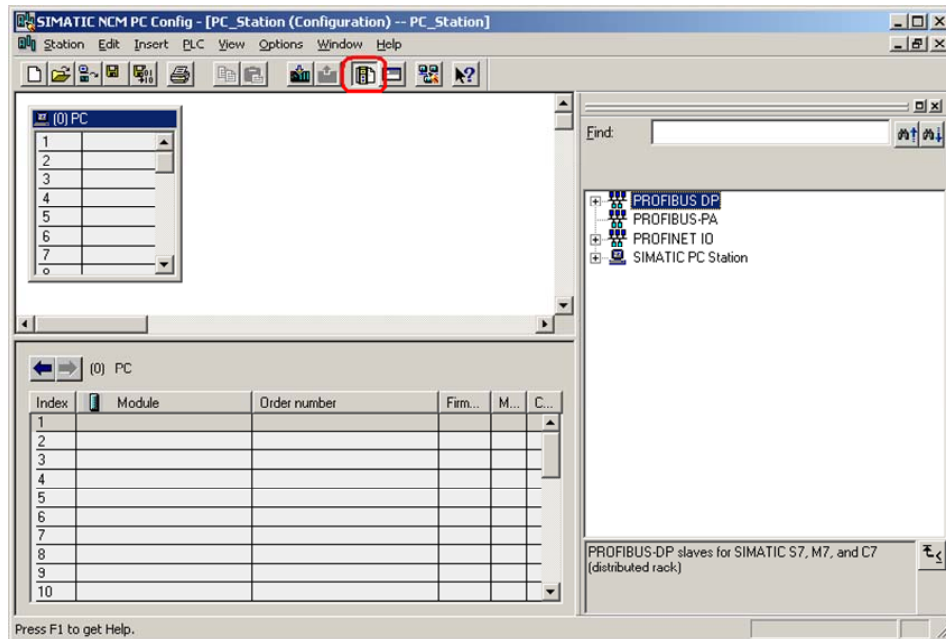
Figure 2-3 Adapting the name of the PC station



Assign the PC station you have just inserted the name of your computer (in the example: "PC_Station").

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

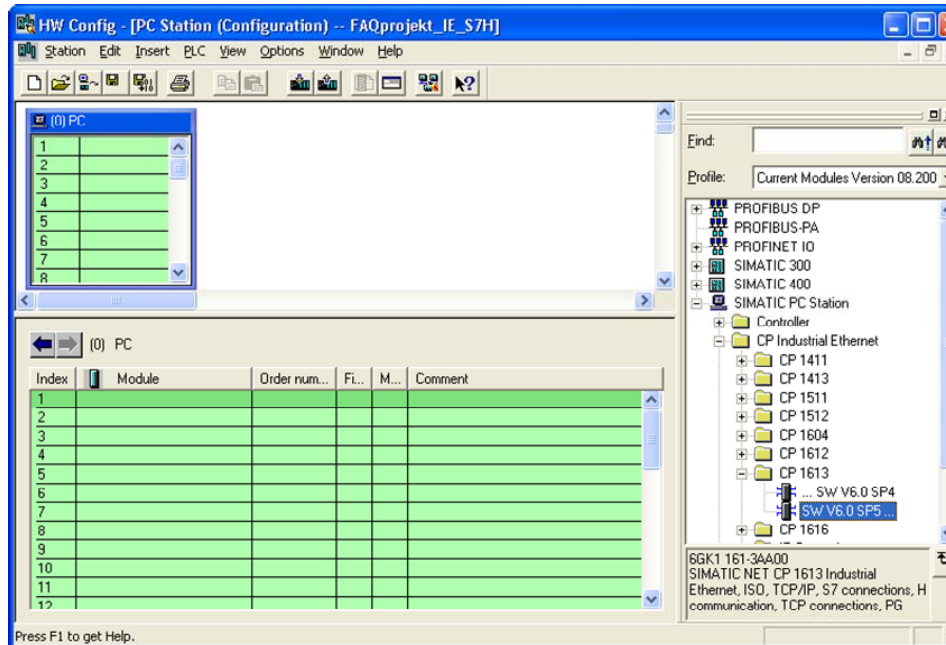
Figure 2-4 Hardware Configuration of the PC Station



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Guide_SRS5_OPC_e.doc

You will see an empty Rack. If the hardware catalog is missing click on the button marked in red.

Figure 2-5 Selecting the Modules from the Hardware Catalog

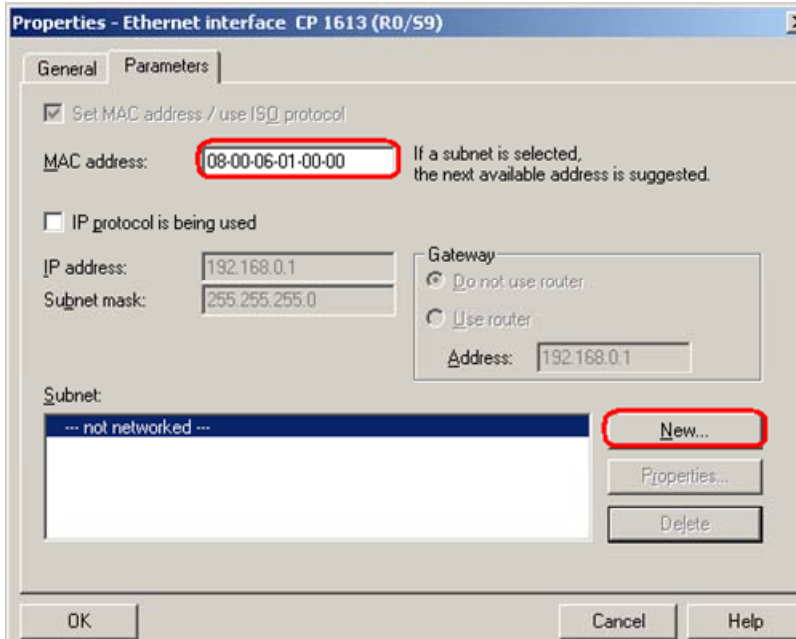


Now place your PC modules in this rack (for example by dragging them from the catalog).

If you use a normal Ethernet network card, a CP1612 or a CP1512 in your PC station, select in the STEP 7 hardware catalog the IE General instead of CP 1613.

