FAQ • 01/2015

Connecting a PC Station to an S7-1200 using OPC

NCM PC or STEP 7 V5.5 SP3, TIA Portal

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Table of contents

1 Introduction

This document shows you how to connect a PC station to an S7-1200 using OPC.

Using the SIMATIC NCM PC tool or STEP 7 V5.5 SP3

- You configure a PC station
- You establish an S7 connection between the SIMATIC NET OPC server and the S7-1200.

You configure the S7-1200 in the TIA Portal.

2 Configuring the S7-1200 in the TIA Portal

You configure the S7-1200 in the TIA Portal.

Then you create the user program and define which data is to be monitored over the S7 connection of the OPC server.

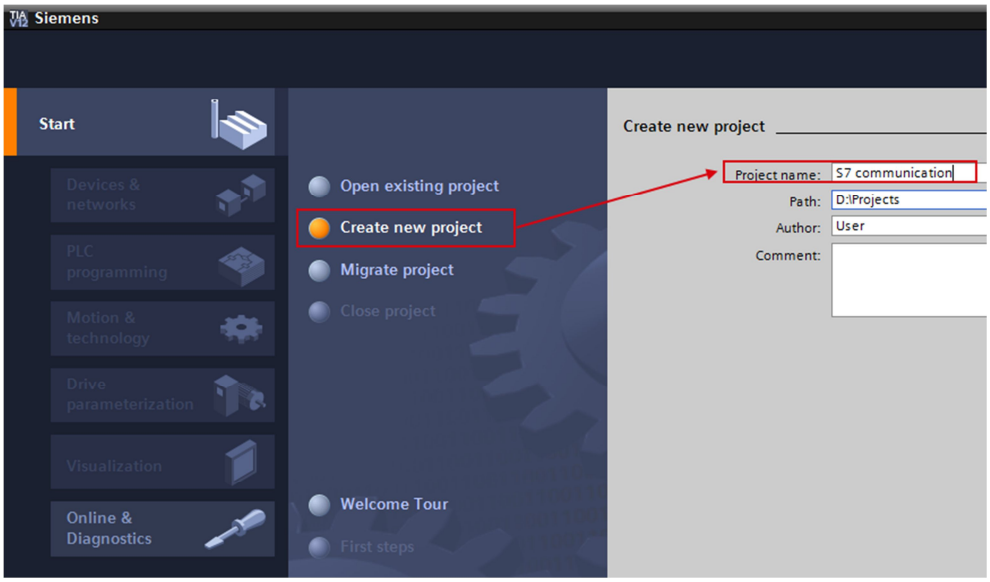
2.1 Creating a Project

In Windows, select the menu "Start > All Programs > Siemens Automation > TIA Portal V12" to start the TIA Portal.

In the Portal view, select the "Create new project" action.

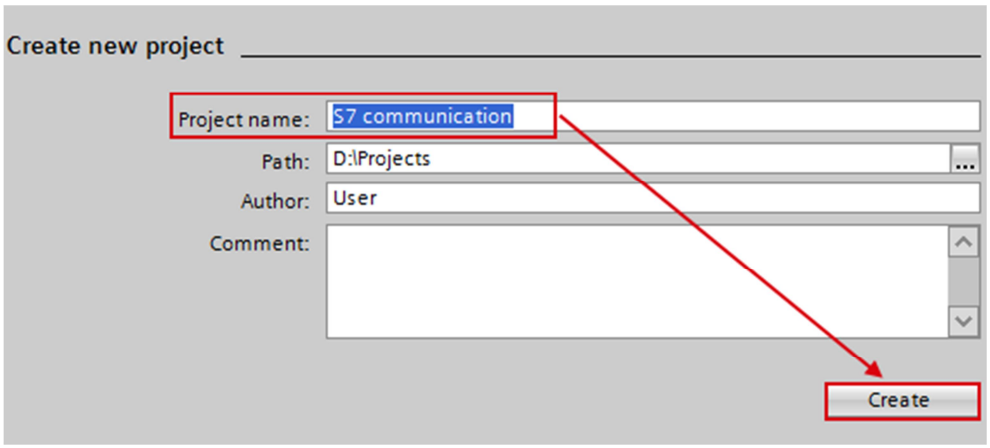
Enter the project name in the appropriate field.

Figure 2-1



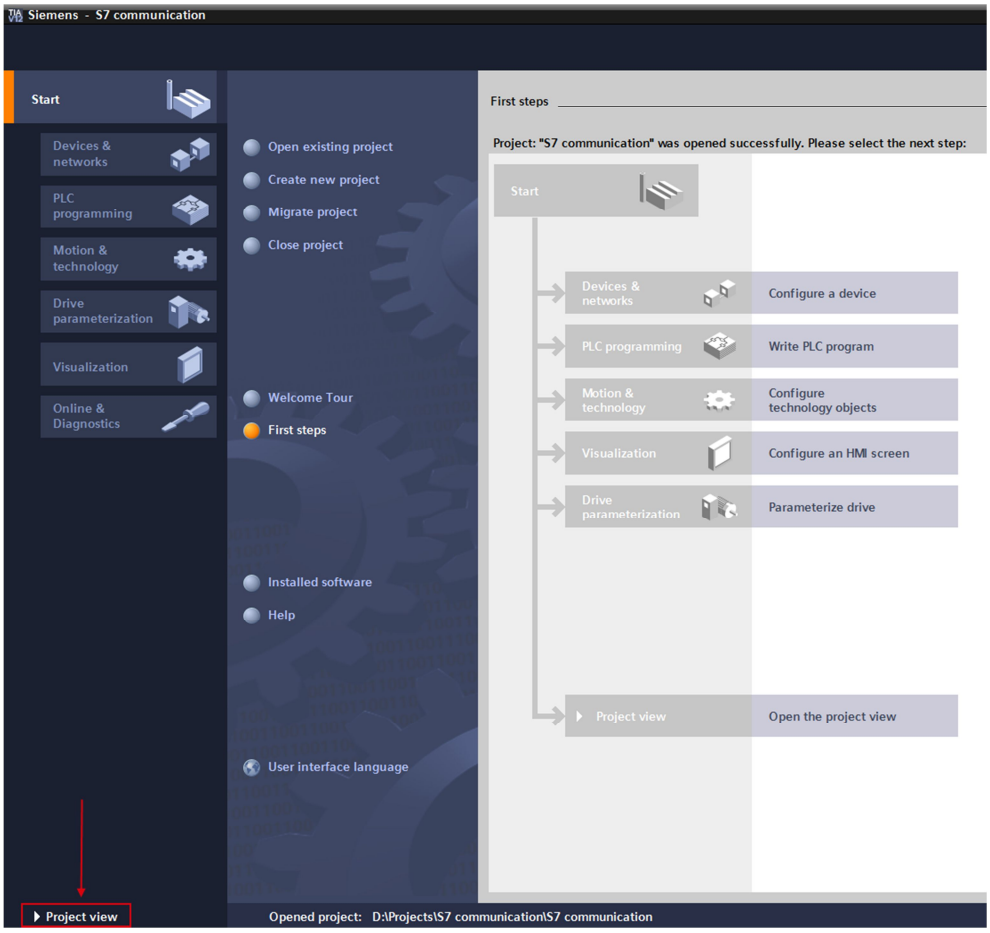
Click the "Create" button to create a new project.

Figure 2-2



Use the "Project View" link to switch to the Project View.

Figure 2-3

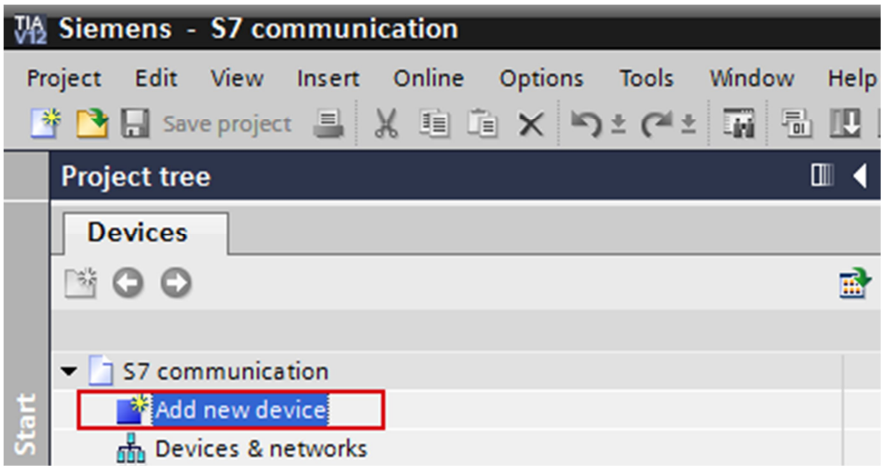


2.2 Configuring the Hardware

Add an S7-1200 Station

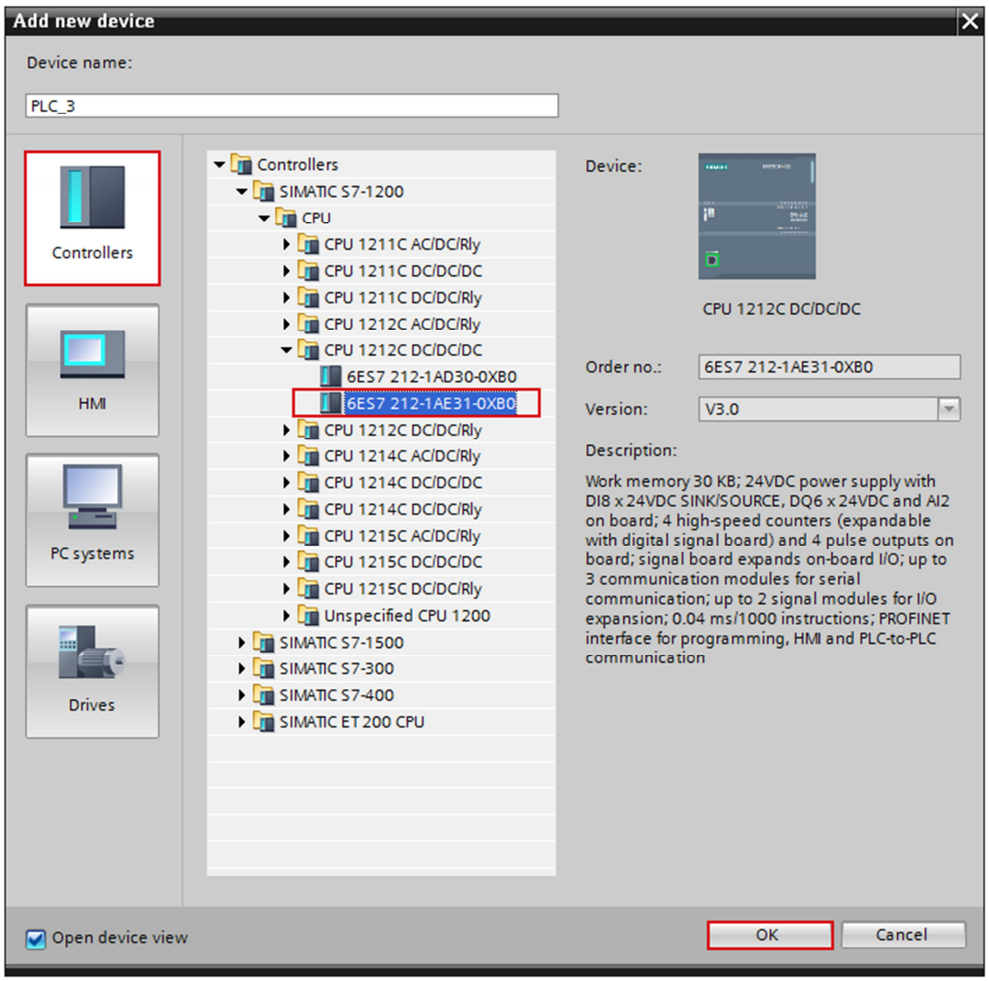
In the project tree, double-click the "Add new device" item. The "Add new device" dialog opens.

Figure 2-4



Click the Controllers button in the working area. Go to "Controllers > SIMATIC S7-1200 > CPU" and select the required controller. Click the "OK" button to add the selected S7-1200 CPU to your project.

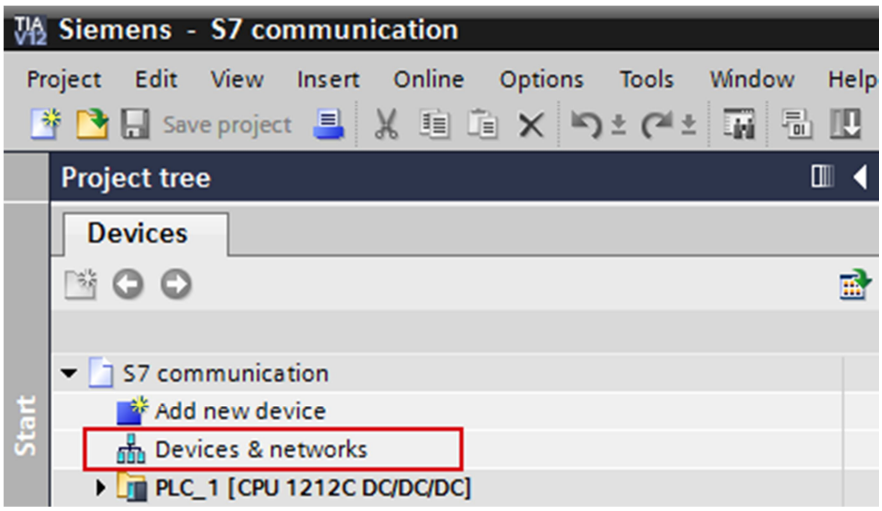
Figure 2-5



Define IP address and assign subnet

In the project tree, double-click the "Devices & networks" item. The devices and networks editor opens.

Figure 2-6

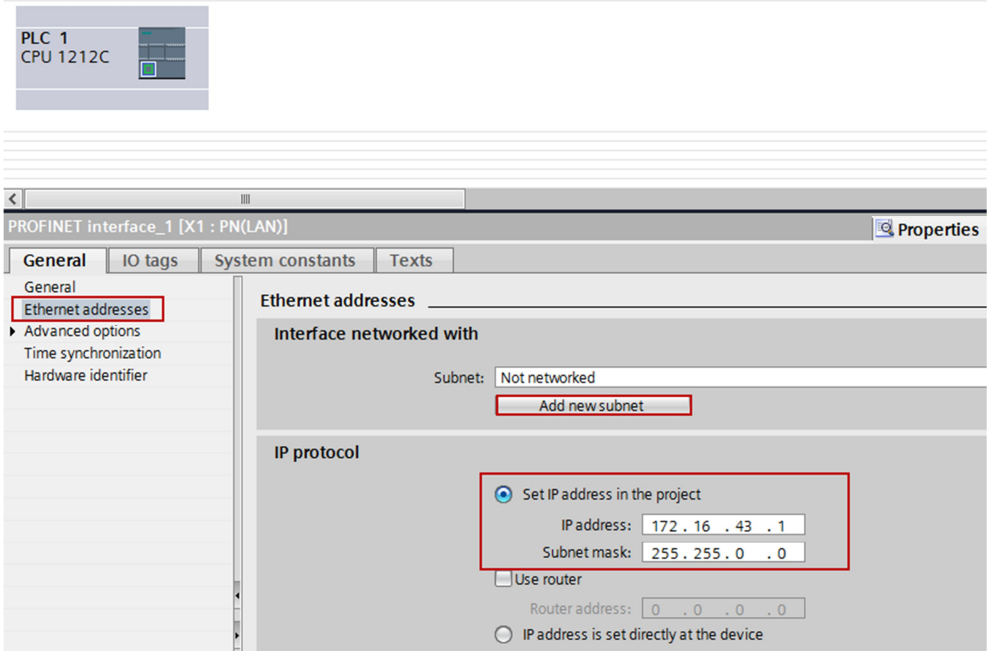


In the Network View or Device View of the devices and networks editor you click the PROFINET interface of the S7-1200 CPU.

In the inspector window you switch to the "Properties" tab. Select the "Ethernet addresses" item in the area navigation.
In this example you enter the IP address 172.16.43.1 and the subnet mask 255.255.0.0 for the PROFINET interface of the S7-1200 CPU.

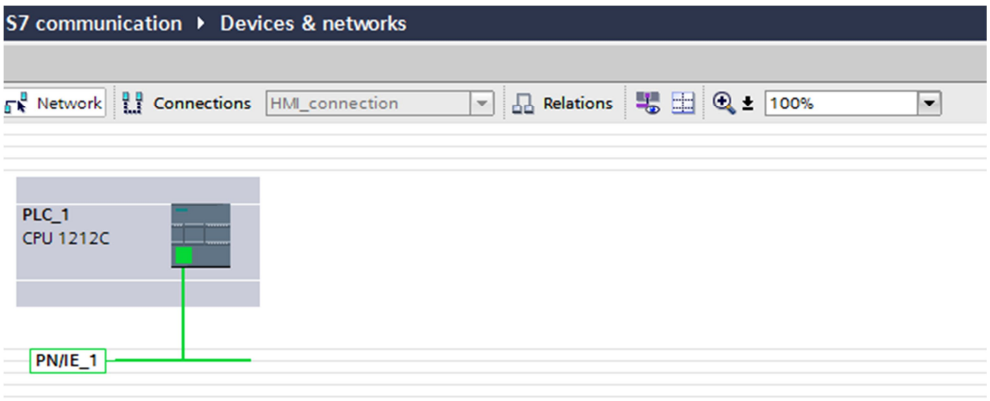
Then assign a subnet to the PROFINET interface. Click the "Add new subnet" button to insert a new subnet.

Figure 2-7



The connection between the subnet, PN/IE_1, for example, and the S7-1200 is now displayed in the "Network View" of the devices and networks editor.

Figure 2-8



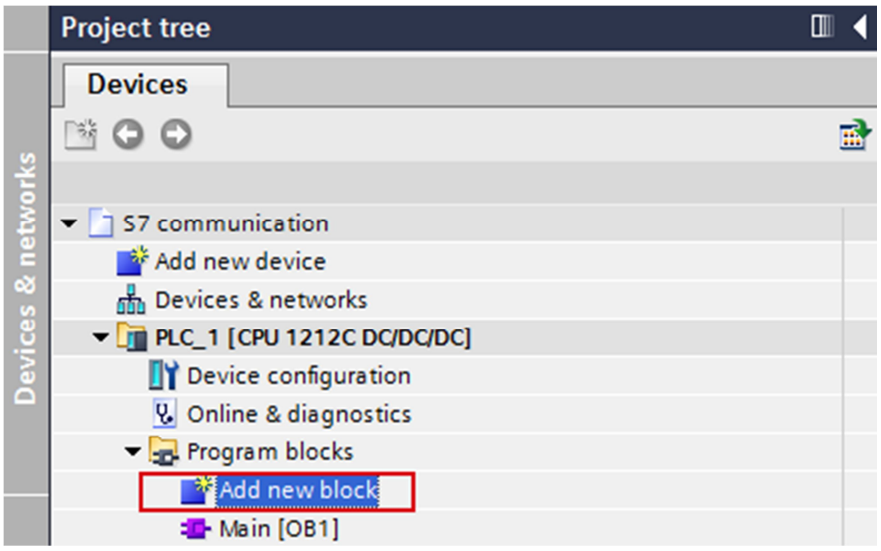
2.3 Creating a User Program

Add a data block

In the project tree, navigate to the device folder of the S7-1200 CPU, "PLC_1 [CPU 1212C …]", for example. The device folder contains structured objects and actions that belong to the device.

In the device folder you navigate to the "Program blocks" subfolder and double-click the "Add new block" action. The "Add new block" dialog opens.

Figure 2-9

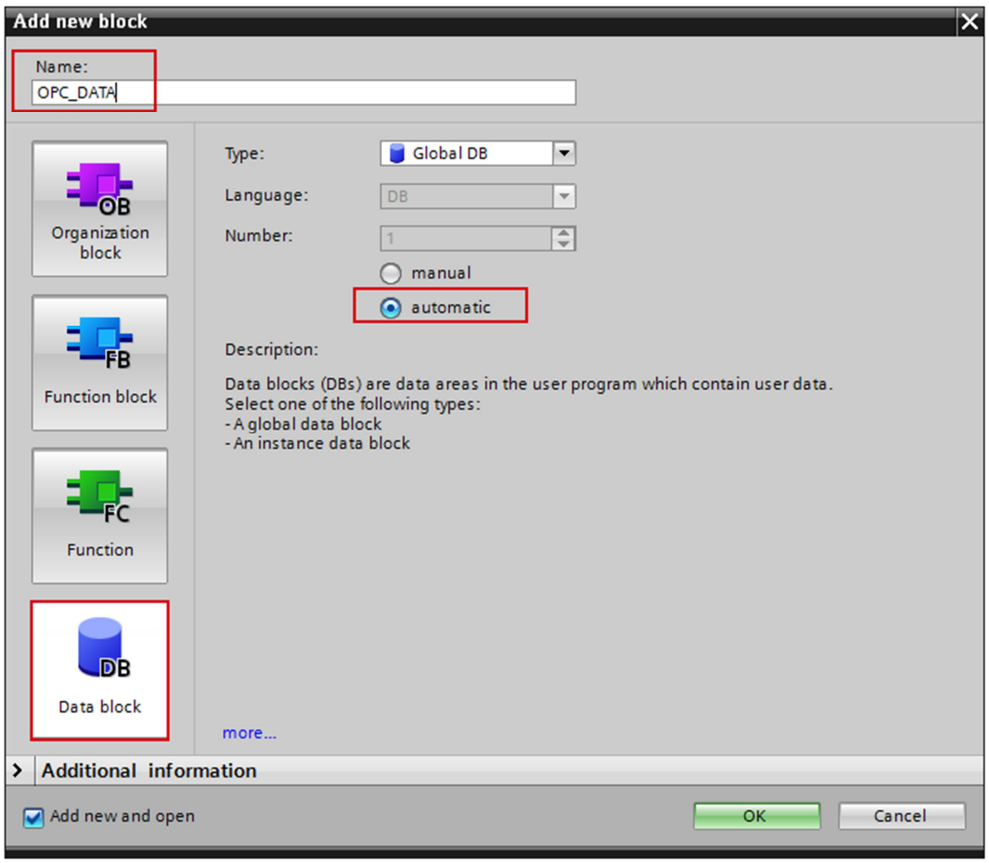


Click the "DB Data block" button. Enter the name of the data block and enable the "Automatic" option to assign the number of the data block automatically. If you enable the "Manual" option, you can assign the number of the data block manually.

Apply the settings with "OK".

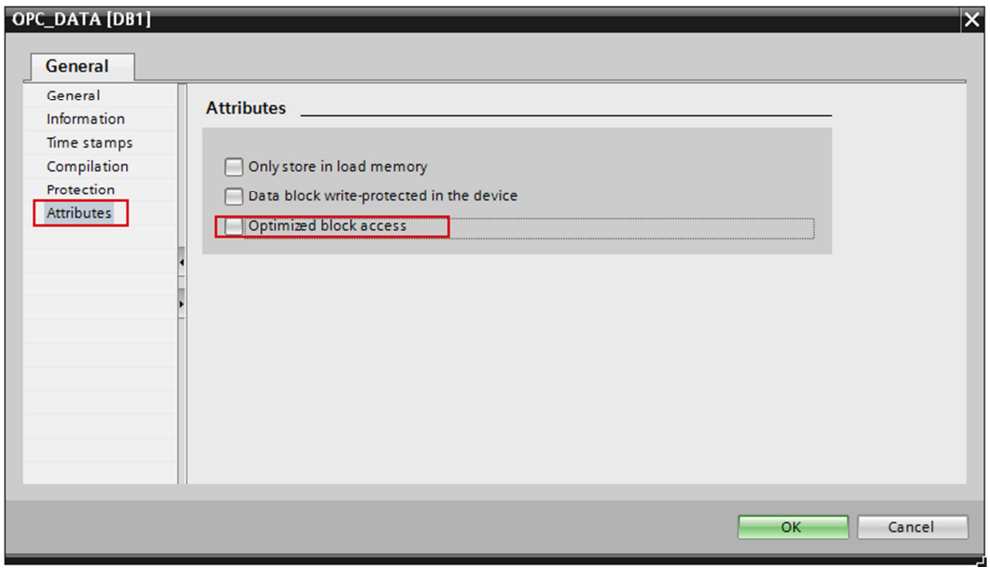
The data block DB1 "OPC_DATA" is created in this example.

Figure 2-10



In the Properties of the data block you go to "Attributes" and disable the "Optimized block access" option.
Data blocks with standard access have a fixed structure. The data elements in the declaration include both symbolic names and a fixed address in the block. The address is displayed in the "Offset" column. You can address the tags in this block both symbolically and absolutely.

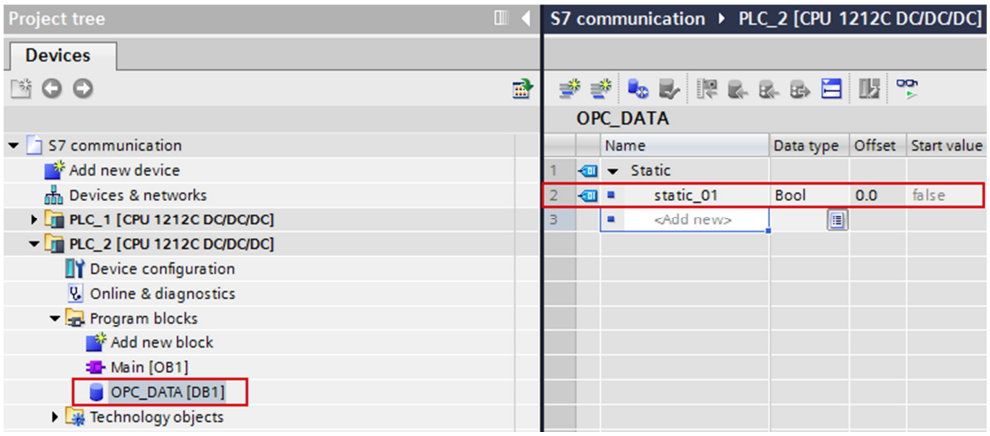
Figure 2-11



Define static variables in the data block

Define the static variable "static_01" of the "Bool" data type in the DB1 "OPC_DATA".

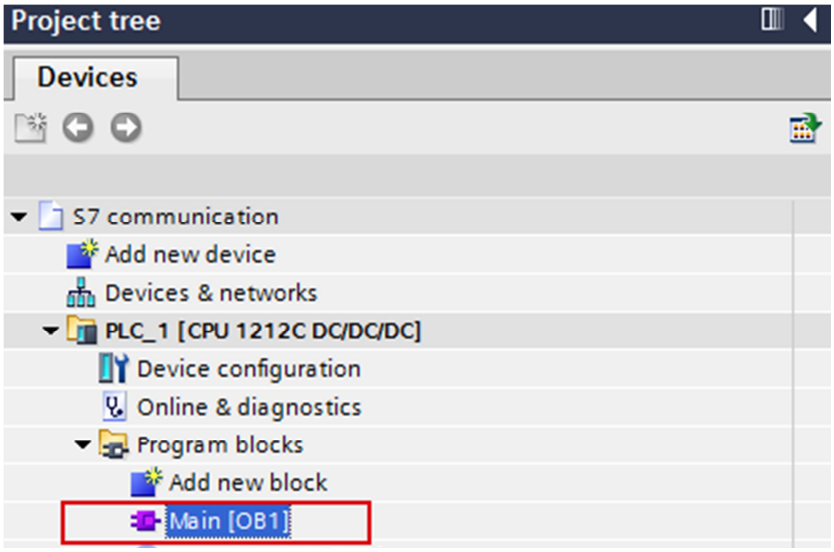
Figure 2-12



Create Main [OB1]

In the "Program blocks" folder, you double-click the "Main [OB1]" block to open the corresponding dialog window.

Figure 2-13



Create the program as shown in Figure 2-14. The bit links are in the "Instructions" task card under "Basic instructions > Bit links".

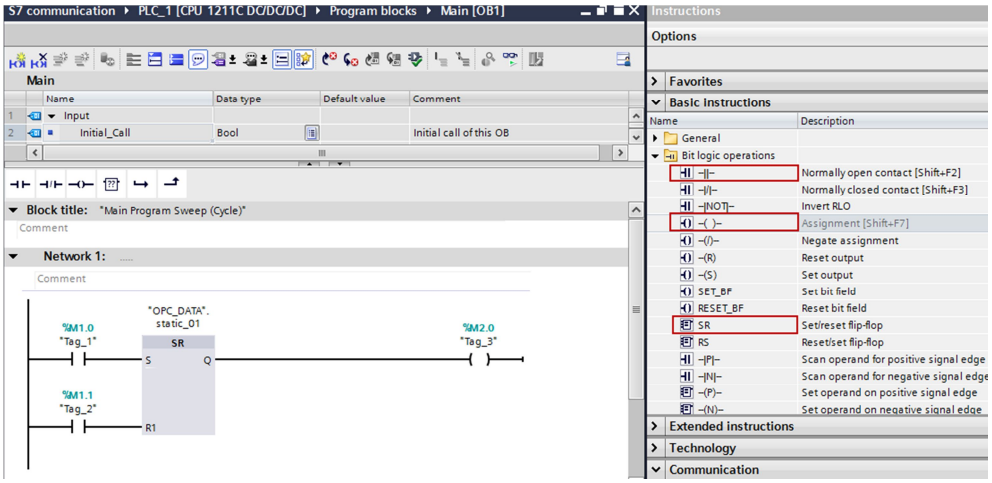
Use drag-and-drop to add the normally open contact, the flip-flop and the Assignment to Network 1 of the "Main [OB1]" block.

Assign the variables below to the flip-flop, to the normally open contact at inputs S and R of the flip-flop and to the assignment at output Q of the flip-flop.