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

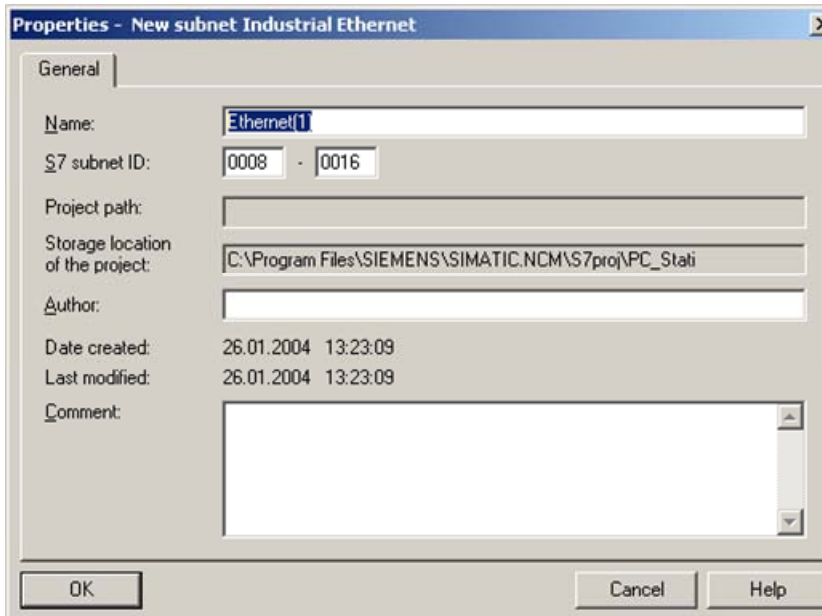
Figure 2-6 Address Assignment Dialog Box



Deselect the "IP Protocol is being used" check box and select "MAC address". Please enter the MAC address of the CP1613 and choose under subnet the already existing Ethernet network.

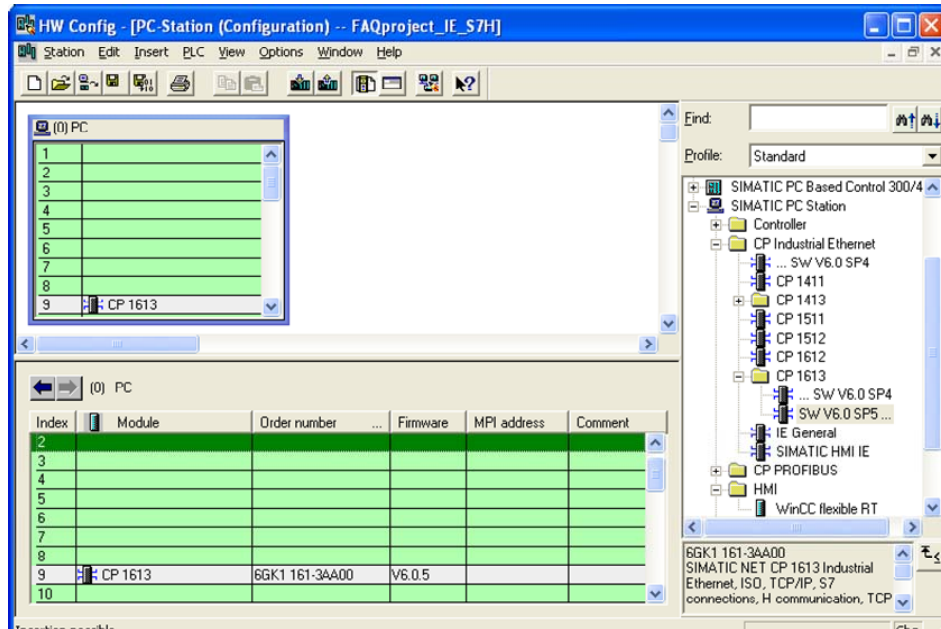
To create a new Industrial Ethernet network click on the "New" button. A further dialog will open which you have to confirm with "OK" (Figure 2-7 Setting up an Ethernet Network in STEP 7 or NCM PC).

Figure 2-7 Setting up an Ethernet Network in STEP 7 or NCM PC



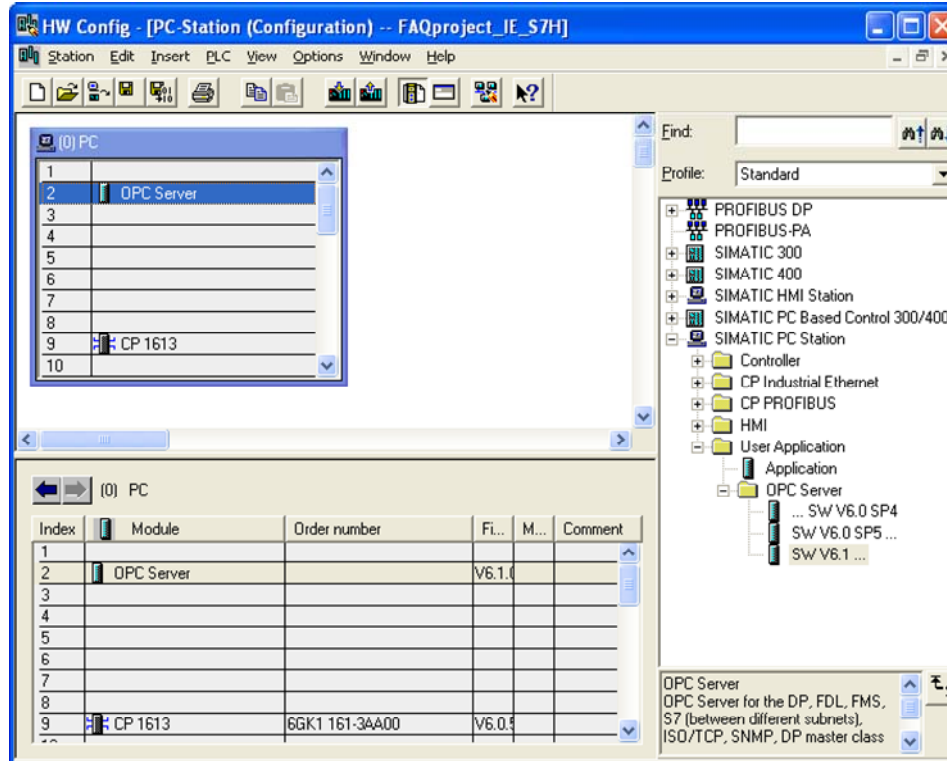
The CP1613 is now fully configured and networked. Confirm the parameter assignment with OK.

Figure 2-8 The CP1613 placed in the PC Station



The module is now plugged in a PC Station slot.

Figure 2-9 Editing OPC Server



Chose the OPC server from the hardware catalog and move it with "drag & drop" into the slot.

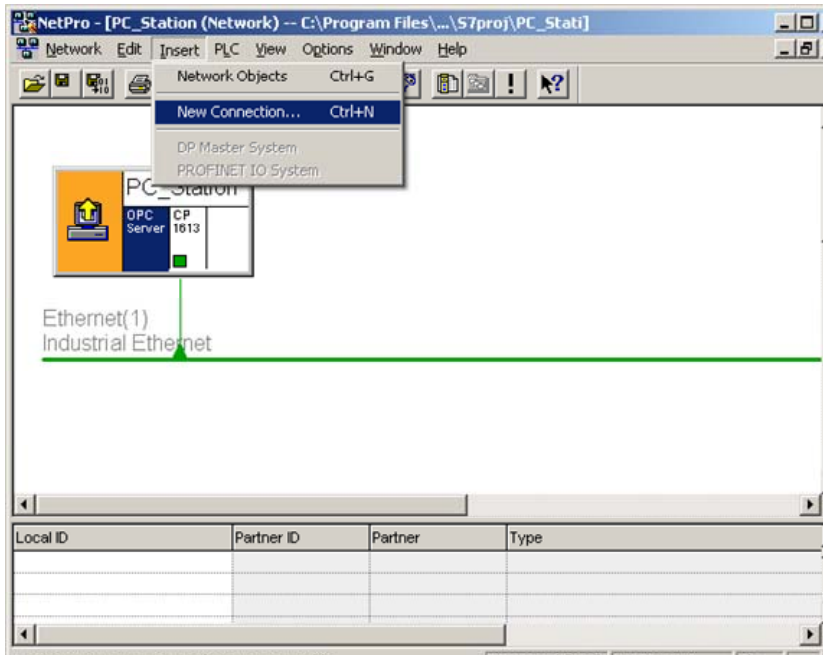
Figure 2-10 NetPro Symbol



Open the program NetPro. Use the symbol which is marked in red in the Toolbar (see Figure 2-10 NetPro Symbol).

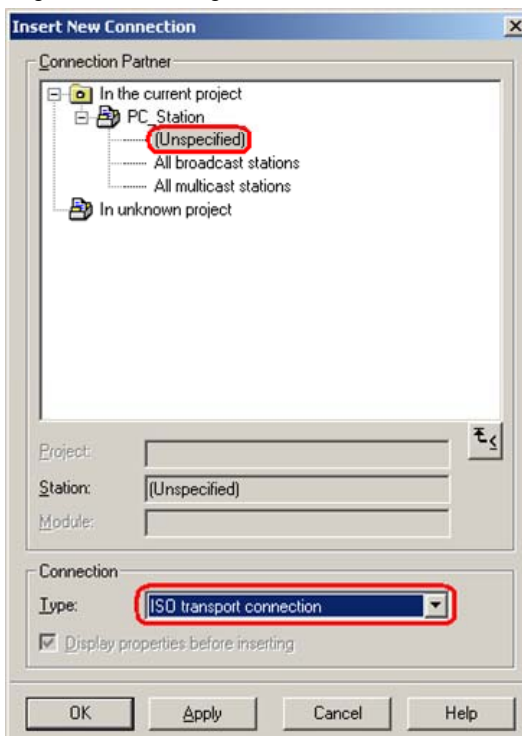
In the next step, you configure the ISO transport connection between the SIMATIC S5 station and the OPC server.

Figure 2-11 Insert a new connection in NetPro with STEP 7



To insert a connection, select the OPC server. With "Insert → New Connection", you create a connection.

Figure 2-12 Inserting a new connection in NetPro

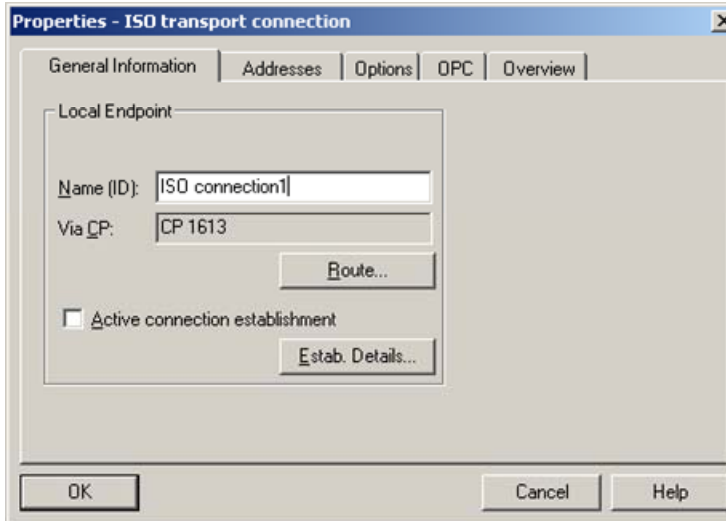


Select "unspecified" and use "ISO transport connection" as the connection type.

Unspecified means that the partner (the S5 station) of the connection is not configured in the same STEP 7 / NCM PC project like the PC station.

Exit the dialog with "Apply". The properties dialog of the connection opens.

Figure 2-13 Properties Dialog of the connection → tab "General Information"

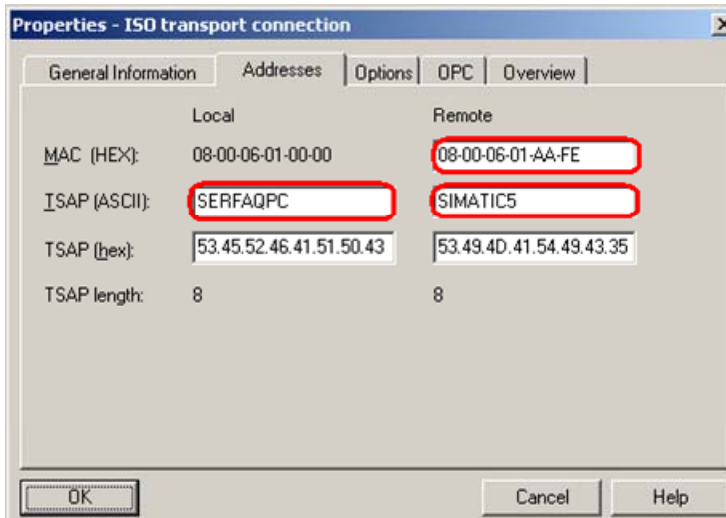


The properties dialog of the connection appears.