Table 2-1

Variable	Description
M1.0	SR flip-flop input S: NO contact
M1.1	SR flip-flop input R: NO contact
DB1.DBX0.0	SR variable
M2.0	SR flip-flop output Q: Assignment

Figure 2-14



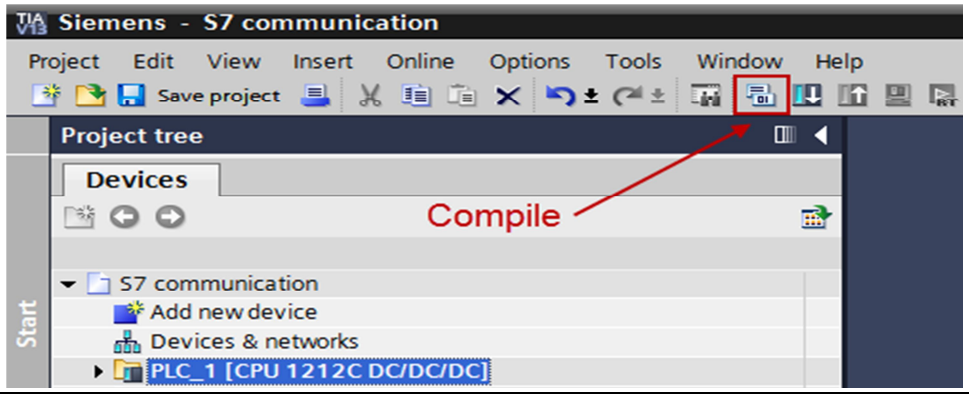
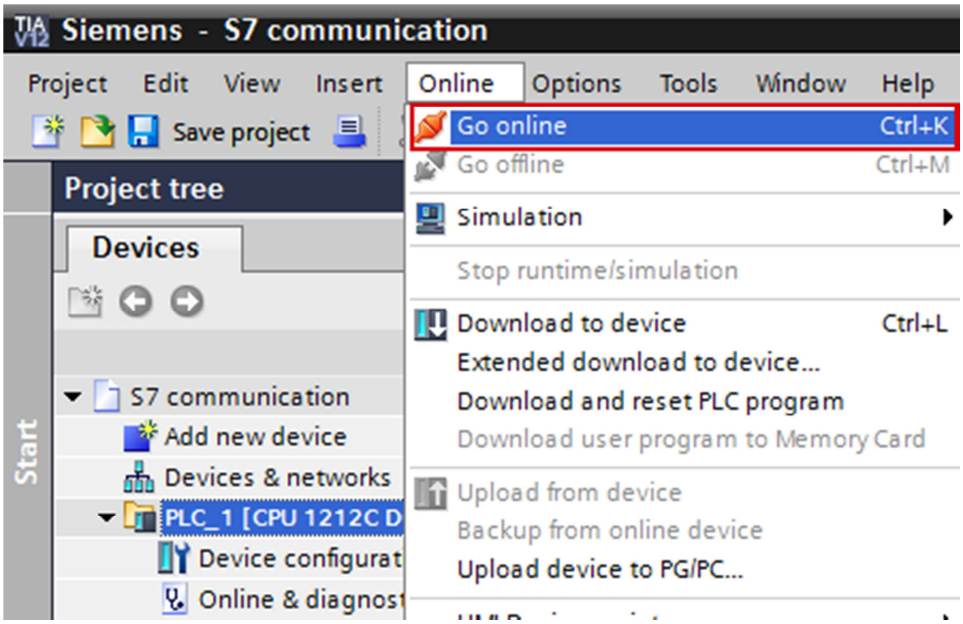
Note The "%" character before the absolute address is added automatically by TIA Portal.

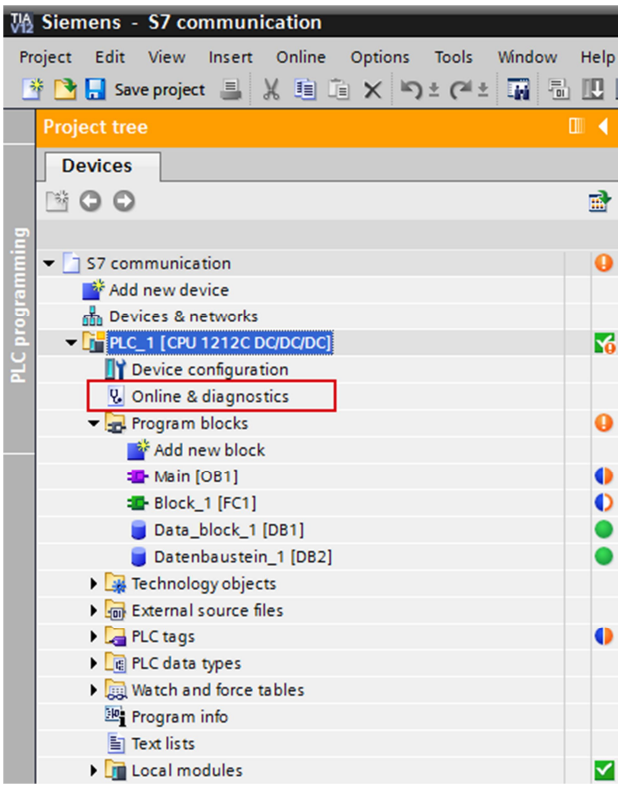
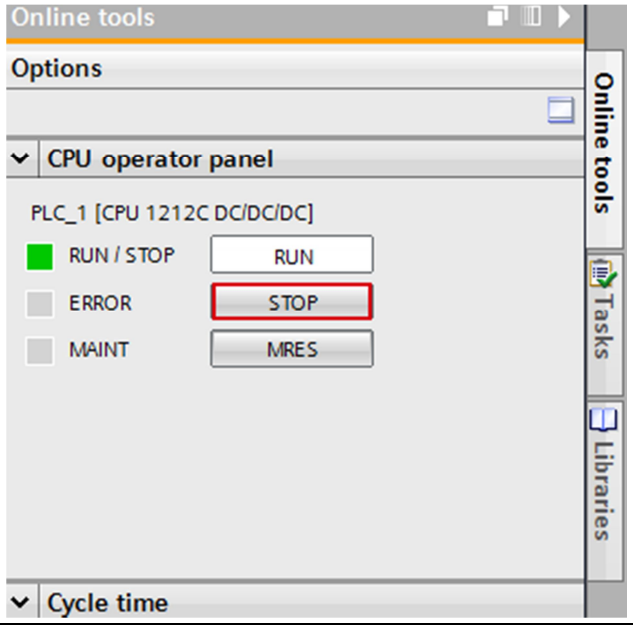
Click the "Compile" button.

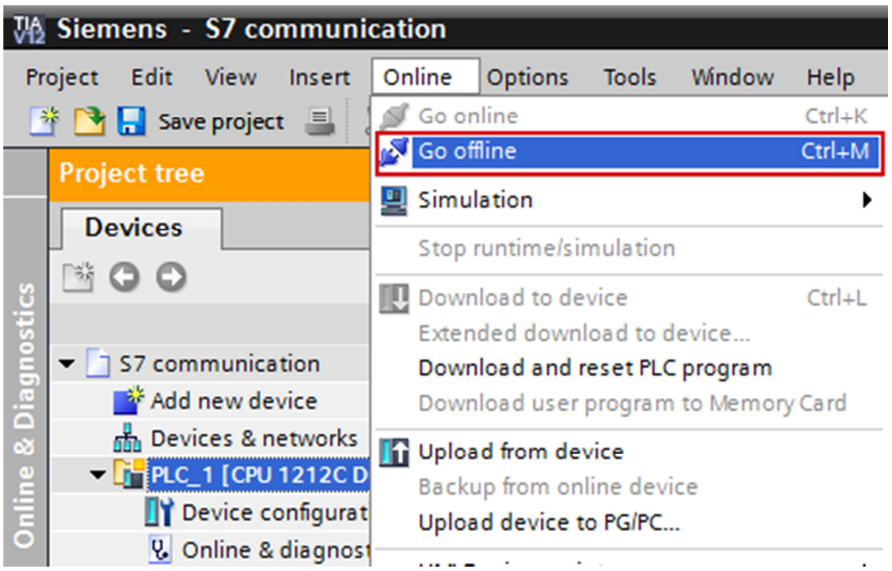
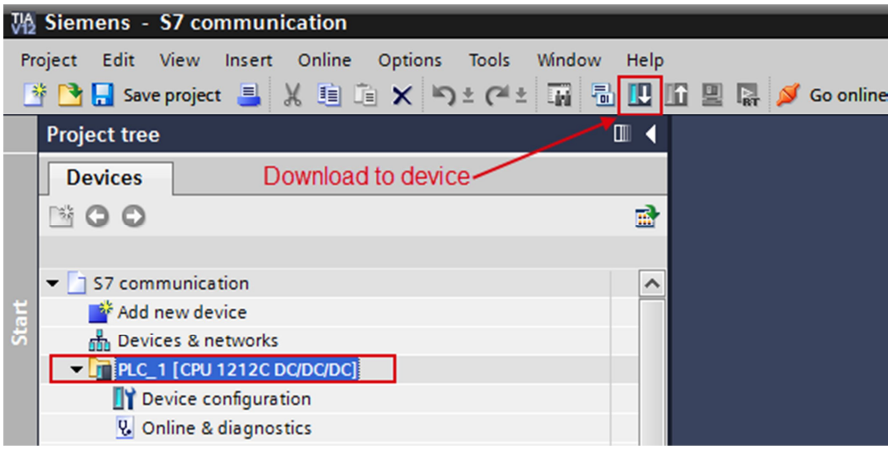
2.4 Downloading the Hardware Configuration and User Program

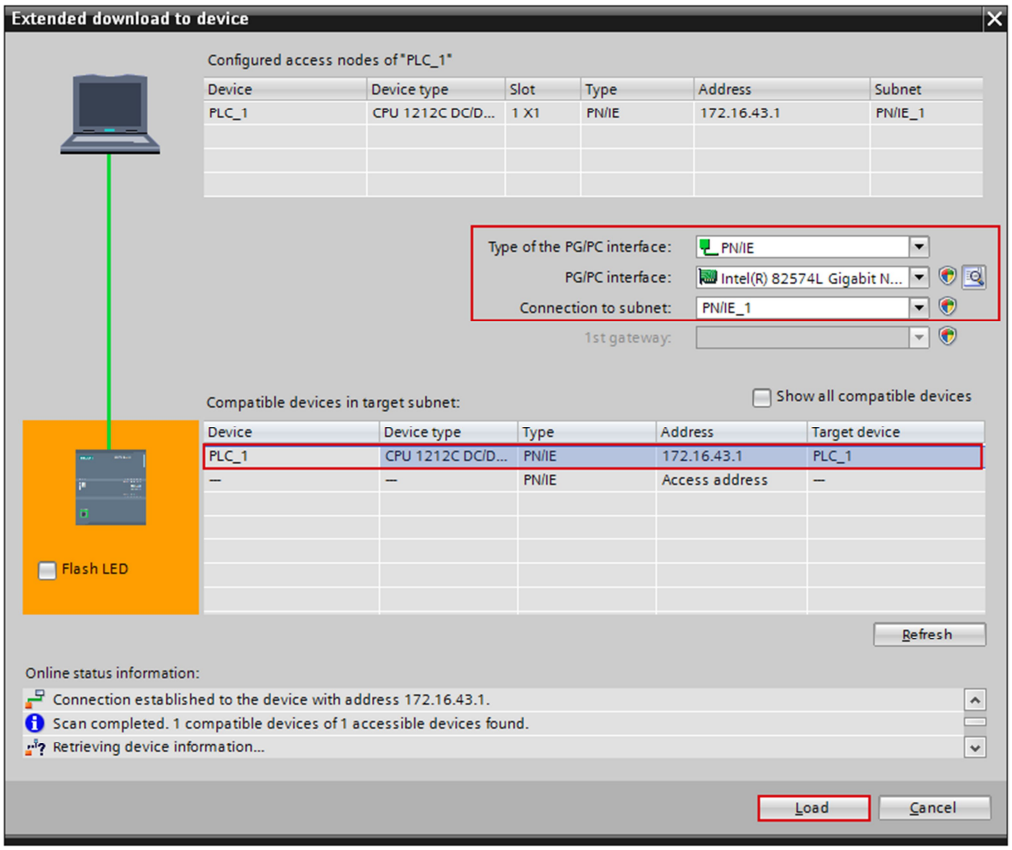
Follow the instructions below to download the configuration and the user program into the S7-1200 CPU.

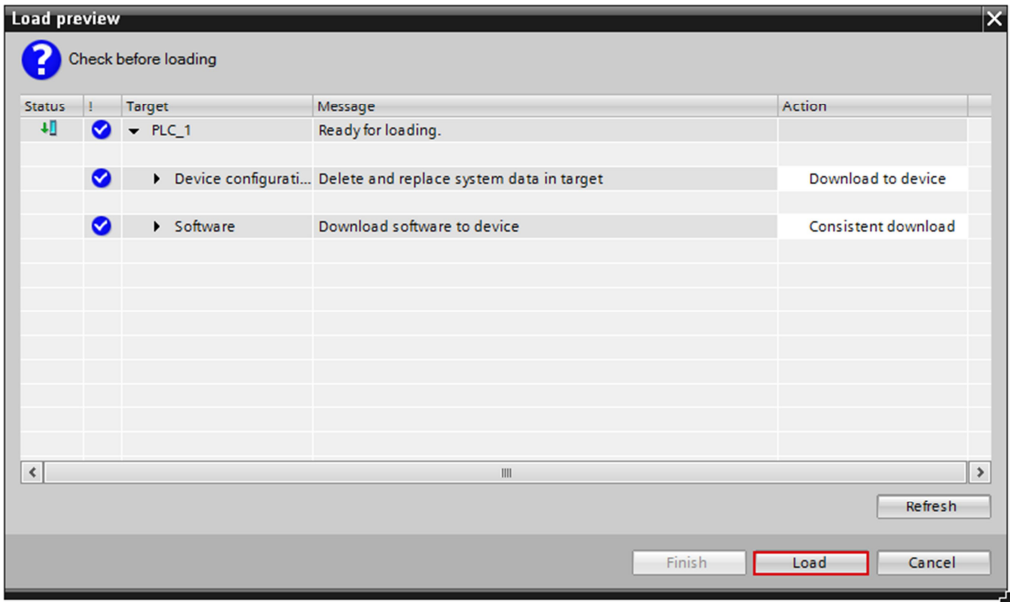
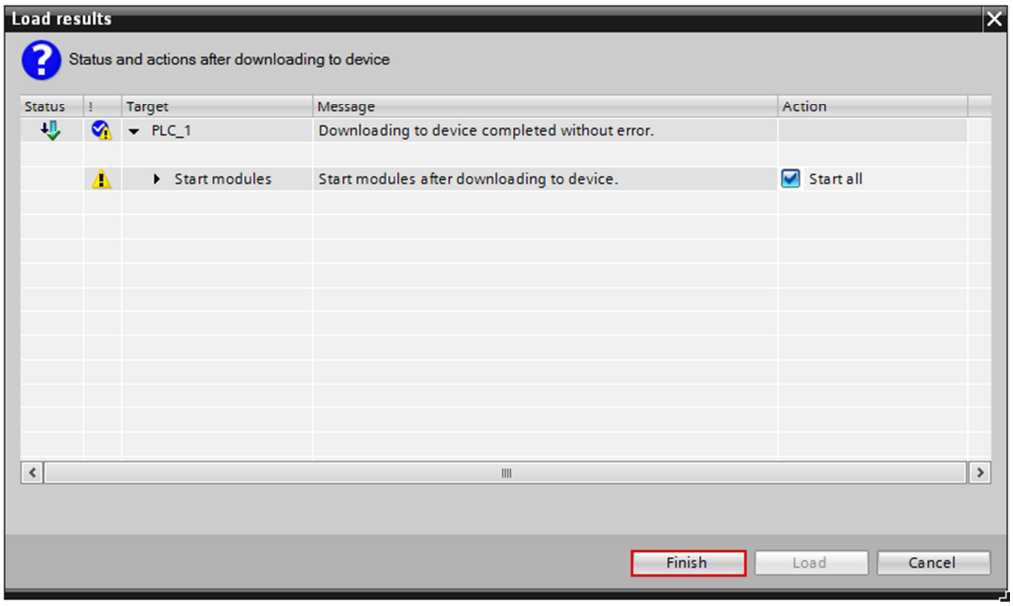
Figure 2-15

No.	Action
1.	In the project navigation you mark the device folder of the S7-1200 CPU. Click the "Compile" button in the toolbar. The hardware configuration and the software of the S7-1200 are compiled. 
2.	In the project navigation you mark the device folder of the S7-1200 CPU. Select the menu "Online > Go online". 

No.	Action
3.	In the project navigation you click the arrow on the left of the device folder of the S7-1200 CPU to display the objects and actions of the device. Double-click the "Online & diagnostics" item. 
4.	In the "Online tools" task card you open the "CPU operator panel" palette. If the S7-1200 CPU is in "RUN" mode, click the "STOP" button to put the S7-1200 CPU into "STOP" mode. 

No.	Action
5.	Disconnect the online connection to the S7-1200 CPU in order to be able to download the hardware configuration and the software into S7-1200 CPU. 
6.	In the project navigation you mark the device folder of the S7-1200 CPU. Click the "Download to device" button in the toolbar. The hardware configuration and the software are downloaded to the S7-1200 CPU. 

No.	Action
7.	The "Extended download to device" dialog opens automatically only if the access path from the PG/PC to the S7-1200 CPU has to be set. Make the following settings: • Type of the PG/PC interface: PN/IE • PG/PC interface: network card of the PG/PC • Connection to subnet: subnet to which the S7-1200 CPU is connected From the list of compatible devices you select the S7-1200 CPU and click the "Load" button. 

No.	Action
8.	In the "Load preview" dialog you click the "Load" button to start the loading procedure. 
9.	In the "Load results" dialog you click the "Finish" button to finish the loading procedure. 

3 Configuration of the PC Station

Before you start configuring the PC station in NCM PC or STEP 7 V5.5 SP3, determine or change the IP address of the network card that you are using in your PC station. You enter the IP address and subnet mask of the network card when you configure the PC station in NCM PC or STEP 7 V5.5 SP3.

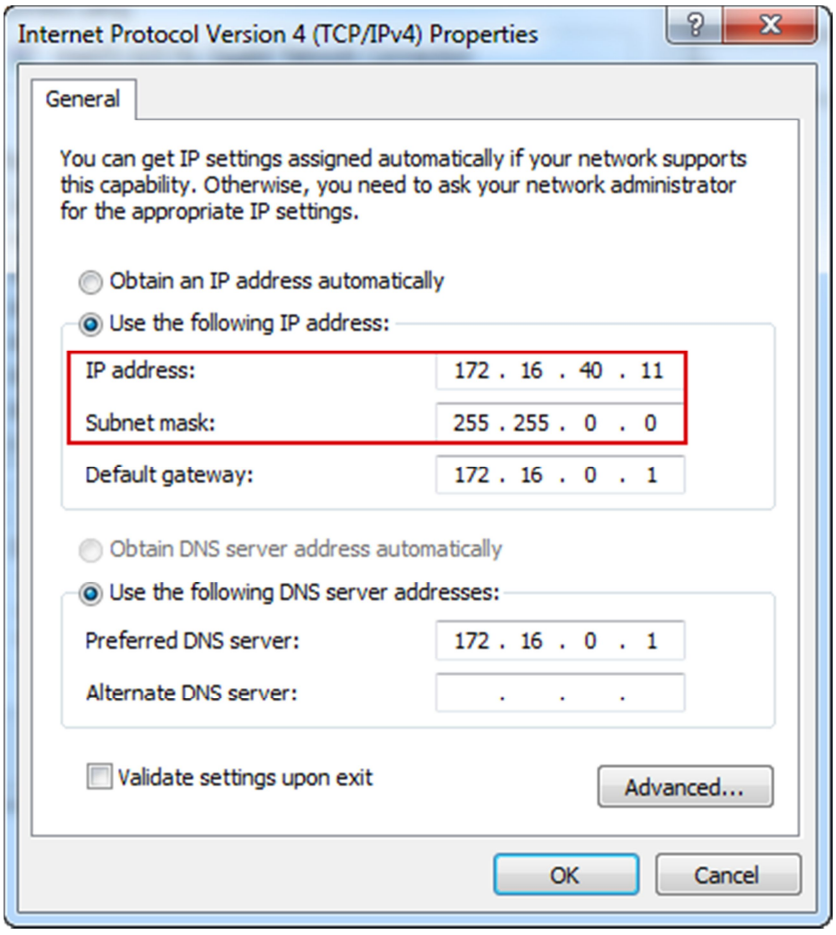
Determine and change the IP address and subnet mask of the network card

In Windows you open the "Network and Sharing Center" and select the "Change adapter settings" functions. Open the Properties dialog of the network card to which the S7-1200 is connected.

In this example the network card receives the IP address 172.16.40.11 and subnet mask 255.255.0.0.

Note The IP address configured for the PC station in NCM PC or in STEP 7 V5.5 SP3 must match the IP address set in Windows. If you are not using a router, the IP addresses of the PC station and the S7-1200 must be in the same subnet.

Figure 3-1



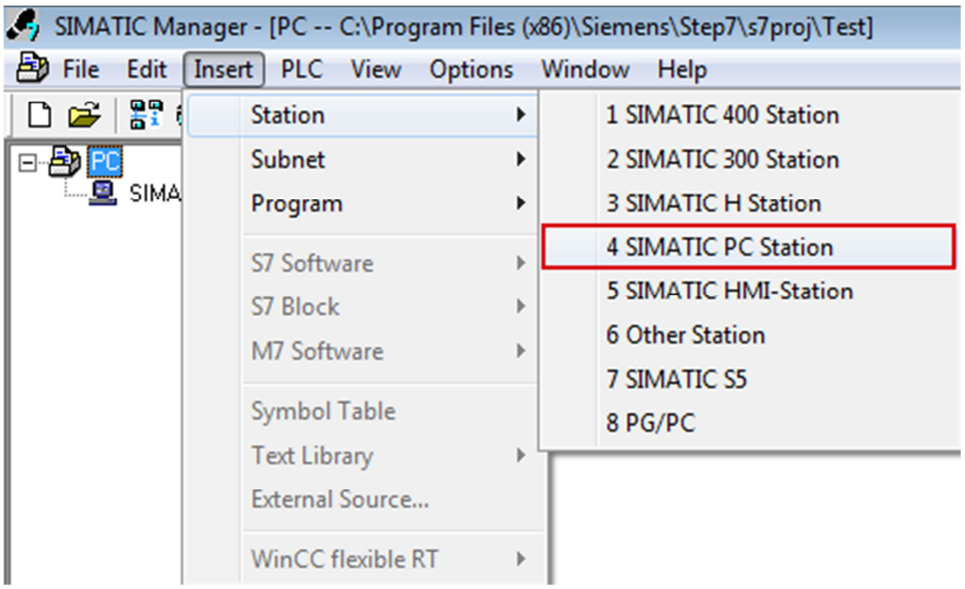
3.1 Creating a Project

In Windows, select the menu "Start > All Programs > Siemens Automation > SIMATIC > SIMATIC Manager" to start the SIMATIC Manager from NCM PC or in STEP 7 V5.5 SP3.

In the SIMATIC Manager, you create a new project with the menu "File > New".

In the SIMATIC Manager, you add a SIMATIC PC station with the menu "Insert > Station > SIMATIC PC Station".

Figure 3-2

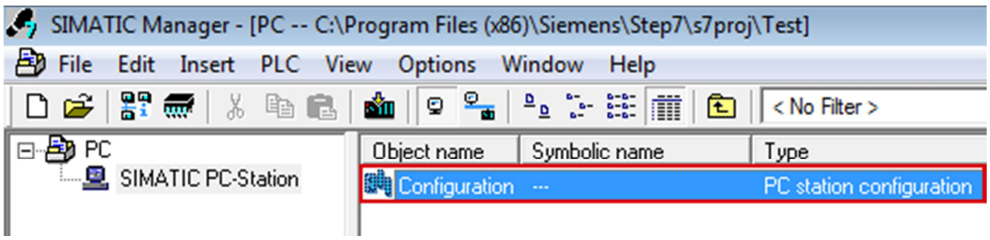


Change the name of the SIMATIC PC station as required. We use the name "SIMATIC PC Station" in this example.

3.2 Configuring the Hardware

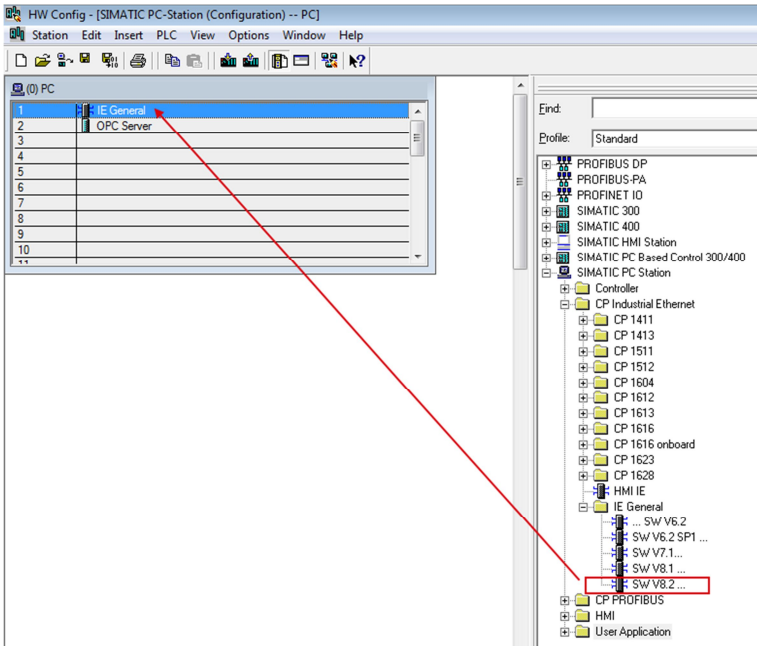
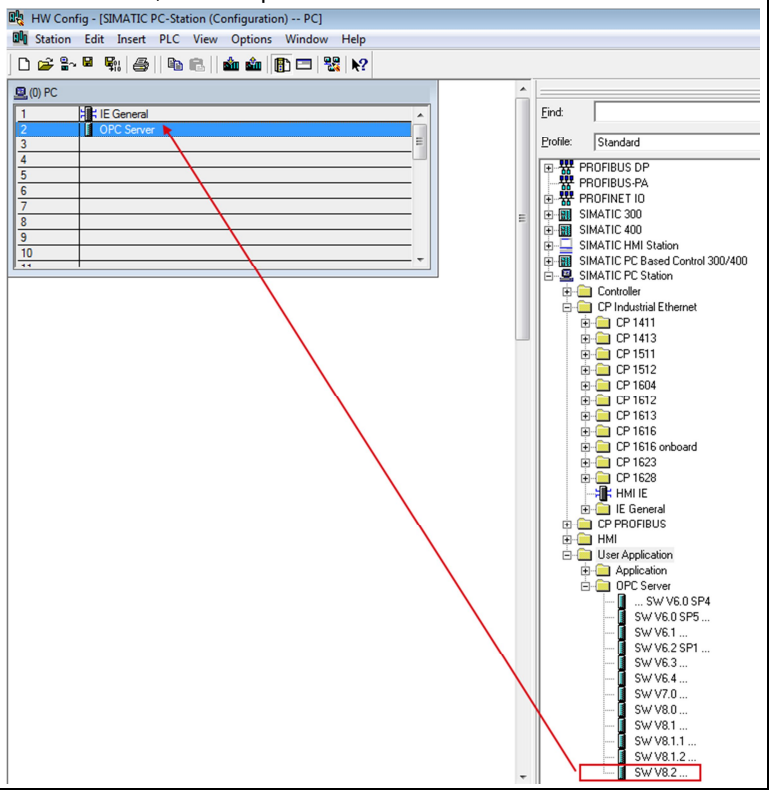
Double-click the "SIMATIC PC Station" object and then the "Configuration" object. The "HW Config" dialog open to edit the station configuration.

Figure 3-3



Use drag-and-drop to insert the modules below into the configuration table of the SIMATIC PC station, which represent the structure of the real PC. The modules are in the "Hardware Catalog" window under "SIMATIC PC Station".

Table 3-1

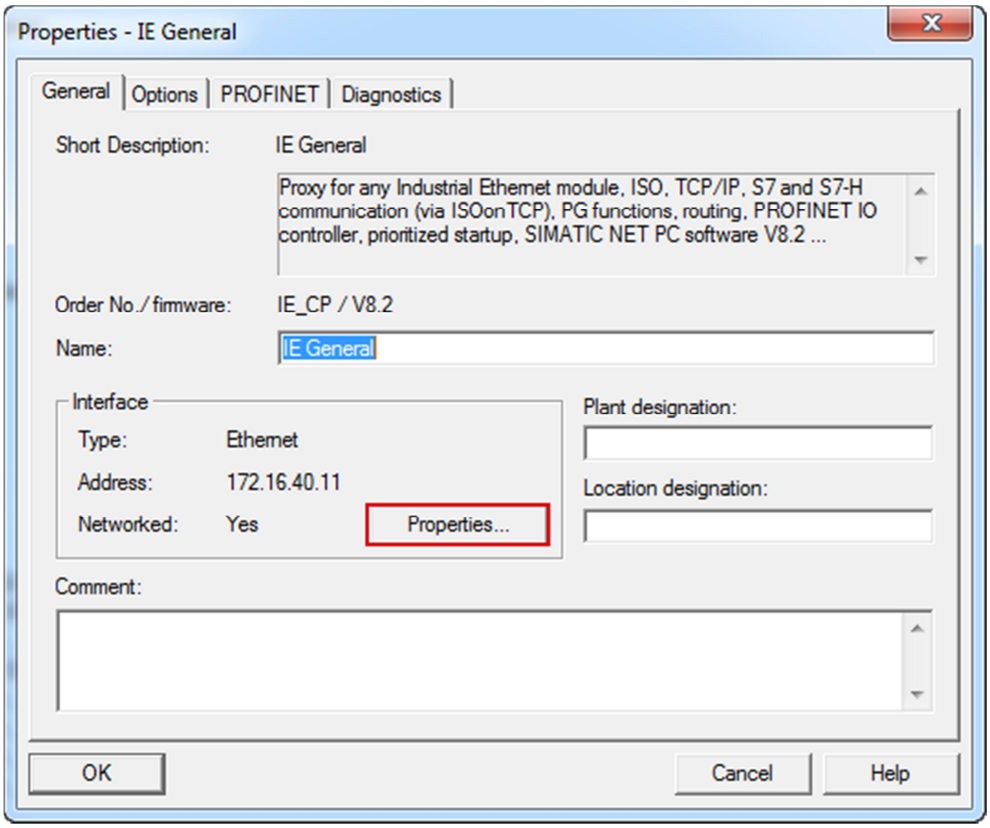
Component	Description
IE General	Because the SIMATIC PC Station is connected to the S7-1200 by means of an Industrial Ethernet network card, you insert the "IE General" module in the configuration table at Slot 1, for example. 
OPC server	In this example we use the SIMATIC NET OPC server so that an OPC client can access variables of the S7-1200 through a configured S7 connection. Insert the "OPC Server" module in the configuration table at Slot 2, for example. 