- Specify the connection name in the tab "General Information".
- In our example, the SIMATIC S5 establishes the connection. You should therefore uncheck "Active connection establishment".

Then change to the tab "Addresses".

Figure 2-14 Entering Addresses

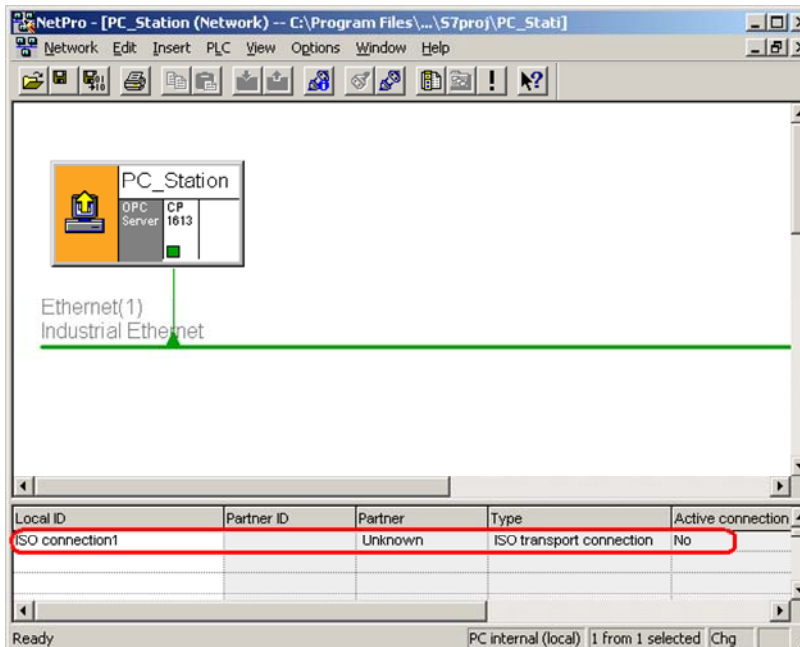


Exit the dialog with "OK" and the dialog shown in Figure 2-12 Inserting a new connection in NetPro with "Close".

NOTE The address information must be included in the connection configuration at the S5 end. Enter the MAC address of the S5 CP 1430. The TSAPs are used to identify the connection between the PC and S5.

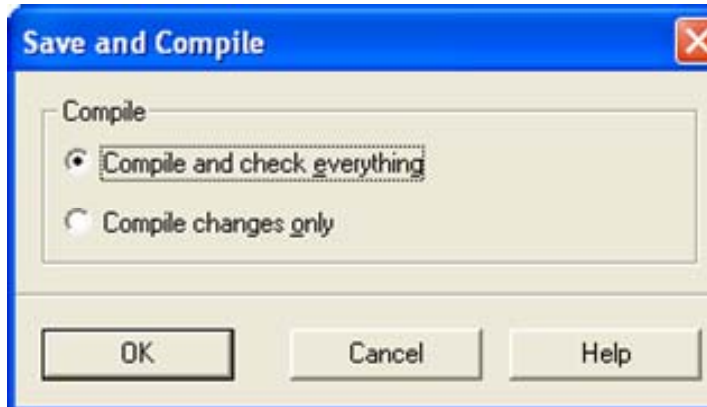
If you mark the OPC server in the SIMATIC PC station the ISO-Transport connection you have just created will be displayed in the connection table.

Figure 2-15 connection table with created ISO-Transport connection



After the ISO-Transport connection has been created the configuration is done. Save and compile the project ("Network → Save and Compile"). Proceeding that way the information in the project will be updated.

Figure 2-16 Save and Compile

**NOTE**

Warning indications can be displayed while proceeding with the “Save and Compile” of a 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.

After the configuration is finished successful you have two possibilities to download the configuration on the PC station.

2.1 Configuration and download from STEP7 or NCM PC

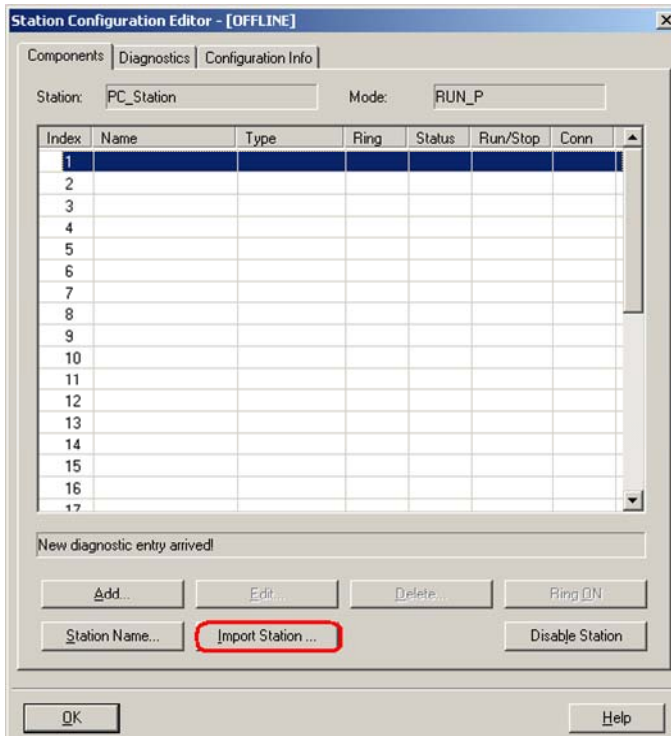
With this function it is possible to perform a configuration completely from a remote computer, if a network connection (standard Ethernet) to the target PC station is available. It is assumed that the PC station can be reached via network connection. The project engineering can be downloaded after that.

2.2 Configuration and Download via “Import Station”

With this function it is possible to download the configuration and project engineering at once also without a connection to the target PC station. Depending on the application, other configurations can be loaded.

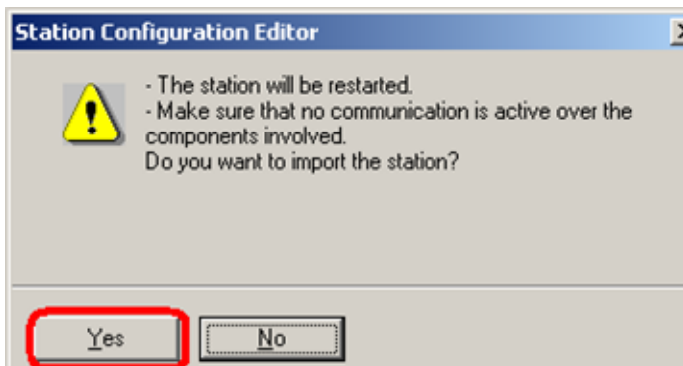
Open the “Station Configuration Editor”. You will find its icon on your desktop and also in the system tray.

Figure 2-17 Station Configuration Editor



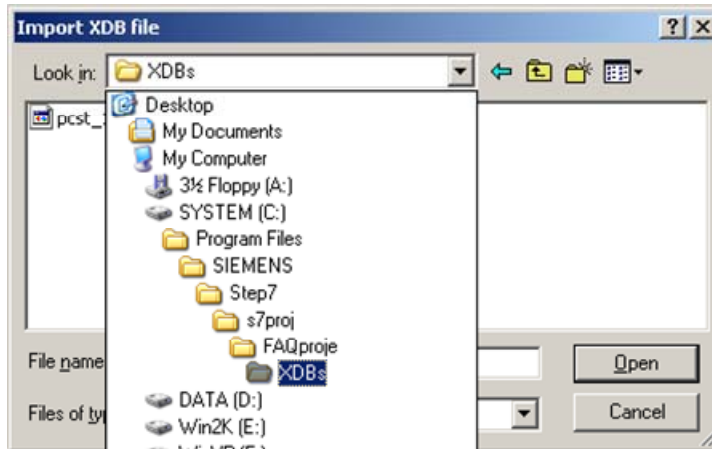
Click on the button "Import station ..." marked in red.

Figure 2-18 Import station



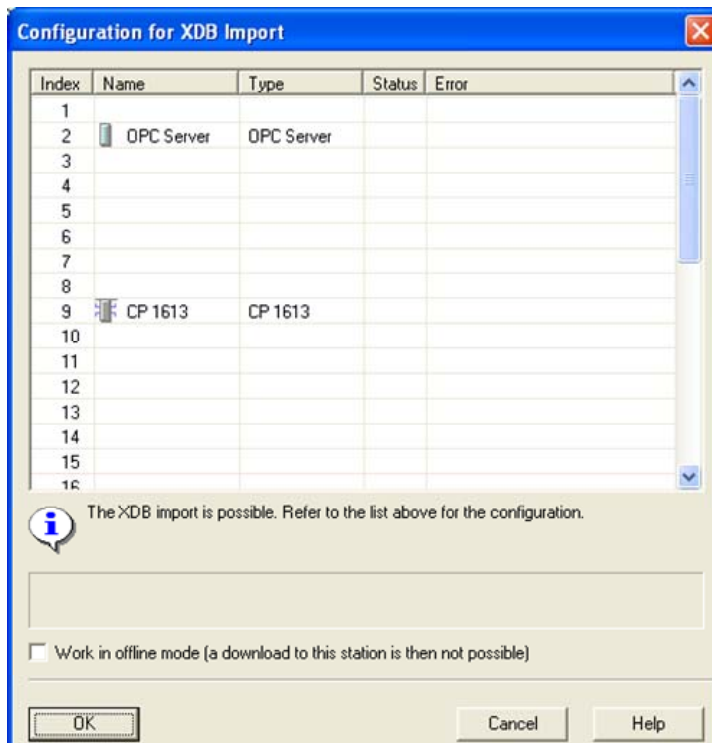
Click on the button "Yes" marked in red.

Figure 2-19 Searching for XDB



In the dropdown choose the directory which contains the *.xdb file. The XDB file is generated by STEP 7. The XDB file is always set in the project directory ".../SIEMENS/STEP 7/S7PROJ" (see Figure 2-1 Giving the project a name)

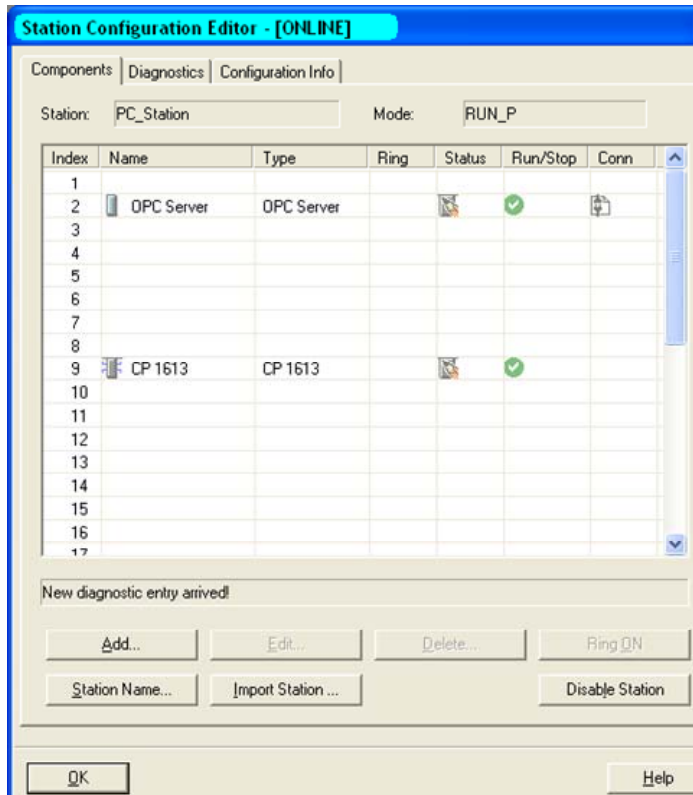
Figure 2-20 Information from the XDB file



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Information about the concerning components and application in the XDB will be shown. Confirm this dialog box with "OK"

Figure 2-21 PC station is now configured



The import is now completed and the configuration is loaded. The connection column shows that the connection is also loaded.