3.3 Defining the IP Address and Subnet Mask and Assigning the Subnet

Configure the IP address of the PC station in the hardware configuration.

In the configuration table you double-click the "IE General" module. The Properties dialog of the "IE General" module opens. In the "General" tab you click the "Properties" button. A dialog opens in which you enter the IP address and subnet mask of the network card and assign a subnet to the network card.

Figure 3-4

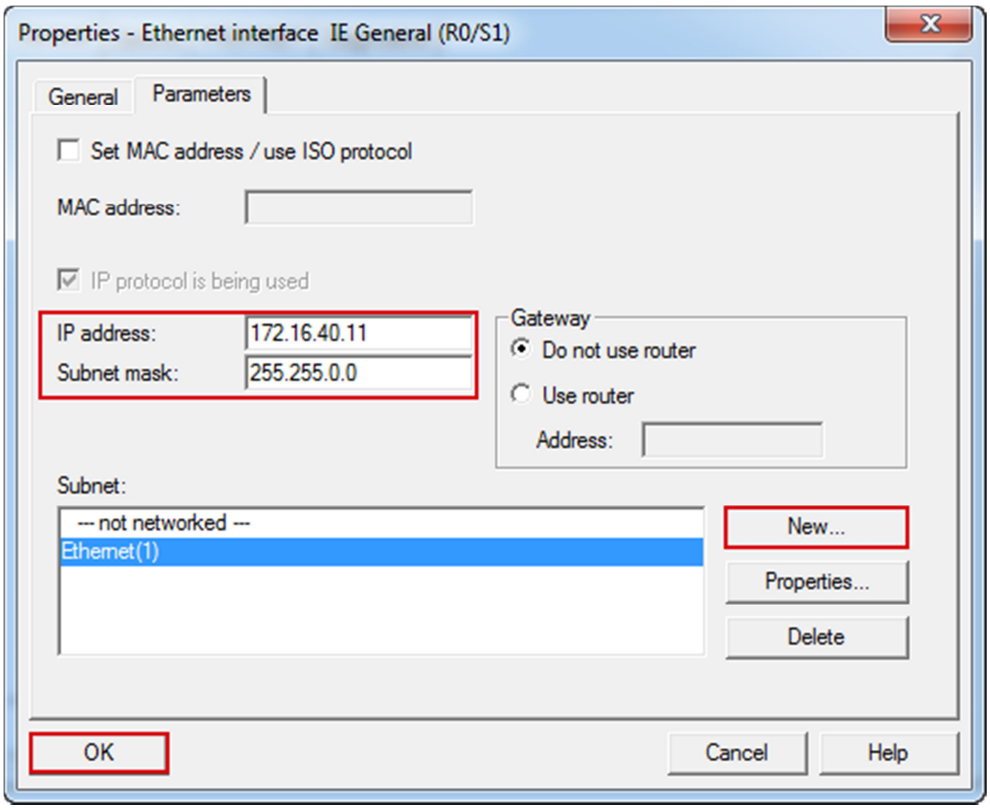


In this example you enter the IP address 172.16.40.11 and subnet mask 255.255.0.0 for the network card.

Click the "New" button to insert a new Ethernet subnet and select the newly created Ethernet subnet.

Click the "OK" button to transfer the IP address and subnet mask and assign the selected subnet.

Figure 3-5

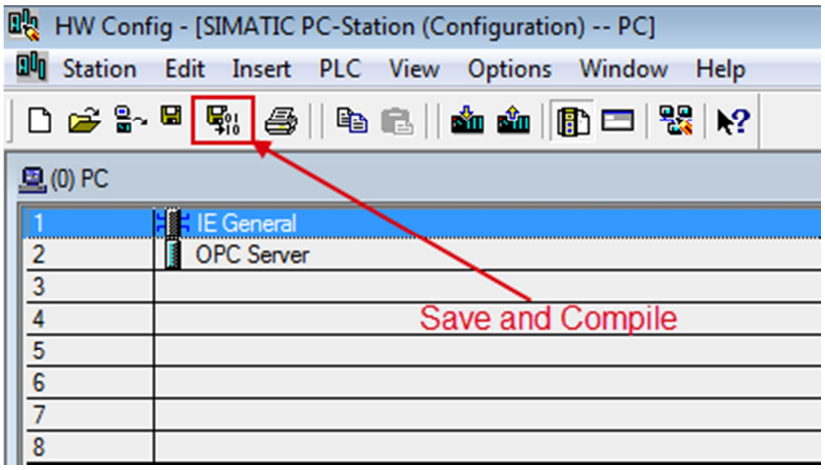


Note The IP address configured for the PC station in the hardware configuration of STEP 7 V5.5 SP3 must match the IP address set in Windows. If you are not using a router, the IP addresses of the PC station and the S7-1200 CPU must be in the same subnet.

In the hardware configuration you click the "Save and Compile" button. The configuration of the PC station is saved and compiled.

Close the hardware configuration.

Figure 3-6



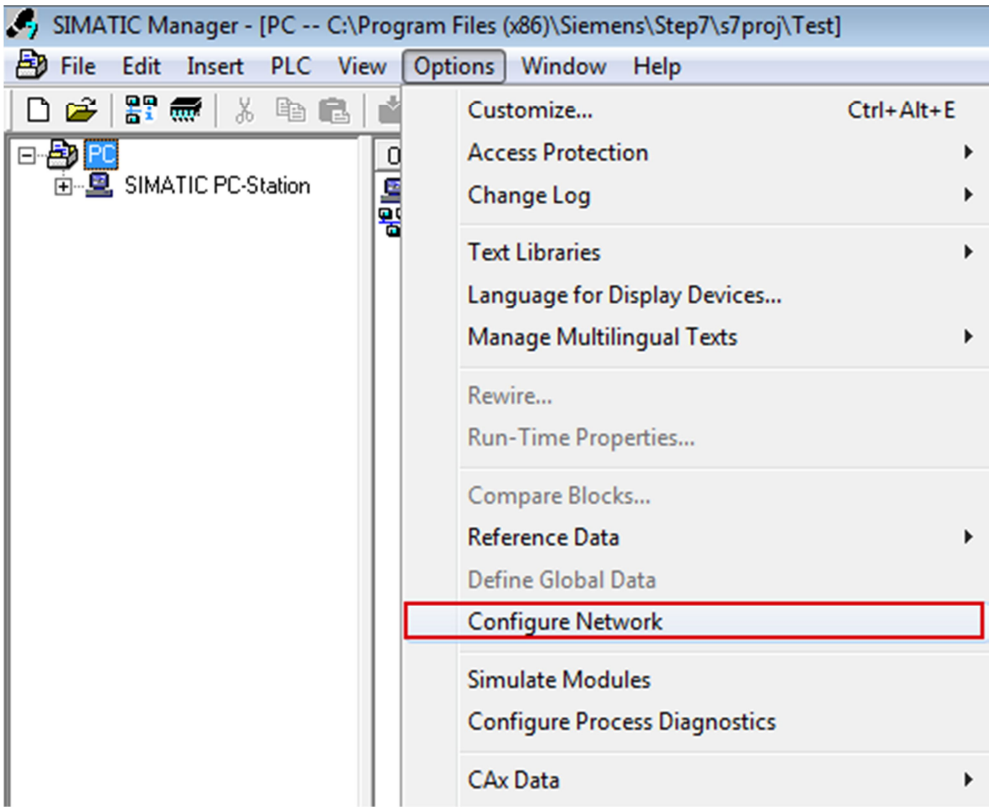
3.4 Configuring the S7 Connection

Open NetPro

You configure the S7 connection in NetPro.

In the SIMATIC Manager you open NetPro with the menu "Options > Configure Network".

Figure 3-7

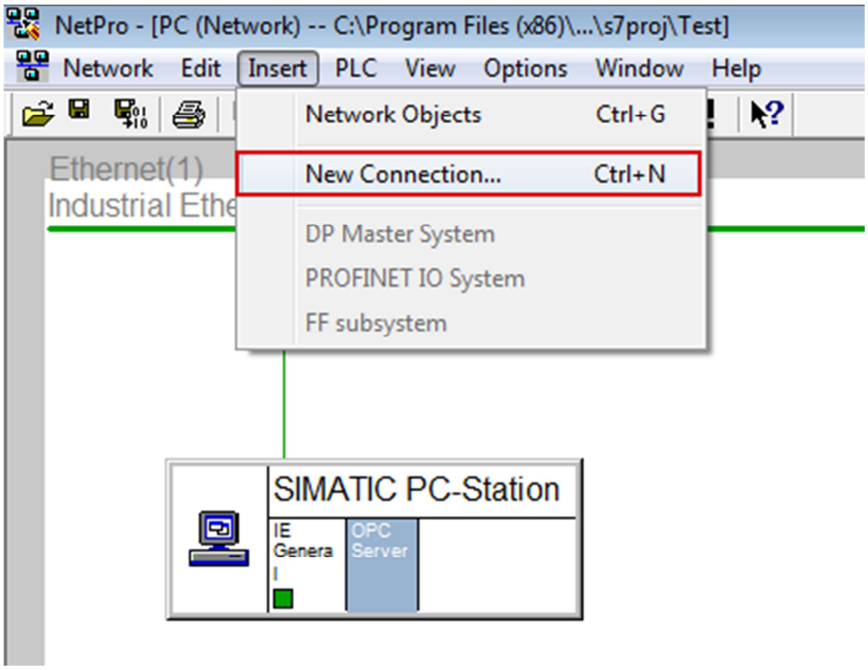


Configuring the S7 Connection

Mark the OPC server in the PC station.

In NetPro you select the menu "Insert > New Connection". The "Insert New Connection" dialog opens.

Figure 3-8

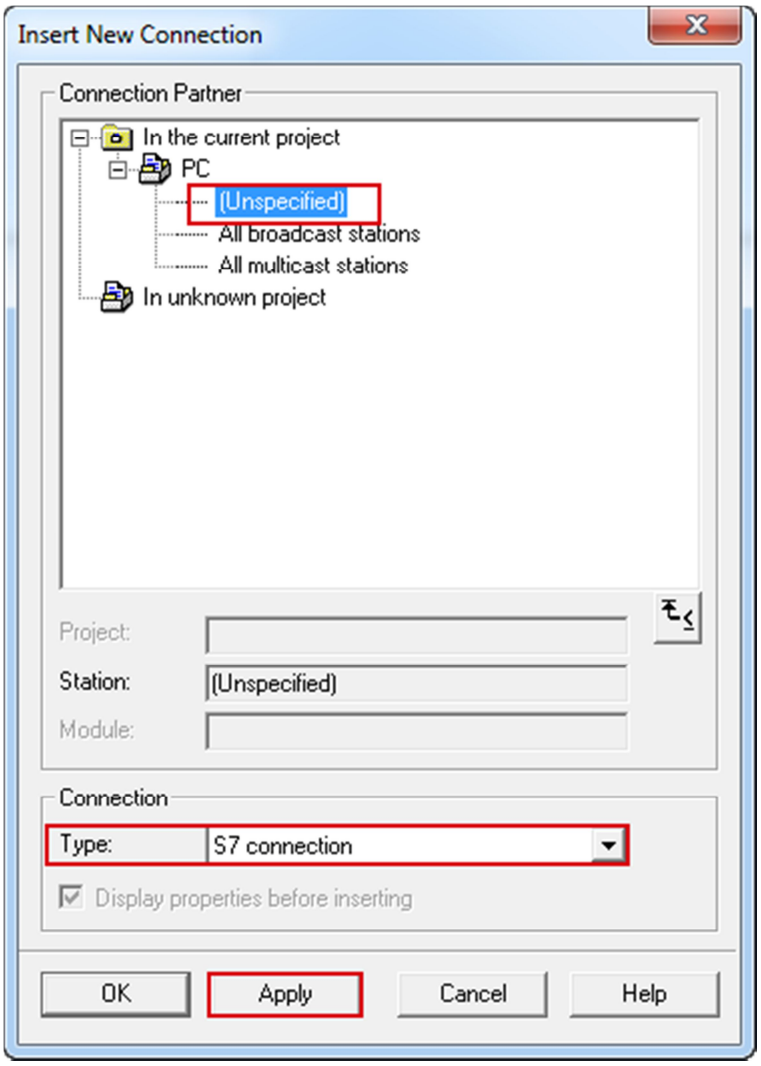


Under "Connection Partner" you select the "(Unspecified)" item, because the connection partner, the S7-1200 CPU, is not configured in the same project as the PC station.

Select "S7 connection" as the connection type.

Then click the "Apply" button to apply the connection partner and type settings. The Properties dialog of the unspecified S7 connection opens.

Figure 3-9

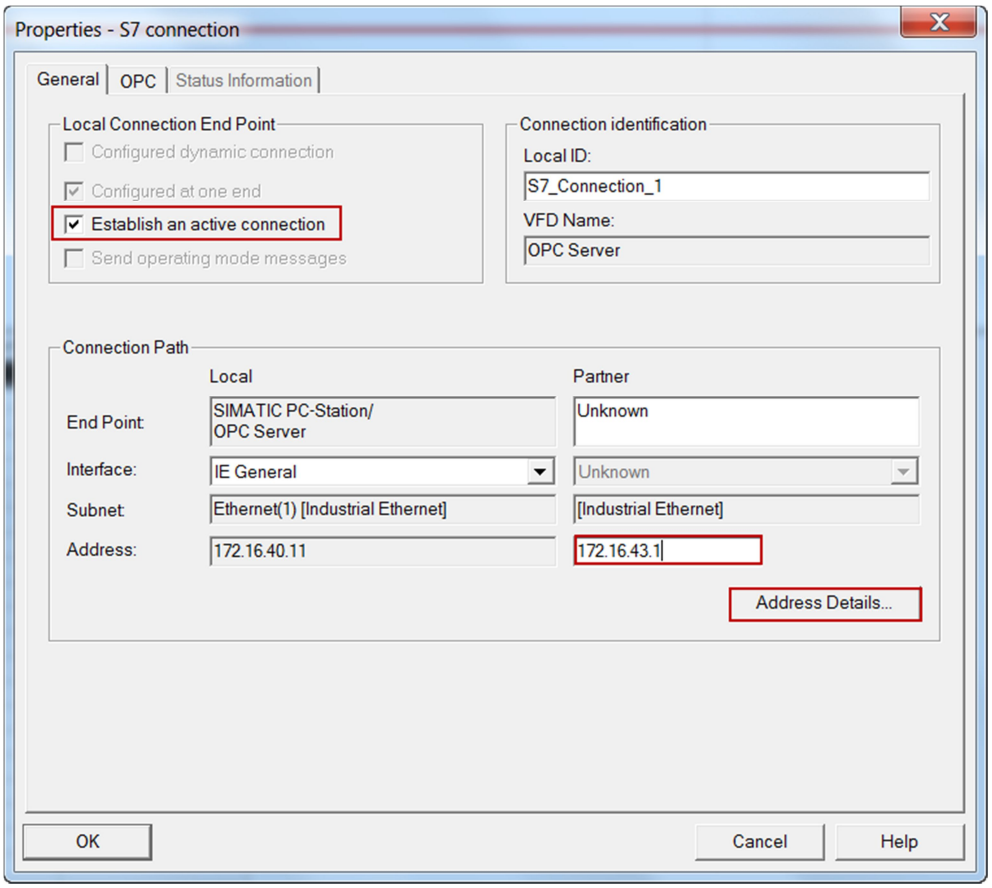


For the PC station to actively establish the unspecified S7 connection you enable the "Establish an active connection" option for the local connection end point.

You enter the IP address 172.16.43.1 of the S7-1200 CPU for the partner.

Click the "Address Details..." button. The "Address Details" dialog opens.

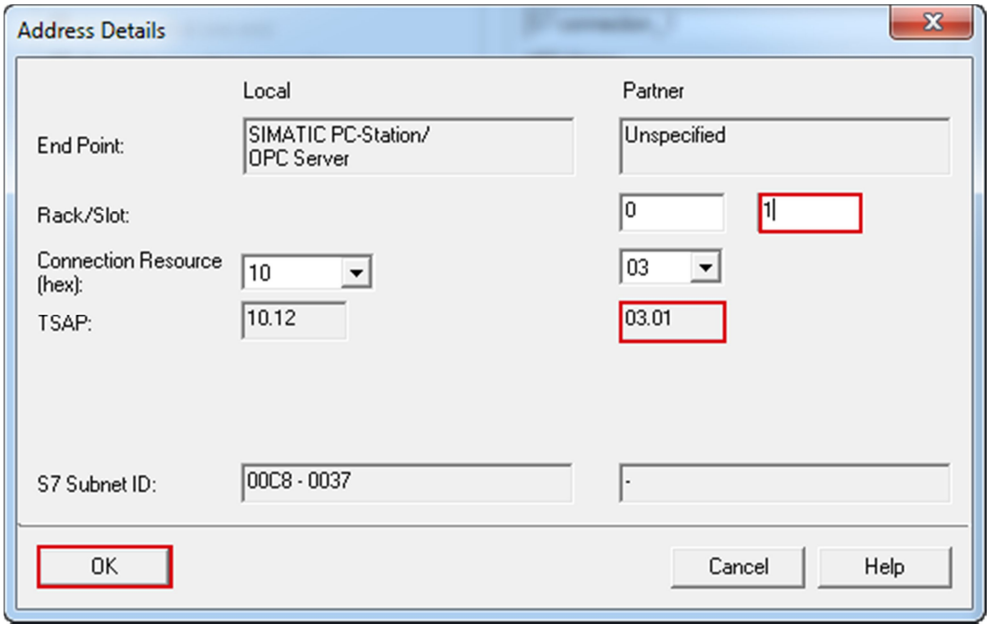
Figure 3-10



For the partner you enter the Slot 1 of the S7-1200 CPU. In this way the following TSAP is set for the partner: 03.01.

Close the "Address Details" dialog box with "OK".

Figure 3-11

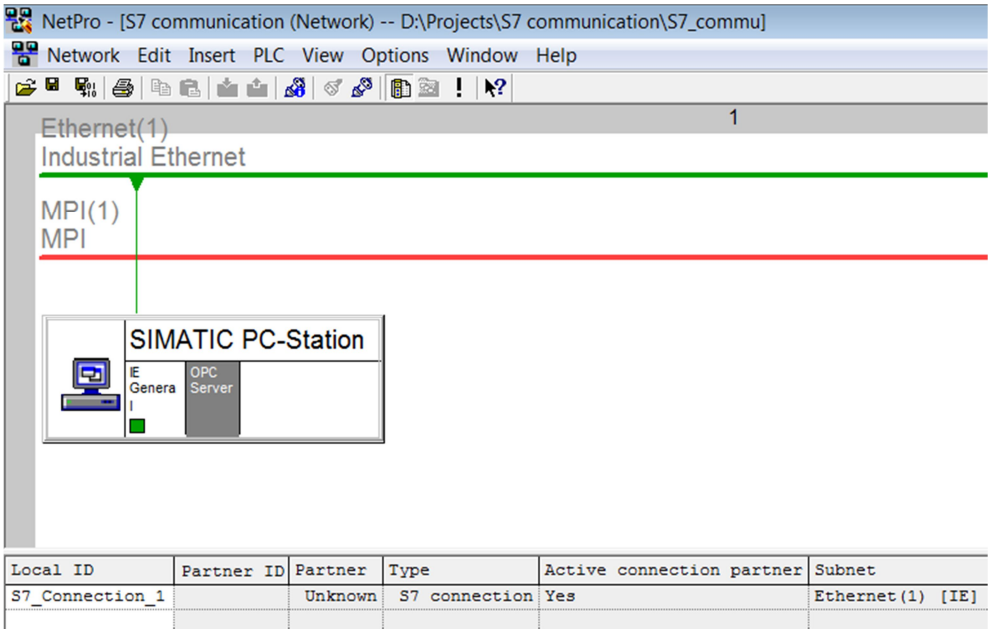


Click the "OK" button to close the Properties dialog of the S7 connection.

Click the "Close" button to close the "Insert New Connection" dialog.

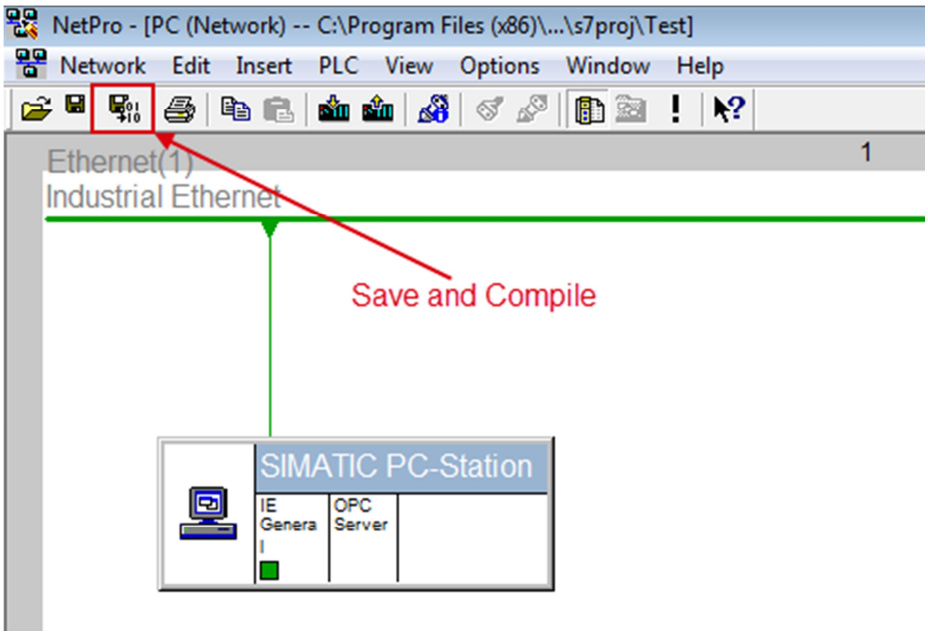
Mark the OPC server in the PC station. The inserted unspecified S7 connection is now displayed in the connection table.

Figure 3-12



In NetPro, you mark the PC station and click the "Save and compile" button. The configuration of the PC station including the connection configuration is saved and compiled.

Figure 3-13



3.5 Downloading the PC Station Configuration

3.5.1 Installing the Station Configuration Editor

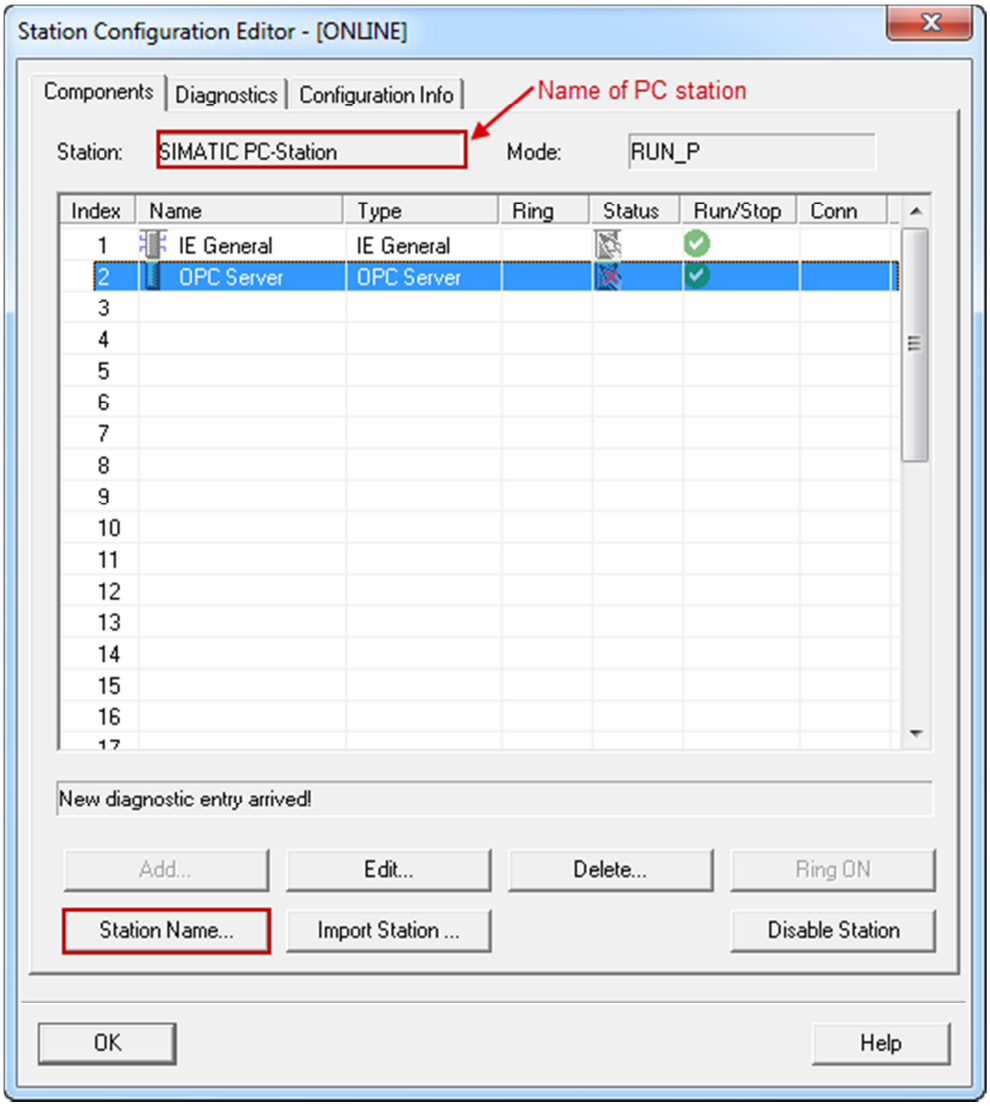
In Windows you select the menu "Start > All Programs > Siemens Automation > Station Configuration Editor" to open the Station Configuration Editor.

Enter the station name

Click the "Station Name..." button and in the "Station Name" dialog you enter the same name for the PC station as in the SIMATIC Manager.

The name of the PC station is displayed in the Station Configuration Editor. We use the name "SIMATIC PC Station" in this example.

Figure 3-14

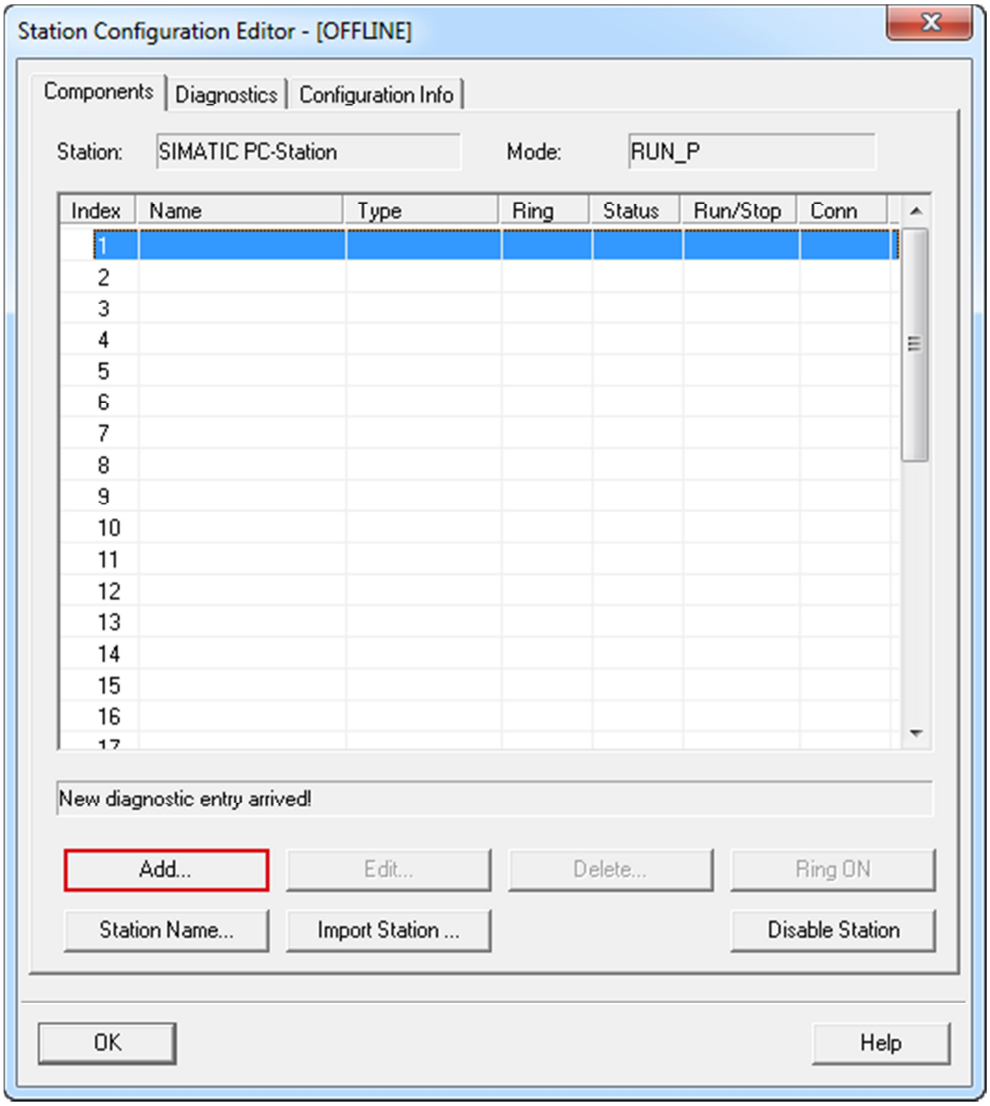


Insert modules

In the Station Configuration Editor you insert the modules in accordance with the hardware configuration of the PC station.