3 Configuration of the SIMATIC S5

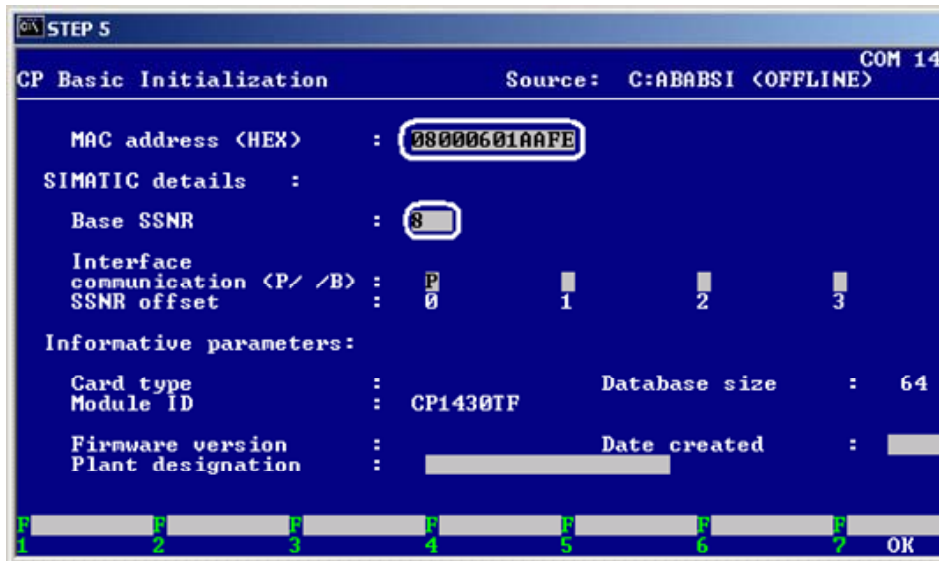
3.1 Initialization of the CP 1430 and creating the Send/Receive connections

Start STEP 5 with "Start → SIMATIC → STEP 5".

Press the "F9" key to change to the configuration tool of the CP 1430 "SINEC NCM COM 1430".

NOTE The "SINEC NCM COM 1430" configuration tool is additional software integrated in STEP 5 to configure the CP 1430. This software is not included in the standard STEP 5 package and must be ordered separately. Initialize the CP using the "Edit → CP_Init" menu.

Figure 3-1 Initializing the CP

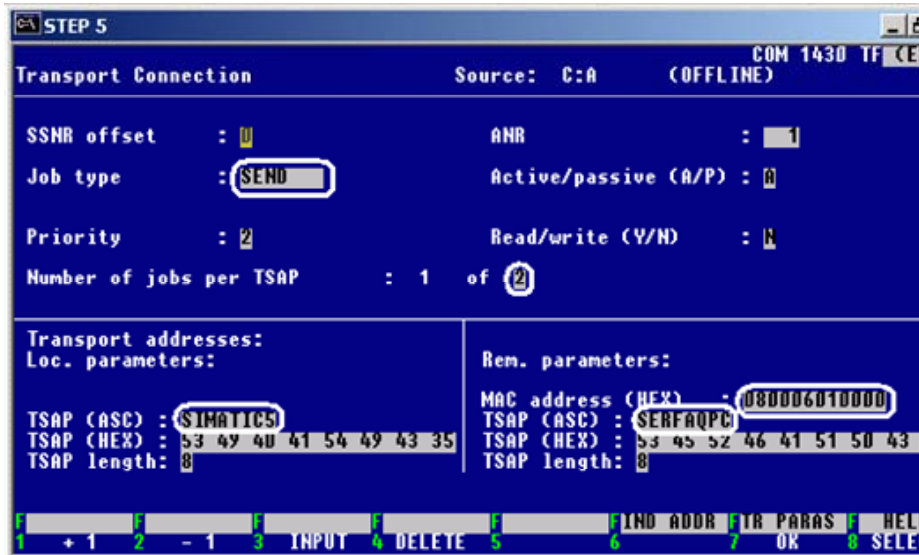


- The MAC address of the CP 1430 must match the MAC address configured in NetPro (see Figure 2-14 Entering Addresses).
- The Base SSNR specifies the CP in the rack. This interface number must be used in the block calls in the S5 program.

Apply the settings with "F7".

Open the "Edit → Connections → Transport Connections" dialog.

Figure 3-2 Creating a Send Connection

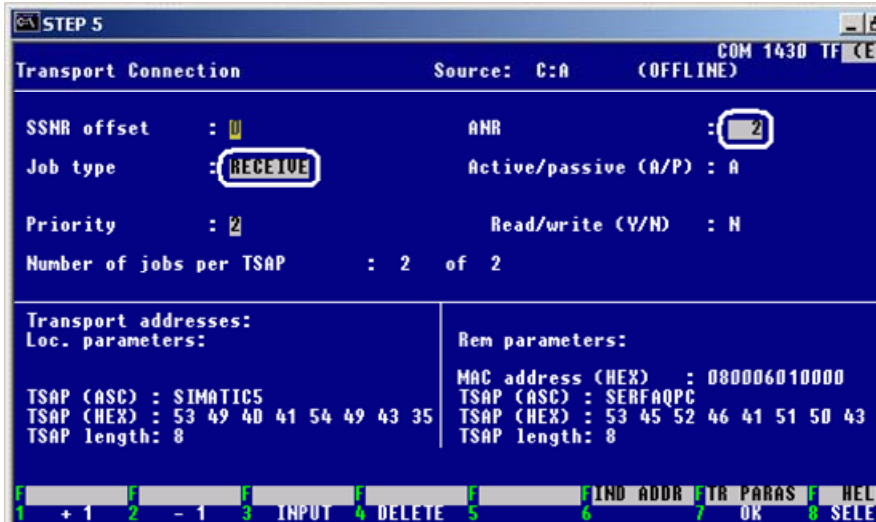


NOTE The address information must be synchronized with the settings made in NetPro.r

- Enter "SEND" for the job type and enter 2 for "Number of jobs per TSAP".
- In the local parameters, enter the TSAP used in NetPro (see Figure 2-14 Entering Addresses).
- In the remote parameters, enter the MAC address of the CP 1613 and the TSAP specified in NetPro for the CP 1613 (see Figure 2-14 Entering Addresses).

As the second job, configure the "Receive" job as shown in the following screenshot (see Figure 3-3 Creating a RECEIVE Connection). Then apply the settings with "F7".

Figure 3-3 Creating a RECEIVE Connection



Then download the configuration to the CP 1430 with "Transfer → FD → CP".

Return to the STEP 5 configuration dialog with "File → Exit" and "ESC".

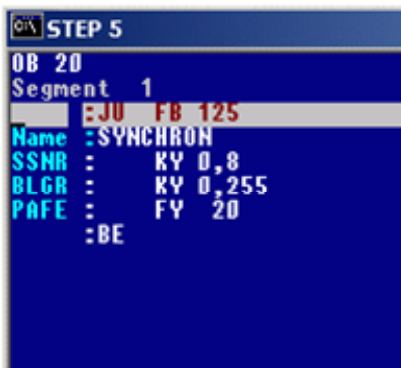
3.2 Description of the S5-CPU program

Synchronization of the CP 1430 with the CPU using the SYNCHRON call in the start-up OBs

Insert the start-up OBs OB20, OB21, and OB22 in your STEP 5 project.