Click the "Add..." button. The "Add Component" dialog opens.

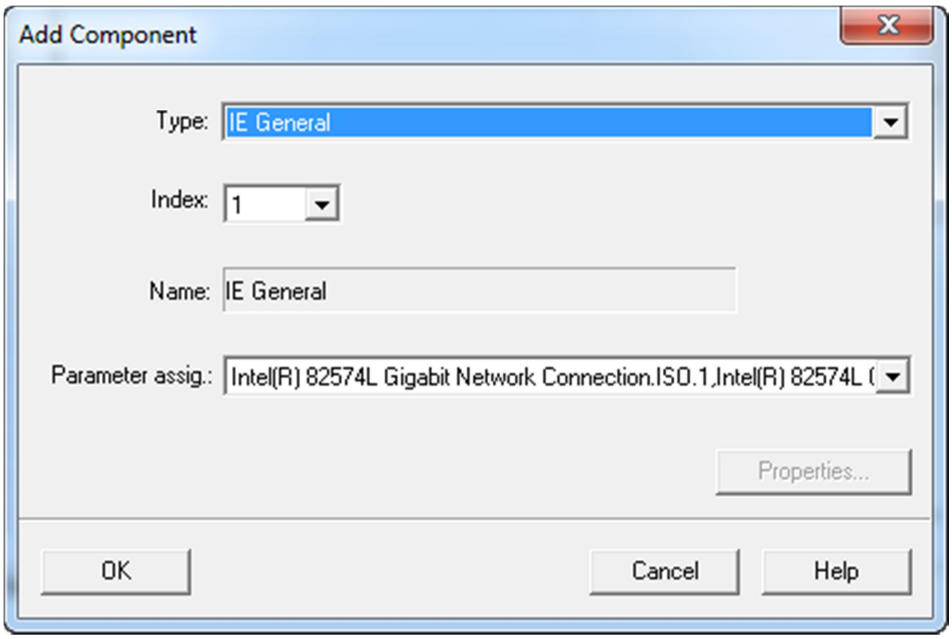
Figure 3-15



Select "IE General" for type and "1" for index to insert the "IE General" module at Slot 1.

Click "OK" to close the dialog box.

Figure 3-16

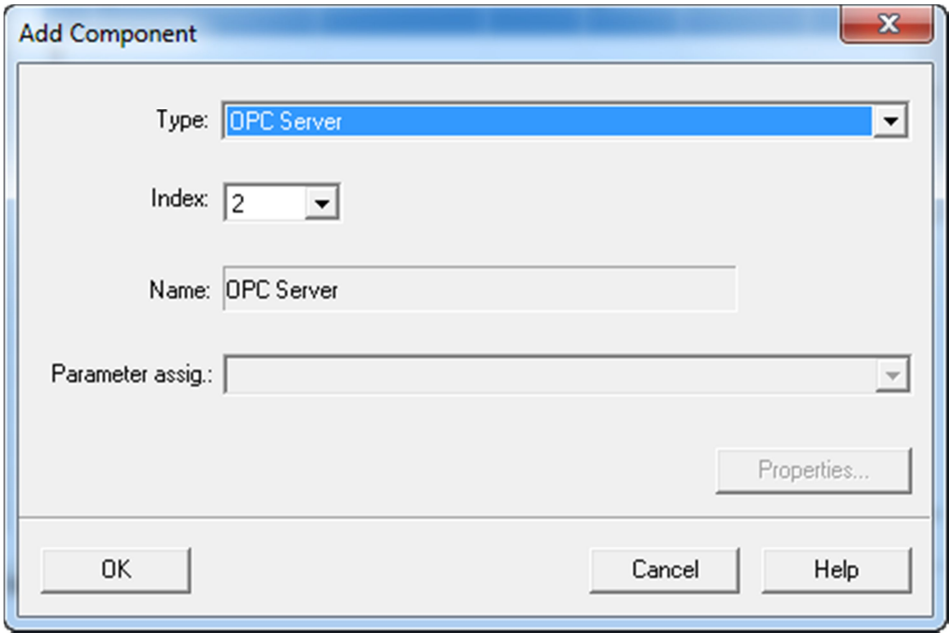


In the Station Configuration Editor you click the "Add..." button once again to insert another module. The "Add Component" dialog opens.

Select "OPC Server" for type and "2" for index to insert the "OPC Server" module at Slot 2.

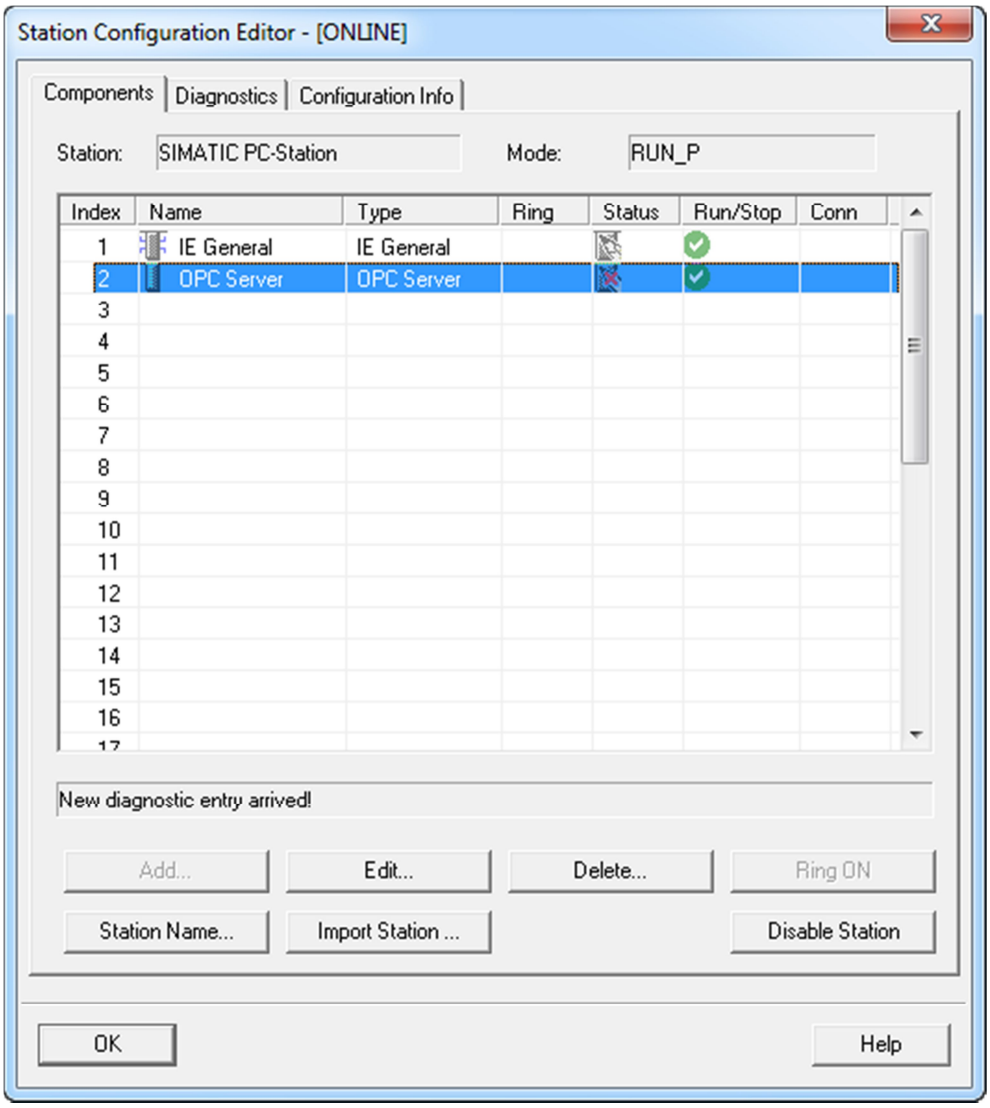
Close the dialog box with "OK".

Figure 3-17



The "IE General" and "OPC Server" modules must be inserted in the same slots in the Station Configuration Editor as in the hardware configuration of the PC station.

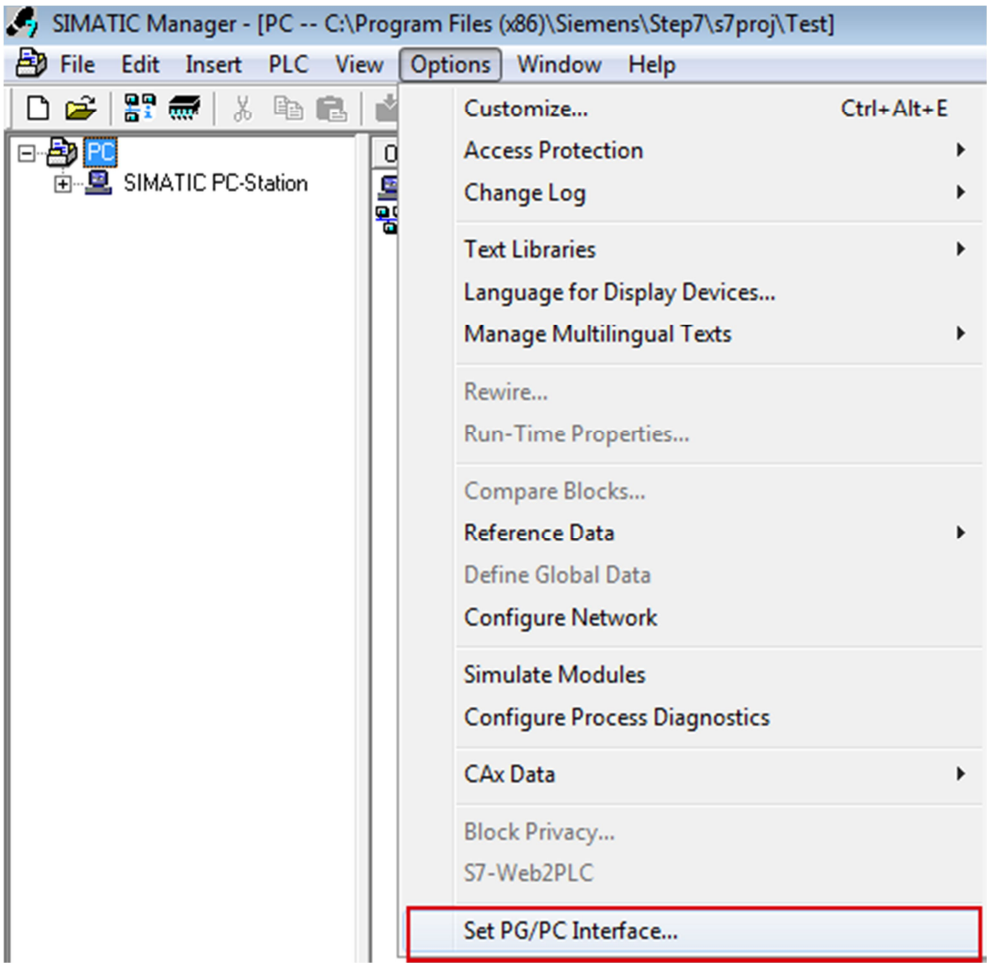
Figure 3-18



3.5.2 Setting the PG/PC Interface

In the SIMATIC Manager you use the menu "Tools > Set PG/PC Interface..." to open the "Set PG/PC Interface" dialog.

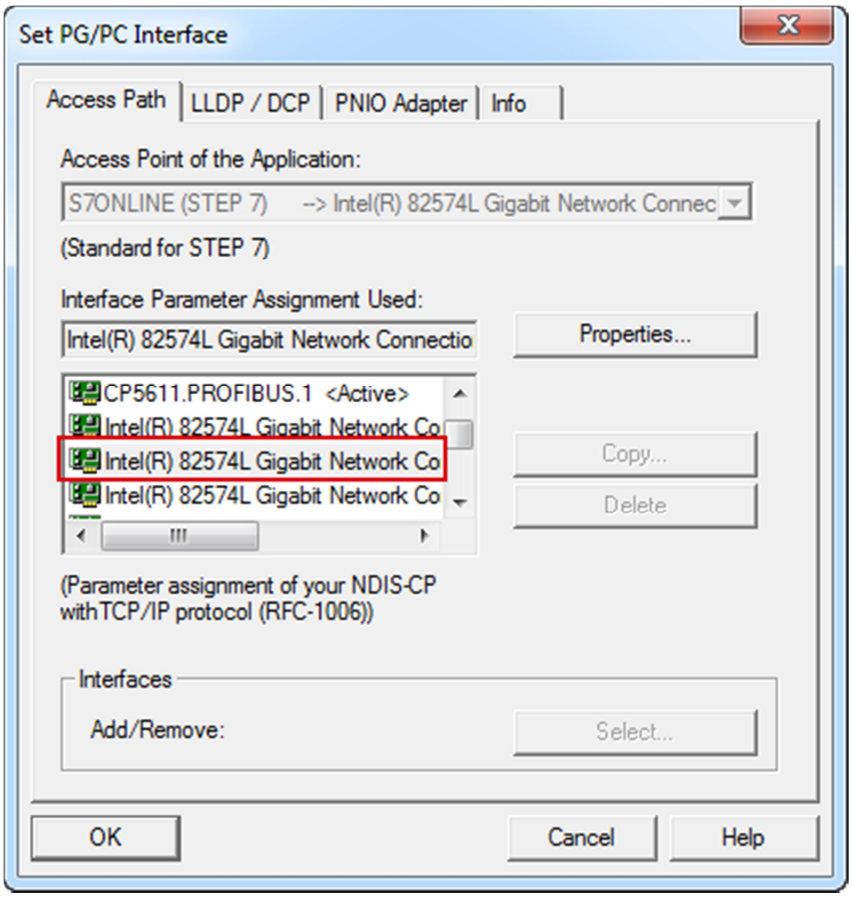
Figure 3-19



In the "Access Path" tab you parameterize the network card as the access point through which the PC station is connected with the S7-1200 CPU and can exchange data.

Click "OK" to close the dialog.