In these OBs, program the FB125 "SYNCHRON" call that synchronizes the CPU and CP

Figure 3-4 SYNCHRON Call



Calling the SEND/RECEIVE block in OB1

Create OB1.

Form an RLO = 1 with the two statements:

- O F 0.0
- ON F 0.0

Insert the SEND block call (FB120).

Figure 3-5 Calling SEND in Segment 1 of OB1

```

STEP 5
OB 1                               C:\HTB135ST.S5D
Segment 1
:O F 0.0
:ON F 0.0
:JU FB 120

Name : SEND
SSNR : KY 0,8           Interface number
A-NR : KY 0,1           Job number
ANZW : FW 100          displayword
QTYP : KS DB           Source type
DBNR : KY 0,10         datablock number
QANF : KF +0           Begin of sendbuffer
QLAE : KF +5           Length of sendbuffer
PAFF : FY 120
    
```

NOTICE Specify the length of the send and receive area in words.

Form an RLO = 1 with the two statements:

- O F 0.0
- ON F 0.0

Then add the RECEIVE block call (FB121) after this.

Figure 3-6 Calling RECEIVE in Segment 1 of OB1

```

STEP 5
OB 1                               C:\HTB135ST.S5D
Segment 1
:ON F 0.0
:JU FB 121

Name : RECEIVE
SSNR : KY 0,8           Interface number
A-NR : KY 0,2           Job number
ANZW : FW 104          displayword
ZTYP : KS DB           Destination type
DBNR : KY 0,10         datablock number
ZANF : KF +0           begin of receivebuffer
ZLAE : KF +5           Length of receivebuffer
PAFF : FY 124
    
```

Hinweis The "SEND" and "RECEIVE" blocks are executed only when RLO = 1 prior to the call.

Calling the "SEND_ALL/RECEIVE_ALL" block in OB1

Insert a further segment.

Program the "SEND_ALL" (FB126) and "RECEIVE_ALL" (FB127) block calls in this segment.

Figure 3-7 Calling "SEND_ALL" and "RECEIVE_ALL" in Segment 2 of OB1



Save OB1 with "F7".

Creating the send and receive buffer

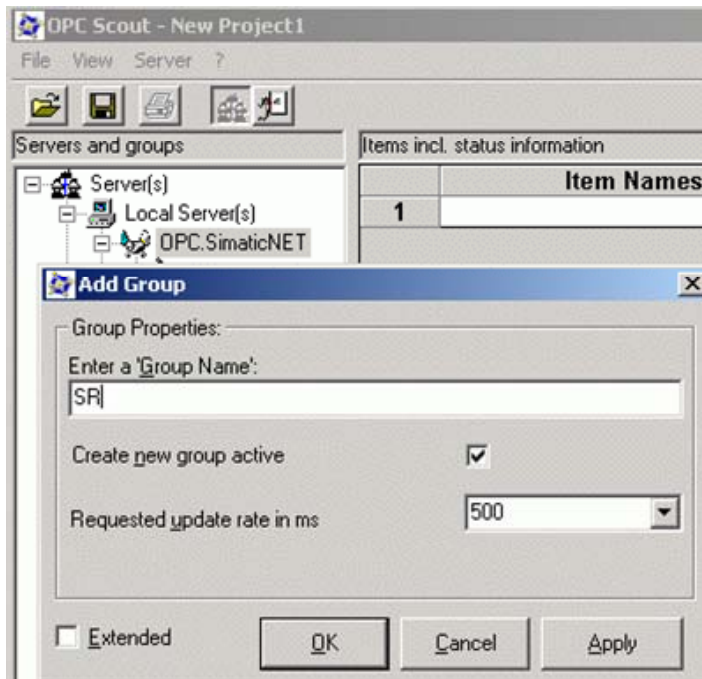
Since the send and receive buffer is located in DB10, this must be created in the project and declared with an adequate length. Then download the entire program to the S5.

4 Establishing the connection with the OPC Scout

You can now start the OPC Scout with "Start → (Windows XP: Start → All Programs→) SIMATIC → SIMATIC NET → OPC Scout".

Connect to the OPC server by double-clicking on "OPC.SimaticNet". In the dialog that appears, enter a suitable group name and confirm this with OK.

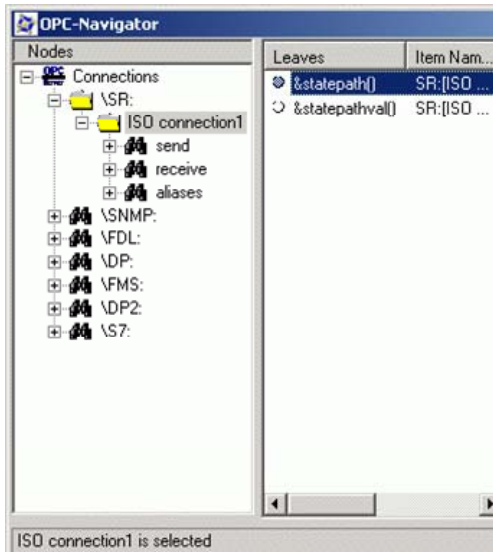
Figure 4-1 Connecting to the OPC server and creating a group



Once the group has been created, double-click on it and the "OPC Navigator" opens. You will now see your protocols in the OPC Navigator.

Double-click on "SR". So the connection name you configured in NetPro appears.

Figure 4-2 OPC Navigator



If you double-click again on the connection, you can define the items for communication or add existing items.

If you select "send", an item appears in the middle section. Move this "send" item to the right with the "→" button.

Double-click on the item on the right-hand side

Figure 4-3 "send" item in the OPC Navigator



Change the item name as shown in the screenshot below and click on "Modify Item".

Figure 4-4 Modifying an item



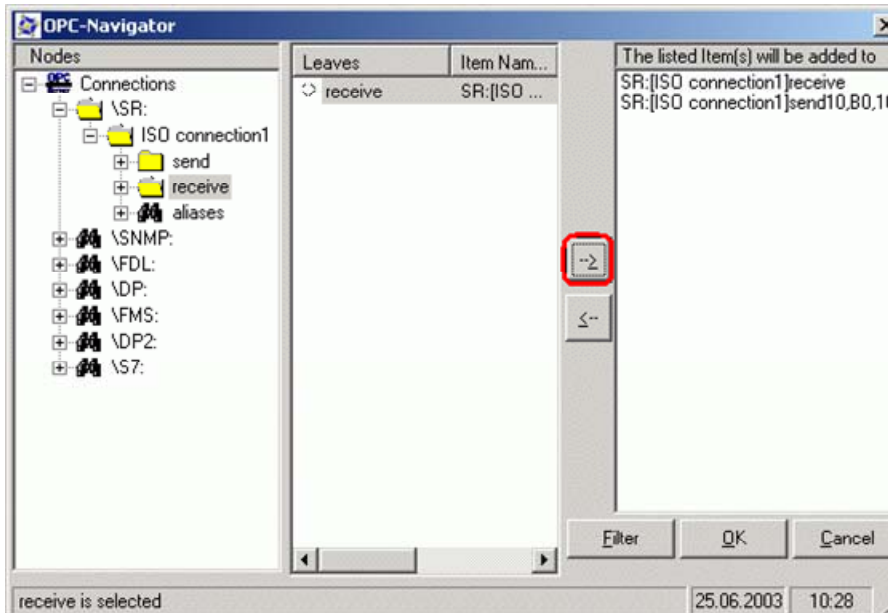
NOTICE

The item "...send 10, B0, ..." means that a send buffer of 10 bytes is reserved on the PC. The size of the receive buffer on the S5 is specified in words (see Figure 3-6 Calling RECEIVE in Segment 1 of OB1). The Parameter ZLAE is defined in the following way: ZLAE = +5 → 5 words.

Double-click on the "receive" folder in the tree structure and add the existing item to the list with "→". Exit the dialog with "OK".

With the "receive" item, it is not necessary to specify the data area.

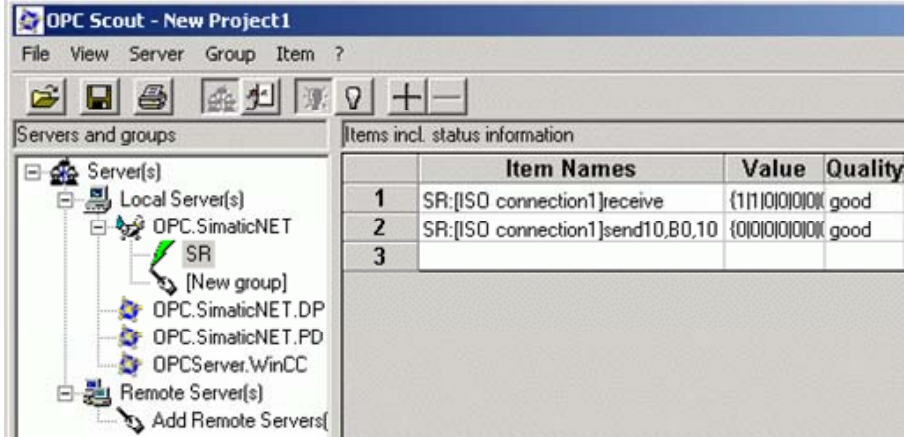
Figure 4-5 Adding the receive Item



The items are adopted in the OPC Scout. If the quality is good, the connection is established and it is possible to read and write respectively the items.

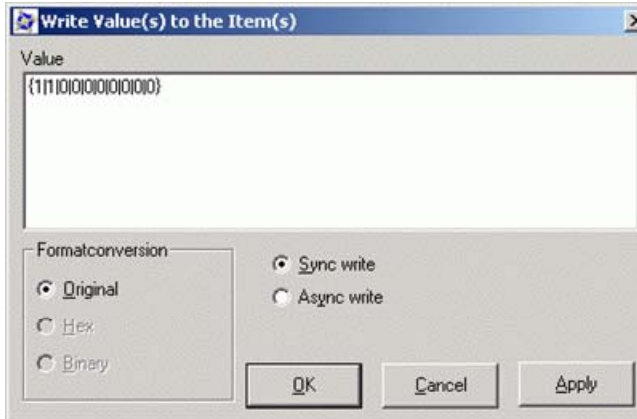
NOTE The quality of the "Send Item" is valid only after values have been written the first time.

Figure 4-6 OPC Scout



By double-clicking on the Value column of the "send" item, you can write values to the send buffer.

Figure 4-7 Writing Values



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

Figure 4-8 successful write job

	Item Names	Value	Quality	Re	Error
1	SR:[ISO connection1]receive	{1110101010}	good		
2	SR:[ISO connection1]send10,B0,10	{1110101010}	good	OK	The operation completed successful
3					

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With Send/Receive, successful writing of data must be checked in the columns "Write Result" and "Error". The "Write Result" and "Error" columns can be made visible in the "View → Options" menu.

5 Basic configuration instructions

5.1 TSAP rules

- The TSAP should always be 8 characters.
- The characters permitted for TSAPs are letters, numbers, hyphens, and underscores.
- You should only use upper case letters.
- The local and remote TSAP can be the same.
- The TSAPs must be unique per connection.
- To check the TSAPs, use the output of the character string in hexadecimal format.

5.2 Interface number (SSNR)

- The interface number of the CP is assigned in the configuration tool of the CP 1430 "SINEC NCM COM 1430" in the (Edit → CP Init) dialog.
- The SSNR must be specified as a parameter in all communication blocks of the CPU (FB120, FB121, FB125, FB126, FB127).
- The interface number must be divisible by 4 (0, 4, 8, 16...).

5.3 SEND (FB120) and RECEIVE (FB121), SEND_A (FB126) and RECV_A (FB127), SYNCHRON (FB125)

- The values specified for QLAE and ZLAE are word values (QLAE = 0, 10 → send 10 words; ZLAE = 0, 10 → receive 10 words).
- The PAFE and ANZW parameters are output parameters. These are used for diagnostics and job monitoring. For more detailed information, refer to the manuals on the CPs.
- The job number (A-NR) specifies the connection configured on the CP (see Figure 3-5 Calling SEND in Segment 1 of OB1 and Figure 3-6 Calling RECEIVE in Segment 1 of OB1).
- The blocks must be called using unconditional calls (for example JU FB120).

5.4 Rules for connection establishment

- A connection is established actively by one station. The partner station must then establish the connection passively.

- On the S5, the type of connection establishment is linked to the job type.
 - Send = active connection establishment
 - Receive = passive connection establishment
- The type of connection establishment (active or passive) is decided by the first job on a connection when there are two jobs ("Number of jobs 1 of 2"). In our example, the first job is "send" and therefore the connection is established actively by the S5.
- The type of connection establishment has no influence on the jobs.

6 History

Version	Date	Changes
V 1.0	09.12.2007	First Issue