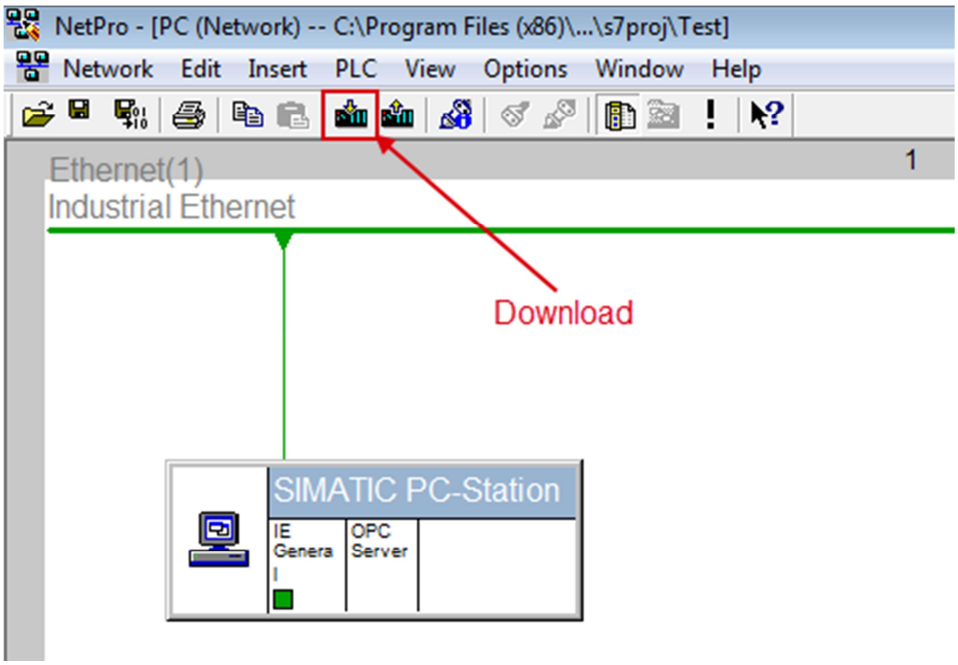
Figure 3-20



3.5.3 Downloading the PC Station Configuration

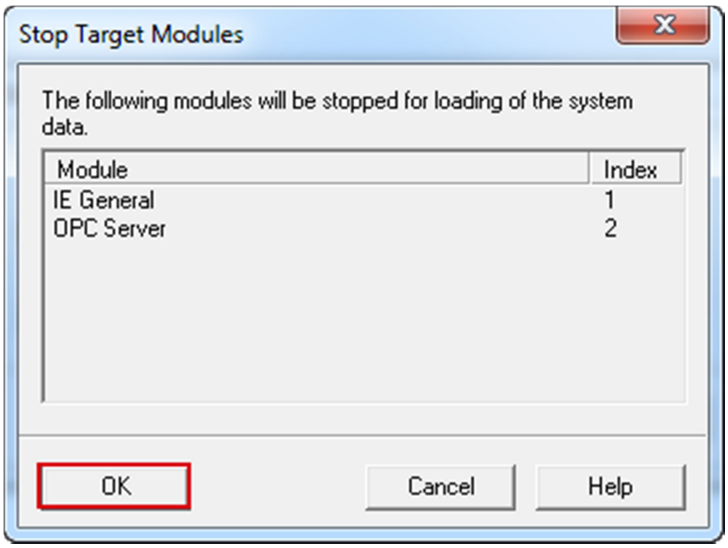
In NetPro, you mark the PC station and click the "Download" button. The configuration of the PC station including the connection configuration is downloaded into the Station Configuration Editor.

Figure 3-21



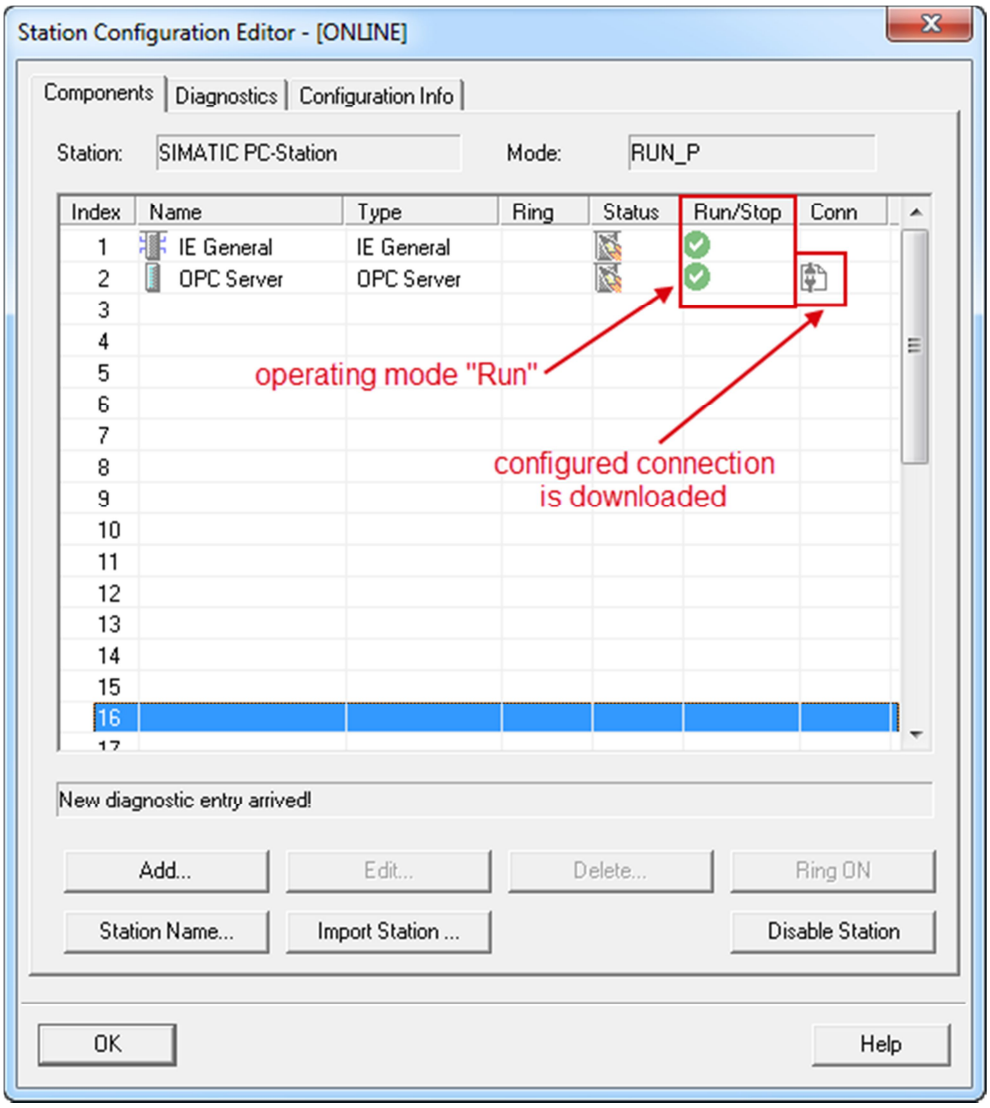
Acknowledge the subsequent message with "OK".

Figure 3-22



In the "Run/Stop" and "Conn" columns symbols show whether the "IE General" and "OPC Server" modules are in "Run" mode and the configured connection is downloaded.

Figure 3-23



4 OPC Scout V10

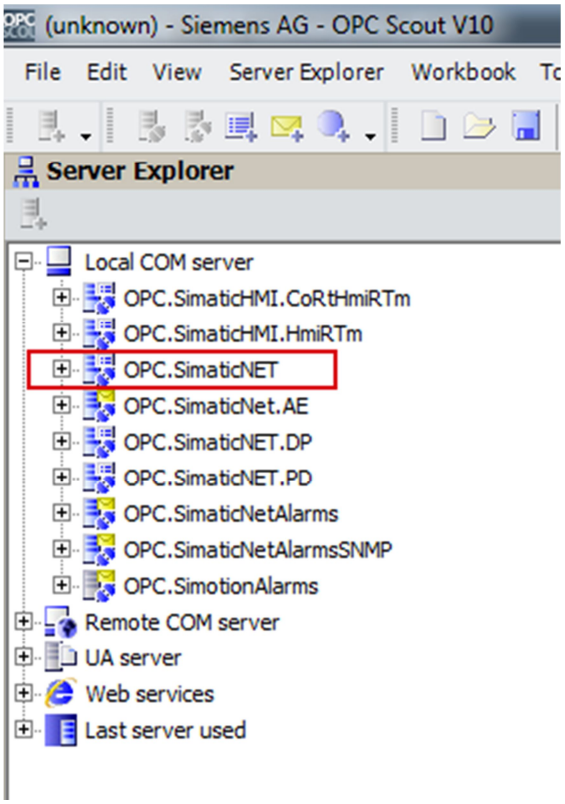
In this example the OPC Scout V10 is used as the OPC client. Using the OPC client you can access the data of the S7-1200 CPU over the OPC server.

Start the OPC Scout V10 by means of the Windows menu "Start > All Programs > Siemens Automation > SIMATIC > SIMATIC NET > OPC Scout V10".

Establish connection to the OPC server

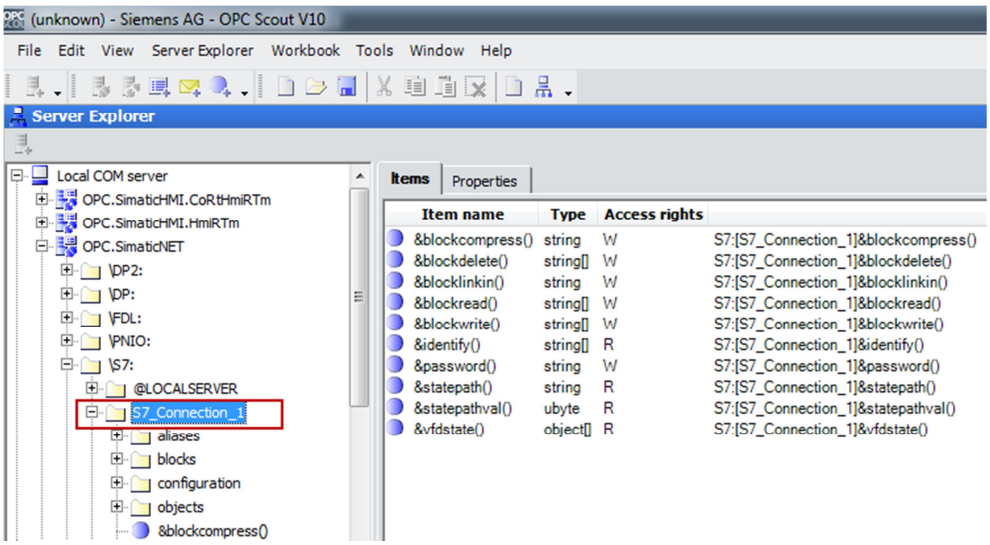
In the Server Explorer you double-click the "OPC.SimaticNET" item to establish a connection to the OPC server.

Figure 4-1



The configured S7 connection named "S7_Connection_1" is displayed in the Server Explorer under OPC.SimaticNET in the "\S7" folder.

Figure 4-2



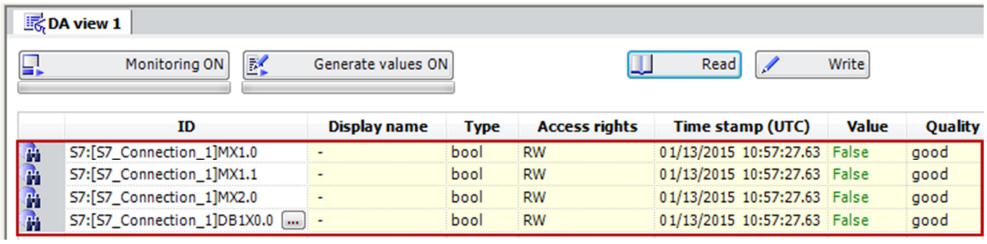
Create OPC items

Add the items below to the DA view.

Table 4-1

OPC item	Description
S7:[S7_Connection_1]MX1.0	By means of the OPC item you monitor and control the marker bit M1.0 in the S7-1200 CPU.
S7:[S7_Connection_1]MX1.1	By means of the OPC item you monitor and control the marker bit M1.1 in the S7-1200 CPU.
S7:[S7_Connection_1]MX2.0	By means of the OPC item you monitor the marker bit M2.0 in the S7-1200 CPU.
S7:[S7_Connection_1]DB1, X0.0	By means of the OPC item you monitor Bit 0.0 of the DB1 data block in the S7-1200 CPU.

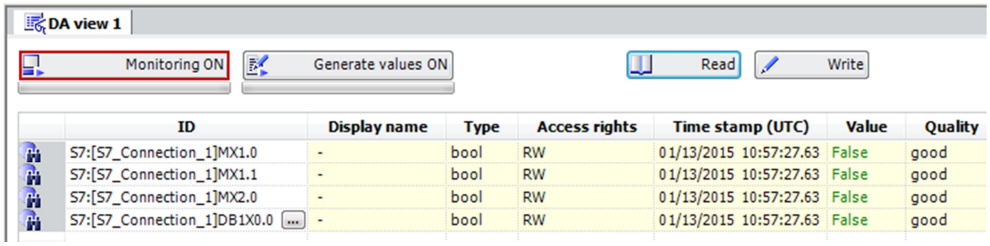
Figure 4-3



Monitor OPC items

Click the "Monitoring ON" button to monitor the values of the OPC items. The values of the OPC items are displayed in the "Value" column.

Figure 4-4



Write values

In the "New value" column you enter the value that you want to write to the S7-1200 CPU.

Enter the values below in the "New value" column (see Table 4-2).

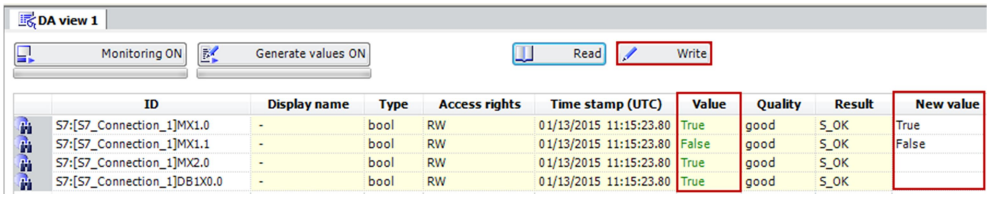
Click the "Write" button. The marker bit M2.0 and Bit 0 in DB1 are given the value "True".

The results of the write procedure are displayed in the "Value" column.

Table 4-2

OPC item	Value
S7:[S7_Connection_1]MX1.0	True
S7:[S7_Connection_1]MX1.1	False

Figure 4-5



Enter the values below in the "New value" column (see Table 4-3).

Click the "Write" button. The marker bit M2.0 and Bit 0 in DB1 are reset to the value "False".

The results of the write procedure are displayed in the "Value" column.

Table 4-3

OPC item	Value
S7:[S7 connection_1]MX1.0	False
S7:[S7 connection_1]MX1.1	True

Figure 4-6